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Haematological Parameters as Screening Markers in Upper Gastrointestinal Malignancies

Naveen P.G.¹, K Veena L Karanth²

¹Assistant Professor ²Associate Professor, Department of Surgery, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Udupi, Karnataka 576104, India.

Abstract

Upper gastrointestinal cancers i.e. Esophageal and gastric cancers are common cancers worldwide and prognosis remains poor. In recent years, hematological parameters are being studied as prognostic indicators for various cancers. There are not many studies on these hematological parameters as screening markers in different cancers. So we conducted a retrospective single center study to evaluate if these blood parameters can be utilized as screening markers for upper GI malignancies.

Aims & objectives is to determine if blood parameters are significantly different in patients with upper gastrointestinal malignancies as compared to control cases.

Hundred (100) cases of upper GI malignancy and equal number of control - age, gender matched to cases without malignancy or infection was included. Both groups evaluated with routine complete blood count and upper GI endoscopy are included. Hematological parameters like hemoglobin, neutrophils and lymphocyte count, Platelet count (PC), mean platelet volume, MPV/PC ratio, red blood cell distribution width (RDW), neutrophil to lymphocyte ratio (NLR), and platelet to lymphocyte ratio (PLR) were calculated and compared to look for statistical difference.

Results proved that blood parameters are statistically different in cases (upper gastrointestinal malignancy) versus controls.

We conclude that hematological parameters can be utilized as a screening markers in upper GI malignancies.

Keywords: upper gastrointestinal malignancy, hematological parameters, neutrophil / lymphocyte ratio, platelets / lymphocyte ratio, screening markers.

Introduction

Cancers of the esophagus and stomach are associated with high mortality with poor prognosis, as most of these malignancies are diagnosed in late advanced stages. The majority of these neoplasms are detected at an advanced stage due to the insidious nature of the onset of symptoms and their similarity in early stages to benign causes of dysphagia and dyspepsia [1]. Esophageal cancer sixth leading cause of death from cancer worldwide. Gastric cancer is the sixth leading cause of malignancy and the eighth leading cause of death from cancer [2]. In India, Esophageal cancer is also the fourth most common cause of death [3]. Constant exposure to the irritants induce chronic inflammation, which results in the development of gastric cancer [4]. For example, in chronic infection of the gastric mucosa with H pylori, there is generation of inflammatory molecules. In most of the individuals, constant production of anti-inflammatory molecules prevent the formation of gastric cancer. However, inflammatory molecules are produced in larger quantities than anti-inflammatory effect of warding off the infection. Prolonged and repeated infections leads to exposure of normal mucosa to high concentrations of inflammatory molecules, which is a major reason for the causation of cancer [5]. The inflammatory response is initiated by raising white blood cells.
either locoregionally or systemically. The same has been seen in a pro-inflammatory bed of tumorigenesis. Chronic inflammation predisposes to tumor formation and tumor in-turn obtains the ability to activate various leukocytes. It activates T cells, specific chemokines and prostaglandins which reciprocate by inducing neutrophils and monocytes [6]. The pro-inflammatory state contributes to tumor growth, progression and metastasis [7]. These biomarkers are found in blood and hence forms an easily accessible parameter for assessment of diagnosis and prognosis.

Platelet/lymphocyte ratio (PLR) refers to the number of platelets to lymphocytes, platelets have cancer promoting and lymphocyte have cancer fighting roles in blood. Platelets are involved in hemostasis but also has role in cancer progression and metastasis. They can promote cancer cell extravasation via release of metalloproteases and tumor angiogenesis and growth at the metastatic site through release of angiogenic factors, platelet-derived growth factor (PDGF), and vascular endothelial growth factor (VEGF),[8] which enables tumor growth and metastatic spread. Platelets also protect tumor cells from killer T-cell-mediated cytolysis [9]. In a symbiotic manner, cancer cells promote a platelet count increase by release of thrombopoietic cytokines and their activation through platelet agonists [10-11].

Lymphocytes plays significant role in tumor defense by inducing cytotoxic death and inhibiting tumor cell proliferation and migration [12-13]. The PLR has been shown to have predictive value in assessing the presence and progression of cancer and the response to drug therapy [14].

Neutrophil/lymphocyte ratio (NLR) refers to number of neutrophils to lymphocytes. Neutrophils interact with cancer cells, and produce cytokines and effector molecules like VEGF that stimulate tumor angiogenesis, growth, and metastasis [15].

Materials and Methods

The study was performed at a tertiary care hospital in southwest of Karnataka, India. It’s a retrospective single centre study. A total number of two hundred medical records were included in study presented from October 2015 to October 2018. Institutional ethical committee approval was taken, with no proposed funding source and no conflict of interests. Inclusion Criteria: 100 cases of Upper Gastrointestinal malignancy including esophageal, Gastro-Esophageal junction, and stomach carcinoma are selected as Cases. For each case - Age, gender, data regarding the location of malignancy, TNM stage of the disease, complete blood count values and upper gastrointestinal endoscopy findings and histopathology reports were noted. Exclusion Criteria: patients with altered liver/ renal function test or with active form of infection are excluded.

Equal number Control were selected. The upper GI endoscopy register was scanned for age and gender matched to Cases. And chosen as Control if their UGI endoscopy was normal, Did not suffer from hypertension, diabetes mellitus, hepatic or renal failure, hyperlipidemia, and autoimmune disease and were not on antiplatelet drugs but had undergone evaluation for complete blood counts. Hemoglobin, Differential count, Platelet count (PC), mean platelet volume (MPV), MPV/PC ratio, red blood cell distribution width (RDW), neutrophil to lymphocyte ratio (NLR), platelet to lymphocyte ratio (PLR), Lymphocyte to monocyte ratio (LMR) were calculated.

Data was processed using SPSS software, to compare and analyze between cases and control groups and looked for statistical significance (p value <0.05). Data was further evaluated with Receiver operating curve analysis to obtain optimal cut off values.

Results

Majority of our study group patients belong to late middle age and elderly individuals, about 64% of patients belong to 50 – 70 years age group. About 68% of them were Males and 32% were Females, 24% had esophageal malignancy, 10% had GE junction malignancy and 66% had stomach malignancy. About 18% of patients belong to stage-2 disease, 36% had stage-3 disease and remaining 46% had stage-4 disease.

Statistical analysis of Cases (Group 1) and Control (Group 0) groups are shown in Table 1. Statistical difference with p value <0.05 was noted with Hemoglobin, neutrophil, lymphocyte, Platelet count, MPV, MPV/PC, RDW, NLR, PLR.

There was no statistical significance with blood variables like monocyte, LMR in our study group though some studies have described statistical significance in their study. Stage wise data analysis with Dunetts t- test proved that hematological parameters worsens as stage advances results tabulated in Table 2, Table 3. To obtain optimal cut off values for above hematological parameters,
Receiver operating curve analysis was done. Results shown in Figure 1. Optimal cut off values and sensitivity and specificity with AUC were summarized in Table 4.

### Table 1: Group 1- cases with UGI malignancy, Group 0- controls. N- Number of patients.

<table>
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<tr>
<th>Blood Parameters</th>
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<th>Mean</th>
<th>Std. Deviation</th>
<th>Sig. (p value)</th>
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<tr>
<td></td>
<td>0</td>
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<td>57.21</td>
<td>12.04</td>
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<tr>
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<td>20.91</td>
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<tr>
<td></td>
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<td>8.91</td>
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<tr>
<td>Monocyte</td>
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<td></td>
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### Table 2: Stage Wise Comparision: Group 0- controls, Group 2- stage II, Group 3- stage III, Group 4- stage IV, N- number of patients.

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Table 3: Stage Wise Comparision: Group 0- controls, Group 2- stage II, Group 3- stage III, Group 4- stage IV, N- number of patients.

<table>
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<th>Group</th>
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<td>N 200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation 12.095474</td>
<td>74977.274</td>
<td>0.0000138</td>
</tr>
</tbody>
</table>

Fig. 1: ROC Analysis

Table 4: Optimal Cut off Values

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cut off Values</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Area Under Curve (Auc)</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDW</td>
<td>14.5</td>
<td>0.70</td>
<td>0.89</td>
<td>78%</td>
<td>0.72-0.85</td>
</tr>
<tr>
<td>Neutrophils/ Lymphocytes</td>
<td>2.3</td>
<td>0.75</td>
<td>0.65</td>
<td>73%</td>
<td>0.73-0.87</td>
</tr>
<tr>
<td>Platelets/Lymphocyte</td>
<td>117.3</td>
<td>0.70</td>
<td>0.71</td>
<td>82%</td>
<td>0.73-0.77</td>
</tr>
<tr>
<td>MPV/Platelets</td>
<td>0</td>
<td>0.66</td>
<td>0.76</td>
<td>70%</td>
<td>0.63-0.77</td>
</tr>
</tbody>
</table>

Discussion

Mean hemoglobin value in group 1 was 10.3 g/dl as compared to group 0 which is 13.3 g/dl so patients with upper GI malignancy had low hemoglobin levels. Mean value of RDW in group 1 was 17.24 as compared to group 0 which is 13.74, normal range from our institute laboratory for RDW is 11.5 to 14. Hence, RDW values were elevated in patients with Upper GI malignancy above normal range but in control group it was well within normal range. Neutrophil and lymphocyte counts were
both statistically significant, neutrophil counts showed an increasing trend and lymphocyte count decreasing trend in patients with upper GI malignancy as compared to control group. Platelet count was also statistically significant and showed an increasing trend. MPV showed decreased values in Group 1 than Group 0. MPV/PC showed decreased values in Group 1, NLR and PLR were elevated in patients with upper GI malignancy. Though LMR showed an increasing trend in patients with upper GI malignancy there was no statistical significance between group 0 and group 1 in our study. However a study by Deng Q et al. [16] on Gastric carcinoma LMR was statistically significant and was elevated.

On comparison of different Stages, noticed that blood parameters worsens as stage advances. Mean Hemoglobin in stage II was 10.5 g/dl in stage III- 9.9 g/dl and in stage IV- 10.5 g/dl. Mean RDW in Stage II-16.01, Stage III– 18.37. Mean Platelet counts showed increasing values as disease Stage advanced. Whereas MPV and MPV/PC showed further more decreasing values as disease stage advanced in comparison to control group. Mean PLR and NLR were also increasing as disease stage advanced. In control group mean PLR- 96.04 and NLR-2.31. In Stage II it was 247.24 and 5.9, PLR and NLR respectively. In Stage IV values were significantly elevated in comparison to control and stage II i.e., 452.09 and 8.46, PLR and NLR respectively.

On ROC curve analysis in our study we found optimal cut off values for RDW- >14.5, NLR >2.3, PLR >117.3.

These hematological parameters have been studied in several other malignancies including Gastric carcinoma. In a study by Aizawa et al.[17], on Gastric malignancy, with preoperative evaluation on 264 patients, obtained optimal cut offs as NLR > 3.2, Hemoglobin < 13 g/dl, Platelet count > 250 K/μL, CRP > 1 mg/dL, albumin< 35 g/L.

Deng et al. [16] study on Gastric carcinoma with preoperative evaluation on 385 patients showed NLR > 2.36, dNLR> 1.85, PLR > 132, LMR > 4.95.

Pre-surgery study by Kim et al. [18] on Gastric malignancy with 1,986 as sample size presented optimal cut offs as NLR > 2, PLR > 126. In our study Hemoglobin was lower in the Upper GI malignancy group as compared to control with a mean value of 10.3 g/dl, neutrophil counts was marginally higher, Lymphocyte count was low, Platelet counts was high, as compared to control group. NLR >2.3, PLR >117.3, RDW >14.5, but MPV/PC values were so small, almost equal to zero, so we ignored it.

Conclusion

In our study we found statistical significance in most of the hematological parameters, which are altered in patients with upper GI malignancies. As hematological parameters plays significant role in onset, progression and metastasis of malignancies. Including them as screening markers in diagnosis upper gastrointestinal malignancy cases adds on to increased sensitivity of disease diagnosis. Using NLR >2.3 and PLR > 117 and observing varying trends in blood parameters such as neutrophils, lymphocyte, platelets, MPV, MPV/PC in patients with specific or nonspecific symptoms of upper GI malignancy helps in better, early and easy diagnosis and better survival. Since these hematological parameters worsens as disease Stage advances, so it also proposes prognostic significance, and helps treating physician for better decision making in managing (surgery/chemoradiotherapy) these patients with advanced upper GI malignancies.

References


Risk Factors Responsible to Surgical Site Infections Following Emergency non – Traumatic Exploratory Laparotomy

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Abstract

Background: Multiple risk factors and perioperative characteristics can increase the likelihood of superficial surgical site infections. Research has shown that patient factors, surgical techniques, skin preparation, timing and method of wound closure are significant factors that can influence the incidence of subsequent infection. Keeping the facts in the mind, the present study was undertaken to determine the various risk factors to SSI. Material and methods: The present study is hospital based observational study conducted over period of two year. Patients admitted in surgical ward requiring Emergency non traumatic exploratory laparotomy were included in the study. After admission, short history and physical examination was conducted on each patient admitted in General surgery with acute abdomen. Patients requiring emergency laparotomy and fulfilling the inclusion criteria were offered to participate in the study. All the traumatic cases were excluded from the study. Result: Surgical Site Infections, though can be found at any age, high incidence was seen in the 4th, 5th, 6th decades of life. Most of the infections were noticed between 4th – 8th postoperative days. SSI was high in patients with co-morbidities. Conclusion: It can be concluded from the findings of the study that microorganisms that are normal inhabitants of our body are mainly responsible for surgical site infection (SSI). Proper care of the patients as a whole throughout the peri-operative period is very vital to reduce the rate of surgical site infection. Strict adherence to aseptic wound dressing techniques should be enforced during each procedure to reduce the SSIs.

Keywords: Risk factor; surgical site infection; Type of operation; Co-morbidity.

Introduction

Surgical site infections are one of the commonly encountered complications after surgery. They cause pain and inconvenience to patients resulting in prolonged hospital stay and may be potentially fatal at times. The infection of a wound can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defenses, leading to cellulitis, lymphangitis, abscess and bacteremia [1]. Surgical site infections and its management are cumbersome to both patient and health facilities.

Surgical Site Infections (SSIs), previously called post-operative wound infections, result from bacterial contamination during or after a surgical procedure. Surgical site infections are the third most common hospital associated infection, accounting for 14-16 per cent of all infections in hospitalized patients [2]. Despite every effort to maintain asepsis, most surgical wounds are contaminated to some extent. However infection rarely develops if contamination is minimal, if the wound has been made without undue injury, if the subcutaneous tissue is well perfused and well oxygenated and if there is no dead space. The criteria used to define surgical site infections have been standardized and described three different anatomic levels of...
infection: superficial surgical site infection restricted to skin and subcutaneous tissue, deep surgical site infection involving fascia and muscle layers and organ / space surgical site infection associated with the body organs and body spaces [2,3].

According to the degree of contamination wounds may be classified as clean, potentially contaminated, contaminated, and dirty [4]. The incidence of infection, morbidity and mortality increases from clean to dirty. The risk of infection is greater in all categories if surgery is performed as an emergency [5]. The risk of wound infection is influenced but not entirely determined by the degree of contamination.

Multiple risk factors and peri-operative characteristics can increase the likelihood of superficial surgical site infections. Important host factors include diabetic mellitus, hypoxemia, hypothermia, leucopenia, nicotine, long term use of steroids or immunosuppressive agents, malnutrition, nares contaminated with Staphylococcus aureus and poor skin hygiene. Peri-operative / environmental factors are operative site shaving, breaks in operative sterile technique, early or delayed initiation of antimicrobial prophylaxis, inadequate intra-operative dosing of antimicrobial prophylaxis, infected or colonized surgical personnel, prolonged hypotension, poor operative room air quality, contaminated operating room instruments or environment and poor wound care postoperatively [3].

Wound infections usually appear between fifth and tenth post – operative day, but they may appear as early as first post – operative day or even years later. The first sign is usually fever, and post – operative fever required inspection of the wound. The patient may complain of pain at the surgical site. The wound rarely appear severely inflamed, but edema may be obvious because the skin sutures appear tight [3].

Advances in the control of infection in surgery have occurred in many ways, such as, aseptic operating theatre techniques have replaced toxic antiseptic techniques, antibiotics have reduced post – operative infection rates, and delayed primary or secondary closure remains useful in contaminated wounds. When enteral feeding is suspended during the peri – operative period, and particularly with underlying disease such as immunosuppression, cancer, shock or sepsis bacteria tend to colonize the normally sterile upper gastrointestinal tract. They may then translocate to the mesenteric lymph nodes and cause the release of endotoxin, which further increases the susceptibility to infection and sepsis, through activation of macrophages and pro-inflammatory cytokine release. The use of selective decontamination of the digestive tract (SDD) is based on the prevention of this colonization [6].

According to the sources, Surgical Site Infections may be classified into two types, primary and secondary or exogenous. Primary infections are those acquired from community or endogenous source. Secondary or exogenous infections are acquired from operating theatre or the ward or from contamination at or after surgery. According to severity, surgical site infections can be divided into two types, major and minor. Criteria of major SSI are significant quantity of pus, delayed return home and Patients are systemically ill. Minor SSI may discharge pus or infected serous fluid but should not be associated with excessive discomfort, systemic signs or delay in return home [6].

There are various types of localized infections, such as abscess, cellulitis, lymphangitis etc. Abscess may follow puncture wound as well as surgery, but can be metastatic in all tissues following bacteremia. Abscess needs drainage with curettage. Modern imaging techniques may allow guided aspiration. Antibiotics are indicated if the abscess is not localized. Healing by secondary intention is encouraged. Cellulitis is non-supportive invasive infection of tissues. It is poorly localized in addition to cardinal signs of inflammation. It is usually caused by organisms such as –hemolytic streptococci, staphylococci and Clostridium perfringens. Tissue destruction, gangrene and ulceration may follow, which are caused by release of proteases. Systemic signs are common, such as SIRS, chills, fever and rigors. These follow the release of organisms, exotoxins and cytokines into the circulation. However, blood cultures are often negative. Lymphangitis presents as painful red streaks in affected lymphatic, often accompanied lymph node groups in the related drainage area [6].

Systemic inflammatory response syndrome (SIRS) can be defined as, presence of any two of hyperthermia (>38°C) or hypothermia (<36°C), tachycardia (>90 beats / min) or tachypnea (>20 cycles / min) and white cell count >12,000 or <4,000 [6].

Sepsis is defined as the systemic manifestation of SIRS, with a documented infection. Multiple organ dysfunction syndromes (MODS) is the effect that the infection produces systemically. Multiple system organ failure (MSOF) is the end stage of uncontrolled MODS [6].

The use of antibiotic prophylaxis before surgery has evolved greatly in the last twenty years. It is
generally recommended in elective clean surgical procedures and in clean-contaminated procedures that a single dose of cephalosporin be administered intravenously by anesthesia personnel in the operative room just before incision. Additional doses are generally recommended only when the operation lasts for longer than two to three hours [7].

Surgical site infection is the most important cause of morbidity and mortality in the post-operative patients, but it is preventable in most of the case if proper assessment and appropriate measures are taken by the surgeons, nursing staff, patients and others in the preoperative period.

SSIs are one of the most important causes of healthcare-associated infections. Surgical site infections (SSI) are still a real risk of surgery and represent a substantial burden of disease for both patients and healthcare services in terms of morbidity, mortality and economic cost. Infections increase the discomfort and disability experienced by patients following surgical procedures.

Research has shown that patient factors, surgical techniques, skin preparation, timing and method of wound closure are significant factors that can influence the incidence of subsequent infection. Previous literature has shown Escherichia Coli was the commonest microorganism responsible for surgical site infections following emergency non-traumatic abdominal operations, further research is necessary to identify the important factors responsible for high infection rate following emergency non-traumatic exploratory laparotomy. In this study it has been tried to find out the common organisms responsible for surgical site infections following emergency non-traumatic exploratory laparotomy. In addition, the sensitivity patterns of the microorganisms were ascertained. Further, factors responsible for infections were determined, that will be helpful to prevent infection in future following similar types of operation. So these study findings will play an important role to reduce the infection rate and thereby reduce the morbidity and mortality. Furthermore, application of the recommendations of this study in the practical field will reduce the rate of surgical site infections and thereby will improve cosmesis and make the results of operations better as a whole.

Keeping above facts in the mind, the present study was undertaken to determine the incidence of various risk factors such as clinical, socioeconomic, nutritional and other co-morbid conditions contributing to surgical site infections following emergency non-traumatic exploratory laparotomy.

Materials and methods

The present study is hospital based observational study conducted at Dept. of General Surgery, J J hospital, Mumbai over period of two years. Patients admitted in surgical ward requiring Emergency non-traumatic exploratory laparotomy were included in the study.

Before start of our study an informed consent is obtained in local vermacular language for each patient. The study did not involve any additional investigation or any significant risk.

Selection criteria

Inclusion Criteria:
1. The patients required emergency non-traumatic exploratory laparotomy
2. Patients more than 12 years of age.
3. All superficial and deep SSI developing within a 30 day period Post-surgery, as per the traditional definition.

Exclusion Criteria
1. Patients with trauma were excluded from the study
2. Patients less than 12 years of age.
3. Organ space SSI & Wound infections occurring beyond the 30 day time period post-surgery.

Data collection procedure

After admission, short history and physical examination was conducted on each patient admitted in General surgery with acute abdomen. Patients requiring emergency laparotomy and fulfilling the inclusion criteria were offered to participate in the study. All the traumatic cases were excluded from the study. All the necessary information regarding the study was explained to the patients or their guardian willing to participate in the study. Detailed history was taken to establish proper diagnosis and to know about the presence of the risk factors regarding surgical site infection. All the surgical procedures, medical management and investigations were conducted under direct guidance and supervision of senior. Only essential investigations were done for proper diagnosis and reduction of risk. Data collection sheets were filled in by the investigator himself. All of the preoperative factors related to SSI present in the patient were noted down in
the data sheet. After proper resuscitation (where applicable) and preparation, patients were sent to operation theatre for operation. Strict aseptic precautions were followed during the operation. Meticulous techniques were practiced as far as possible.

The operation procedure and related perioperative factors were observed directly and recorded in the data collection sheet instantly. During the postoperative period all the patients were closely monitored. If any symptom or sign of infection appear during this period then proper investigation was instituted for the diagnosis of infection and to assess the type and severity of the infection. If any collection of pus identified it was drained out and sent for culture and sensitivity test. Proper antibiotic was given to every patient both preoperative and post-operative periods. Postoperative events were recorded in the data sheet during every day follow up.

After completing the collection of data was compiled in a systematic way. Patients were followed up 30 days postoperative period with weekly OPD visits and telephone conversations as and when required.

**Data analysis**

Descriptive statistics such as mean, SD and percentage was used to present the data. To assess, the association factors with SSI, chi-square test was used. A p-value less than 0.05 were considered as significant. Data analysis was performed by using software SPSS v16.0.

**Results**

| Table 1: Surgical site infection (SSI) distribution by different age groups |
|-----------------|-----------------|-----------------|
| Age in Years    | SSI Status      | Total           |
|                 | Yes             | No              |
| 15–19           | 4 (33.3)        | 8 (66.7)        | 12               |
| 20–29           | 6 (15.4)        | 33 (84.6)       | 39               |
| 30–39           | 12 (24.0)       | 38 (76.0)       | 50               |
| 40–49           | 15 (29.4)       | 36 (70.6)       | 51               |
| 50–59           | 9 (29.0)        | 22 (71.0)       | 31               |
| 60–69           | 7 (41.2)        | 10 (58.8)       | 17               |
| Total           | 53 (26.5)       | 147 (73.5)      | 200              |

Mean ± SD = (40.2±13.3) years

It was observed that, majority of the patients were belongs to age group 40-49 (25.5%) followed 30-39 (25%), 20-29 (19.5%), 50-59 (15.5%), 60-69 (8.5%) and 15-19 (6%). However, these differences were not statistically significant (p = 0.4) (Table 1).

| Table 2: Surgical site infection (SSI) distribution by sex |
|-----------------|-----------------|-----------------|
| Sex             | SSI Status      | Total           |
|                 | Yes             | No              |
| Male            | 28 (22.2)       | 98 (77.8)       | 126              |
| Female          | 25 (33.8)       | 49 (66.2)       | 74               |
| Total           | 53 (26.5)       | 147 (73.5)      | 200              |

It was observed that among 126 male patients 28 (22.2%) developed SSI, whereas among 74 female patients 25 (33.8%) developed SSI. Rate of SSI was slightly higher in females. Sex difference in SSI was not statistically significant (p =0.1) (Table 2).

| Table 3: SSI distribution based on types of operations |
|-----------------|-----------------|-----------------|
| Types of Operations | SSI Status      | Total           |
|                 | Yes             | No              |
| 1. Appendectomy in case of appendiculat with Peritoneal toileting | 15 (25.00) | 45 (75.00) | 60 |
| 2. Adhesiolysis or resection and anastomosis in small intestinal obstruction | 06 (10.00) | 54 (90.00) | 60 |
| 3. Repair of ileal perforation / ileostomy and thorough Peritoneal toileting | 13 (41.9) | 18 (58.1) | 31 |
| 4. Repair of Peptic ulcer Perforation | 13 (56.5) | 10 (43.5) | 23 |
| 5. Resection of Volvulus of sigmoid colon and primary anastomosis / Hartman’s procedure 1 | 06 (30.00) | 14 (70.00) | 20 |
| 6. Herniotomy and Hernioraphy in case of Obstructed inguinal hernia | 0 (0.00) | 6 (100.00) | 6 (100.00) |
| Total           | 53 (26.5)       | 147 (73.5)      | 200              |

It was found that out of 60 Appendicular Perforation cases 15 (25.0%) developed SSI, out of 60 small intestinal obstruction cases 6 (10.00%) developed SSI, out of 31 ileal perforation cases 13 (41.9%) developed SSI, out of 23 Peptic ulcer perforation 13 (56.5%) developed SSI, out of 20 sigmoid volvulus cases 6 (30.00%) developed SSI and it was nil for 6 obstructed inguinal hernia cases. The highest rate of SSI (56.5%) was in Repair of Peptic ulcer cases and lowest in obstructed hernia operations. The associated between the type of operation and rate of SSI was statistically significant (p = 0.001) (Table 3).
With regard to the association between timing of surgery and appearance of symptoms and rate of SSI, it was observed that the surgical site infection rates were 11.1%, 17.2%, 23.1%, 26.2%, 32.5%, 40.6% when operations were initiated <6, 6-12, 12-24, 24-48, 48-72 and >72 hours later respectively. The rate of infection increased as the time lapse between appearance of first symptom and initiation of operation were increased. However association between the timing of the surgery after appearance of symptoms with the rate of SSI was not statistically significant (p = 0.17) (Table 4).

Table 4: SSI distribution based on timing of surgery after appearance of symptoms

<table>
<thead>
<tr>
<th>Timing of Surgery after Appearance of Symptoms (in Hours)</th>
<th>SSI Status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48-72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 6</td>
<td>02 (11.1)</td>
<td>16 (88.9)</td>
</tr>
<tr>
<td>6-12</td>
<td>05 (17.2)</td>
<td>24 (82.8)</td>
</tr>
<tr>
<td>12-24</td>
<td>09 (23.1)</td>
<td>30 (76.9)</td>
</tr>
<tr>
<td>24-48</td>
<td>11 (26.2)</td>
<td>31 (73.8)</td>
</tr>
<tr>
<td>48-72</td>
<td>13 (32.5)</td>
<td>27 (67.5)</td>
</tr>
<tr>
<td>&gt;72</td>
<td>13 (40.6)</td>
<td>19 (59.4)</td>
</tr>
<tr>
<td>Total</td>
<td>53 (26.5)</td>
<td>147 (73.5)</td>
</tr>
</tbody>
</table>

In relation to different types of wounds, by the degree of contamination, it was observed that 37 were clean wounds; SSI developed only in 2 (5.4%) of these clean cases. There were 65 clean contaminated cases, among them SSI occurred in 5 (7.7%); whereas SSI developed in 13 cases among 25 (52%) contaminated wounds, which was high rate. The rate of SSI is 33 among 73 (45.2%) dirty cases. The difference had high statistical significance (P < 0.001). It can be understood that the infection rate increased with that of degree of wound contamination (Table 5).

Table 5: SSI distribution based on types of wounds by the degree of contamination

<table>
<thead>
<tr>
<th>Types of Wounds</th>
<th>SSI Status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Clean</td>
<td>02 (5.4)</td>
<td>35 (94.6)</td>
</tr>
<tr>
<td>Clean Contaminated</td>
<td>05 (7.7)</td>
<td>60 (92.3)</td>
</tr>
<tr>
<td>Contaminated</td>
<td>13 (52.0)</td>
<td>12 (48.0)</td>
</tr>
<tr>
<td>Dirty</td>
<td>33 (45.2)</td>
<td>40 (54.8)</td>
</tr>
<tr>
<td>Total</td>
<td>53 (26.5)</td>
<td>147 (73.5)</td>
</tr>
</tbody>
</table>

In relation to co-morbidity, it was observed that 87 (43.5%) patients had co-morbid disorders associated with the main surgical disease and 113 (56.5%) patients had no co-morbid disorder. Among the patients with co-morbid disorders 38 (43.7%) developed surgical site infection. Whereas, in the patients without any co-morbidity only 15 (13.3%) developed SSI. It was clear that associated co-morbid disorders played a vital role as a host related risk factor for SSI. Moreover the difference was statistically significant (p < 0.001) (Table 6).

Table 6: SSI distribution based on co-morbidity status

<table>
<thead>
<tr>
<th>Co-Morbidity Status</th>
<th>SSI Status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>With Co-morbidity</td>
<td>38 (43.7)</td>
<td>49 (56.3)</td>
</tr>
<tr>
<td>Without Co-morbidity</td>
<td>15 (13.3)</td>
<td>98 (86.7)</td>
</tr>
<tr>
<td>Total</td>
<td>53 (26.5)</td>
<td>147 (73.5)</td>
</tr>
</tbody>
</table>

Discussion

The present study however revealed an alarming rate of 26.5% overall prevalence rate after abdominal surgery. It is above the infection rate in so many places. The incidence in America is reported as 5% [8], 4.65% in England [9] and 20% in India [10].

Such a high prevalence revealed by the study requires urgent attention by all, bearing in mind the financial implication to both patients and hospital management. It is important to suggest that steps are taken to reduce the rate of infections to an acceptable level. The surgical procedure with the highest SSI percentage was small bowel surgery (70%) because the small bowel as well as the large, is colonized by lots of bacteria increasing the risk of infection in that category.

Age of 200 patients ranged from 15-65 years. Most of the patients (171, 85.5%) were in between 20-60 years with average age 40 years. In a similar study conducted in an Iranian teaching hospital average age of the patients was 46.70 years [11]. Average age of the patients in the Iranian study was much higher than the present study.

It was revealed that among 200 patients, 53 (26.5%) developed surgical site infection (SSI). This findings is consistent with the finding of Razavi et al. where they found 189 patients among 802 (26.40) suffered from SSI [11]. The overall SSI rate of present study as consistent with findings of study carried out by Renvall et al. in which SSI rate in acute surgery was 22.4 percent [12].

Regarding sex distribution of the patients, 126 (63%) were male and 74 (37%) were female. Rate of SSI in males were 22.2%, whereas among females it was 33.8%. Rate of SSI was slightly higher in females, which was not statistically significant. This finding is consistent with that of Razavi et al. where they could not find any significant correlation between sex and SI. Moreover, rate of SSI in males
were 19.6% whereas in females it was 15.1% (p < 0.093). So, SSI is not correlated with sex [11].

With regards to types of operations, the highest rate of infection (56.5%) was in repair of Peptic perforation cases and lowest in obstructed hernia operations. Theses findings were consistent with the result of Surgical Site Infection Surveillance (SSIS) for general surgery which was the published as Wexford General Hospital Surgical Site Infection (SSI) data report in 2009 showing number of SSI and rate of SSI (%) by category of operations. They had done 132 appendicular perforation, among them SSI occurred in 7 (5.3%) cases. SSSI occurred in 10 (19.2%) cases among 52 Colonic surgeries, 4 (23.5%) case among 17 small bowel surgery and 5 (26.3%) cases among 19 Laparotomies. No SSI was reported among 82 herniorrhaphy case [13].

With regard to Timing of surgery after appearance of symptoms and rate of SSI, it was observed that the site infection rate was 11.1%, 17.2%, 23.1%, 26.2%, 32.5%, 40.6% when operations were initiated <6, 6 -12, 12-24, 24-48, 48-72 and >72 hours later respectively. The rate of SSI increased as the time lapse between first manifestation of symptoms and initiation of operation prolonged. This is similar to the findings was observed by Huda M.N., SSI rate was 15.25%, 21.73%, 27.27%, 40% and 50% respectively when operations were done 6, 12, 24, 48 and 72 hours later [14]. This finding is also consistent with the study conducted in a Peruvian hospital; in which patients with SSI had a longer hospital stay than did not-infected patients (14.0 Vs 6.1 days; p < 0.001); it is because prolonged preoperative hospital stay increases SSI rate and occurrence of SSI causes prolonged postoperative stay [15].

In relation to different types wounds, by the degree of contamination, it was observed that 37 were clean wounds, SSI developed only in 2 (5.4%) of these clean cases. There were 65 clean contaminated cases, among them SSI occurred in 5 (7.7%); whereas SSI developed in 13 (52%) among 17 contaminated wounds. The rate of SSI was 33 among 73 (45.2%) dirty cases. Among SSI, rate of SSI was high in dirty cases (36.5%). The difference was statistical significant (p <0.01). It was revealed that the infection rate increased with that of degree of wound contamination. These findings were consistent with the findings of 10 years prospective study of 62,963 wounds by Cruse and Frood in 1980, where infection rate was 1.5%, 7.7%, 15.2% and 40% in clean, clean contaminated, contaminated and dirty wounds respectively [16]. Moreover survey conducted by Ali and Khan observed SSI 25.00%, 28.60% and 54.80% respectively in clean, clean contaminated and contaminated wounds [17]. In addition, Renvall et al. in a prospective study carried out on 696 patients estimated SSI rates were 4.2%, 9.1% and 14.4% in clean, clean contaminated and dirty wounds respectively [12].

In all the studies mentioned above rate of SSI rose with increase in the degree of wound contamination. In relation to co - morbidity, it was observed that 87 patients had co – morb disorders associated with the main surgical disease and 113 patients had no co – morb disorder. Among the patients with co – morb disorders, 38 (43.7%) developed surgical site infection (SSI), whereas in the patients without any co – morbidity only 15 (13.3%) developed SSI. It was clear that associated co – morb disorders played a vital role as a host related risk factor for SSI. Moreover, the difference was statistically significant (p < 0.001).

**Conclusion**

The study revealed that there was around 25% Surgical Site infection rate after abdominal surgery which was quite high, Pragmatic steps are thus needed to reduce the infection rate to acceptable levels. It can be concluded from the findings of the study that microorganisms that are normal inhabitants of our body are mainly responsible for SSI. Various factors like condition of the wounds, timing of surgery after appearance of symptoms, duration of operation, prolonged exposure of peritoneal cavity to environment, prophylactic use of antibiotics and factors associated with surgery like type of incision, type of operation, presence of co – morbidity etc greatly contribute to occurrences of SSI. So, quality of surgical care including immediate assessment of patients, resuscitative measures, adequate preparation of patients and aseptic environment are important for control of SSI. Moreover in absence of highly advanced surgical amenities, preoperative resuscitative units, modern operation theatre facilities and sophisticated sterilization procedure, it is necessary to sue prophylactic antibiotics to encounter the various types of micro – organisms responsible for surgical site infection.

**References**

Risk Factors Responsible to Surgical Site Infections Following Emergency non – Traumatic Exploratory Laparotomy

15(30):1-156.


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A Comparative Prospective Study of 50 Cases of Hernioplasty Done by Polyester Mesh Versus Polypropylene Mesh

Anshuman A. Tripathi1, Vikram B. Gohil2, Samir M. Shah3

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Abstract

Background: Open hernioplasty is one of the most common surgical treatments [1]. The aim of the mesh used in hernia repair should be to reinforce the abdominal wall without reducing the mobility by excessive scarring [2]. Worldwide over a million meshes are implanted every year [3]. Complications such as foreign body sensation and reduced life quality are described in the follow-up and depends on the size and structure of the incorporated material [12]. Polyester mesh is hydrophilic as opposed to hydrophobic prosthesis such as polypropylene mesh or polytetrafluoroethylene mesh and thus encourages early biologic fixation and collagen ingrowth into surrounding tissue [5]. Objective: Evaluate the effect of type of mesh (polypropylene mesh versus polyester mesh) used during hernia repair on mean-time outcomes mainly focusing on post-operative wound infection, development of seromas, post-operative return to work, post-operative foreign body awareness and recurrence. Methods: A total of 50 cases of anterior abdominal wall hernias are selected and divided into Group A that consists of 25 cases of hernioplasty done using polypropylene mesh and Group B that consists of 25 cases of hernioplasty done using polyester mesh. They are studied and followed up using standard questionnaire at Sir T. Hospital and Government Medical College, Bhavnagar, Gujarat (364001). Results: Among 50 cases studied, percentage of male patients was higher than that of female patients. The use of synthetic polyester mesh in the hernioplasty results in no or decreased incidences of wound infection, seroma formation and foreign body sensation. It can also be concluded that Polyester mesh is cost effective in terms of hospital stay duration and early resumption of work. Conclusion: In this study use of polyester mesh for hernioplasty have more satisfactory outcomes as compared to polypropylene mesh when various parameters are compared.

Keywords: Hernioplasty; mesh; polypropylene; polyester.

Introduction

The mechanism behind such hernia formation is still under debate in the direction of anatomical defect or connective tissue disorder [4]. In different studies nearly five percent of all patients with implanted meshes because of a primary inguinal hernia suffer from chronic pain [6]. The extent of the foreign-body reaction with its provoked scar tissue formation seems to depend on the amount and structure of the incorporated material [13]. Permanent relief of pain or discomfort and low incidence of peri- and postoperative complications and recurrence rates are the goals of successful hernia repair [7]. Now days we have three big groups of material concerning non-resorbable meshes: polypropylene, polyester and polytetrafluoroethylene [8]. It has been observed that choice of the mesh-prosthesis in inguinal hernia repair is far more important than technique as a determinant of outcome [11]. Still in literature there is no consensus which material has the best biocompatibility in humans [9]. It is clear that the evolution of meshes is not yet complete and the ideal mesh has yet to be found [10].
Aims and Objectives

1. Evaluate the effect of type of mesh (polypropylene mesh versus polyester mesh) used during hernia repair on mean-time outcomes mainly focusing on development of seromas, recurrence, post-operative wound infection, post-operative return to work, foreign body awareness.
2. To accentuate the scope of new material in hernia repair.
3. To reduce overall complications in hernia repair.

Material and Methodology

In this study total of 50 cases of anterior abdominal wall hernias are selected. Among them Group A consists of 25 cases of hernioplasty done using polypropylene mesh and Group B consists of 25 cases of hernioplasty done using polyester mesh. They are studied and followed up between September 2016 to May 2017 at Sir T. Hospital and Government Medical College, Bhavnagar, Gujarat (364001). Patients are selected on the basis of various criteria.

Once patient is selected, written and informed consent is obtained from him/her and their relatives. They are then explained about the study, procedure, follow up schedules and complications, if any. Detailed clinical history taking and examination was done. Routine and specific investigations were done. All the 50 cases of hernia were taken under open hernioplasty and given regional anaesthesia. In 25 cases, hernioplasty was performed with use of polyester hydrophilic mesh and rest 25 cases of hernioplasty were done using polypropylene hydrophobic mesh. Standardized questionnaires were used to document different parameters. Follow up was taken on Post-operative Day 15th, 30th and 90th Incidence of seroma/discharge/collections was assessed using ultrasonography imaging technique (USG). Data obtained was entered on printed case record forms/sheets.

Observations & Results

Table 1: Sex Distribution

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<th>No. of people in Nasiruddin S., S.S., J. DH 2017 et al. [15] study</th>
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<td>2.</td>
<td>Female</td>
<td>16 (32%)</td>
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In both the studies, the number of male patients is more as compared to females.

Graph 1: Sex Distribution
Table 2: Age Distribution

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<th>Sr. No.</th>
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<td>6.</td>
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<td>2 (4%)</td>
<td>1 (1.6%)</td>
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In both the studies, maximum numbers of patients are from age group of 41-50 years.

Graph 2: Age Distribution

Table 3: Types of Hernia and its Gender Distribution

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<td>00</td>
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<tr>
<td>5.</td>
<td>Femoral</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

Inguinal hernias are more common in males and umbilical and incisional hernias in females.

Graph 3: Types of Hernia and its Gender Distribution
Table 4: Comparison of Post-Operative Parameters Between Polypropylene Mesh and Polyester Mesh on Day 30

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameters</th>
<th>No. of Patients in Polypropylene Mesh (Group A)</th>
<th>No. of Patients in Polyester Mesh (Group B)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Post-Operative Wound Infection</td>
<td>08 (32%)</td>
<td>00</td>
<td>0.0232</td>
</tr>
<tr>
<td>2.</td>
<td>Post-Operative Seroma Formation</td>
<td>03 (12%)</td>
<td>00</td>
<td>0.0009</td>
</tr>
<tr>
<td>3.</td>
<td>Recurrence</td>
<td>00</td>
<td>00</td>
<td>1.0000</td>
</tr>
<tr>
<td>4.</td>
<td>Post-Operative Return to Work</td>
<td>12 (48%)</td>
<td>25 (100%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>5.</td>
<td>Post-Operative Foreign Body Sensation</td>
<td>15 (60%)</td>
<td>00</td>
<td>0.0065</td>
</tr>
</tbody>
</table>

Graph 4: Comparison of Post-Operative Parameters Between Polypropylene Mesh and Polyester Mesh on Day 30

Table 5: Comparison of Post-Operative Parameters Between Polypropylene Mesh and Polyester Mesh on Day 90

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameters</th>
<th>No. of Patients in Polypropylene Mesh (Group A)</th>
<th>No. of Patients in Polyester Mesh (Group B)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Post-Operative Wound Infection</td>
<td>04(16%)</td>
<td>00</td>
<td>0.0186</td>
</tr>
<tr>
<td>2.</td>
<td>Post-Operative Seroma Formation</td>
<td>07(28%)</td>
<td>00</td>
<td>0.0018</td>
</tr>
<tr>
<td>3.</td>
<td>Recurrence</td>
<td>00</td>
<td>00</td>
<td>1.0000</td>
</tr>
<tr>
<td>4.</td>
<td>Post-Operative Return to Work</td>
<td>18(72%)</td>
<td>25(100%)</td>
<td>0.0096</td>
</tr>
<tr>
<td>5.</td>
<td>Post-Operative Foreign Body Sensation</td>
<td>15(60%)</td>
<td>00</td>
<td>0.0065</td>
</tr>
</tbody>
</table>
There was no complain in patients of any of the group i.e. polyester mesh group and polypropylene mesh group.

**Discussion**

In our study maximum patients are of age group of 41-50 years (26 people-52%) which is approximately similar to Nasiruddin S, S.S., J. DH 2017 et al. [15] study in which maximum patients are of age group of 41-50 years (24 people-40%). Similarly, male patients were 34 (68%) and female patients were 16 (32%) which is almost similar to the gender distribution of patients that were studied in Nasiruddin S, Suresh S, Jayanth DH 2017 et al. [15] study i.e. male patients were 48 (80%) and female patients were 12 (20%).

In our study maximum male patients have inguinal hernia, i.e. 33 patients (97%) and 1(3%) patient of incisional hernia. Similarly, maximum female patients have umbilical hernia and incisional hernia i.e. 10 patients (62.5%) and 6(37.5%) patients respectively.

In our study, it is found that there were no incidence of post operative wound infection, seroma formation or foreign body sensation in patients treated with polyester mesh. Also, maximum patients were satisfied after operation and all of them resumed their work/occupation sooner as compared to those treated with polypropylene mesh. Similar results were obtained in Nasiruddin S, S.S., J. DH 2017 et al.[15] and Mike ralf Langenbach, stefan sauerland [14] study.

Study of recurrence of hernia in any mesh group requires long term follow up i.e. five to ten years. However in our study period time no recurrence was found in either of the groups (polyester and polypropylene mesh).

It was found that none of the patients treated with polyester mesh had incidence of post-operative wound infection or seroma formation and foreign body sensation when compared to those treated with polypropylene mesh. Similar results were obtained in Nasiruddin S, S.S., J. DH 2017 et al. [15] and Mike ralf Langenbach, stefan sauerland [14] study.

So, considering all the parameters of our study it can be said that polyester mesh is better than polypropylene mesh.

**Conclusion**

Our present study concludes that in this new era of advanced surgical technique and new prosthesis
material for hernia repair, use of synthetic hydrophilic polyester mesh in the hernioplasty results in fewer incidences of wound infection, seroma formation and foreign body sensation. It can also be concluded that Polyester mesh is cost effective in terms of hospital stay duration and early resumption of work. Hydrophilic polyester mesh promotes biological tissue fixation with collagen ingrowth within mesh with minimal tissue reaction.

So, overall in hernia repair our study shows that Polyester mesh is superior to Polypropylene mesh.

References


Correlation Between BIRADS Scoring and Histology in Women Undergoing Breast Surgery in our Institution

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How to cite this article:

Abstract

Developed in the early 1990s, the BIRADS classification has been used extensively as a surrogate to histopathological reporting of breast cancer. Prior to implementation of BIRADS there was a lack of uniformity in reporting of mammography findings and this often resulted in varied reporting and management strategies. This ambiguity had also led to increased difficulties in establishing performance standards across settings. This had been the main impetus in developing the BIRADS system and several research studies have shown the scoring system to be useful in predicting the likelihood of cancer. These results are also seen in this study and hence further show the value of BIRADS in effective management of breast cancer. In this study, a total of 50 patients aged between 15 and 73 years with mean age being 44 years were included. They underwent preoperative imaging with either ultrasound or mammogram after which they underwent surgery. And their Mammogram/ultrasound findings are compared with their final Histopathology report. The BIRADS categories 1, 2 and 3 are clubbed together and considered as “Benign”, while categories 4, 5 and 6 were clubbed together as “Malignant”. This was compared with their final histopathology report which was either benign or malignant and the correlation was established. Out of the 50 cases, 40 of them were correctly classified. Breast lesions evaluated for malignancy using BIRADS scoring had Sensitivity of 75%, Specificity of 83.3%, Positive predictive value of 75% and Negative predictive value of 83.3%.

Keywords: BIRADS; Prediction; Breast cancer; Mammogram; Histopathology; Correlation.

Introduction

Breast carcinoma is the most common type of malignancy diagnosed in women worldwide. In majority of the developed countries it is the most frequently encountered malignancy and one of the major causes for cancer related deaths. Breast carcinoma has been extensively studied in the modern medicine era and with the availability of vast evidence based data and literature, various treatment modalities have been introduced to treat this life threatening disease. Majority of the breast carcinomas are usually asymptomatic and the usual mode of presentation is an incidental palpable lump or pain and rarely, they present with nipple discharge and skin changes [1,25]. Breast carcinomas have varying levels of invasion and aggressiveness irrespective of the duration with a few patients having metastatic symptoms at the time of presentation itself. Even though extensive screening programs and clinical tests are available for early detection of this disease, the turnover and outcome still remains poor in developing countries. There is a lack of self-awareness of this life threatening malignancy in our country. The
general approach in case of breast carcinoma is by "triple assessment" combining the clinical finding with that of the radiological and pathological correlation remains as a standard guideline for breast carcinoma [2].

Liver function tests, Chest X-Ray, Abdomen ultrasonography and bone scan aid in staging the disease. Histo-pathological correlation along with immunohistochemistry analysis has introduced another modality of treatment. The usual routine of management in breast carcinoma is with surgery, radiotherapy and chemotherapy depending on the stage of the disease [25]. Though each modality of treatment has its own pros and cons, combined approach is the therapy of choice leading to less toxic therapy with a good outcome and better prognosis. Breast carcinoma management is reaching new heights with its vast research interest and data availability. Numerous centres throughout the world are promoting screening programmes and Breast self examination to detect the disease as early as possible. Due to increase in awareness and screening programmes, the number of women presenting to the hospital with a breast lump has increased substantially. Prior to conducting invasive biopsies or fine needle aspiration cytology, non-invasive imaging needs to be performed. Mammography and sonomammogram are the usual imaging modalities of choice for diagnosis of a breast lump [15]. They can be used both for diagnostic and screening purposes.

To make the reporting uniform, BIRADS (Breast Imaging Reporting and Data Systems) was created by the American College of Radiology (ACR). It has six categories, 1-denotes negative study, 2-denotes benign lesion, 3-denotes probably benign lesion, 4-denotes suspicious abnormality, 5-denotes lesion is highly suspicious of malignancy and 6-denotes previously biopsy proven malignancy [8]. This scoring system was designed to standardize the interpretation and reporting of mammogram and sonomammogram. But despite this, there is a lot of variability in the reporting according to several studies. In this study, we seek to assess the predictive value of BIRADS score with final histological report in our institution. The objective was to correlate between the BIRADS Score and the Histopathological finding in women undergoing Breast Surgery in our institution, and to check Sensitivity, Specificity, Positive and Negative predictive value of BIRADS scoring in predicting malignancy.

Materials and methods

The Cross sectional study was conducted between the year 2015 and 2016, at the PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India, where 50 patients with breast cancer, with the following criteria (a) Women of all ages (b) Preoperative mammogram / sonomammogram with BIRADS scoring (c) Undergone Breast surgery in our institution (d) Conclusive histopathology report and (e) Well documented clinical record were included in the study, and women with (a) history of previous breast surgery (b) surgery done elsewhere, were excluded. All women who present to the OPD with a breast lump, will as per department protocol, undergo “triple assessment”, which includes Physical Examination, FNAC/ Biopsy. Mammogram/Ultrasound breast and only those who eventually need surgical intervention are followed up and their Mammogram/ ultrasound findings are compared with their final Histopathology report. The BIRADS categories 1,2 and 3 are clubbed together and considered as “Benign” while categories 4,5 and 6 were clubbed together as “Malignant”. This was compared with the final histopathology report which was either benign or malignant and the correlation was established.

Results and analysis

A total of 50 cases were included in the study. The most common BIRADS score was 3 with 18 patients. BIRADS score of 2 and 4 had 12 patients each. There were no patients with BIRADS category 1 in our study.

In this study, the average age was 44 yrs with the oldest being 73 yrs and the youngest being 15 yrs. After age wise breakdown, the largest number of patients were in the 5th decade of life with 13 cases, with the 4th decade coming a close second with 11 cases. Women above 60 yrs of age made up more than 20% of our study. 19 women in the study were below 40 yrs of age which could be attributed to education and increased awareness.

The Age wise distribution of BIRADS score is shown in Figure 1. The BIRADS scoring tended to show more benign pathology in women less than 40 yrs of age. Only 2 women less than 40 yrs of age had a BIRADS score of 4. Older patients tended to have higher BIRADS SCORE (4 and above ) indicating malignancy. 15 out of 18 patients above 50 yrs of age had a BIRADS score of 4 or more 9 out of 11 patients
above 60 yrs of age had a BIRADS score of 4 or more. The Age wise distribution of Histopathology report is shown in Figure 2. The final histopathology followed a similar pattern to the BIRADS scoring. All patients less than 30 yrs of age had benign
lesions. However, 10 out of 11 patients over 60 yrs of age had a malignancy. The youngest patient with malignancy was 37 yrs old who had an infiltrating ductal carcinoma.

Comparison of BIRADS with Histopathological report is shown in Figure 3. BIRADS 2 had 11 benign cases and 1 malignant (Figure 2), which was a case of Ductal Carcinoma In Situ. BIRADS 3 has 14 benign cases and 4 malignant cases. BIRADS 4 has 4 benign and 8 malignant cases. BIRADS 5 has 1 benign case and 4 malignant cases.

Table. 1 shows the frequency of benign and malignant lesions. The most common BIRADS category in this study was 3. Amongst benign lesions, the most common BIRADS category in this study was also BIRADS 3 with 14 out of the total 30 benign cases coming from this category (46.67%). Amongst malignant lesions, the most common BIRADS category in this study was BIRADS 4 with 8 out of the total 20 malignant cases coming from this category (40%).

The comparison of BIRADS classification with histopathologic findings to detect malignant lesions is denoted in Table. 2.

Table 1: Frequency of benign and malignant lesions

<table>
<thead>
<tr>
<th>BI-RADS Category</th>
<th>Frequency in All Masses</th>
<th>Frequency in Benign Masses</th>
<th>Frequency in Malignant Masses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>12/50 (24.0%)</td>
<td>11/30 (36.67%)</td>
<td>1/20 (5.0%)</td>
</tr>
<tr>
<td>3</td>
<td>18/50 (36.0%)</td>
<td>14/30 (46.67%)</td>
<td>4/20 (20.0%)</td>
</tr>
<tr>
<td>4</td>
<td>12/50 (24.0%)</td>
<td>4/30 (13.33%)</td>
<td>8/20 (40.0%)</td>
</tr>
<tr>
<td>5</td>
<td>5/50 (10.0%)</td>
<td>1/30 (3.33%)</td>
<td>4/20 (20.0%)</td>
</tr>
<tr>
<td>6</td>
<td>3/50 (6.0%)</td>
<td>0/30 (0%)</td>
<td>3/20 (15.0%)</td>
</tr>
</tbody>
</table>

Table 2: Comparison of BIRADS classification with histopathologic findings to detect malignant lesions

<table>
<thead>
<tr>
<th>BIRADS</th>
<th>Total no.</th>
<th>Histopathology Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Malignant</td>
</tr>
<tr>
<td>Malignant (4,5,6)</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>(12+5+3)</td>
<td>(True positive)</td>
<td>(False positive)</td>
</tr>
<tr>
<td>Benign (1,2,3)</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>(0+12+18)</td>
<td>(False negative)</td>
<td>(True negative)</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>30</td>
</tr>
</tbody>
</table>

Discussion

Developed in the early 1990s, the BIRADS scoring method has been used extensively as a surrogate to histopathological reporting of breast cancer. In BIRADS, mammograms are categorized from 0 – 6, with category 0 - requiring further investigation and category 6 - being biopsy proven malignancy. Categories 1 to 5 are further broken down into negative, benign finding, probably benign finding, suspicious and highly suggestive of malignant lesion respectively [8]. Prior to implementation of BIRADS there was a lack of uniformity in reporting of mammography findings and this often resulted in varied reporting and management strategies. This ambiguity had also led to increased difficulties in establishing performance standards across settings. This had been the main impetus in developing the BIRADS system and several research studies have shown the scoring system to be useful in predicting the likelihood of cancer. These results are also seen in this study and hence further show the value of BIRADS in effective management of breast cancer. In this study, a total of 50 patients were included. They underwent preoperative imaging with either ultrasound or mammogram after which they underwent surgery. These patients were aged between 15 and 73 years with mean age being 44 years. The majority of the participants (36%) had breast lesions classified into BI-RADS category 3 that corresponds to likely benign finding. Category 2 and 4 were the next most common (24%)
Correlation Between BIRADS Scoring and Histology in Women Undergoing Breast Surgery in our Institution

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Corresponding to benign lesion and suspicious abnormalities respectively. Amongst benign lesions, the most common BIRADS category in this study was also BIRADS 3 with 14 out of the total 30 benign cases coming from this category (46.67%). Amongst malignant lesions, the most common BIRADS category in this study was BIRADS 4 with 8 out of the total 20 malignant cases coming from this category (40%). Out of the 50 cases, 40 of them were correctly classified. There were 5 cases which were benign on imaging but turned out to be malignant on histopathology and similarly, there were 5 cases which were suspicious of malignancy on imaging but eventually turned out to be benign.

Breast lesions evaluated for malignancy using BIRADS scoring had a Sensitivity of 75%, Specificity of 83.3%, Positive predictive value of 75% and Negative predictive value of 83.3%.

Conclusion

The standardized terminology of the BIRADS lexicon allows quantification of the likelihood of carcinoma in a breast lesion. In experienced hands, the BIRADS system can be a very useful predictor of malignancy. However, Imaging should not be used in isolation due to chance of missing malignancy. Imaging should always be done in conjunction with clinical examination and FNAC/Biopsy (Triple Assessment) to get a comprehensive perspective prior to surgery[2].

Limitations of the study

As multiple radiologists were used to interpret the images, we were not able to effectively capture inter and intra-rater reliabilities. This study only included surgically proven lesions. Hence the study does not inform on predictive value of BIRADS on benign appearing lesions that were interpreted as definitely benign or were recommended for follow-up only (BIRADS 1, 2 and 3) and thus did not undergo surgery.

Compliance with Ethical Standards

Ethical approval: “For this type of study formal consent is not required.”

References


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A Comparative Study between Figure of Eight Suturing Technique and Omentopexy in Closure of Peptic Ulcer Perforation in a Rural Medical College of Karnataka

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Abstract

Background: Figure of 8 techniques has been described in the literature for peptic ulcer perforation repair especially when the patient comes late, when the edges of the ulcer and the wall of duodenum are very friable. Methods: Sixty patients included in the study at AIMS, B G Nagar, Bellur Cross were divided into two groups after randomization. Study group, patients underwent figure of eight suturing technique and Control group, patients underwent Grahm’s technique of omentopexy for peptic ulcer perforation. Results: The mean age of the study group was 48.7+7.56 Years and 49.6+8.69 years among the control group. In the Study group nearly 29 (96.6%) male and 1 (3.3%) female. Among the Control group 27(90%) males and 3 (10%) Females were included in the study. The Mean APACHE II score in the study group was 3.8+1.8 and in the control group it was 3.6+1.3 with p value found to be statistically not significant between the groups. The mean operative time in the control group was 76.65 min in study group and 73.58 min in control group. Bile Leak was in 2 (6.6%) in study group and 1 (3.3%) in control group. Septicemia was seen in 6.6% in study group and 10% in Control group. The commencement of oral Feed was started after 5.5 days in study group and 5.13 days in control group. The Mean hospital stay was 12.6 days in both the study and control group. Conclusions: The present study is non-inferior than omentopexy in terms of post-operative complications. It can be used as a safe alternative to omentopexy especially when the patient comes late.

Keywords: Peptic ulcer perforation; Figure of eight suturing technique; Omentopexy; APACHE.

Introduction

One of the major common complication of Peptic ulcer disease is the Duodenal ulcer perforation [1]. Even in the recent years constant and precise use of the drugs against H pylori and various anti-ulcer agents the incidence of peptic ulcer has not come down drastically in most of the countries.

The most common causes of peptic ulcer disease are due to the infection of H Pylori organisms, usage of drugs like NSAIDS for years, intake of Alcohol for many years along with the cigarette smoking, consumption of foods which are spicy, smoky. Peptic Ulcer is also seen most commonly among the persons with Type A personality [2,3].

The peptic ulcer disease leads to one of the most common complication is perforation of the ulcer in the duodenal part. Duodenal part and lesser curvature of stomach are the most common sites of perforation seen among the patients [4].

The treatment of peptic ulcer perforation is a case of emergency, where active and proper intervention is needed to avoid the further complication of perforation.

If the perforation is not treated surgically in time, the ulcer perforates in the abdominal cavity and leading to peritonitis. All the cases of Peptic Ulcer
Perforation need to treated surgically by closure of the perforation, treating the ulcer and even the treatment of peritonitis [5].

Omentopexy is the most common method of treatment of peptic ulcer perforation among the cases which report to the hospital at the earliest. The other modality of the treatment is the figure of 8 technique done when the patient comes to hospital after more than 24 hours of perforation and the edges of the ulcer are very friable [6].

Objective

To study to compare the safety of figure of eight suturing with Omentopexy in the treatment of peptic ulcer perforation.

Methodology

A Hospital based comparative study was carried out at AIMS, B G Nagar, Bellur Cross from October 2015 to June 2018. A total of Sixty Patients were included in the study. The study subjects were divided into two groups based on the randomization technique. Study Group underwent figure of eight suturing techniques for peptic ulcer perforation and control Group underwent Grahams Technique of Omentopexy for the peptic ulcer perforation.

Inclusion criteria

1. All patients of Peptic perforation between 2-60 years of age.
2. Size of perforation ≤ 2 cm.
3. APACHE II score 1-10.

Exclusion criteria

1. Patients with other Intra-abdominal organpathology.
2. Patient not fit enough to with stand surgery (advance cardiacl disease).

Data on patients’ profile was collected which included age, sex, socio-economic status, risk factors (smoking, alcohol, tobacco chewing, use of ulcer genic drugs and history of acid peptic disease), symptoms, signs, chest X-ray findings, USG abdomen findings, day of presentation, presence of shock at presentation, chest condition, laboratory investigations (Hemoglobin concentration) and pre-operative APACHE II score.

Graham’s technique of omentopexy was performed by closing the perforation by placing interrupted full - thickness 2-0 vicry sutures along the margins of the ulcer, leaving the ends sufficiently long, so that viable omental patch can be securely placed over the perforation. The sutures were tied drawing the patch into the perforation. In the figure of ‘8’ suturing technique, suture was applied a bit away from edges and a figure of 8 was made as follows. Needle was inserted proximal to the perforation (Point A) and brought out through the perforation, it was then reintroduced into the perforation and bought out at a point (Point B) distal to the perforation. The needle was then inserted below the first point of entry proximal to the perforation site (Point C) and brought out at Point D in the same manner. The suture was then tied making figure of ‘8’. Care was taken to keep the knot in the middle. The closed ulcer was covered by omentum and sutures were applied to the stomach and the duodenum wall to fix the omentum to cover the ulcer area. A tube drain was put inside the peritoneal cavity at the hepatorenal pouch through a separate stab incision in the right flank after a through abdominal lavage with warm saline in allcases [7,8].

Results

Out of the total 60 cases included in our study were analyzed.

Socio Demographic Profile:

The mean age of the study group was 48.7±7.56 Years and 49.6±8.69 years among the control group. The age was found to be statistically not Significant. The gender distribution in the study group and control group was also found to be statistically not significant. In the Study group nearly 29 (96.6%) male and 1 (3.3%) female. Among the Control group 27 (90%) males and 3 (10%) Females were included in the study.

The socio economic class of the majority of the study participants in both the control and study group were from lower socioeconomic class. In the study group 28 (93.3%) were from lower socio economic class and 27 (90%) in the control group were from lower socioeconomic class. The socioeconomic class was also found to statistically not significant between the two groups.

Majority of the risk factors seen were common in both the groups. Smoking and Alcohol was the major risk factors seen among both the groups. Other than these risk factors usage of NSAIDs Drugs and the food Habbits were other risk factors.
Clinical Features:

Nearly 25 (83.3%) of the patients presented to the hospital within the first 24 hours of the onset of symptoms and 26 (86.6%) presented in the next 48 hours. Remaining 9 (30%) presented on the third day of onset of symptoms. The Mean day of presentation in our study was 2.95±0.8 days in Study group and 2.36±1.1 Years in the control group. There was no statistically significant in the days of presentation between the groups.

All the study participants presented with localized Abdominal Pain in the Right Hypochondria region. In the study group 15 (50%) cases presented with distension, 5 (16.6%) with fever along with pain. In the control group 20 (66.6%) cases presented with distension and 9 (30%) with fever.

Rebound tenderness was seen among all the cases in both the study and control group. Nearly 28 (86.6%) in study group and 27 (90%) in control group presented with both Guarding and rigidity.

The mean hemoglobin Level in our study group was 10.9±2.5 and in the control group was 11.2±1.6 gms/dl and it was also found to be statistically not significant. Nearly 92.5% of the study participants was Haemoglobulin between 10-13 gm/dl.

The Mean APACHE II score in the study group was 3.8±1.8 and in the control group it was 3.6±1.3 with p value found to be statistically not significant between the groups.

Table 1: Outcome variables in both the group

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Study group n=30 (%)</th>
<th>Control group n=30 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean operative time</td>
<td>76.65 min</td>
<td>73.58 min</td>
</tr>
<tr>
<td>Bile leak</td>
<td>2 (6.6%)</td>
<td>1 (3.3%)</td>
</tr>
<tr>
<td>Septicemia</td>
<td>2 (6.6%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Intra-abdominal abscess</td>
<td>2 (6.6%)</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>Wound infections</td>
<td>1 (3.3%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Burst abdomen</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lung complications</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Post-operative mortality</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Commencement of oral feed</td>
<td>5.5 days</td>
<td>5.133 days</td>
</tr>
<tr>
<td>Mean hospital stay</td>
<td>12.6 days</td>
<td>12.6 days</td>
</tr>
</tbody>
</table>

The mean operative time in the control group was 76.65 min in study group and 73.58 min in control group. Bile Leak was in 2 (6.6%) in study group and 1 (3.3%) in control group. Septicemia was seen in 6.6% in study group and 10 % in Control group. Intra abdominal Abscess was seen in 2 (6.6%) in both the groups. 1 (3.3%) in study group and 3 (10%) in control group presented with wound infections. The commencement of oral Feed was started after 5.5 days in study group and 5.13 days in control group. The Mean hospital stay was 12.6 days in both the study and control group.

Discussion

The age group in our study which was affected by peptic ulcer was similar to the age groups seen in other studies done by Khalil A R et al. [9] and Thomas et al. [10] There was shift of age pattern in the incidence of peptic ulcer towards the older age group is seen in many parts of the world [11] due to changes in the lifestyle and other factors.

The percentage of males affected with peptic ulcer was more among males in our study than females. This variation in the gender is contributed due to various cultural practices and food habits in different parts of the world. The incidence of perforation more among male in our study was in contrast to study findings of Haleem M Taj et al. [12] and Khalil A R et al. [9]. Vinmal Bhandari et al. [11] study also showed similar results to our study in the incidence of perforation among male.

The incidence of the perforation is commonly seen in the lower socioeconomic group throughout the world, it was noted by Thomas et al. [10] that since 1959 the incidence of peptic ulcer and perforation is more frequently seen in the lower socioeconomic group.

The risk factors like smoking and alcohol consumption seen in our study was also seen in the study done by Svanes C [13].

The clinical signs and symptoms of the peptic ulcer perforation like Pain tenderness guarding and distension was seen in all the cases of the perforation in the studies done Gujar N et al. [14] and Druat M L et al. [15]. Testini [16] in his study reported that few patients presented with shock during the time of admission and mortality was high among such cases, whereas in our study the mortality was nil due to proper and timely active intervention in the management of shock and low APACHE II Score.

This study included the patients who had APACHE II score between 1 to 10 at the time of admission. The overall mean APACHE II score in our study was similar to the study findings of the Vinmal Bhandari et al. [11].

The mean operative time in both the procedure was almost same in our study and the time was also found to be statistically not significant, in the other studies done by Vinamal Bhandari et al. [11].

The post-operative complication seen in both the procedure in our study were the commonest complication seen in any surgical intervention. Vinamal B [11] and Kocher B et al. [17] also found similar complication like our study findings.
The mean days of starting oral feeding in both the groups was almost similar showing that both the procedure was acceptable by all the patients. The time of starting oral feeding in our study was little higher than the study done by Mukhopadhy M et al. [18] and Vinamal B et al. [11].

The mean duration of Hospital stay in our study in both the groups was much higher when compared to the hospital stays in the studies done by Hallem Taj M et al. [12], Vinamal B et al. [11]. Our hospital being set up in the rural areas the patients who are admitted are usually moderate to heavy workers and would assume the work soon after discharge and would end up with complications. Hence the hospital duration days was extended in our study and complete rest was given to them in the hospital only.

Conclusion

In our study we found that both the procedures used in the treatment of the peptic ulcer perforation is equally efficient in terms of effectiveness and outcome of the treatment. The procedure can be used as a safe alternative to the omentopexy procedure. As with figure of eight suturing technique, lesser tendency to cut through because the pressure at one point is divided into two directions, and the pressure is exerted on four points instead of two points. So, the procedure can be recommended as a safer alternative to omentopexy for perforated peptic ulcer especially when the patient presents late to the hospital, where the edges of the ulcer and walls of the duodenum are very friable.

References

A Clinical Study of Effectiveness of Sac Eversion with Minimal Separation in the Treatment of Hydrocele

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Abstract

Context: Primary vaginal hydrocele is commonest disease worldwide. In tropics lymphatic filariasis is main cause. Surgery is treatment of choice. A number of methods are described. “Sac eversion with minimal separation” is described to have many advantages. This study is done to know the efficacy of the method over others. Aims: To study the efficacy of “Sac eversion with minimal separation technique”. Settings and Design: Prospective experimental study, General Surgery department of Narayana Medical College from 15th October 2014 to September 2016. Methods and Material: Detailed history, clinical examination, investigations from patients with primary vaginal hydrocele is noted in proforma. All are operated by this technique. Post operative complications are documented. Statistical analysis used: Percentages and mean. Results: Among 64 cases maximum incidence was found in 3rd decade, agriculturist and coolies. Many cases presented with symptoms for 2 - 4 years. Right sided scrotal swelling was common. Scrotal oedema was the common complication. Average hospital stay was 2 days. Conclusions: This technique is good compared to conventional procedures because it is much easier and simpler, consumes less time, can be done with small incision under local anesthesia. As the sac is not stripped from the surrounding scrotal tissues, bleeding is minimal, post operative haematoma does not occur and other complications like pain, fever, infection, disruption of wound are prevented.

Keywords: Hydrocele; Sac eversion technique; scrotal oedema; hematoma.

Introduction

Primary vaginal hydrocele is defined as abnormal accumulation of serous fluid between the visceral and parietal layers of tunica vaginalis [1]. It is one of commonest disease occurring worldwide. Surgery has been the traditional treatment of choice for hydrocele, which is relatively simple and generally known. A number of simple methods of treatment of hydroceles with fewer complications are described such as 1) Lords Procedure [2,3] 2) Jaboulay’s technique [2] 3) Simplified Minimal dissection technique by P.K. Jhawar and L.S Sharma [4]. 4) Winkelmann’s Procedure [5]. Sac Eversion with minimal separation by S. Mahaboob [6,7] All these methods have their own advantages however; they are not practicable in Long standing Hydroceles, Cases of recurrence after tappings, Cases of failed attempts of Sclerosing and Filarial hydrocele. Such cases are common in rural India especially in filarial endemic zones. A simple technique “Sac eversion with minimal separation” is described for the treatment of above mentioned hydroceles. It is said to have the following advantages 1) It can be done under local anaesthesia. 2) Needs minimum dissection. 3) Minimum discomfort to the patient. 4) No drain is necessary. 5) done as an OP - procedure. 6) Complications are negligible with no recurrence. Dr. S. Mahaboob, (1991) described “Sac eversion
with minimal separation technique in long standing filarial hydroceles and chylocele under local anaesthesia [6,7]. Chalasani V, Woo HH (2002) advocated small incision to treat large hydroceles. They found hydrocele repair can be done safely through a 3 cm incision [8]. Winkelmann’s and Bergman’s procedures were proved to be satisfactory for the surgical treatment of patients with hydrocele by Al-Khalil N, Panchev P (2004) [9].

Materials and Methods

Source of data: All patients who were admitted in General Surgery department of Narayana Medical college with primary vaginal hydrocele, from October 2014 to September 2016. Research design: A prospective experimental study. Inclusion criteria: Patients between 18 - 70 yrs, with primary vaginal hydrocele, those willing for surgery. Exclusion criteria: scrotal swellings other than primary vaginal hydrocele. Methodology: Detailed history is taken, clinical examination was done, Lab evaluation done to evaluate the comorbid conditions. USG is done to confirm primary vaginal hydrocele. Institutional ethical committee approval was taken prior to commencement of the study. All patients underwent surgery by Sac Eversion With Minimal Separation Technique under cord block. Post operative complications like pain, Fever, secondary haemorrhage, haematoma, Scrotal Oedema, Infection, Stitch abscess, pyocele, Orchitis, Testicular torsion, Postoperative lymph scrotum, Recurrence are noted and documented in the proforma.

Results

Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age in years</th>
<th>No. of patients</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20</td>
<td>1</td>
<td>1.56</td>
</tr>
<tr>
<td>21-30</td>
<td>5</td>
<td>7.8</td>
</tr>
<tr>
<td>31-40</td>
<td>17</td>
<td>26.5</td>
</tr>
<tr>
<td>41-50</td>
<td>19</td>
<td>29.6</td>
</tr>
<tr>
<td>51-60</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>&gt;60</td>
<td>14</td>
<td>21.8</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Type of Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>No of Patients</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>3</td>
<td>4.7</td>
</tr>
<tr>
<td>Private workers</td>
<td>7</td>
<td>10.9</td>
</tr>
<tr>
<td>Govt employees</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>Businessmen</td>
<td>6</td>
<td>9.4</td>
</tr>
<tr>
<td>Coolies</td>
<td>13</td>
<td>20.3</td>
</tr>
<tr>
<td>Agriculturists</td>
<td>27</td>
<td>42.2</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Side of Hydrocele

<table>
<thead>
<tr>
<th>Side</th>
<th>No. of Patients</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>30</td>
<td>46.87</td>
</tr>
<tr>
<td>Left</td>
<td>26</td>
<td>40.63</td>
</tr>
<tr>
<td>Bilateral</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: Laterality of Hydrocele in Different Age Groups

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Unilateral %</th>
<th>Bilateral %</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>1.56</td>
<td>0</td>
</tr>
<tr>
<td>21-30</td>
<td>7.8</td>
<td>0</td>
</tr>
<tr>
<td>31-40</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>41-50</td>
<td>23.4</td>
<td>4</td>
</tr>
<tr>
<td>51-60</td>
<td>10.9</td>
<td>1</td>
</tr>
<tr>
<td>&gt;60</td>
<td>14.06</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>82.8</td>
<td>17.2</td>
</tr>
</tbody>
</table>

Fig. 1: Sac Eversion With Minimal Separation
Table 5: Duration of Hydrocele

<table>
<thead>
<tr>
<th>Duration of symptoms</th>
<th>No. of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 yrs</td>
<td>10</td>
<td>15.6</td>
</tr>
<tr>
<td>1.1-2 yrs</td>
<td>12</td>
<td>18.7</td>
</tr>
<tr>
<td>2.1-3 yrs</td>
<td>13</td>
<td>20.4</td>
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<tr>
<td>3.1-4 yrs</td>
<td>13</td>
<td>20.4</td>
</tr>
<tr>
<td>4.1-5 yrs</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>5.1-6 yrs</td>
<td>3</td>
<td>4.6</td>
</tr>
<tr>
<td>&gt;6 yrs</td>
<td>5</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6: Presenting Complaints

<table>
<thead>
<tr>
<th>Complaints</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swelling</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td>Dragging type of pain</td>
<td>21</td>
<td>32.8</td>
</tr>
<tr>
<td>Mechanical discomfort</td>
<td>37</td>
<td>57.8</td>
</tr>
</tbody>
</table>

Table 7: Post Operative Pain

<table>
<thead>
<tr>
<th>Post op pain</th>
<th>Day 1</th>
<th>%</th>
<th>Day 2</th>
<th>%</th>
<th>Day 3</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>47</td>
<td>56</td>
<td>87.5</td>
</tr>
<tr>
<td>Mild</td>
<td>30</td>
<td>47</td>
<td>25</td>
<td>39</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>26</td>
<td>40.5</td>
<td>9</td>
<td>14.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Severe</td>
<td>8</td>
<td>12.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
<td>64</td>
<td>100</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 8: Post Operative Complications

<table>
<thead>
<tr>
<th>Post operative complications</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>3</td>
<td>4.2</td>
</tr>
<tr>
<td>Scrotal edema</td>
<td>12</td>
<td>16.7</td>
</tr>
<tr>
<td>Haematoma</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Infection</td>
<td>3</td>
<td>4.2</td>
</tr>
</tbody>
</table>

All patients were ambulated from the first postoperative day onwards. All patients were discharged on the third post operative day.

Discussion

Table 9: Comparison of Age incidence

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Meredith F Campbell [10]</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>10.74</td>
<td>1.56</td>
</tr>
<tr>
<td>21-30</td>
<td>27.63</td>
<td>7.8</td>
</tr>
<tr>
<td>31-40</td>
<td>16.23</td>
<td>26.5</td>
</tr>
<tr>
<td>41-50</td>
<td>19.52</td>
<td>29.6</td>
</tr>
</tbody>
</table>

Table 10: Comparison of side of hydrocele

<table>
<thead>
<tr>
<th>Side</th>
<th>Meredith F Campbell</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>51.30%</td>
<td>46.90%</td>
</tr>
<tr>
<td>Left</td>
<td>39.50%</td>
<td>40.60%</td>
</tr>
<tr>
<td>Bilateral</td>
<td>9.20%</td>
<td>12.50%</td>
</tr>
</tbody>
</table>

Pain

In the present study patients were assessed regarding pain on 1st, 2nd, 3rd post operative days according to VAS. By 3rd day only 12% of cases had mild pain. In Albrecht W et al. [11] (1992) study patients reporting postoperative pain was 15.8%. In a study done by Nagamuneiah et al. [12] to assess various procedures for hydrocoele, pain after Lords plication was present in 22.22% cases, in Jhawar and Sharma technique pain was in 22.22% cases, after Jaboulay’s procedure pain was seen in 61.11% cases and after radical excision of sac 66.66% cases had pain. On applying chi-square test the P value is found to be 0.0049; S. This ‘p value shows that the difference in the occurrence of post-operative complication pain among the procedures is statistically significant.

Fever

In the present study patients 4.16% had fever in the post operative period. In the study done by Nagamuneiah et al. [12] to assess various procedures for hydrocoele Post operatively fever was noted in 6.6% cases who had Jaboulay’s procedure, 16.66% cases who had radical excision of sac, whereas no one in Lord’s plication or Jhawar and Sharma technique developed fever. On applying chi-square test the p value is found to be P=0.09; NS. This means that the difference in occurrence of postoperative complication fever among the four procedures is statistically nil significant.

Haematoma

Haematoma was present in 4.12% of cases in the present study and in study done by Nagamuneiah
et al. [12] 11.11% cases of Jaboulay’s and 38.88% in radical excision of sac, no case of Lord’s plication or Jhawar and Sharma developed haematoma. On applying chi-square test the P value is found to be $p<0.001$; S. This means that the difference in occurrence of postoperative complication haematoma among the four procedures is statistically significant.

In the present study where only minimal eversion and separation of sac is done, hematoma was noted only in 1 case. This is explained on the basis that much dissection is not required. Hence no haematoma formation occurred which is preclude to all other complications present with conventional methods of treatment.

**Scrotal oedema**

In the present study 16.70% cases developed scrotal oedema. In study done by Nagamuneiah et al. [12] 16.66% of cases who underwent Lord’s procedure developed oedema in the scrotum. Singh DR et al. (1996) performed a study on Lord’s procedures in 26 patients as outpatient operation, scrotal oedema was noted in 3 (11.53%) cases. Scrotal oedema occurred not only due to infection but also due to dissection and breakage of lymphatics. Scrotal oedema was more in Jaboulay’s procedure 33.33% cases and radical excision 61.11% and least in the Lord’s plication 16.66% and Jhawar and Sharma technique 11.11%. Post operatively patients were given antibiotics, anti-inflammatory analgesics and scrotal support. On applying chi-square test the P value is found to be $p=0.005$; S. This means that the difference in occurrence of postoperative complication scrotal oedema among the four procedures is statistically significant.

**Infection**

In the present study 4.12% cases developed wound infection. In study done by Nagamuneiah et al. [12] developed wound infection in 5.5% cases of Jaboulays and 11.11% of radical excision of sac. In Lord’s plication and Jhawar and Sharma no infection was noted. On applying chi-square test the P value is found to be $p=0.28$; NS. This means that the difference in occurrence of postoperative complication infection among the four procedures is statistically nil significant.

**Recurrence:** No recurrence was noted in any case.

**Post-operative hospital stay**

In our series all patients had mean post operative stay of 3 days. One patient who developed haematoma and 3 cases that developed wound infection stayed for 7-8 days and were discharged on 9th POD. In the study done by Nagamuneiah et al. [12] the patients who underwent Lord’s procedure were discharged 6-8 days operative stay. And most of the patients who underwent Jhawar and Sharma technique had postoperative stay of 6-8 days. Most of the patients who underwent Jaboulays procedure got discharged between 8-12 days. Patients who underwent radical excision of sac had more post operative stay most of them >12 days, and upto 24 days. This indicates excessive dissection lead to increased days of post operative stay.

Most complications like infections, scrotal oedema or haematoma were commonly noticed in procedures, which had extensive, dissections. Dissection of the sac wall leads to breakage or tearing of anastomotic vessels leading to bleeding and haematoma, scrotal edema. It was more with Jaboulays’ procedure and radical excision of the sac. Excision of the non absorbing parietal layer of the tunica is essential to prevent recurrence. Dissection of the sac wall leads to tearing of the vessels leading to bleed and haematoma, so recent techniques have been evolved for minimal incision, minimal dissection hence less chance of haematoma or scrotal edema. So dissection of hydrocele sac only adds morbidity hence Lord’s procedure and Jhawar and Sharma techniques which include minimal dissection has nil haematoma incidence and also decreased complication rate in our study. Hence decreased postoperative stay compared to other surgical modalities and decreased cost incurred for patients.

**Conclusion**

Sac Eversion with Minimal separation technique is a good surgical technique for the primary vaginal hydrocele compared to other conventional procedures because it is much easier and simpler in technique, consumed less time, and it can be done through a small incision and can be done under local anesthesia. As the sac is not stripped from the surrounding scrotal tissues, bleeding is minimal, post-operative haematoma does not occur and consequently other complications like pain, fever, infection, disruption of wound etc can be prevented. I am fully aware that 72 cases is too small a number to draw any definite conclusions. The follow up too has been short but under prevailing circumstances, I have made an attempt to do my best.
Conflict of Interest: Nill

Acknowledgement

I express my deepest gratitude to my teacher and guide Dr. V.V. Subramanyam, M.S Professor, Dr. Sree ram Satish, Professor & HOD of surgery, Dr. K. Rup Kumar, M.S., Professor of Surgery, Dr. Lokesh, M.S., Assistant professors of surgery, for their valuable help and guidance during my study.

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Sd/-

(Asharfi Lal)
Hyperbaric oxygen therapy: Trends at Prana Hyperbaric Oxygen Therapy Centre Mumbai, India

Manoj Gupta
Director, Prana Hyperbaric Oxygen Therapy Center, Mumbai, Maharashtra 400092, India.

Abstract

Background: Hyperbaric Oxygen Therapy (HBO) is an established treatment modality, internationally practiced since a long time ago. International protocols for the practice of hyperbaric oxygen therapy have been established in the United States by the Undersea and Hyperbaric Medical Society and in Europe by the European Committee for Hyperbaric Medicine. In India, HBO seems to be a well-accepted adjunctive treatment for diabetic foot, gas gangrene and post radiation complications. Objective: The main aim of this study is to describe the referral patterns, the different indications and patient population treated at the Prana HBO center, and to describe the protocols followed at the center and determine whether these conform to the standards established by the UHMS. Study Design: A Descriptive cross sectional study (retrospective record review) was performed to realize the aim and objectives of this study. Place of Study: The study was carried out at the Prana HBO Centre, which is owned by the Investigator and located in the Northern parts of Mumbai, in India. Methods: The data was collected from all the patient files, which are stored at the center. TCOM data was also collected from the Centre register which is maintained separately. Observation & Discussion: A total number of 276 patients were treated at the hyperbaric facility during the study period. These individuals received a total of 2,740 individual treatment sessions. An average of 9.928 (SD=±2.2) treatment sessions were thus provided to each patient. One patient received 80 treatment sessions, skewing the data. The median number of treatment sessions was 10, with an inter-quartile range of 5 - 10. TCOM was carried out on diabetic foot patients (67.8%) and in non-healing wound (22.2%). Chronic venous ulcers and compromised skin graft cases TCOM was not advised either by the treating doctor or the wound was so big that, TCOM was not possible. Conclusions: Indian perspective requires Standard HBOT facility and registry reporting as a part of healthcare reform to facilitate the acquisition of real-world data for HBOT comparative effectiveness studies, with matched cohorts.

Keywords: Hyperbaric oxygen therapy; India; Clinical and basic research.

Introduction

Hyperbaric Oxygen Therapy (HBO) is an established treatment modality [1], which is internationally practiced since a long time ago. International protocols for the practice of hyperbaric oxygen therapy have been established in the United States by the Undersea and Hyperbaric Medical Society (UHMS) [2] and in Europe by the European Committee for Hyperbaric Medicine (ECHM) [3]. These are generally accepted as the standard of care in the western world and treatment protocols were developed for around 17 indications overall. However, additional indications are accepted by other hyperbaric medical societies. Approximately 53 indications are accepted in China [4,7], twenty in Japan [5] and 72 in Russia [5].

Transcutaneous Oxygen Monitoring (TCOM) is advised (in international guidelines) in all
peripheral non-healing wounds before treatment in the chamber [9]. The UHMS published standard protocols, which is based on the current available medical evidence [2]. These protocols would typically prescribed the type of patients who should be selected (i.e. establishing a bona fide indication for therapy), and the typical work-up required for evaluation. This would for instance include the use of TCOM for diabetic ulcers of the lower limb [9]. The protocols also describe the range of treatment depth (while breathing 100% oxygen) that would yield a therapeutic tissue oxygen tension for the disease being treated. These typically range from 150 kPa to 280 kPa (depending on the disease being managed). Apart from the treatment depth, the report also describes the typical number of treatments to be provided for each indication, ranging from one session (e.g. for decompression sickness) to as many as 40 sessions (e.g. for radiation-induced lesions).

In Mumbai, HBO seems to be a well-accepted adjunctive treatment for diabetic foot, gas gangrene and post radiation complications [8]. However referring doctors seems to not be aware of the other indications approved by the UHMS and ECHM and they are also seemingly not aware of the standard protocols to be followed even in conditions for which they are aware that HBO is of benefit.

Despite these guidelines being in existence for more than three decades, there are no publications available that describe the actual treatment practices of hyperbaric facilities. Anecdotally, it seems like treatment is provided for off-label indications in almost all hyperbaric facilities and such use creates ethical dilemmas [10]. This is especially the case when treatment is provided to desperate patients (or parents) for non-indications (i.e. “indications” that have been scientifically proven to have no benefit), such as cerebral palsy [11].

Equally problematic would be the non-use of hyperbaric oxygen therapy for established indications, when such treatment modality is readily available. This could be due to a lack of available hyperbaric facilities and/or the lack of awareness about the use of HBO amongst doctors in Mumbai.

The main aim of this study is to describe (report on) the referral patterns to, the different indications and patient population treated at the Prana HBO center, and to describe the protocols followed at the center and determine whether these conform to the standards established by the UHMS. The study therefore had the following objectives, to describe the different indications treated at the Centre, to describe the patient population treated at the Center, to describe the typical treatment protocols followed at the Centre, to compare the protocols followed at the Centre with published international protocols and standards, to describe the referral patterns to the Center.

**Study Design**

A Descriptive cross sectional study (retrospective record review) was performed to realize the aim and objectives of this study.

**Study setting**

The study was carried out at the Prana HBO Centre, which is owned by the Investigator and located in the Northern parts of Mumbai, in India. The center has one Sechrist Monoplace hyperbaric chamber and a TCOM machine with 3 electrodes. The oxygen gas supply is from oxygen cylinders of 7000 liters’ capacity each. The center has all the requisite certifications and registrations as required by the local authority in Mumbai. The data was collected from all the patient files, which are stored at the center. TCOM data was also collected from the Centre register which is maintained separately. The Investigator is the medical practitioner working in this center and the physician who consulted the patients. The study is limited to the patients who were seen at the Centre during the previous two years.

**Inclusion Criterion**

The study included all those cases that were given HBO, including cases treated for conditions which were not part of the UHMS list of “approved indications” [2]. The study also included all those cases who were consulted and after investigations (such as TCOM studies) were advised that HBO treatment was not indicated.

**Exclusion Criterion**

The study excluded all those patients who were consulted by the Investigator but were not treated with HBO, nor they were evaluated for HBO (e.g. by means of TCOM studies).

**Data sources**

All the data was collected from patient files and the register, which is manually maintained at the center. The collected data was directly captured in an MS excel spread sheet for analysis. Factors associated with following the approved protocols,
association was determined by calculating the Odds Ratio of contingency tables, with 95% confidence intervals. The Chi 2 test was used to determine statistical significance between the two groups. A significance level of 0.05 was used for all these tests.

Addressing potential bias

Because this study was a retrospective record review, it may be subject to information bias, since the information was primarily captured for clinical management purposes and not for research. The data was thus not always captured in a systematic manner.

Ethics review

This study was performed within the scope of international ethical guidelines and legislation. Ethics review and approval was provided by Stellenbosch University (number: U16/06/015) and the ethics committee of the Hyperbaric Society in India.

Results

A total number of 276 patients were treated at the hyperbaric facility during the study period. These individuals received a total of 2,740 individual treatment sessions. An average of 9.928 (SD=7.2) treatment sessions were thus provided to each patient. One patient received 80 treatment sessions, skewing the data. The median number of treatment sessions was 10, with an inter-quartile range of 5-10.

The average age of the study participants was 40.899 (SD = 17.21) years; with a range of 2 to 69 years, and the median age was 45 (IQR = 29-54) years Figure 2.

The majority of patients (n=212) treated at the facility were male.

A total of 13 indications were treated at the unit (Fig. 4), of which nine are considered “approved indications” by the UHMS. Autism spectrum disorder, Cerebral palsy, head injuries and stroke have not been classified as approved indications by the UHMS. Level B evidence exists that autism spectrum disorder and cerebral palsy are negative indications for HBO therapy. Level C evidence exists that the acute phase of stroke is a negative indication, but evidence for or against chronic stroke is limited Figure 3.

The unit’s compliance with the UHMS recommended number of treatments and treatment depths are depicted in Figures 5 and 6.

All treatments provided at this unit complied with this standard. When considering all the factors associated with compliance (treatment depth, numbers, duration and frequency), the overall compliance with the recommended international protocols is depicted in Figure 7.

Transcutaneous Oxygen Monitoring (TCOM) is usually indicated for all wounds that have a hypoxic component. Indications that would potentially require TCOM measurements include chronic venous ulcers, compromised skin grafts, diabetic foot problems, non-healing wounds and chronic radiation injuries. The application of TCOM for these indications are depicted in the Figure 8.

Fig. 1: Shows the distribution of treatment numbers received by patients
Fig. 2: depicts the age distribution of the study participants.

Fig. 3: Patient Sex

Fig. 4: Bar Graph of Indications treated
Hyperbaric oxygen therapy: Trends at Prana Hyperbaric Oxygen Therapy Centre Mumbai, India

Fig. 5:

Pie chart indicating proportion of patients' treatments complying with the recommended treatment number per indication (N=276)

- 45%: Appropriate nr of treatments
- 27%: Low number of treatments
- 28%: Non-approved indications

Fig. 6:

Pie chart indicating proportion of patients' treatments complying with the recommended treatment depths per indication (N=276)

- 45%: Appropriate treatment depth
- 4%: Shallow treatment depth
- 51%: Non-approved indications

Fig. 7:

Pie chart indicating the proportion of patients' treatments fully compliant with the UHMS treatment recommendations (N=276)

- 45%: Compliant
- 23%: Non-compliant
- 32%: Non-approved indications
Table 1: Factors associated with overall compliance with the treatment recommendations in patients treated for approved indications (N=151)

<table>
<thead>
<tr>
<th>Variable Evaluated</th>
<th>N (%)</th>
<th>OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female gender</td>
<td>40 (26.5)</td>
<td>1.9 (0.9 - 3.9)</td>
<td>0.086</td>
</tr>
<tr>
<td>Age &lt; 10 years</td>
<td>0 (0)</td>
<td>(. - -)§</td>
<td>.</td>
</tr>
<tr>
<td>Age &lt; 20 years</td>
<td>3 (2)</td>
<td>(1.147 - -)§</td>
<td>0.067</td>
</tr>
<tr>
<td>Age &lt; 30 years</td>
<td>15 (9.9)</td>
<td>6.9 (1.9 - 25.6)</td>
<td>0.001</td>
</tr>
<tr>
<td>Age &lt; 40 years</td>
<td>48 (31.8)</td>
<td>3.2 (1.6 - 6.6)</td>
<td>0.001</td>
</tr>
<tr>
<td>Age &lt; 50 years</td>
<td>84 (55.6)</td>
<td>3.4 (1.7 - 6.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age &lt; 60 years</td>
<td>132 (87.4)</td>
<td>4.3 (1.2 - 15.5)</td>
<td>0.017</td>
</tr>
<tr>
<td>Age &lt; median age</td>
<td>59 (39.1)</td>
<td>2.8 (1.4 - 5.4)</td>
<td>0.003</td>
</tr>
<tr>
<td>Age &lt; mean age</td>
<td>49 (32.5)</td>
<td>3 (1.5 - 6.1)</td>
<td>0.002</td>
</tr>
<tr>
<td>Indications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic foot ulcers</td>
<td>59 (39.1)</td>
<td>0 (0 - 0.032)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Compromized grafts or flaps</td>
<td>22 (14.6)</td>
<td>(.12.4 - -)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Venous ulcers</td>
<td>11 (7.3)</td>
<td>0.1 (0.0 - 0.96)</td>
<td>0.028</td>
</tr>
<tr>
<td>Central Retinal Artery Occlusion</td>
<td>12 (7.9)</td>
<td>(.5.4 - -)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sudden hearing loss</td>
<td>8 (5.3)</td>
<td>(.3.3 - -)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Necrotizing soft-tissue infections</td>
<td>12 (7.9)</td>
<td>0 (0.0 - 0.4)§</td>
<td>0.002</td>
</tr>
<tr>
<td>Non-healing wounds</td>
<td>9 (6)</td>
<td>(.3.8 - -)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Late radiation injury</td>
<td>12 (7.9)</td>
<td>0.7 (0.2 - 2.4)</td>
<td>0.762</td>
</tr>
<tr>
<td>Thermal burns</td>
<td>6 (4)</td>
<td>(.2.4 - -)§</td>
<td>0.004</td>
</tr>
<tr>
<td>Other treatment-related conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiencing ear pain during the treatment</td>
<td>26 (17.2)</td>
<td>1.1 (0.5 - 2.5)</td>
<td>0.887</td>
</tr>
<tr>
<td>Not being referred to the unit</td>
<td>13 (8.6)</td>
<td>0.6 (0.2 - 2.1)</td>
<td>0.430</td>
</tr>
<tr>
<td>Not completing the planned treatment regime</td>
<td>9 (6)</td>
<td>0 (0 - 0.6)§</td>
<td>0.011</td>
</tr>
</tbody>
</table>

§ Cornfield method used to calculate the Odds Ratio (OR)
Table 2: Referral sources for different indications

<table>
<thead>
<tr>
<th>Referral source/Indication</th>
<th>Internet Search</th>
<th>Burns Specialist</th>
<th>Endocrinologist</th>
<th>ENT Surgeon</th>
<th>General Surgeon</th>
<th>Maxillo Facial Surgeon</th>
<th>Neurologist</th>
<th>Neurosurgeon</th>
<th>Ophthalmologist</th>
<th>Plastic Surgeon</th>
<th>Pediatric Surgeon</th>
<th>Radiation Oncologist</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autism</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Cerebral Palsy</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Chronic Venous Ulcers</td>
<td>2</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Compromised Skin Grafts</td>
<td>2</td>
<td></td>
<td>1</td>
<td>19</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>CRAO</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>12</td>
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<tr>
<td>Diabetic foot</td>
<td>6</td>
<td>5</td>
<td>40</td>
<td>8</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Injury</td>
<td></td>
<td></td>
<td></td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Hearing Loss</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Necrotizing Fascitis</td>
<td></td>
<td>9</td>
<td></td>
<td>3</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Healing Wound</td>
<td></td>
<td></td>
<td>2</td>
<td>7</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>12</td>
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<td>Radiation Injury</td>
<td>2</td>
<td></td>
<td>3</td>
<td>9</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
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<tr>
<td>Stroke</td>
<td>4</td>
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<td>25</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Thermal Burns</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>65</td>
<td>3</td>
<td>26</td>
<td>80</td>
<td>12</td>
<td>22</td>
<td>8</td>
<td>9</td>
<td>276</td>
</tr>
</tbody>
</table>

Side-effects and complications: None of the patients suffered a serious complication from HBO, such as a pneumothorax, etc. However, some minor side-effects were experienced. A total of 48 (17.39%) of the patients suffered ear pain in the chamber - most likely as a result of mild barotrauma of the ears. However, Barotrauma wasn’t noted as a complication for any of these patients. One patient suffered hypoglycemia during a treatment, while eleven patients suffered visual changes related to the HBO.

Discontinuation of treatments: A total of 11 (3.99%) of patients did not complete their planned number of treatments. The reasons for discontinuation of treatments included financial constraints (n=8), inability to tolerate the chamber treatments (n=1), referral to another hospital (n=1) and one patient discontinued treatment for an unknown reason.

Discussion

Transcutaneous treatment is generally indicated in hypoxic wound. In the study TCOM was carried out on diabetic foot patients (67.8%) and in non-healing wound (22.2%). Chronic venous ulcers and compromised skin graft cases TCOM was not advised either by the treating doctor or the wound was so big that, TCOM was not possible.

Hyperbaric oxygenation has become a recognized treatment for a number of disorders although its role in many other conditions remains experimental, controversial or simply unknown to the medical professional at large. Most of the current indications for HBO are based on evidence obtained from uncontrolled clinical trials. There are few of the randomized, double blind, and controlled studies that are emphasized these days before recognition of any new therapeutic method or for reevaluation of older well established methods.

Un-established indications [11] are conditions in which systematic clinical use of hyperbaric oxygen treatment (HBOT) is not supported by adequate proof of benefit. HBOT is vulnerable to use in many such conditions for various reasons, perhaps the most important being that a placebo or participation effect may create an impression of efficacy. The systematic use of HBOT in un-established indications raises ethical concerns about provision of misleading information, giving false hope, and taking payment for therapy of doubtful benefit. Any practice perceived as unethical or unscientific has the potential to draw the wider field into disrepute. Of substantial contemporary relevance is the use of HBOT in treatment of various forms of chronic brain injury; in particular, cerebral palsy in children and the sequel of mild traumatic brain injury in adults.

HBOT in China [13] has a wide range of indications, involving nearly every system of the human body. However, contraindications are
relatively limited. Although the use of HBOT in China for the clinical treatment of various diseases has been widely studied, the quality of these clinic trials is generally low due to a small sample size and high heterogeneity between studies. Russia [6] has extensive hyperbaric facilities. There are over 60 centers with hyperbaric facilities and approximately 1300 hyperbaric chambers are currently in Russia. Russia has one of the longest lists of indications for hyperbaric oxygen therapy (72 indications). Again the research publication from Russia is inadequate.

In India hyperbaric oxygen facilities are restricted to limited cities. If you consider the population (1.25 billion) v/s HBO facility (only 46 centers with 50 machines), it is grossly inadequate to carry out any kind of research activity. Besides this the HBO treatment is comparatively new in Indian scenario which makes further difficult in convincing the doctors for referral of patients. There are hardly any research papers from India to give any data to referring doctors due to poor research in this field and whatever Indian data is available it is inadequate to support the HBO treatment.

Conclusion

Among advanced modalities of treatment, HBOT has the unique ability to ameliorate tissue hypoxia, reduce pathologic inflammation, and mitigate ischemia reperfusion injury. Most conditions for which it is utilized have few successful alternative treatments, and the morbidity and mortality associated with treatment failure are significant. Although numerous small RCTs provide compelling support for HBOT, however there are significant barriers to trial design.

In Indian perspective requires standard HBOT facility and registry reporting as a part of healthcare reform to facilitate the acquisition of real-world data for HBOT comparative effectiveness studies, with matched cohorts. Predictive models already exist that may be useful in selecting the patients most likely to need HBOT and most likely to benefit from it. Although it is not clear whether patients, payers, or clinicians will support the allocation of healthcare resources by mathematical models, a better paradigm for the appropriate use of HBOT is needed.

Conflict of Interest: The author declares no conflict of interest for this study.

Acknowledgement

Author acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript.

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5. KK Jain. Textbook of hyperbaric medicine, Fifth revised and updated edition, Pg 500, Table 43.1
6. KK Jain. Textbook of hyperbaric medicine, Fifth revised and updated edition, Pg 501, Table 43.2
Comparative Study Between Skin Closures with Adhesive Skin Glue
2-Octyl Cyanoacrylate and Suture Material in Clean Elective Surgeries

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Abstract

Background: The choice of wound closure after surgery, whether major or minor procedure, has always raised many concerns. One of those concerns is how fast and comfortable will be the recovery. Usage of surgical adhesives, 2-Octyl Cyanoacrylate provides a flexible, water resistant, sealed skin closure. It provides a needle-free method of wound closure, an important consideration because of blood-borne viruses (e.g., HIV). Objectives: To discover the advantages and disadvantages of using 2-Octyl Cyanoacrylate glue for skin closure in comparison with that of suturing. Methodology: A comparative study was done in two groups of patients (with 35 patients each). In both the groups, detailed history was taken preoperatively and routine investigations like haemoglobin, total count, ESR, RBS were done to rule out any acute or chronic infection. Shaving of the parts was done at the same time on previous evening. Injection Cefazolin 1 gm single dose was given intravenously at the time of anaesthesia. In one group, 2-Octyl Cyanoacrylate was used as a method of skin closure. In the 2nd group, skin incision was closed using sutures. Results: The present study proves that the Time taken for skin closure, the Post-operative pain and Cosmetic appearance are significantly better with adhesive glue 2-Octyl Cyanoacrylate than the traditional skin closure by suturing. Conclusion: Skin closure with adhesive glue Octyl Cyanoacrylate is better than the traditional skin suturing. As it forms a flexible, water resistant sealed skin closure and allows patient to shower any time after surgery. It is faster, comfortable and cosmetically better technique for skin closure. It significantly reduces post-operative pain.

To conclude, adhesive glue Octyl Cyanoacrylate skin closure is a significantly better technique than traditional skin closure by suturing in clean elective surgeries.

Keywords: Adhesive glue; 2 Octyl Cyanoacrylate; Skin suturing; clean elective surgeries.

Introduction

The choice of wound closure after surgery, whether major or minor, has always raised many concerns. One of those concerns is how fast and comfortable the recovery will be. Wound closure techniques have evolved from the earliest development of suturing materials to comprise resources that include synthetic sutures, absorbable and non-absorbable, staples, tapes and adhesive compounds.

Although suture materials and aspects of the technique have changed, the goals remain the same: closing dead space, supporting and strengthening wounds until healing increases their tensile strength, approximating skin edges for an aesthetically pleasing and functional result, and minimizing the risks of bleeding and infection.

A New technology of surgical adhesives i.e Cyanoacrylate, is fast catching up. As an 8-carbon alkyl derivative, the polymer 2 Octyl Cyanoacrylate is less reactive than the shorter-chain derivatives. The slower degradation of the Octyl derivatives may result in slower concentrations of the Cyanoacrylate polymer by-products in surrounding tissues,
resulting in less inflammation. Additionally, plasticizers are added to produce a more pliable and tissue-compatible product that flexes with the skin and remains inherent for longer periods of time.

Traditionally, needle skin suturing with suture material is used because of cost-effectiveness. Nowadays surgeons are looking for faster, comfortable and cosmetically better techniques for skin closure, moreover 2-Octyl cyanoacrylate is easier to use and provides a flexible, water resistant, sealed skin closure. It provides a needle-free method of wound closure, an important consideration because of blood-borne viruses (e.g., HIV). It requires no bandaging due to its antimicrobial properties. From the patient’s perspective, it gives less pain during the post-operative period, patients can even have a shower, needs no suture or staple removal, disappears naturally as incision heals and leaves no mark. Cyanoacrylates typically fix within a minute and achieve full bond strength in 24 hours [1].

Materials and Methods

Study design: This was a comparative study conducted on 70 patients divided into two groups of 35 each.

Settings: Department of General Surgery in H.K.E’s Basaveshwar Teaching and General Hospital.

Source data: 70 Patients (35 in each Group) who underwent clean elective surgery with no focus of infection on the body, admitted in the Department of General Surgery in H.K.E’s Basaveshwar Teaching and General Hospital during the period of Dec 2010 to Nov 2011.

Procedure:

A comparative study was conducted on patients who were divided into two groups of 35 each. In patients of both the groups, detailed history was taken preoperatively and routine investigations like haemoglobin, total count, differential count, ESR, RBS were done to rule out any acute or chronic infection. Preoperative shaving of the parts was done at the same time on previous evening and same antibiotic protocol was followed. Injection Cefazolin 1 gm single dose was given intravenously at the time of anaesthesia and in minor surgeries, which were done under local anaesthesia, antibiotic was administered immediately before surgery.

In both the groups, after completion of the procedure, the wound was dried. The time at the start of skin closure and the time of finishing skin closure were noted using stop watch timer [2,3].

In both the groups, the post-operative pain was assessed at 0 hours, 12 hours, 24 hours, 48 hours, 72 hours, and 7th day using visual analogue scale of 0 to 100. 0 being no pain and 100 is worst pain possible as rated by patient themselves [4,5,6].
The outcome of wound was assessed at 3rd, 5th, 7th post-operative days using ASEPSIS SCORE. Wound was scored from 0 to 10, according to the proportion of wound involved and presence of serous collection, erythematous changes, purulent exudate, and separation of deep tissues [7,8,9].

Table 1: Wound Asepsis score

<table>
<thead>
<tr>
<th>Wound characteristic</th>
<th>Proportion of wound affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;20</td>
</tr>
<tr>
<td>Serous exudate</td>
<td>0</td>
</tr>
<tr>
<td>Erythema</td>
<td>0</td>
</tr>
<tr>
<td>Purulent exudates</td>
<td>0</td>
</tr>
<tr>
<td>Separation of deep tissue</td>
<td>0</td>
</tr>
</tbody>
</table>

The wound was assessed for cosmesis on 7th post-operative day using modified Hollander cosmesis scale [7]. A total cosmetic score was derived by adding the score of variables. A score of 1 was given to each variable if not present in the wound, so a score of 6 was considered as optimal while 5 or less as sub-optimal.

Table 2: Modified Hollander Cosmesis Scale

<table>
<thead>
<tr>
<th>Categories</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step off borders: Edges not on same plane</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Contour irregularities: Wrinkled skin near wound</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Wound margin separation: Gap between the sides</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Edge inversion: Wound not properly inverted</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Excessive distortion</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Good overall appearance</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

On the follow up on 1st month and 3rd month, the wound cosmesis was assessed by independent blinded observer and wound scoring was done using Visual Analog scale of 0 to 100 [7,8,10].

Inclusion Criteria
Cases undergoing clean elective surgical procedure and skin closure with suturing or with 2-octyl cyanoacrylate adhesive glue under same antibiotic coverage for same duration from Dec 2010 to Nov 2011.

Exclusion Criteria
1. Cases not undergoing primary closure.
2. Surgeries where stomas were necessary.
3. Patients not agreeing for 2-octyl cyanoacrylate skin closure.
4. Patients who did not come for follow-up on 7th or 15th post-operative day.

Method of Statistical Analysis
1. Chi - Square test with Yates correction, if required.
2. Student ‘t’ test.

Results
All were clean elective surgery cases. The patients were randomly included in either Skin Suturing group or Adhesive Glue group. Same antibiotic for same duration was administered in patients of both the groups.

There was no irritation of skin, hypersensitivity reaction or toxicity in any group.

There were 40 (57.14%) males and 30 (42.85%) females in the present study.

Out of 35 total cases in adhesive glue group, 18 (51.45%) were males and 17 (48.57%) were females. In suturing group, there were 22 (62.85%) males and 13 (37.14%) female cases out of 35 total cases.

The mean age for Adhesive Glue group was 19.71±10.10 years and that for Skin Suturing group was 23.71±12.88 years. Nevertheless, the difference in the age between the two categories was statistically not significant (p>0.609).

The elective surgeries included in this study were open appendectomy, herniorrhaphy, excisions of Fibroadenoma, lipoma, dermoid and sebaceous cysts.

The Mean time taken for skin closure in adhesive glue is 76.57 seconds ±14.12 and that of skin suturing is 401.86 seconds ± 84.96. This difference is of great significance with p value of <.0001 confidence.
Table 3: Post operative pain score

<table>
<thead>
<tr>
<th></th>
<th>0 hrs</th>
<th>12 hrs</th>
<th>24 hrs</th>
<th>36 hrs</th>
<th>48 hrs</th>
<th>72 hrs</th>
<th>7th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive glue</td>
<td>84.57 ± 2.62</td>
<td>69.43 ± 2.55</td>
<td>54.00 ± 2.55</td>
<td>36.54 ± 2.55</td>
<td>24.86 ± 2.55</td>
<td>12.54 ± 2.55</td>
<td>3.80 ± 1.14</td>
</tr>
<tr>
<td>Skin suturing</td>
<td>97.11 ± 1.007</td>
<td>84.69 ± 2.36</td>
<td>68.54 ± 2.46</td>
<td>53.69 ± 2.18</td>
<td>34.69 ± 2.10</td>
<td>19.43 ± 1.94</td>
<td>7.94 ± 1.62</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0017</td>
<td>0.0017</td>
<td>0.0009</td>
<td>0.0027</td>
</tr>
</tbody>
</table>

Visual Analog Scale (VAS) is calibrated from 0 to 100, 0 is marked for being no pain and 100 being sense of worst pain. This difference was statistically significant at all times. (Table 3)

Table 4: Distribution of ASEPSIS Score at different intervals (Days)

<table>
<thead>
<tr>
<th>Interval (Days)</th>
<th>Type of material</th>
<th>Seroma</th>
<th>Erythema</th>
<th>Purulent</th>
<th>Wound seperations</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd day</td>
<td>Adhesive glue</td>
<td>2 (5.71%)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>3 (8.57%)</td>
<td>1 (2.86%)</td>
<td>2</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>5th day</td>
<td>Adhesive glue</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>2 (5.71%)</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>7th day</td>
<td>Adhesive glue</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 (5.71%)</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 (5.71%)</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>70</td>
</tr>
</tbody>
</table>

This difference is of great significance and outcome is good with adhesive Glue although on 7th day the difference was not significant. (Table 4)

Table 5: Total Complications observed in each group

<table>
<thead>
<tr>
<th>Complications</th>
<th>Type of Material used</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adhesive Glue (N=35)</td>
<td>Skin suturing (N=35)</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seroma</td>
<td>2 (5.71%)</td>
<td>5 (14.28%)</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purulent exudates</td>
<td>3 (8.57%)</td>
<td>4 (11.42%)</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erythema</td>
<td>0</td>
<td>1 (2.9%)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound Separation</td>
<td>2 (5.71%)</td>
<td>2 (5.71%)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7 (19.99%)</td>
<td>12 (34.31%)</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wound Cosmesis Score on 7th post-operative day using Modified Hollander Cosmesis Scale showed that Skin Suturing group had a maximum score of 6 and a minimum of 4 in 2 patients. In Adhesive Glue group, maximum score was 6 and minimum was 5 in 2 patients. These early results were more in favour of Adhesive Glue.

Further, in the follow-up at 1st & 3rd month, the Wound cosmesis was assessed by a blinded independent observer and was scored in a Visual Analogue Scale from 0 to 100. (Table 5).

Wound Cosmesis Score at 1st month: Skin Suturing group had a minimum score of 82 and a maximum of 91 with a mean of 86.54±2.92. In Adhesive Glue group, maximum score was 99 and minimum was 97 with a mean of 98±0.76. This difference is significant with a p value of <.0001 confidences.

Wound Cosmesis Score at 3 months: Skin Suturing group has a minimum score of 85 and maximum of 93 with a mean of 88.29±2.13. In Adhesive Glue group, maximum score was 100 and minimum of 98 with a mean of 98.94±0.84. This difference was also significant with a p value of < .0001 confidences.
Discussion

**Age**

In a study conducted by Matin.S.F, in 50 patients, incisions were closed with Octyl Cyanoacrylate, and in 42 patients, with Skin suturing [11]. In the patients of Octyl Cyanoacrylate skin closure, mean age was 52.5 years and that of Skin Suturing was 51.24 years. In the present study, the age for Skin Suturing group was 23.71±13.06 years and that for Adhesive Glue group was 19.71±10.25 years. Nevertheless, this difference in the age between the two categories was not statistically significant (p>0.610) as patients were randomly selected.

**Sex ratio**

Also, it was observed from this study that the sex ratio (Male: Female ratio) of Adhesive Glue Group was 1:0.94 and that of Skin Suturing Group was 1:0.54 where as the respective values of Matin.S.F study was 1:0.85 and 1:0.7824.

**Time Taken for Skin Closure**

In Matin.S.F. Study in the Octyl Cyanoacrylate Group, the mean time taken for skin closure in Adhesive Glue Group was faster than Skin Suturing Group (150 seconds versus 360 seconds) [11]. In the Present Study, the mean time taken for skin closure in Adhesive Glue was much faster than Skin Suturing Group (76.57 Seconds Versus 401.86 seconds) which is of great significance with p<0.0001.

**Post-Operative Pain**

The present study shows significantly less postoperative pain during early and 7 days post-operatively. The earlier studies by Arunachalam P et al and Ong C.C.P et al., have compared the post-operative pain using Visual Analog Scale of 0 to 100 and have shown less post-operative pain in Adhesive Glue Group but of no significance [10,12]. In the present study, there was significantly less pain in Adhesive Glue Group up to first 72 hours following surgeries but the difference in pain on 7th post-operative day was not statistically significant.

**Wound asepsis score**

The wound Asepsis Score on 3rd & 7th day, was a maximum of 4 in Skin suturing group and 2 in Adhesive glue group. The wound Asepsis Score on 7th day was 4 in both groups.

The complications in adhesive glue were observed in 7 cases (2 seromas, 3 purulent and 2 wound separations) and 12 cases (5 seromas, 4 purulent, 1 erythema and 2 wound separation) were observed in skin suturing group in the present study. Earlier published studies by Singer A.J., et al., shows that the infection rates at the end of 1 week after surgery were similar and fewer cases of Adhesive Glue were erythematous. But Wound Dehiscence rate is 1.6% in Adhesive Glue group and 0.9% in Suturing Group [13]. In the Present Study, Wound separation was noted in 2 cases (5.71%) in Adhesive Glue group and 2 cases (5.71%) in Skin Suturing Group which is equivalent in significance. Toriumi D.M., et al., in their study evaluated the Wound at 1st week and observed no complications [14].

**Wound cosmesis score**

The study conducted by Toriumi. D.M., et al., observed wounds using Modified Hollander Cosmesis Scale and later by Visual Analog Scale showed superior results with Adhesive Glue Skin Closure [14]. In the present study, the early results on 7th day are in favour of Adhesive Glue Group and the later follow up at 1st month and 3rd month show significant difference and Adhesive Glue group had better Cosmesis as compared with Skin Suturing.

In summary, comparing Time Taken for Skin Closure, the Post Operative Pain, the Cosmetic Appearance between Adhesive Glue group and

<table>
<thead>
<tr>
<th>Interval</th>
<th>Type of material used</th>
<th>No</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Min.</th>
<th>Max.</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th day</td>
<td>Adhesive glue</td>
<td>35</td>
<td>5.94</td>
<td>0.50</td>
<td>5.00</td>
<td>6.00</td>
<td>0.86</td>
<td>0.3931</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>35</td>
<td>5.74</td>
<td>0.56</td>
<td>4.00</td>
<td>6.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 month</td>
<td>Adhesive Glue</td>
<td>35</td>
<td>98.00</td>
<td>0.76</td>
<td>97</td>
<td>99</td>
<td>4.31</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>35</td>
<td>86.54</td>
<td>2.92</td>
<td>82</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 month</td>
<td>Adhesive Glue</td>
<td>35</td>
<td>98.94</td>
<td>0.76</td>
<td>98</td>
<td>100.00</td>
<td>4.28</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Skin suturing</td>
<td>35</td>
<td>88.29</td>
<td>2.13</td>
<td>85</td>
<td>93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Skin Suturing Group of the present study with earlier studies, proves that Adhesive Glue Octyl Cyanoacrylate in skin closure was significantly better than the traditional Skin Suturing Closure.

Conclusion

The present study shows that the Adhesive Glue Octyl Cyanoacrylate Skin Closure is better than Traditional Suturing Skin Closure. The concept of a surgical tissue adhesive for superficial skin closure is an attractive alternative to the use of sutures for both Surgeons and Patients due to following characters;

1. The reduced time taken for skin closure resulted in a shorter operative time.
2. Forms a flexible, water resistant, sealed skin closure.
3. Faster, comfortable and cosmetically better technique for skin closure, and is easier to use.
4. Practically, the watertight barrier formed by Octyl Cyanoacrylate allows patient to shower any time after surgery.
5. No stitches to be removed.
6. No need to apply bandages.
7. Reduced postoperative pain.
8. Disappears naturally as incision heals, leaves no mark.
9. Octyl Cyanoacrylate is non-irritating to skin and side effects are extremely less.

Therefore it can be safely concluded that Octyl Cyanoacrylate can be used in surgical Skin Closure in clean elective surgeries

References

Study of the Efficacy of Triple Assessment in the Diagnosis of Thyroid Nodule

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How to cite this article:

Abstract

Background and Objectives: The management of thyroid nodules is multi-disciplinary and involves surgeons, pathologists, endocrinologists and radiologists. Here, we conducted a prospective correlational study of 50 patients who presented with solitary thyroid nodule to Basaveshwara Teaching and General Hospital during Nov 2016 to June 2018. The objectives were: 1. To study the clinical presentation, USG and FNAC findings of thyroid nodules. 2. To study the concordance and discordant results in the triple assessment. 3. To compare the results with the histopathological findings when available.

Methods: All the patients who fit the inclusion criteria (n=50), underwent triple assessment i.e clinical examination, Ultrasound Examination and US guided FNAC of the thyroid nodule along with complete thyroid profile and routine investigations. The findings of the triple assessment were then compared with Histopathological Report, post-surgery. The concordance of the preliminary investigations was then assessed. Results: In this study, the peak incidence was noted in the age group of 31-40 with 34% of the patients (n=17). The youngest patient was 18 yrs old and the eldest, 70 yrs old. 88% (n=44) of the patients were females, whereas 12% patients were male. The most commonly accompanied symptom to the thyroid swelling was pain/discomfort (in 14 patients). Most patients (44%) were categorised into Bethesda Category II indicating benign swellings. The diagnostic accuracy of USG and FNAC were 92% and 98% respectively. Conclusion: • The incidence of thyroid cancer is 22% among the patients with thyroid nodules. • There is a higher incidence of benign lesions (88%) most of which belonged to Bethesda Category II. • Sex profile of both benign and malignant lesions showed high female preponderance. • Ultrasound guided Fine Needle Aspiration Cytology showed high sensitivity and 98% diagnostic accuracy.

Keywords: Triple assessment; thyroid nodule; US guided FNAC.

Introduction

Thyroid swellings are one of the common problems seen in surgical practice. The management of thyroid nodules is multi-disciplinary and involves surgeons, pathologists, endocrinologists and radiologists [1].

The current approach to thyroid swellings has been revolutionized with the introduction of Thyroid ultrasonography (USG) and Fine Needle Aspiration Cytology (FNAC).

Ultrasound is easy to perform, widely available, does not involve ionizing radiation and is readily combined with FNAC [2]. Because of superficial location and good vascularisation of thyroid gland, high resolution real time grey scale and colour Doppler sonography can delineate and demonstrate the normal thyroid anatomy and pathological conditions with remarkable clarity.

The role of FNAC in pre-operative assessment of thyroid swellings has been well established in several studies. It has resulted in substantial improvements in diagnostic accuracy, cost reductions, and higher malignancy yield at the time of surgery [3].

It is therefore the ideal investigation of choice for evaluating thyroid nodules. Together, they can determine the nature of thyroid swelling and help in designing a rational treatment strategy.
Triple assessment

Triple assessment means:

i. History and physical examination including malignancy risk stratification.

ii. Imaging, usually the ultrasonographic evaluation of the thyroid and the neck.

iii. Image guided FNAC for confirmation; FNAC without image guidance has a false positive rate of 40% which can be avoided by guided FNAC [4].

However 10%-15% of the lesions cannot be categorized either as benign or as malignant by triple assessment alone. Bethesda system of the FNAC of the thyroid gland ensures uniformity of reporting so that the pathologist and surgeon are in the same frequency. It helps in the prognosis and management. Bethesda system is reported in six specific categories which are linked to the recommended management options.

Objectives

1. To study the clinical presentation, USG and FNAC findings of thyroid nodules.

2. To study the concordance and discordant results in the triple assessment.

3. To compare the results with the histopathological findings when available.

Methodology

A prospective correlational study was conducted on 50 consecutive patients who presented to the Department of General Surgery at Basaveshwara Teaching and General Hospital during the period of November 2016 to June 2018 which included patients presenting with thyroid enlargement to evaluate the efficacy of triple assessment of thyroid nodules.

Inclusion criteria

1. Patients with clinically suspected thyroid nodules.

2. As a pre-requisite before surgery in patients with thyroid disease.

Exclusion criteria

1. Pregnant women with thyroid swellings.

2. Patients not willing to undergo Ultrasonography and FNAC.

Procedure

The qualifying participants were informed in detail regarding the risks and benefits of each procedure and written informed consent was obtained. All patients with Thyroid nodules were clinically evaluated and subjected for Ultrasonography of the thyroid nodule and neck. Then, FNAC of the thyroid nodule on the basis of the Ultrasonography findings was done. Thyroid Function Tests of the patients were also done to plan the further medical or surgical management. These observations were then compared with the histopathological findings.

Results

In our study, 88% (n=44) of the patients were females, whereas 12% patients were male. (Table 1).

| Table 1: Age wise distribution of thyroid nodules |
|-------------------|---------|------|
| Age               | Number  | Percentage (In %) |
| <20               | 1       | 2%               |
| 21-30             | 16      | 32%              |
| 31-40             | 17      | 34%              |
| 41-50             | 10      | 20%              |
| 51-60             | 2       | 4%               |
| >60               | 4       | 8%               |
| Total             | 50      | 100%             |

In this study, the peak incidence was noted in the age group of 31-40 with 34% of the patients (n=17), closely followed by the age group of 21-30 with 32% patients (n=16). The youngest patient was 18 yrs old and the eldest, 70 yrs old (Figure 1).

Table 2: Age wise distribution of benign and malignant thyroid nodules proven by HPE

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Benign number</th>
<th>Benign percentage</th>
<th>Malignant number</th>
<th>Malignant percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>1</td>
<td>2%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>21-30</td>
<td>13</td>
<td>26%</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>31-40</td>
<td>16</td>
<td>32%</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>41-50</td>
<td>9</td>
<td>18%</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>51-60</td>
<td>0</td>
<td>0%</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>&gt;60</td>
<td>0</td>
<td>0%</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>78%</td>
<td>11</td>
<td>22%</td>
</tr>
</tbody>
</table>

In this study, there was a trend towards malignancy with increasing age and most benign tumours were noted below the age of 50 yrs. All the patients above the age of 50, who presented to us, had malignant thyroid nodule (Figure 2).

A total of 40 patients (80%) were euthyroid at the time of presentation. 1 patient was hypothyroid and 9 were hyperthyroid.

All the 50 patients came to the OPD with complaints of swelling in the anterior aspect of the neck. Following that, the most commonly accompanied symptom was pain/ discomfort (in 14 patients) (Figure 3).
Fig. 1: Graphical representation of age wise distribution

Fig. 2: Graphical Representation of Age wise distribution of benign and malignant thyroid nodules proven by HPE

Fig. 3: Distribution of patients according to presenting symptoms
In our study, most patients (44%) were categorised into Category II indicating benign swellings (Figure 4).

Table 3: Distribution of patients based on Bethesda categories of the nodules on FNAC

<table>
<thead>
<tr>
<th>Category</th>
<th>Diagnostic Category</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Nondiagnostic or Unsatisfactory</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>II</td>
<td>Benign</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>III</td>
<td>Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>IV</td>
<td>Follicular Neoplasm or Suspicious for a Follicular Neoplasm</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>V</td>
<td>Suspicious for Malignancy</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>VI</td>
<td>Malignant</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 4: Comparative characters of nodules by various methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Benign percentage</th>
<th>Malignant percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical examination</td>
<td>45 (90%)</td>
<td>5 (10%)</td>
</tr>
<tr>
<td>Ultrasound examination</td>
<td>44 (88%)</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>US guided FNAC</td>
<td>40 (80%)</td>
<td>10 (20%)</td>
</tr>
<tr>
<td>HPE</td>
<td>39 (78%)</td>
<td>11 (22%)</td>
</tr>
</tbody>
</table>

*P/E = Physical Examination

Fig. 4: Graphical representation of distribution of patients according to Bethesda categories

Fig. 5: Graphical Representation of Comparative characters of nodules by various methods
Table 5: USG and HPE correlation

<table>
<thead>
<tr>
<th></th>
<th>Histopathological Examination</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Malignant</td>
<td>Benign</td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Malignant</td>
<td>8(a)</td>
<td>1(b)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>True positive</td>
<td>3(c)</td>
<td>38(d)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>False positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>False negative</td>
<td>11</td>
<td>39</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity: TP/TP+FN × 100 = 72.7%
Specificity: TN/TN+FP × 100 = 97.4%
PPV: TP/TP+FP × 100 = 88.8%
NPV: TN/TN+FN × 100 = 90.4%
Diagnostic Accuracy: (TP+TN)/ FP+FN+TP+TN × 100 = 92%

Table 6: FNAC and HPE correlation

<table>
<thead>
<tr>
<th></th>
<th>Histopathological Examination</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Malignant</td>
<td>Benign</td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US guided FNAC</td>
<td>Malignant</td>
<td>10(a)</td>
<td>0(b)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>True positive</td>
<td>1(c)</td>
<td>39(d)</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>False positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>False negative</td>
<td>11</td>
<td>39</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

There were no inconclusive reports on FNAC.
Sensitivity: TP/TP+FN × 100 = 90.9%
Specificity: TN/TN+FP × 100 = 100%
PPV: TP/TP+FP × 100 = 100%
NPV: TN/TN+FN × 100 = 97.5%
Diagnostic Accuracy: (TP+TN)/ FP+FN+TP+TN × 100 = 98%

Discussion

According to Khalid et al, the mean age of presentation of Thyroid nodules is 32.2 +/- 11.58 years with a range of 13 to 90 years [5]. In retrospective, consecutive analysis by Hee-Nee Pang and Chung-Ming Chen, the mean age of patients with nodular goitres was 48.1 years and the mean age of presentation for malignant thyroid tumours was 49.25 years [6]. A study done by Aghini Lombardi et al on an iodine deficient community showed that thyroid nodularity was 0.5% in children and progressively increased with age to 28.5% in the 56- to 65 yr old group [7]. According to Edino ST et al the ages of the patients with carcinoma ranged from 16 to 65 years, with a mean age of 38.8 years [8].

In this study, the age incidence for the benign lesions ranged from 18 years to 64 years. The age incidence for the malignant lesions ranged from 31 to 72 years. The most common age group for benign lesions was between 41 to 50 years. This study shows an increase in malignancy rate with age; with 36.3% of malignant cases noted in >60 yr olds with mean age of presentation of malignant thyroid tumours being 49.36%.

Sex: The present study observed female preponderance in both benign and malignant tumors. It was observed that out of 50 cases, 44 (88%) were females and 6 (12%) were males. The female to male ratio was 7:1. The female to male ratio for malignancy was 2.6:1. In females, 36 (81.8%) of the thyroid nodules were benign in nature and 8 (18.1%) were malignant. whereas in males, 3 (50% of male patients) were benign and 3 (50%) were malignant.
72.7% (n=8) of all malignancies were found in females and 27.3% (n=3) in males. Thus most of the thyroid nodules were benign irrespective of the sex. The malignancy rates were higher in males as compared to females.

Mulandzi et al., in his study in 2001, observed female preponderance in both benign and malignant tumors in the ratio of 6:1 [9].

Yeole BB et al., in his descriptive epidemiological study of thyroid cancer in Bombay stated that they are three times more frequent among women than men [10]. In another data report in Luxemberg by Mark Keipes, et al., the ratio of male to female was 1:4 [11].

Study by Hee-Nee Pang and Chung-Ming Chen showed that 79.1% with nodular goitres were females [6].

Edino et al. states that 72% of malignant patients are females, and 28% are males [8]. Thus our study correlates with these values.

Clinical Profile

Present study shows that the duration of symptom before seeking medical attention varies from 1 month to 11 years. Thus majority of the patients with benign disease had symptoms for 1 month to as long as 11 years. Majority of the patient with malignant disease had duration of symptoms ranging from 2 months to 5 years.

In the present study, all [100%] the patients presented with thyroid swelling, of which 72% did not have any symptoms other than swelling. 28% of the patients complained of pain or discomfort in the neck. Pressure symptoms like dysphagia was present in only 6% of the patients, difficulty in breathing, change of voice was present in 4% patients each.

Study by Hee-Nee Pang and Chung-Ming Chen showed that most of the thyroid nodules were asymptomatic. 6.7% complained of painful nodules, 6.0% patients noted hoarseness of voice and another 6.0% gave a history of dysphagia. According to Khalid et al dyspnea was the most common symptom [20.5%], followed by thyrotoxic symptoms in 18.9%, dysphagia in 16.6%, pain in 8.2%, hypothyroid symptom in 6% and hoarseness of voice in 5.2% of the patients. 21.87% of the patients presenting with toxic symptoms had anxiety and palpitations. Next most common symptom was heat intolerance [17.18%] followed by weight loss [14.06%]. Menstrual disturbance and excessive sweating were the other toxic symptoms in that order.

Ultrasonography was found to be very useful in the evaluation of Thyroid malignancy. In the present study, ultrasonography diagnosed 9 (18%) patients with adenoma and 6 (12%) with adenoma along with cystic degeneration. 10 (20%) patients were diagnosed to have colloid cyst and 14 (28%) with colloid goitre. Multinodular goitre was noted in 6 (12%) patients. USG diagnosed accurately 5 (10%) patients with malignancy, indicating a sensitivity of 72.7%.

Study done by Mary C. Frates, Benson C.B., Doublet P M, et al. noted that the presence of any calcification within nodule raises the likelihood of malignancy. In particular, microcalcification in a predominantly solid nodule is associated with approximately threefold increase in cancer risk as compared with solid nodule without calcification [12].

L. Solbiati et al. in 1985 showed that margin was ill-defined and irregular in 69.7% and well-defined in 30.3%. Thyroid lesion with well-defined margin suggests benign pathology [13]. However, results are unequivocal in the present study.

FNAC was found to be very useful in the evaluation of thyroid nodule. In majority of the cases where the FNAC was benign it proved to be benign thyroid nodule on postoperative histopathological examination. 78% of the thyroid lesions were diagnosed as benign by FNAC and 20% were diagnosed as malignant.

In present study, FNAC is reported according to Bethesda system. In all cases, samples were collected from image guided FNAC. 44% of patients were categorised by Bethesda system as category-II, 16% as category-III, 14% as category-I, 12% as category-V, 8% as category- VI and 6% as category-IV.

Most of the malignant lesions were Bethesda category-V and VI on FNAC. One patient was diagnosed with category-IV. Benign nodule was the most common diagnosis made by FNAC [44%].

<table>
<thead>
<tr>
<th>Table 7: Comparison of FNAC with other studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Benign</td>
</tr>
<tr>
<td>Malignant</td>
</tr>
<tr>
<td>Suspicious</td>
</tr>
</tbody>
</table>

Histopathology showed 39 [78%] out of 50 patients had benign thyroid lesion. Remaining 11 [22%] patients had malignancy.

Edino et al in their study of 160 multinodular goiters, 24 (15.0%) had histologically diagnosed cancer. Well differentiated follicular carcinoma was the predominant histological type in 13 (52%)
cases, followed by papillary in 10 (40%), medullary carcinoma in 1 (4%) and anaplastic carcinoma in 1 (4%) patient [8].

Table 8: Comparison of histopathological diagnosis to other studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign</td>
<td>81.66%</td>
<td>81.25%</td>
<td>81%</td>
<td>78%</td>
</tr>
<tr>
<td>Malignant</td>
<td>18.33%</td>
<td>18.75%</td>
<td>18%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Analysis of the cytological reports in various series confirms the very high diagnostic accuracy of fine needle aspiration cytology.

Fine needle aspiration cytology revealed that the nodule was benign in 40 patients, suspicious in 1 and malignant in 10 patients. 10 out of total 11 malignant cases were diagnosed by FNAC. One case of Bethesda category-VI was diagnosed as Bethesda category-IV by FNAC, thus giving a false negative report.

The overall sensitivity of fine needle aspiration cytology in Goiter in the present study was 90.9%, specificity was 100%, positive predictive value of 100%, negative predictive value of 97.5% & diagnostic accuracy of 98%.

Thus, FNAC is a valuable investigation to aid clinical examination and evaluation of a patient with goiter. Due to its high accuracy, specificity and sensitivity, FNAC is a reliable investigation in preoperative diagnosis of malignancy in a thyroid swelling. Our values are comparable with other similar studies.

Table 9: Validity tests of FNAC by various studies

<table>
<thead>
<tr>
<th>Name of the study</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohammed Saddique et al.</td>
<td>75%</td>
<td>95.83%</td>
<td>81.31%</td>
<td>93.81%</td>
</tr>
<tr>
<td>Bagga &amp; Mahajan [15]</td>
<td>66%</td>
<td>100%</td>
<td>100%</td>
<td>96%</td>
</tr>
<tr>
<td>Mundasad et al. [17]</td>
<td>52.6%</td>
<td>86.6%</td>
<td>38.4%</td>
<td>90.4%</td>
</tr>
<tr>
<td>Present Study</td>
<td>90.9%</td>
<td>100%</td>
<td>100%</td>
<td>97.5%</td>
</tr>
</tbody>
</table>

Conclusion

In the current prospective study of 50 patients: The incidence of thyroid cancer is 22% among the patients with thyroid nodules.

There is a higher incidence of benign lesions (88%) most of which belonged to Bethesda Category II.

Regarding age incidence, benign lesions commonly presented in the 4th decade.

Sex profile of both benign and malignant lesions showed higher female preponderance.

Ultrasound guided Fine Needle Aspiration Cytology proved to be a useful first line investigation for malignant lesions of thyroid as it showed high sensitivity and 98% diagnostic accuracy.

References


Comparative Study of Laparoscopic Versus Open Appendicectomy

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How to cite this article:

Abstract

Background: Frequently commonly happened abdominal surgery is appendicectomy. Open appendicectomy (OA) first introduced by Mac Burney in 1884, as on now operation of choice in acute appendicitis. Laparoscopic Appendicectomy (LA) now a days is widely practiced but could not gain universal approval. LA was first done in 1983. All recent studies shows in favour of LA. Our study is to view the therapeutic benefits of LA by comparing with open appendicectomy. Methods: It is a prospective study in 101 cases underwent in district hospital Gulbarga which was attached to esic medical college. Our study series is taken from july 2017 to aug 2018 in LA and OA from jan 2018 to july 2018, and compared mean operating time, time of oral feeding, post operative stay, analgesics administered. Results: we observed that mean operating time for LA is 48±8 and OA is 35±10, LA requires 1.1 shots less analgesics than OA, Oral feeding was resumed in 20 hours earlier following LA when compared to OA, Post operative stay 2.1 days shorter in LA than OA, In female patients we noticed other pathologies like ovarian cysts and peritoneal pathology, diagnosis done and managed laparoscopically in same sitting. Conclusion: In our study it is found that LA is more effective and safe procedure in both male and female sexes. LA has tremendous advantage having less post operative infection, hospital stay and less analgesia administered and early return of bowel movements.

Keywords: (LA) Laparoscopic Appendicectomy; (OA) Open Appendicectomy; Appendicitis.

Introduction

Appendicitis is very common among causative factor of acute abdomen requiring surgical procedure which will be an emergency.

Life incidence of about 8 to 9% in male and 6 to 7% in females [1].

Open appendicectomy (OA) was described by mc Burney in about 1884 still is a gold standard method of operation for acute appendicitis in old ages since about 100 years [2].

Laparoscopic appendicectomy (LA)  rst described by semm a german surgeon in about 1983. His approach has got more popularity since 3 decades [3].

The advantage of LA as of now is often little controversial, after having many trials which has meta analysis and systematic comparision in this two techniques the conclusion advantage is yet to suffice for each one procedure, which is to be superior and preferable.

The European Association of Endoscopic surgeon (EAES) has released guidelines for appendicitis operation in favour of laparoscopic approach [4].

In our hospital study there is no much cost difference between OA and LA.

It can be minimal expense by minimal invasive surgery.

The advantage of LA is less pain and less hospital stay and early return of bowel function, and early joining for duties and better cosmetic result [3].

The main is aim to have comparative study for time duration of surgery, stay in hospital, and early ambulation and less post operative complications with good results.
Materials and methods

Prospective study of about 101 patients who underwent operation in district hospital Gulbarga, which was attached to ESIC medical college Gulbarga. OA jan 2018 to july 2018 and LA july 2017 to august 2018.

Diagnosis is done with clinical history, examination, and laboratory investigations and imaging procedures.

In operative steps only appendix removed via mac burney’s incision has been studied, Operative time is monitored from time of incision to closure of wound, post operative stay in days is calculated from the time patient is taken out from operation theatre till discharge, how many analgesic injections given is recorded, time of allowing soft diet is noted in hours from the time of surgery done.

Data were analysed by standard statistical method by using Microsoft excel and P value is also calculated.

Laparoscopic procedure

Ten (10) mm trocar is used in infra umbilical region, 5 mm trocar is used mid way between pubic symphisis and umbilicus, another 5 mm trocar is used in right hypochondrium (Figure 1,4).

After identifying, isolation of appendix is done and mesoappendix is coagulated, after resection appendix base is ligated with rod loop constructed with roeder’s Knot with no. 1 vicryl (Fig. 2,3), invariably two or three loops are inserted, hemostasis is secured by cautery then appendix is removed through 5 mm port of hypochondrium, if any collection, suction is to be used and irrigation done.

In open method grid iron incision is taken in mac burney’s area, all abdominal layers opened, mesoappendix is ligated, base of appendix is ligated with non absorbable thread or silk, appendix is removed, appendix base is not buried. Cephalosporin antibiotics given for 5 days with metronidazole, soft diet is allowed after 3 days, then patient is discharged if no fever is present.

Result

This is a study of 101 patients, 50 (OA) and 51(LA). Age of patients varies from 10 yrs to 74 yrs
Operating time 48±8 minutes in LA, and 35±10 minutes for OA.

No conversion of LA to OA is done in our series.
Average number of doses of analgesics in OA is 4 while for LA is 2. Average feeding starts after 60 hours in OA, and 24 hours in LA, the difference is 36 hours, in favour of LA.

The post operative stay was 5 days in OA and 3 days in LA. LA required 2 days less stay compared to OA.

Two cases of ovarian cyst pathology in laparoscopic group is seen, cystectomy done accordingly.

Table 1: Comparative study between LA versus OA

<table>
<thead>
<tr>
<th>Time</th>
<th>LA</th>
<th>OA</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating time</td>
<td>48±8 mins</td>
<td>35±10 mins</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Analgesics given</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Diet resumed orally</td>
<td>24 hours</td>
<td>60 hours</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital stay</td>
<td>3 days</td>
<td>5 days</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Other pathologies

<table>
<thead>
<tr>
<th>Other pathologies in LA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovarian cyst</td>
<td>2 (cystectomy done)</td>
</tr>
<tr>
<td>Peritoneal biopsy</td>
<td>2</td>
</tr>
<tr>
<td>Any adhesions</td>
<td>-</td>
</tr>
</tbody>
</table>
Discussion

Since three decades onwards there is tremendous amount of shift from open surgery to minimal access surgery. The operation classical is open appendicectomy method which is simple and more effective. But complications like wound infection, painfullness, and delayed recovery are present.

Another option is LA, in small incision and wider clear vision are advantage over open method.

The comparatively study of open versus laparoscopic surgery, laparoscopy is small incision, more access and clear vision, wide field with telescope camera, but benefit is still not much clear. Will keep in mind that laparoscopic surgery and open surgery has been complimentary related to each other. The advantages having several study there are minimal or decreased mortality rate, short stay in hospital, quick return to work and less cost [5]. But more so controversy still continues about these advantages and laparoscopic appendicectomy has not replaced the open method as laparoscopic cholecystectomy has done [6]. No conversion from LA to OA was present in this series. Mean operating time of LA was 15±6.1 minutes longer OA, other authers Quoted similar results [7,8]. But operation as a whole both OA and LA is dependent upon patient choice and his/her preference. There are more complications in OA like, wound infection rate is high as compared to LA. One case in LA group and five cases in OA group.

Infact major advantage in LA is less wound infection and its preference of choice and having major benefit to patient. There is remarkable decrease in stay in the hospital in LA. (p <0.001) [9]. And less analgesics signficantly (p < 0.002). The average cost of LA in total is about 30% more when compared to OA in general.

But in our group both LA and OA cost is same.

Conclusion

LA is a safe and effective procedure in patients having high BMI and patients having a differential diagnosis where diagnosis is in dilemma. Another benefit is that other pathologies like ovarian cyst, early tubal pregnancy, laparoscopic tubectomy or adhesiolysis can be performed with less complications and less stay in hospital.

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No conflict of interest declared.

Approval from institutional ethical committee is taken.

References

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A Comparative Study of Magnesium Sulphate and Glycerin Dressing Versus Glycerin Dressing Alone for Cellulitis in Diabetics

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How to cite this article:

Abstract

Background: Acute bacterial non-necrotizing cellulitis, or erysipelas, is an acute infection of the dermis and subcutaneous tissue, characterized by erythema, swelling, warmth and pain. Cellulitis has an incidence of 16.4 to 24.6 per 1000 persons-years [1]. Cellulitis is an acute, painful and potentially serious infection associated with significant morbidity and healthcare costs [2]. In the present study, cellulitis denotes acute, nonsuppurative, superficial skin infection of presumed bacterial origin. Prompt diagnosis and treatment leads to faster recovery and reduces the risk of serious complications and long-term health problems. Supportive nursing measures can ease symptoms and provide comfort during the acute phase. Cellulitis is a widely prevalent condition, especially in a country like India, with the highest population of diabetics. Cellulitis most typically occurs in the leg, and less often in the upper extremity, in the face, or other parts of the body. Around 50% of people who develop cellulitis suffer from longstanding oedema following the infection. Thus reducing oedema is important, as it improves venous return, maintains skin health and reduces the risk of recurrent infection [3]. Objectives: The purpose of this study is to study, establish and compare two treatment modalities namely, Magnesium Sulphate & Glycerin paste dressing versus plain Glycerin dressing for cellulitis in diabetic patients. Methods: The present prospective study was done in the Department of General Surgery, Basaveshwar Teaching and General Hospital, attached to Mahadevappa Rampure Medical College, Kalaburagi, Karnataka. A total of 60 diabetic patients with cellulitis of limbs were divided into 2 groups (Group A: MgSO4+ Glycerin paste dressing, Group B - Plain Glycerin dressing) and were subjected to the above mentioned treatment modalities respectively and followed up, to assess the outcome with respect to improvement in oedema, erythema and pain associated with cellulitis. Results: The average (Mean) number of days required for erythema to resolve in Group A patients – 5.33±1.32 days, while for patients in Group B it was – 19.5±4.12 days, which is statistically significant (p<0.0001). These findings suggest towards anti-inflammatory action/property of MgSO4+ Glycerin paste dressing. The average(Mean) number of days required for oedema to resolve among Group A patients was – 12.56±2.55 days, while among Group B patients it was – 38.56±9.67 days, which was statistically significant (p<0.0001). These findings re-establish the hygroscopic nature of MgSO4+ Glycerin paste and hence its role in resolving oedema from cellulitis areas. There is very limited evidence showing action of MgSO4 in relieving pain associated with wounds. In our study we found that, the mean duration required for total relief from pain among cellulitis patients, treated with MgSO4+ Glycerin paste dressing was 3.9±1.06 days, as against 15.06±3.15 days needed for patients in plain Glycerin dressing group (p<0.0001). This suggests that MgSO4+ Glycerin paste indeed helps in alleviating pain as against plain Glycerin dressing, in cellulitis. The overall beneficiary effects of MgSO4+ Glycerin paste can be emphasized clearly by comparing the average length of hospital stay for patients- which was 13.76±2.84 days for Group A versus 41.03±10.96 days for Group B. Interpretation & Conclusion: Based on the findings of this study, it can be concluded that MgSO4+ Glycerin paste dressing is better than plain Glycerin dressing, for reducing oedema in patients with cellulitis. In this study the...
overall length of hospital stay (LOS) was significantly less for patients treated with MgSO₄ + Glycerin paste dressing. The findings of this study are also suggestive of the possible anti-inflammatory action of MgSO₄ + Glycerin paste dressing, as evidenced by lesser duration required for resolution of erythema and pain among cellulitis patients treated with this modality.

**Keywords:** Cellulitis; Diabetes Mellitus; Magnesium Sulphate and Glycerin paste; Oedema; Erythema.

**Background**

Acute bacterial non-necrotizing cellulitis, or erysipelas (most probably from Greek “erythros”, red, and “pella”, skin), is a skin infection affecting the dermis and subcutaneous tissue [4]. Until the recent decades, the most typical location of erysipelas was the face. At present, erysipelas is most commonly located in the leg [5]. There is some confusion in the terminology concerning cellulitis and erysipelas. In the present study, cellulitis is defined as acute bacterial non-necrotizing cellulitis, which corresponds to erysipelas (in Finnish study). Thus, suppurative conditions are excluded, as well as necrotizing infections. For practical reasons, the term “cellulitis” is used in the text to denote acute non-necrotizing cellulitis, which is the subject of the present study.

Cellulitis is not uncommon. Incidence is estimated to be 200/100 000 persons/year [6]. The incidence of cellulitis has likely been quite stable throughout the 20th century, but case fatality rate has declined close to zero after the introduction of penicillin. The exact pathogenetic mechanisms behind the clinical manifestations of cellulitis are unknown. Although bacterial etiology is not always possible to ascertain, BHS and especially group A BHS (GAS) is considered the main pathogen. The role of Staphylococcus aureus as a causative agent in diffuse non-suppurative cellulitis is controversial [4,7]. A typical clinical picture of cellulitis is an acute onset of erythematous skin lesion, with more or less distinct borders, accompanied with, often high, fever. Treatment of cellulitis consists of administration of antibiotics and supportive measures. Skin breaks, chronic oedema and obesity have most consistently been found associated with acute and recurrent cellulitis [8,9,10].

The number of adults who are vulnerable to developing cellulitis is growing in line with the population ageing and rising levels of obesity and diabetics [11]. Cellulitis damages the lymphatic system and increases the risk of oedema and lymph edemas. Around 50% of people who develop cellulitis suffer from longstanding oedema following the infection. Thus reducing oedema is important, as it improves venous return, maintains skin health and reduces the risk of recurrent infection [12].

Supportive measures can ease symptoms and provide comfort during the acute phase. From this understanding, arises the need to study and compare measures to reduce oedema. Cellulitis is a widely prevalent condition, especially in a country like India, with the highest population of diabetics! The mainstay of treatment of cellulitis in the recent past has been antibiotic therapy and plain compression dressing. Hence the purpose of this study is to compare two treatment modalities namely- Magnesium Sulphate+Glycerin paste versus plain Glycerin dressing and identify the better option for treating patients suffering from cellulitis in our setup.

**Aims & Objectives**

1) To study and establish the role of Magnesium Sulphate with Glycerin dressing in cases of cellulitis in Diabetics.

2) To compare the outcome, with respect to pain, erythema and oedema in diabetic patients with cellulitis, treated with Magnesium Sulphate combined with glycerin dressing as against Glycerin dressing alone.

**Materials and Methods**

The present study was a prospective study and was carried out at Department of General Surgery, Basaveshwar Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Kalaburagi, Karnataka, from January 2017 to June 2018.

**Source of Data:** Diabetic patients diagnosed with cellulitis of limbs.

**Sample size:** A total of 60 patients were divided into two groups of 30 each.

**Sampling Procedure:** The sample size of 60 patients (diabetic) diagnosed with cellulitis were studied. MgSO₄ + Glycerin paste dressing was used for Group A - 30 patients, while plain Glycerin dressing was used for Group B - 30 patients.

**Selection criteria**

**A. Inclusion**

- Diabetic patients clinically diagnosed with...
cellulitis of limb.
• Patients aged >18 years.

B. Exclusion
• Patients with known allergies to MgSO₄ and Glycerin.
• Non-diabetic patients with cellulitis.
• Patients with co-existing necrotizing fasciitis, folliculitis, septic bursitis, septic arthritis, carbuncles and furuncles.

Method of collection of data

The selected patients were interviewed and their demographic data and clinical history was recorded. Further the patients were subjected to physical examination and relevant investigations and the assigned treatment modality. The findings were recorded and tabulated in a predesigned proforma.

Procedure

Diabetic patients diagnosed with cellulitis were subjected to the treatment modality assigned to their respective group and were followed up until discharge from the hospital. They were observed and studied with respect to the improvement in limb oedema, resolution of erythema and complete relief from pain. The findings thus recorded, were tabulated and studied to reach to a conclusion.

Outcome

• The length of stay (LOS) of the patients in each group was recorded and compared.

Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age Range (in years)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-40</td>
<td></td>
</tr>
<tr>
<td>41-60</td>
<td></td>
</tr>
<tr>
<td>61-80</td>
<td></td>
</tr>
<tr>
<td>&gt;80</td>
<td></td>
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<table>
<thead>
<tr>
<th>Group A</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (20%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>11 (36.66%)</td>
<td>11 (36.66%)</td>
</tr>
<tr>
<td>2 (6.66%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>2 (6.66%)</td>
<td>16.72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (26.66%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>11 (36.66%)</td>
<td>11 (36.66%)</td>
</tr>
<tr>
<td>0 (0%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>0 (0%)</td>
<td>16.94</td>
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</table>

<table>
<thead>
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<th>Total</th>
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<tbody>
<tr>
<td>14 (23.33%)</td>
<td>60 (100%)</td>
</tr>
<tr>
<td>22 (36.66%)</td>
<td>22 (36.66%)</td>
</tr>
<tr>
<td>2 (3.33%)</td>
<td>60 (100%)</td>
</tr>
</tbody>
</table>

p value = 0.50

Table 2: Sex Distribution

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>23 (76.66%)</td>
<td>7 (23.34%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>Group B</td>
<td>23 (76.66%)</td>
<td>7 (23.34%)</td>
<td>30 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>46 (76.66%)</td>
<td>14 (23.34%)</td>
<td>60 (100%)</td>
</tr>
</tbody>
</table>

A pain scale ranging from 0-10, with 0 being no pain and 10 being severe pain, was used to record the pain in the affected limb and followed up until discharge.

• A clinical tool (subjective) was devised and used to follow up the patients with respect to resolution of oedema and erythema and the data was recorded.

Results

A total of 60 patients were divided into 2 groups, of 30 patients each, as follows:
• Group A – MgSO₄ + Glycerin paste dressing.
• Group B – Plain Glycerin dressing.

The data obtained was tabulated and analyzed. The final results and observations were tabulated as below.

In the present study, most number of patients in Group A were in the age group of 41-60 years (11 patients, 36.66%) and equally in the range of 61-80 years (11 patients, 36.66%). The same findings were noted for Group B too, i.e. 11 patients (36.66%) each in the age group of 41-60 years and 61-80 years. The mean age of patients in Group A was: 56.56 years, whereas it was 54.90 years in Group B. (Table 1).

In the present study of 60 patients, most were males – 46 (76.66%) while the rest were females-14 (23.34%). In the study Group A comprised of 23 (76.66%) males and 7 (23.34%) females. Group B also had 23 (76.66%) males and 7 (23.34%) females (Table 2).

In the present study, the minimum LOS for a
patient in Group A was 9 days while it was 25 days for a patient in Group B. The maximum LOS for a patient in Group A was 18 days, while it was 66 days for a patient in Group B. The average (Mean) LOS in Group A was 13.76 days. The average (Mean) LOS in Group B was 41.03 days (Table 3).

In the present study, the minimum number of days required for erythema to resolve completely, for a patient in Group A was 3 days, while it was 13 days for a patient in Group B. The maximum number of days required for erythema to resolve for a patient in Group A was 8 days, while it was 28 days for a patient in Group B. The average (Mean) number of days required for erythema to resolve in Group A patients – 5.33 days. The average (Mean) number of days required for erythema to resolve in Group B patients – 19.5 days (Table 4).

In the present study, the minimum number of days required for oedema to resolve completely among Group A patients was 9 days, while it was 24 days in Group B patients. The maximum number of days required for oedema to resolve completely among Group A patients was 18 days, while it was 60 days in Group B patients. The average (Mean) number of days required for oedema to resolve among Group A patients – 12.56 days. The average (Mean) number of days required for oedema to resolve among Group B patients – 38.56 days (Table 5).

In the present study, the minimum number of days required for complete pain relief among Group A patients was 2 days, while it was 10 days among Group B patients. The maximum number of Days required for complete pain relief was 6 days among group A patients, while it was 22 days among Group B patients. The average (Mean) number of days required for pain to resolve among Group A patients – 3.9 days. The average (Mean) number of days required for pain to resolve among Group B patients – 15.06 days (Table 6).

### Table 3: Length of Stay (LOS)

<table>
<thead>
<tr>
<th></th>
<th>Minimum LOS</th>
<th>Maximum LOS</th>
<th>Average Length of hospital stay (LOS) in days (Mean)</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>9</td>
<td>18</td>
<td>13.76</td>
<td>2.84</td>
</tr>
<tr>
<td>Group B</td>
<td>25</td>
<td>66</td>
<td>41.03</td>
<td>10.96</td>
</tr>
</tbody>
</table>

p value = <0.0001

### Table 4: Days Required for Erythema to Resolve

<table>
<thead>
<tr>
<th></th>
<th>Minimum days required</th>
<th>Maximum days required</th>
<th>Average no. of days required (Mean)</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>3</td>
<td>8</td>
<td>5.33</td>
<td>1.32</td>
</tr>
<tr>
<td>Group B</td>
<td>13</td>
<td>28</td>
<td>19.5</td>
<td>4.12</td>
</tr>
</tbody>
</table>

p value = <0.0001

### Table 5: Days Required for Oedema to Resolve

<table>
<thead>
<tr>
<th></th>
<th>Minimum days required</th>
<th>Maximum days required</th>
<th>Average number of days required (Mean)</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>9</td>
<td>18</td>
<td>12.56</td>
<td>2.55</td>
</tr>
<tr>
<td>Group B</td>
<td>24</td>
<td>60</td>
<td>38.56</td>
<td>9.67</td>
</tr>
</tbody>
</table>

p value = <0.0001

### Table 6: Days Required for Pain to Resolve

<table>
<thead>
<tr>
<th></th>
<th>Minimum days required</th>
<th>Maximum days required</th>
<th>Average number of days required (Mean)</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>2</td>
<td>6</td>
<td>3.9</td>
<td>1.06</td>
</tr>
<tr>
<td>Group B</td>
<td>10</td>
<td>22</td>
<td>15.06</td>
<td>3.15</td>
</tr>
</tbody>
</table>

p value = <0.0001
Discussion

Cellulitis is an inflammatory condition of the skin and subcutaneous tissue, characterized by erythema, swelling, warmth and pain. Cellulitis has an incidence of 16.4 to 24.6 per 1000 persons-years [1]. Cellulitis is an acute, painful and potentially serious infection associated with significant morbidity and healthcare costs [2]. Prompt diagnosis and treatment leads to faster recovery and reduces the risk of serious complications and long-term health problems. Supportive nursing measures can ease symptoms and provide comfort during the acute phase.

The number of adults who are vulnerable to developing cellulitis is growing in line with the population ageing and rising levels of obesity and diabetics [11]. Cellulitis damages the lymphatic system and increases the risk of oedema and lymph edemas. Around 50% of people who develop cellulitis suffer from longstanding oedema following the infection. Thus reducing oedema is important, as it improves venous return, maintains skin health and reduces the risk of recurrent infection [3].

The mainstay of treatment of cellulitis in the recent past has been antibiotic therapy and plain compression dressing. Hence the purpose of this study was to compare the efficacy of two dressing modalities, i.e. MgSO4 + Glycerin paste versus plain Glycerin and identify the better option for treating patients suffering from cellulitis in our setup.

This prospective study was carried out in Basaveshwar Teaching and General Hospital attached to Dept. of General Surgery, Mahadevappa Rampure Medical College, Kalaburagi, Karnataka. Based on the average hospital data, 60 diabetic patients diagnosed with cellulitis of limb/limbs were included in the study. MgSO4 + Glycerin paste dressing was used for 30 patients (Group A), while plain Glycerin dressing was used for another 30 patients (Group B).

In the present study, most number of patients in Group A were in the age group of 41-60 years (11 patients, 36.66%) and equally in the range of 61-80 years (11 patients, 36.66%). The same findings were noted for Group B too. i.e. 11 patients (36.66%) each in the age group of 41-60 years and 61-80 years. The mean age of patients in Group A was 56.56±16.72 years, whereas it was 54.90±16.94 years in Group B. However the difference observed in age distribution and the mean age was statistically not significant (p=0.050).

Magnesium Sulphate or Epsom salt, contains Magnesium, has a hygroscopic action, which helps to alleviate the pain and inflammation of injuries such as sprains and strains. The Southwest Council of Naturopathic Medicine and Health Sciences recommend using Epsom salt compresses to take away the pain and swelling of insect bites and stings. In a study done by Biswas D, in Kolkata, 2005, it was said that glycerin with Magnesium Sulphate was being used effectively in the treatment of swelling in phlebitis [13]. The treatment with Glycerin + Magnesium Sulphate emulsion also takes less time as compared to that taken by 50% Magnesium Sulphate solution [14].

Glycerin + Magnesium Sulphate paste application was found to be very effective when compared with Magnesium Sulphate fomentation in reducing swelling and duration, in patients with oedema due to phlebitis [15]. External application of magnesium sulphate is usually adopted to reduce local inflammation and swelling in clinical practice. Once the magnesium sulphate is mixed with glycerin, the glycerin can effectively prevent its evaporation and extend its duration of action [16].

In the present study, the minimum number of days required for erythema to resolve completely, for a patient in Group A was 3 days, while it was 13 days for a patient in Group B. The maximum number of days required for erythema to resolve for a patient in Group A was 8 days, while it was 28 days for a patient in Group B. The average (Mean) number of days required for erythema to resolve in Group A patients - 5.33±1.32 days, while for patients in Group B it was -19.5±4.12 days, which is statistically significant (p<0.0001). These findings suggest towards anti-inflammatory action/property of MgSO4 + Glycerin paste dressing.

In the present study, the minimum number of days required for oedema to resolve completely among Group A patients was 9 days, while it was 24 days in Group B patients. The maximum number of days required for oedema to resolve completely among Group A patients was 18 days, while it was 60 days in Group B patients. The average (Mean) number of days required for oedema to resolve among Group A patients was - 12.56±2.55 days, while among Group B patients it was - 38.56±9.67 days, which was statistically significant (p<0.0001). These findings re-establish the hygroscopic nature of MgSO4 + Glycerin paste and hence its role in resolving oedema from cellulitis areas.

There is very limited evidence showing action of MgSO4 in relieving pain associated with wounds. In our study we found that, the mean duration required for total relief from pain among cellulitis patients, treated with MgSO4 + Glycerin paste dressing was
3.9±1.06 days, as against 15.06±3.15 days needed for patients in plain Glycerin dressing group (p<0.0001). This suggests that MgSO$_4$+ Glycerin paste indeed helps in alleviating pain as against plain Glycerin dressing, in cellulitis.

The overall beneficiary effects of MgSO$_4$+ Glycerin paste can be emphasized clearly by comparing the average length of hospital stay for patients- which was 13.76±2.84 days for Group A versus 41.03±10.96 days for Group B.

**Conclusion**

1. Based on the findings of this study, it can be concluded that MgSO$_4$+ Glycerin paste dressing is better than plain Glycerin dressing, for reducing oedema in patients with cellulitis, by virtue of its hygroscopic action.

2. In this study the overall length of hospital stay (LOS) was significantly less for patients treated with MgSO$_4$+ Glycerin paste dressing.

3. The findings of this study are also suggestive of the possible anti-inflammatory action of MgSO$_4$+ Glycerin paste dressing, as evidenced by lesser duration required for resolution of erythema and pain among cellulitis patients treated with this modality.

**References**


13. Vishwa’s D. Dissertation to compare the effect of four selected nursing interventions on patients with phlebitis related to peripheral IV infusion in selected hospital of Kolkata; 2005.


15. Bronco Loyola D’Souza, and Shivakumar. Effectiveness of Magnesium Sulphate crystal fomentation versus paste application for phlebitis among children receiving peripheral infusion at selected hospital in Mangalore. NUJHS. 2016 Mar;6(1).

Comparing Accuracy of Alvarado Score and Ultrasonography with Operative Findings in Acute Appendicitis

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How to cite this article:

Abstract

Context: Acute appendicitis is one the very common acute abdomen presenting to the emergency department. Many scoring systems and radiological modalities have been developed over the years for the diagnosis of acute appendicitis. Aims: Our objective is to study acute appendicitis, the various clinical patterns that help to make a clinical diagnosis and effectiveness of radiological investigation in diagnosing acute appendicitis and its influence on clinical decision making. Method: The study group included all the patients presenting to KIMS Hubli with suspected acute appendicitis and operated for the same during December 2016 to May 2018. Results: The current study included 172 cases. Out of which 61.8% were male and 38.2% were female. Majority of the study population belonged to the age group of 10-30 years. The most common symptom was pain abdomen followed by nausea and vomiting, fever and anorexia. Most common sign elicited was right iliac fossa tenderness and followed by rebound tenderness. On blood investigations 66.5% of the patients had leukocytosis of >10,000. 64.1% of the patients had Alvarado score of 7 and more. As per USG, 94.1% of them had signs of acute appendicitis. The most common position in our study is retrocecal. Appendicitis was reported in all the cases on histopathological examination. Conclusion: Clinically diagnosing a case of appendicitis based on symptoms and signs combined with affordable radiological investigations can reduce unnecessary delay in the operative management of acute appendicitis. It is evident in our study that clinical and radiological investigations have no specificity in clinical diagnosis of acute appendicitis.

Keywords: RIF- right iliac fossa, USG- ultrasonography

Introduction

The surgical treatment of appendicitis is one of the great public health advances of the last 150 years. Appendicitis is a disease of the young, with 40% of cases occurring in patients between the ages of 10 and 29 years. In 1886, Fitz reported the associated mortality rate of appendicitis to be at least 67% without surgical therapy [1]. Currently, the mortality rate for acute appendicitis with treatment is reported to be <1%. Today, ultrasonography (USG) of abdomen is one of the commonly asked investigations by the surgeon in case of acute abdomen. Advantage of USG over other radiological investigation is that it is easily available, cost effective, portable, no known side effects, non-invasive and requires minimal patient preparation [2]. ALVARADO score is the most commonly employed system for suspecting acute appendicitis clinically. There have been many studies for evaluating the efficacy of this scoring system.

Our objective is to study acute appendicitis, the various clinical patterns that help to make a clinical diagnosis and effectiveness of radiological investigation in diagnosing acute appendicitis and its influence on clinical decision making. The emphasis laid here is whether a proper
history and clinical examination, coupled with cost effective investigation like ultrasound can help prove the diagnosis as later confirmed by operative and histopathology examination findings.

**Materials and Methods**

The study group included all the patients presenting to KIMS Hubli with suspected acute appendicitis and operated for the same during December 2016 to May 2018. The patients more than 18 years of age, patients who were admitted history of recurrent appendicitis and female patients with suspected gynecological problems were excluded from the study population. ALVARADO score was calculated for all the patients. This is a prospective observational study.

**Results**

The current study included 172 cases. Out of which 61.8% were male and 38.2% were female. 78.7% of the study population was in the age group of 10-30 years. The symptoms in our study were pain abdomen (100%), nausea and vomiting (64.2%), fever (45.1%) and anorexia (4.6%). Clinical presentation of acute appendicitis in adults at the Chris Hani Baragwanath academic hospital by Richard Nshuti et al. show that predominant presenting symptoms were right iliac fossa pain (95%), nausea (80%), and vomiting (73%) and fever was present in 15%. (Fig. 1).

Most common signs elicited were tenderness in the right iliac fossa (100%) and rebound tenderness (84%). On blood investigations 66.5% of the patients had leukocytosis of >10,000.

64.1% of the patients had Alvarado score of 7 and more. When the Alvarado score of 5 and more was considered, there are 151 patients considered to be a case of acute appendicitis in which all were turned out to be having appendicitis on histopathological examination.

When the Alvarado score of 7 and more was considered to be the case of acute appendicitis, there are 110 cases suspected of acute appendicitis. All of them were turned out to be appendicitis on histopathological examination. The mean score is around 6 and the standard deviation is 1.65. Majority of the patients had score of 7 and above (64.1%). 23% of the patients had score of 5 and 6. Only 12.8% of our study population had score 4 and less. (Table 1).

Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study by M Kalan et al. show that sensitivity of Alvarado score with cut off 7 was 93% in men, 67% in women and 100% in children which comparable to our study with sensitivity of 63.9 [3].

All the patients had undergone ultrasonography in our study. As per USG, 94.1% of them had signs of acute appendicitis. A Prospective Study of Ultrasonography in the Diagnosis of Appendicitis by Julien B.C.M. et al. shows that sensitivity of ultrasonography 80.55% whereas sensitivity in our study is 94.1% [4]. (Fig. 2).

On intra operative examination during open appendicectomy done in all the patients in our study population majority of the study population

| Table 1: Show the distribution of Alvarado score in our study population |
|--------------------------|----------------|----------------|---------|---------|---------|
| 7-10                     | 5-6            | 4 or less      | mean    | SD      | minimum | maximum |
| 111(64.1)                | 40(23.1)       | 22(12.8)       | 6.66    | 1.65    | 3       | 10      |

(Fig. 1: Show the most common presenting symptoms in acute appendicitis)
Comparing Accuracy of Alvarado Score and Ultrasonography with Operative Findings in Acute Appendicitis

Fig. 2: Show the ultrasonography examination findings in suspected cases of acute appendicitis

Fig. 3: Show the position of appendix on intra operative examination

Fig. 4: Shows the sensitivity of different modalities of examination in the diagnosis of acute appendicitis
99.4% had evidence of inflamed appendix and only 1 normal appendix was witnessed. The most common position in our study is retrocecal (64.9%) and least is post ileal (1.2%). [Fig. 3]

All the specimens where sent for histopathology examination. Appendicitis was reported in all the cases on histopathological examination.

The sensitivity to diagnose appendicitis was highest in intra operative examination (99.41%), followed by ultrasonography (94.1%). Alvarado scoring has higher sensitivity when the cut off was kept at 5 (87.2%) and more rather than 7 (63.9%) and more.

**Discussion**

The study was conducted at Karnataka Institute of Medical Sciences from December 2016 to June 2018. The present study included total of 172 cases who were admitted with suspicion of acute appendicitis.

The lower incidence fever and nausea and vomiting could be due easy availability medication prescribed by the local doctors. The lower incidence of anorexia could be attributed the early presentation to the emergency centre where patients could not have appreciated the same. The lower incidence of rebound tenderness may be due to early presentation of the patients where parietal peritoneum was not inflamed. Histopathologically all the sent specimens were positive for signs of acute appendicitis and that could be due to inflammation that might happen during intra operative manipulation.

The lack of specificity in both Alvarado scoring and ultrasonography indicate that neither of these measurements was accurate in the diagnosis of acute appendicitis. ALVARADO score with cut off 5 significantly increased sensitivity of clinically diagnosing acute appendicitis. On considering the USG as the primary radiological investigation of choice, it has sensitivity of 94.1% but no specificity which might be due to objective differences in the operator and difficulty in visualising the appendix due to overlying bowel gas shadow. So this objective scoring system with additional radiological investigation such as ultrasonography could possibly increase the sensitivity of diagnosing acute appendicitis. Sensitivity being lower with Alvarado score alone it is advisable to have ultrasonographic examination to increase the efficacy of the clinician in diagnosing acute appendicitis. (Fig. 4).

Finally clinically diagnosing a case of appendicitis based on symptoms and signs combined with affordable radiological investigations can reduce unnecessary delay in the operative management of acute appendicitis as it is evident in our study that clinical and radiological investigations have no specificity.

**Conclusion**

Clinically diagnosing a case of appendicitis based on symptoms and signs combined with affordable radiological investigations can reduce unnecessary delay in the operative management of acute appendicitis. It is evident in our study that clinical and radiological investigations have no specificity in clinical diagnosis of acute appendicitis.

**References**

Comparison of Negative Pressure Wound Therapy Using Vacuum-Assisted Closure with Conventional Wound Dressing in the Treatment of Diabetic Foot Ulcers: Our Experience

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1Assistant Professor 2Junior Resident 3Associate Professor 4Assistant Professor and Unit Chief 5Junior Resident, Department of Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka 560002, India.

How to cite this article:

Abstract

Background: Diabetic foot ulcers (DFUs) are considered one of the most common and devastating chronic complications of diabetes. As a consequence of DFUs, a lower limb is lost every 30 seconds somewhere in the world, and the probability of losing the other leg is 50% after 3 years. DFUs contribute to 85% of non-traumatic lower limb amputations and lead to 13 to 17% of mortality rate in patients with diabetes mellitus. Negative pressure wound therapy (NPWT) is a newer non-invasive adjunctive therapy system that uses controlled negative pressure, using vacuum assisted closure (VAC) device, to help promote faster wound healing by removing fluid from open wounds, preparing the wound bed for closure, reducing oedema, and promoting formation of granulation tissue.

Methodology: We have conducted a study in Bangalore Medical College and Research Institute Bangalore for a period of one year comparing the conventional dressing versus VAC dressing in faster healing of the wound. Induced about 40 patients in the study.

Conclusion: Patients treated with VAC therapy has faster appearance of granulation tissue than that with Conventional dressings. From our study VAC therapy has proved to be more effective than conventional dressing in healing of Diabetic Foot Ulcers.

Keywords: Diabetic foot ulcers (DFUs); Negative pressure wound therapy (NPWT), Diabetes mellitus (DM).

Introduction

Diabetes mellitus (DM) is a syndrome characterized by hyperglycemia that results from absolute or relative impairment in insulin secretion and/or insulin action [1]. With the development of people’s living standards and lifestyle changes, the incidence of diabetes has been rising. An estimated 382 million people had DM in 2013; this number will increase to 592 million by 2035 [2]. Hazards of DM usually present as complications; diabetic foot ulcers (DFUs) are considered one of the most common and devastating chronic complications of diabetes. The expected lifetime risk of a DM patient developing a foot ulcer is 12%–25%[3]. As a consequence of DFUs, a lower limb is lost every 30 seconds somewhere in the world, and the probability of losing the other leg is 50% after 3 years. DFUs contribute to 85% of non-traumatic lower limb amputations and lead to 13 to 17% of mortality rate in patients with diabetes mellitus [4].

The management of the DFU is largely determined by its severity (grade), vascularity of the limb, and the presence of infection [5].

Conventional dressing is the standard method; however, maintaining a moist wound environment is difficult. Subsequently, various hydrocolloid wound gels, growth factors, enzymatic debridement compounds, hyperbaric oxygen therapy, cultured skin substitutes.

Negative pressure wound therapy (NPWT) is a newer non-invasive adjunctive therapy system that uses controlled negative pressure, using vacuum...
assisted closure (VAC) device, to help promote faster wound healing by removing fluid from open wounds, preparing the wound bed for closure, reducing oedema, and promoting formation of granulation tissue [6,7] The data available on the role of NPWT for the management of DFU (Diabetic Foot Ulcer) is limited. Therefore, we conducted a study to compare the effectiveness of VAC with conventional dressings in the healing of DFU.

Classification

Comparative study done by using university of Texas (UT) wound Classification as shown in Table 1.

Methods

Study design and area

A randomized controlled study was done in department of surgery in a tertiary care hospital in Bengaluru.

Study period: One year

Study population:

Patients admitted in department of general surgery in Bangalore Medical College and Research Institute, Bangalore.

Inclusion criteria

Patients with non healing ulcer in diabetic patients.

Exclusion Criteria

Ulcer associated with malignancy, collagen vascular disease, extensive osteomyelitis, charcots arthropathy, pregnancy and medications like corticosteroids, immunosuppressive drugs and chemotherapy.

Methodology

The study was a prospective time bound study conducted in Bangalore Medical College and Research Institute, Bengaluru.

History relevant investigations, local examination was done for all patients followed by thorough wound debridement and irrigation of Diabetic Wound for all diabetic wound patients. NPWT dressing was then applied. And NPWT dressing changed every week. And repeated debridement done when needed. NPWT dressing involves the pressure between - 125 mmhg to - 150 mmhg was maintained in all patients. Wound characteristics were recorded at every dressing with respect to size, shape, discharge, granulation tissue, etc.

Sample Size

A total of 40 patients were included in our study.

Efficacy assessment

The primary Efficacy end point was complete wound closure rate. Wound closure is defined as skin closure without drainage or dressing requirements. Secondary end point is defined as time for appearance of granulation tissue, reduction of size of ulcer.

Results

Statistics

All the data entered in Microsoft excel sheet. All the quantitative data entered as mean standard deviation, and compared using student t test. P value less that 0.5 is considered significant.

<table>
<thead>
<tr>
<th>Table 1: University of Texas Diabetic Wound Classification System.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
</tr>
<tr>
<td>A (No infection or ischemia)</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>
Mean age of subjects was 53.6 and 53.1 years for conventional and VAC dressings respectively. (Graph 1).

Table 2: Distribution of patients based on gender

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>VAC</td>
<td>86%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Male patient proportion is found to be greater in both conventional and NPWT groups. (Table 2).

Table 3: Distribution of patients based on Co morbidities

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>VAC</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>45%</td>
<td>38%</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>4.4%</td>
<td>12%</td>
</tr>
<tr>
<td>Bronchial asthma</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Iscemic heart disease</td>
<td>16.8%</td>
<td>28%</td>
</tr>
<tr>
<td>None</td>
<td>35.6%</td>
<td>38.2%</td>
</tr>
</tbody>
</table>

Table 4: Distribution of patients based on UT Classification.

<table>
<thead>
<tr>
<th>University of Texas classification</th>
<th>Conventional</th>
<th>VAC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage A</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Grade 1</td>
<td>16.6%</td>
<td>6.25</td>
<td>12.5</td>
</tr>
<tr>
<td>Stage B</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Grade 2</td>
<td>20.8%</td>
<td>18.75</td>
<td>17.5%</td>
</tr>
<tr>
<td>Stage A</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Grade 1</td>
<td>16.6%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>Stage A</td>
<td>11</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Grade 2</td>
<td>45.8%</td>
<td>56.2</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>16</td>
<td>40</td>
</tr>
</tbody>
</table>

Most of the patients belong to stage B grade 2 according to UT Classification. (Table 4).

Table 5: Distribution of patients based on granulation tissue

<table>
<thead>
<tr>
<th>Granulation tissue</th>
<th>Conventional</th>
<th>VAC</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>16</td>
<td>13</td>
<td>29</td>
<td>0.3</td>
</tr>
<tr>
<td>Week 2</td>
<td>24</td>
<td>16</td>
<td>40</td>
<td>1</td>
</tr>
</tbody>
</table>

So from above table, patients treated with VAC therapy developed granulation tissue earlier than that treated with conventional dressings. (81.2% in VAC patients compared to 66.6% in conventional dressings). (Table 5).

Eginton et al compared the rate of wound healing with vacuum assisted close device with the conventional moist dressings for large diabetic wounds over 4 weeks and found that over first several weeks VAC dressings were decreased the wound depth and volume more effectively than the conventional moist dressings. They conclude that negative pressure wound therapy may accelerate the wound healing in diabetic Ulcers [13].

Table 6: Distribution in terms of reduction of granulation tissue

<table>
<thead>
<tr>
<th>% decrease in the size of the wound</th>
<th>Conventional</th>
<th>VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>Week 2</td>
<td>30%</td>
<td>54%</td>
</tr>
<tr>
<td>Week 3</td>
<td>52%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Distribution in terms of hospital stay.

Patients treated with VAC therapy went home after 4 weeks when compared to 6 weeks of stay in hospital in conventional dressings, in diabetic ulcer patients.
Discussion

The study measures time need for the complete wound closure in chronic diabetic patients using negative pressure wound therapy.

Time needed for complete healing and formation of granulation tissue by conventional dressings according to multiple studies were shown to be 60 to 130 days [15,16,17]

Mechanism of action negative pressure wound therapy.

Macrodeformation

Refers to induced wound shrinkage caused by collapse of the pores and centripetal forces exerted onto the wound surface by the foam [8,9]. Polyurethane ether foams exposed to 125 mmHg suction can decrease the foam volume by approximately 80% and result in a substantial decrease in wound surface area.

Microdeformation

In NPWT, cells are subjected to shear and hydrostatic pressure from extracellular fluid, stretch and compression from their surrounding matrix, and the ubiquitous pull of gravity. Microdeformation, in essence, is the morphologic result of these integrated mechanics. Cell shape has been demonstrated to be a determinant of cellular function [9].

Alteration of the wound environment

The PU drape is semiocclusive there by restricting evaporative water losses while remaining impermeable to proteins and microorganisms thereby maintaining a favourable and moist wound. In comparison with conventional therapies, the reduced number of required dressing changes in NPWT also can add to comfort of patient.

Fluid Removal

Excess fluid buildup is commonly accepted as a contravening factor in healing, partly owing to the compressive effect it can exert on local cells and tissues. The evacuation of fluid reduces micro vascular compression, increasing perfusion and allowing faster wound healing. Toxins from the wound, bacteria, and exudate can also be removed with the fluids. NPWT also induces a gradual increase in lymphatic density at wound edges, thereby improving drainage.

Angiogenesis

Negative Pressure Wound Therapy induces wound site local hypoxia and stimulation of Vascular Endothelial Growth Factor with subsequent angiogenesis [10]. It is not surprising that NPWT demonstrates increased microvessel density during chronic wound treatment. NPWT stimulates wound-site angiogenesis through anumber of mechanisms: mechanical stimulation (microdeformation), removal of factors inhibiting angiogenesis.

Granulations tissue formation

NPWT helps in increasing the proliferation of fibroblasts, migration of macrophage, and formation of early granulation tissue. In proliferation phase effect of NPWT include robust granulation tissue formation including the blood vessel sprouting [11].

During the inflammation phase, NPWT removes the infiltrating leukocytes and simultaneously induces the inflammation [14].

Outcome

The primary end point in the study the granulated wound is ready for Skin grafting of split skin grafting or healing by secondary intention. Lone et al observed that in 86.4% of the patients wounds were closed by split thickness skin grafting in VAC group as compared to 90.9% in conventional dressing patients. In rest of the patients wounds were closed spontaneously [12].

Conclusion

A total of 40 patients between 35 to 60 years with stage A or B with grade 2 according to UT Classification were divided in to two groups.

Group A: vacuum assisted closure.

Group B: convention wound dressing. And following observations made in the study.

- Hypertension and ischemic heart disease were the most common comorbidity associated in diabetic ulcer patients.
- Patients treated with VAC therapy had early appearance of granulation tissue that that treated with the conventional wound dressings. (81.2% when compared with the 66% the conventional wound dressings)
Patients treated with VAC therapy have more decrease in the size of the ulcer wound when compared to that treated with conventional dressings.

So we can conclude that VAC (NPWT) is superior to conventional wound dressing in treating the diabetic ulcer patients in terms of early appearance of granulation tissue and duration of hospital stay.

References

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A Prospective Randomised Study of Effectiveness of Chewing Gum on Post-Operative Ileus among the Patients who have Undergone Abdominal Surgery

Shilpa H1, Dayananda R2, Shreeniketan Nayak3, Praveena S4

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How to cite this article:

Abstract

Context: Postoperative ileus limits early hospital discharge for patients who had undergone abdominal surgery. Literature indicates that chewing gum is evaluated as a convenient method to enhance recovery from postoperative ileus after abdominal surgery. Aims: To evaluate the efficacy of chewing gum on post-operative ileus among the patients of abdominal surgery. Settings and Design: Prospective randomized interventional study. Methods and Material: Patients were assigned randomly to one of two groups of each procedure depending on condition of the patient. Interview schedule and checklist were used to assess the bowel sounds, passage of first flatus, passage of stool and return of appetite. The patients in the study group as per planned protocol were administered chewing gum three times a day for 30 min starting from the time patient become conscious till the onset of one of the primary endpoints. The patients are allowed to chew the gum even with Ryle’s tube. Statistical analysis used: Data was analysed using IBM SPSS version 22 software with Chi-square test used for test of significance. Results: The mean duration of return of first bowel sounds, the passage of first flatus, passage of stool and return of appetite was significantly shorter in the study group as compared to the control group as per tests of statistical significance. Conclusions: It is concluded that use of chewing gum in the postoperative period is a safe and cheap method to stimulate bowel motility and reduce the postoperative ileus after abdominal surgery.

Keywords: chewing gum; bowel motility; postoperative ileus.

Introduction

Postoperative ileus limits early hospital discharge for patients who had undergone abdominal surgery [1]. Literature indicates that chewing gum is evaluated as a convenient method to enhance recovery from postoperative ileus after abdominal surgery [2]. The present study was aimed to evaluate the efficacy of chewing gum on bowel motility among patient who had undergone abdominal surgery for significant difference in early return of first bowel sound, passage of flatus, passage of stool and return of appetite with the administration of chewing gum. A total of 111 patients who underwent both elective and emergency open abdominal surgeries were participating in the study.

Aims and Objectives

To study the effectiveness of chewing gum in postoperative patients by reducing the time to first passage of flatus, time to first feces and time to the first appearance of good appetite between the control and study group.

Methodology

Source of data and materials

All patients who underwent abdominal surgery (Emergency and Elective cases) between January
2016 and September 2017 at KIMS, Hubballi were included in the study. Initially, the patient was identified according to condition and procedure he had undergone. A total of 111 patients who fulfilled the inclusion and exclusion criteria were included.

The study involves 37 patients in Omental patch repair group for intestinal perforation, 43 patients in Appendicectomy group for acute appendicitis, 13 patients in Biliary surgery group for calculous cholecystitis with Common bile duct stone, 18 patients for other abdominal procedure.

Patients were randomized within the group to control and study group. Randomization is done with simple random sampling technique. So each group has two groups of control and study group. The tools and protocol were developed through a review of relevant literature and validated by experts from the field department of General Surgery. Tools used in the study were interview schedule and checklist to assess the bowel sounds, the passage of first flatus, the passage of stool, and the return of appetite.

**Type of study:** A prospective Randomised control study

**Sample size:** 111 patients

**Method of collection of data:** The patients in the study group as per planned protocol were administered chewed gum three times a day for 30 min starting from the time patient become conscious (<12 hr) till the passage of the bowel sounds, passage of first flatus, the passage of stool, and return of appetite. Patients were evaluated as per the symptoms and detailed history, the complete physical examination was done. Preoperative investigations, mechanical bowel preparation, intraoperative findings including incision size, procedure, type of anesthesia, postoperative investigations, the appearance of bowel sounds, flatus, stool, and appetite were all documented.

**Inclusion criteria**

All patients who have undergone abdominal surgeries, aged above 14 years who require postoperative care are all included.

**Exclusion criteria**

- Patients who are unconscious.
- Patients who are intubated and not extubated within 12 hrs of postoperative period.
- Patients who had facial and maxillofacial injuries.

**Results**

Our study is a randomized control study of the effectiveness of chewing gum on post-operative ileus among the patients who have undergone abdominal surgery between January 2016 and September 2017 at KIMS Hubballi.

Initially, patients were identified according to the condition and procedure they had undergone. A total of 111 patients who fulfilled the inclusion criteria were included.

For study group chewing gum was given for about 30 minutes 3 times a day and observed for results.

1. 111 patients who had undergone abdominal surgery were included in the study. Patients were evaluated with a detailed history and complete physical examination. All routine investigations, intraoperative findings, bowel parameters were noted.

2. Distribution of patients among different surgeries

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Study group (No. of Patients)</th>
<th>control group (No. of Patients)</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendicectomy</td>
<td>22</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>Omental patch repair</td>
<td>18</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td>Biliary procedures</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Other procedure</td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>total</td>
<td>55</td>
<td>56</td>
<td>111</td>
</tr>
</tbody>
</table>

3. Mean age of patients in the study group was 41.3 years and in the control group was 38.27 years

4. In our study, emergency surgeries were 84 and elective surgeries were 27.

5. In our study most of the surgeries were on intestine and 5 patients had undergone both intestinal and non-intestinal surgery.

6. In our study, 43 patients had local peritonitis and 41 patients had diffuse peritonitis. 27 patients did not have peritonitis.

7. In omental patch repair group bowel parameters came earlier in the study group compared to the Control group. There was a significant difference between the two groups (p<0.05) But it is found that no statistical significance was there in return of flatus (p = 0.053).

8. In appendectomy group bowel parameters came earlier in the study group compared to the Control group. However, there was no significant difference in time between the
two groups. But it is found that statistical significance was there in appearance bowel sound (p = 0.019).

9. In biliary procedures, bowel parameters came earlier in the study group compared to the Control group. There was a significant difference between the two groups (p<0.05). But it is found that no statistical significance was there in return of appetite (p = 0.227).

10. Bowel parameters came earlier in the study group compared to the Control group in other procedures. However, there was no significant difference in time between the two groups. But it is found that statistical significance was there in the appearance of stool (p = 0.031).

11. Most of the patients liked the chewing gum. Only 7.1% did not like the chewing gum.

Bowel parameters came earlier in the study group compared to the Control group in Overall group. There was a significant difference between the two groups (p<0.05). But it is found that no statistical significance was there in return of flatus (p = 0.064) and the return of appetite (p=0.202) (Table 1).

Bowel parameters came earlier in the study group compared to the Control group in appendectomy group. However, there was no significant difference in time between the two groups. But it is found that statistical significance was there in appearance bowel sound (p = 0.019) (Table 2).

Bowel parameters came earlier in the study group compared to the Control group in biliary procedures. There was a significant difference between the two groups (p<0.05) but it is found that no statistical significance was there in return of appetite (p = 0.227) (Table 4).

**Table 1:** Effectiveness of chewing gum among the patients in study and control group (overall)

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Control group</th>
<th>Study group</th>
<th>Total</th>
<th>p value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time in hours</td>
<td>Mean time in hours</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowel sound</td>
<td>43.2</td>
<td>19.6</td>
<td>36.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Flatus</td>
<td>50.0</td>
<td>21.9</td>
<td>42.7</td>
<td>19.5</td>
</tr>
<tr>
<td>Stool</td>
<td>55.7</td>
<td>24.0</td>
<td>47.7</td>
<td>20.01</td>
</tr>
<tr>
<td>Appetite</td>
<td>50.4</td>
<td>27.2</td>
<td>44.0</td>
<td>25.1</td>
</tr>
</tbody>
</table>

* Unpaired t-test

**Graph 1:** Effectiveness of chewing gum among the patients in study and control group (overall).
Table 2: Effectiveness of chewing gum among the patients in study and control group Omental patch repair (OPR)

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Control group</th>
<th>Study group</th>
<th>Total</th>
<th>p value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time in hours SD</td>
<td>Mean time in hours SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowel sound</td>
<td>46.8 10.12</td>
<td>39.0 9.6</td>
<td>35</td>
<td>0.026</td>
</tr>
<tr>
<td>Flatus</td>
<td>52.3 12.6</td>
<td>43.3 13.8</td>
<td>35</td>
<td>0.053</td>
</tr>
<tr>
<td>Stool</td>
<td>58.2 12.0</td>
<td>48.7 9.5</td>
<td>35</td>
<td>0.014</td>
</tr>
<tr>
<td>Appetite</td>
<td>60.3 12.7</td>
<td>52.3 10.2</td>
<td>35</td>
<td>0.048</td>
</tr>
</tbody>
</table>

* Unpaired t-test

Graph 2: Effectiveness of chewing gum among the patients in study and control group (OPR).

Table 3: Effectiveness of chewing gum among the patients in study and control group (appendectomy)

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Control group</th>
<th>Study group</th>
<th>Total</th>
<th>p value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time in hours SD</td>
<td>Mean time in hours SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowel sound</td>
<td>24.3 6.9</td>
<td>19.6 5.7</td>
<td>43</td>
<td>0.019</td>
</tr>
<tr>
<td>Flatus</td>
<td>29.4 7.8</td>
<td>25.9 7.7</td>
<td>43</td>
<td>0.136</td>
</tr>
<tr>
<td>Stool</td>
<td>32.7 8.8</td>
<td>28.7 8.1</td>
<td>43</td>
<td>0.127</td>
</tr>
<tr>
<td>Appetite</td>
<td>21.8 11.9</td>
<td>16.4 6.8</td>
<td>43</td>
<td>0.077</td>
</tr>
</tbody>
</table>

* Unpaired t-test

Graph 3: Effectiveness of chewing gum among the patients in study and control group (appendectomy).
Table 4: Effectiveness of chewing gum among the patients in study and control group (biliary procedures)

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Control group</th>
<th>Study group</th>
<th>Total</th>
<th>p value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowel sound</td>
<td>64.0</td>
<td>52.5</td>
<td>6.2</td>
<td>14</td>
</tr>
<tr>
<td>Flatus</td>
<td>72.3</td>
<td>62.0</td>
<td>8.7</td>
<td>14</td>
</tr>
<tr>
<td>Stool</td>
<td>83.8</td>
<td>71.7</td>
<td>8.0</td>
<td>14</td>
</tr>
<tr>
<td>Appetite</td>
<td>76.2</td>
<td>69.4</td>
<td>10.3</td>
<td>14</td>
</tr>
</tbody>
</table>

* Unpaired t-test

Graph 4: Effectiveness of chewing gum among the patients in study and control group (biliary procedures).

Table 5: The effectiveness of chewing gum among the patients in study and control group (Other procedures)

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Control group</th>
<th>Study group</th>
<th>Total</th>
<th>p value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowel sound</td>
<td>66.1</td>
<td>53.4</td>
<td>15.2</td>
<td>19</td>
</tr>
<tr>
<td>Flatus</td>
<td>78.1</td>
<td>63.4</td>
<td>19.9</td>
<td>19</td>
</tr>
<tr>
<td>Stool</td>
<td>85.4</td>
<td>68.8</td>
<td>18.3</td>
<td>19</td>
</tr>
<tr>
<td>Appetite</td>
<td>80.9</td>
<td>69.1</td>
<td>20.3</td>
<td>19</td>
</tr>
</tbody>
</table>

* Unpaired t-test

Graph 5: The effectiveness of chewing gum among the patients in study and control group (Other procedures).
Bowel parameters came earlier in the study group compared to the Control group in other procedures. However, there was no significant difference in time between the two groups. But it is found that statistical significance was there in the appearance of stool ($p = 0.031$) (Table 5).

**Discussion**

Postoperative ileus (POI) occurs commonly after abdominal operations and is one of the limiting factors which prevent early hospital discharge. The pathophysiology of POI includes spinal and local sympathetic neural reflexes, local as well as systemic inflammatory mediators released during surgery as part of the stress response.

The potential complications of prolonged POI include increased postoperative pain, increased nausea, and vomiting, pulmonary complications, poor wound healing, delay in resuming oral intake, delay in postoperative mobilization, prolonged hospitalization, and increased health-care costs.

Sham feeding (when food is smelled or chewed but not swallowed) has been demonstrated to be one of the methods to increase bowel motility. It causes both vagal stimulation and hormonal release; either one or both could modulate the bowel motility. Gum chewing, as an alternative to sham feeding, provides the benefits of gastrointestinal stimulation without the complications associated with feeding. In recent years, the use of chewing gum to reduce the postoperative paralytic ileus has been extensively reviewed in various randomized controlled trials on elective intestinal anastomosis and has been found to be beneficial in reducing POI. The present study was aimed to evaluate the effectiveness of chewing gum on the bowel motility among patients who had undergone abdominal surgery.

Total 111 patients were studied prospectively for bowel motility i.e return of first bowel sound, the passage of first flatus, the return of stool and return of appetite with the administration of chewing gum to 55 patients in the study group and routine postoperative management to 56 patients in the control group. Among abdominal surgeries which are included in the study are omental patch repair, appendectomy, biliary procedures and others collectively included in the other procedure group.

In the present study, the commercially available sugar-free chewing gum used the same is used in the study conducted by Gabriela et al. [3].

Unlike other studies like Gabriela et al, Andersson et al. [4], Topcu et al. [5] which have randomized one type of surgery like Appendectomy, pancreaticoduodenectomy, colorectal surgery respectively, where as our study includes three types of surgeries.

In this study, it was found that patients’ postoperative appearance, bowel sounds, flatus, stool and appetite times are extremely short in the gum-chewing group.

Topcu et al. had found patients who had undergone colorectal surgery had flatus and defecation times in gum-chewing groups to be extremely low [5].

Similarly, Gabriela et al. and Anderson et al. in their studies on patients undergoing appendectomy and pancreaticoduodenectomy demonstrated that bowel activity time was shorter in the patients who had chewed gum after surgery [3].

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Topcu et al. [5] (N 60)</th>
<th>Our study (N 111)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time in hours</td>
<td>$51.07\pm19.63$</td>
<td>$42.7$</td>
</tr>
<tr>
<td>P value</td>
<td>$&lt;0.001^*$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appearance of bowel parameters postoperatively</th>
<th>Andersson et al. [4] (N 28)</th>
<th>Our study (N 111)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time in hours</td>
<td>$3.7$</td>
<td>$42.7$</td>
</tr>
<tr>
<td>P value</td>
<td>$0.340$</td>
<td></td>
</tr>
</tbody>
</table>

In their systematical review and meta-analysis studies, Purkayastha et al. [6] and Chan et al. [7] reported that first flatus and defecation times were shortened markedly by means of gum chewing after colorectal surgery.

In a further systematic review done by Wallstrom & Frisman [8], it was stated that postoperative gum chewing was a method which ameliorates gastrointestinal functions quickly and safely, and is cheap and easy to apply.

**Conclusion**

In conclusion, within the scope of nursing practices for post-operative care, chewing is an effective, easy and cost-effective method for ameliorating of POI in patients undergoing abdominal surgery.

The study recommends that can be replicated on a large sample and in more advanced variables like
length of hospital stay, the rate of postoperative complications and even ileus in medical conditions.

The implications of the study are that surgeons can encourage the postoperative patients to chew the chewing gum to reduce stress enhance relaxation and sense of wellbeing and also act as diversional therapy, which helps in faster recovery, preventing complications and thereby provide cost-effective care and satisfaction to the client.

Conflict of Interest: Nil

References

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Diabetic Foot: Angiographic Assessment and Management

G. Venkatesh¹, A. Deepa², N. Mohammed Niyamathullah³

¹Associate professor, Department of General Surgery, Omandur Medical College, Chennai, Tamil Nadu 600002, India. ²Assistant Professor, Department of General Surgery, Thiruvarur Medical College, Thiruvarur, Tamil Nadu 610004, India. ³Assistant Surgeon, Government Headquarters Hospital, Kumbakonam, Tamil Nadu 612001, India.

How to cite this article:

Abstract

Diabetes is no longer a disease of the affluent west. Global prevalence of diabetes in 2003 was estimated to be 194 million. By 2030, this figure is predicted to rise to 366 million due to longer life expectancy and changing dietary habits. In fact the prevalence is soaring in southern India it may reach an astronomical figure 13% to 18%. In such a scenario knowing about the disease is important [1]. The purpose of the study is to access the percentage of lower limb ischemia in patients with diabetic foot, to study the Efficacy of the lower limb revascularization procedures (open and endovascular) and conventional medical management in ischemic diabetic foot. We also study the role of antiplatelet and anticoagulant agents in ischemic diabetic foot and to study the percentage of patients with diabetic foot prevented from Amputations. The main reasons to diagnose Peripheral artery disease in diabetic individuals are to initiate therapies that decrease the risk of atherothrombotic events, improve quality of life, and decrease disability. A diagnosis of Peripheral artery disease indicates the presence of systemic atherosclerosis that confers additional cardiovascular risk to the patient with diabetes, and gives further impetus to aggressively manage vascular risk factors in this high-risk group. The clinical material for this study consisted of 150 cases of Diabetic foot patients admitted in the surgical wards of Thanjavur Medical College Hospital, Thanjavur during the period September 2016 to September 2017. Various diagnostic and therapeutic criteria were followed, protocols was framed and progress recorded.

Keywords: Diabetes; ulcers; peripheral artery disease; Doppler; Angiography; stents; grafts.

Introduction

The diabetic foot may be defined as a group of syndromes in which neuropathy, ischaemia, and infection lead to tissue breakdown resulting in morbidity and possible amputation. This is of great socioeconomic importance as majority of them are in the prime earning age group and are poor. The treatment of foot ulcers needs frequent surgical consultations, use of costly antibiotics, repeated investigations, dressings and minor surgical procedures. Treatment of diabetes transgresses specialty and hence the need of the hour is ‘multidisciplinary approach’ [2]. This is well exemplified in the management of foot complications. This requires the expertise of diabetic physician, vascular surgeon, orthopaedician, neurologist, and orthoptist and social workers. Vascular surgery is one of the recent specialization and essentially, vascular surgery involves removal of blocks and by passing obstructions. Judicious and appropriate use of revascularization results in a cumulative limb salvage rate of greater than 70% at 5 years in high risk groups. Restoration of flow can be achieved either by management or by Bypass surgery or by a combination of both. There is no increased morbidity for reconstructive surgery in a diabetics and the long-term patency rates are comparable to the nondiabetics. Strandness et al, reported that diabetic patients had more infrapopliteal disease [3].

King et al. found greater involvement of the profunda femoris in diabetic patients [4]. Lower limb ischemia may cause nonhealing ulcers, infection, amputation and even mortality in diabetic patients [5].
In this study, we review our data of ischemic lower limb revascularization procedures in diabetic patients and present results of its efficacy.

**Material and Methods**

The clinical material for this study consisted of 150 cases of Diabetic foot patients admitted in the surgical wards of Thanjavur Medical College Hospital, Thanjavur during the period September 2016 to September 2017.

The patients were selected based on the following criteria:
1. Patient with Proven Diabetics.
2. Diabetic Patients with Lower Limb Ulcers and Discolouration.
3. Diabetics Patients with Lower Limb Pain.

The patients were excluded based on the following criteria:
1. Diabetic Patient with Traumatic Ulcers.
2. Patient with Non Diabetic Vaso-Occlusive Disorders.
3. Diabetic Patients with Concurrent Hypercoagulable Diseases.
4. Diabetic Patients with Hansens/Filarial Disease are Excluded.
5. Diabetic Patients with Ulcers Due Non Vasculopaphic Cause Like Uncontrolled Diabetics, Neuropathy.
6. Diabetic Patients with well Set Gangrene before any Medical/Surgical Intervention

Revascularization was performed for relief of intermittent claudication in 60% of the subjects. Open bypass were done. Peripheral artery bypass is surgery to re-route the blood supply around a blocked artery in one of your leg [6]. Fatty deposits can build up inside the arteries and block them. A graft is used to replace or bypass the blocked part of the artery.

**Observation**

Various factors were observed and analyzed.

The statistics were made using the Software Graph Pad Prism Version 5.

ABPI is subject of variability with patients diabetes vessel disease and not considered as primarily modality in outcome of patient

**Table 1:** Age distribution of the study subjects involved in the study (overall)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age (in years)</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤35</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>36-45</td>
<td>31</td>
<td>20.67</td>
</tr>
<tr>
<td>3</td>
<td>46-55</td>
<td>54</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>56-65</td>
<td>34</td>
<td>22.66</td>
</tr>
<tr>
<td>5</td>
<td>66 - 75</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>&gt;75</td>
<td>1</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Data are expressed as absolute numbers with percentage.

Fig. 1: Age distribution of the study subjects involved in the study (overall)
Table 2: Statistical description of age of the study subjects. (Overall)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mean</td>
<td>52.4 years</td>
</tr>
<tr>
<td>2</td>
<td>Median</td>
<td>52 years</td>
</tr>
<tr>
<td>3</td>
<td>Mode</td>
<td>50 years</td>
</tr>
<tr>
<td>4</td>
<td>Standard deviation</td>
<td>10.6</td>
</tr>
<tr>
<td>5</td>
<td>Variance</td>
<td>112.5</td>
</tr>
<tr>
<td>6</td>
<td>Range</td>
<td>30 to 87 years</td>
</tr>
</tbody>
</table>

Table 3: Comparison of age in years between the groups in the study population

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age in years</th>
<th>Normal group (n=42)</th>
<th>PVD with revascularization done (n=52)</th>
<th>PVD with only antiplatelet drugs given (n=56)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mean years</td>
<td>48.31</td>
<td>52.79</td>
<td>55.13</td>
</tr>
<tr>
<td>2</td>
<td>Standard deviation</td>
<td>9.5</td>
<td>11.6</td>
<td>9.59</td>
</tr>
<tr>
<td>3</td>
<td>Median years</td>
<td>47</td>
<td>52.5</td>
<td>55</td>
</tr>
</tbody>
</table>

Statistical values of the comparison between the groups. Test used: ANOVA

<table>
<thead>
<tr>
<th>S.No</th>
<th>Group comparison</th>
<th>Mean difference</th>
<th>P value</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal group Vs PVD with revascularization</td>
<td>-4.47</td>
<td>0.052 (NS)</td>
<td>-9.54 to 0.58</td>
</tr>
<tr>
<td>2</td>
<td>Normal group Vs PVD with only antiplatelet drug</td>
<td>-6.815</td>
<td>0.0006*</td>
<td>-11.8 to -1.83</td>
</tr>
<tr>
<td>3</td>
<td>PVD with Revascularization VS PVD with only antiplatelet group</td>
<td>-2.337</td>
<td>0.255 (NS)</td>
<td>-7.04 to 2.367</td>
</tr>
</tbody>
</table>

The sample sizes are unequal in all three groups. * indicates p <0.05 and is considered statistically significant.
Data are expressed as mean with standard deviation. The height of the bar in the vertical bar diagram represents the mean and the error bars represents the mean. N in normal group is 42, PVD treated with RV was 52 and PVD treated with antiplatelet drugs was 56. ANOVA with Bonferroni multiple comparison was used to test the statistical differences between the groups. *indicates p<0.05 and considered statistically significant. PVD= Peripheral vascular disease; RV = Revascularization & APD = Antiplatelet drugs.

Table 4: Distribution of gender in the study population.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of the group</th>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male N</td>
<td>%</td>
<td>Female N</td>
</tr>
<tr>
<td>1</td>
<td>Overall (n=150)</td>
<td>119</td>
<td>79.3</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>Normal group (n=42)</td>
<td>29</td>
<td>69.04</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>PVD with revascularization done (n=52)</td>
<td>47</td>
<td>90.38</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>PVD with treated with antiplatelet drugs only (n=56)</td>
<td>43</td>
<td>76.78</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 5: Frequency distribution of type of artery involved in the PVD with revascularization done as treatment group (n=52)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of the artery involved</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anterior tibial artery</td>
<td>12</td>
<td>23.08</td>
</tr>
<tr>
<td>2</td>
<td>Posterior tibial artery</td>
<td>18</td>
<td>34.62</td>
</tr>
<tr>
<td>3</td>
<td>Anterior and posterior tibial artery</td>
<td>3</td>
<td>5.77</td>
</tr>
<tr>
<td>4</td>
<td>Femoral artery</td>
<td>4</td>
<td>7.69</td>
</tr>
<tr>
<td>5</td>
<td>Bilateral femoral artery</td>
<td>1</td>
<td>1.92</td>
</tr>
<tr>
<td>6</td>
<td>Popliteal artery</td>
<td>7</td>
<td>13.46</td>
</tr>
<tr>
<td>7</td>
<td>Femoral with popliteal artery</td>
<td>4</td>
<td>7.69</td>
</tr>
<tr>
<td>8</td>
<td>Iliac artery</td>
<td>3</td>
<td>5.77</td>
</tr>
</tbody>
</table>

Table 6: Frequency distribution of type of artery involved in the PVD treated with antiplatelet drugs group (n=56)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of the artery involved</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anterior tibial artery</td>
<td>6</td>
<td>10.71</td>
</tr>
<tr>
<td>2</td>
<td>Posterior tibial artery</td>
<td>6</td>
<td>10.71</td>
</tr>
<tr>
<td>3</td>
<td>Dorsalis pedis artery</td>
<td>38</td>
<td>67.86</td>
</tr>
<tr>
<td>4</td>
<td>Popliteal artery</td>
<td>5</td>
<td>8.93</td>
</tr>
<tr>
<td>5</td>
<td>Iliac artery</td>
<td>1</td>
<td>1.79</td>
</tr>
</tbody>
</table>

Table 7: Comparison of frequency of anti-platelet drug received in various groups

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of the group</th>
<th>Antiplatelet drugs received</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1</td>
<td>Overall (n=150)</td>
<td>111</td>
</tr>
<tr>
<td>2</td>
<td>Normal group (n=42)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PVD with revascularization done (n=52)</td>
<td>52</td>
</tr>
<tr>
<td>4</td>
<td>PVD with treated with antiplatelet drugs only (n=56)</td>
<td>56</td>
</tr>
</tbody>
</table>

Table 8: Outcome of wound healing in the normal group of the study population (n=42)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of the wound healing</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
<td>3</td>
<td>7.1</td>
</tr>
<tr>
<td>3</td>
<td>Better</td>
<td>18</td>
<td>42.9</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>15</td>
<td>35.7</td>
</tr>
<tr>
<td>5</td>
<td>Excellent</td>
<td>4</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Table 9: Outcome of wound healing in the PVD treated with revascularization group of the study population (n=52).

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of the wound healing</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>10</td>
<td>19.2</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>3</td>
<td>Better</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>5</td>
<td>Excellent</td>
<td>32</td>
<td>61.5</td>
</tr>
</tbody>
</table>
Data are expressed as percentage. The area in the pie chart represents the percentage value of each group.

Fig. 5: Frequency distribution of artery involved in the PVD treated with anti platelet drugs only group (n=56) in pie chart.

Description of quality of wound healing between the groups

Fig. 6: Description of different qualities of wound healing in various groups in the study

Table 10: Outcome of wound healing in the PVD treated only with the antiplatelet drugs group in the study population (n=56).

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of the wound healing</th>
<th>Number (n)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>2</td>
<td>3.6</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
<td>6</td>
<td>10.7</td>
</tr>
<tr>
<td>3</td>
<td>Better</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>19</td>
<td>33.9</td>
</tr>
<tr>
<td>5</td>
<td>Excellent</td>
<td>15</td>
<td>26.8</td>
</tr>
</tbody>
</table>
Table 11a: Comparison of excellent quality of wound healing between the groups

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of wound healing</th>
<th>Group comparison</th>
<th>Proportions</th>
<th>Statistical test</th>
<th>And p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PVD with RV Vs PVD with APD</td>
<td>32/52</td>
<td>Fisher’s exact test</td>
<td>(p=0.0004*)</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
<td></td>
<td>15/56</td>
<td>Relative risk = 2.2</td>
<td>(95% CI =1.14 to 3.7)</td>
</tr>
</tbody>
</table>

Table 11b: Comparison of excellent quality of wound healing between the groups

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of wound healing</th>
<th>Group comparison</th>
<th>Proportions</th>
<th>Statistical test</th>
<th>And p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal Vs PVD with RV</td>
<td>4/42</td>
<td>Fisher’s exact test</td>
<td>(p&lt;0.0001*)</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
<td></td>
<td>32/52</td>
<td>Relative risk = 6.4</td>
<td>(95% CI =2.4 to 16.8)</td>
</tr>
</tbody>
</table>

Table 11c: Comparison of excellent quality of wound healing between the groups

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quality of wound healing</th>
<th>Group comparison</th>
<th>Proportions</th>
<th>Statistical test</th>
<th>And p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal Vs PVD with APD</td>
<td>4/42</td>
<td>Fisher’s exact test</td>
<td>(p=0.04*)</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
<td></td>
<td>15/56</td>
<td>Relative risk = 2.8</td>
<td>(95% CI =1.07 to 7.8)</td>
</tr>
</tbody>
</table>

On comparison of wound healing within various groups Normal Vs PVD with Revascularization Vs PVD with Antiplatelet, the proportions for PVD with RV Vs PVD with APD were 32/52 for RV and 15/56 for APD, using the Fisher’s exact test the P Value is 0.0004 which is statistically significant and the Relative Risk is 2.2 which is under positive Range which shows that patients are definitively benefitted by this study who underwent various Revascularization and Antiplatelets Drugs (Table 11a), the proportions for PVD with RV Vs Normal group were 32/52 and 4/42, using the Fisher’s exact test the P Value is < 0.0001 which is statistically significant with Relative Risk of 6.4 (Table 11b), The proportions for Normal Vs PVD with APD were 4/42 and 15/56, using the Fisher’s exact test the P Value is 0.04 which is statistically significant with Relative Risk of 2.8 (Table 11c).

Discussion

Diabetic foot ulcer is the commonest cause of foot ulcers in Thanjavur Medical College Hospital, Thanjavur. In this study, the incidence of Diabetic foot ulcers increased with age, which correlates with the literature [7]. The total number of patients included in my study were 150.120 were male patients accounting for 80% of the total, 30 were female patients accounting for 20% of the total. Incidence of diabetic foot increased with advancing age in our study. Incidence of diabetic foot was more in age group more than 52 years. Out of 150 patients 108 patients belonged to this age group.

On comparison of age groups among the groups of study population, who were medically managed with antiplatelet and with those managed using surgical revascularization procedures. The mean age of normal group are 48 years and those who were treated with antiplatelet only were 55 years and those treated with revascularization were 52 years, and these were comparatively analyzed using ANOVA test which showed mean difference for normal group vs Peripheral vascular disease(PVD) with revascularization was -4.47 and normal group vs PVD with only antiplatelet are -6.815 and p value is 0.0006, as the value is <0.05 which indicates the sample size and comparison is statically significant (Table 3).

On studying the gender distribution in study population, out of overall 150 numbers, the normal group had 42 numbers, out of which 29 were male and 13 were female in population of those treated with revascularization were 52 years, and these were comparatively analyzed using ANOVA test which showed mean difference for normal group vs Peripheral vascular disease(PVD) with revascularization was -4.47 and normal group vs PVD with only antiplatelet are -6.815 and p value is 0.0006, as the value is <0.05 which indicates the sample size and comparison is statically significant (Table 3).

On studying the gender distribution in study population, out of overall 150 numbers, the normal group had 42 numbers, out of which 29 were male and 13 were female in population of those treated with revascularization in patients with PVD, totally 52 patients were benefitted which includes 47 males and 5 females. Of those 56 patients who were treated with antiplatelet only 43 were male and 13 were female (Fig. 3).
On studying the distribution of type of artery involved in the PVD with revascularization done on study groups (n=52), involvement of Anterior tibial artery is 12 with frequency (%) of 23.08, Posterior tibial artery is 18 with frequency (%) of 34.62, Anterior tibial artery and posterior is 3 with frequency (%) of 5.77, Femoral artery is 4 with frequency (%) of 7.69, Bilateral femoral artery is 1 with frequency (%) of 1.92, Popliteal artery is 7 with frequency (%) of 13.46, Fempop artery is 4 with frequency (%) of 7.69, Iliac artery involvement is 3 and frequency is 5.77 (Table 5).

On studying the distribution of type of artery involved in the PVD with antiplatelet drugs done on study groups (n=56), involvement of Anterior tibial artery is 6 with frequency (%) of 10.71, Posterior tibial artery is 6 with frequency (%) of 10.71, Dorsalis pedis artery is 18 with frequency (%) of 67.86, Popliteal artery is 5 with frequency (%) of 8.93, Iliac artery involvement is 1 and frequency is 1.79 (Table 6). This shows the distal collateral arteries are mostly managed using the antiplatelet drugs rather than going for endovascular procedures. Of various outcomes studies, the major relief for the patient was relieved from claudication and improvement from ischemic changes and wound healing. Out of which wound healing was intensively followed for better significance, which eventually proves patients were improved from pain and symptoms of ischemia. The scale made were Excellent (if wound healing was <4 weeks duration), Good (if wound healing was 4 to 6 weeks duration), Better (if wound healing was 6 to 12 weeks duration) and finally Poor (if >12 weeks duration or patients went for failures of intervention or major amputation performed, which does not include pre study period factors gangrene or uncontrolled diabetics, osteomyelitis, chronic infections who needed life saving amputations)

Diabetic foot with PVD, both ATA and PTA involvement.

Revascularization Tibial stenting with antiplatelets done and gangrenous toes disarticulated, patient got positive ATA and PTA.

Diabetic foot with PVD: Angiographic Assessment and Management
in Diabetic Foot Patients Hadgood Wound Healing, Relieved of Ischemia and Less Amputation Rates.

Conclusion

Ischemia of the lower limb is an important social health problem. Limb salvage in patients with extensive tibial and peroneal occlusive disease is feasible with aggressive revascularization of the vessels of the ankle and foot. The main goal of distal arterial revascularization procedures is to eliminate symptoms, achieve recovery of ulcers, obtain high graft patency and return the patients to an active social life [8].

In patients with Diabetic foot, Angiography like Doppler and CT angiography play a major role in assessing the arterial status and disease and plan its intervention. Distal arterial Revascularization in patients with critical limb ischemia is a limb saving procedure [9]. This study had proven that early assessment of arterial disease and treatment with medical and surgical Revascularization procedure has salvaged many limbs of the patients and improved the wound healing and symptoms of ischemia. This study had shown incidence of Arterial involvement and success rate of revascularization procedure and Antiplatelets in those patients with peripheral vascular disease. Lower limb ischemia is a serious event in patients with diabetes mellitus [10]. The consequences may include increased mortality and morbidity in this particular patient population. However, distal arterial revascularizations are considerably effective procedures to avoid amputation, to eliminate symptoms, to promote ulcer recovery and to help the patient participate in social life.

*ABPI is subject of variability with patients diabetics, vessel disease and not considered as primarily modality in prognosis of patient.
References


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7. The Diabetic Foot Medical And Surgical Management by Aristidis Veres, John M. Giurini.


Nutritional Management of Burn patients: Our Experience

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How to cite this article:

Abstract

Objective: Malnutrition is a common problem encountered by burns patients who were prone for prolonged hospitalisation. ’Malnutrition Universal Screening Tool’ (Must) has been used as a screening method for early detection, categorisation and institute the intervention of malnutrition in burns patients. We report our experience over one year period. Methods: Patients admitted to our Burn Unit over the period 2015-2016 who were all screened and intervened by Must score were identified. Their records were retrospectively analysed for demographic factors, Body Mass Index, severity of burn injury, nutritional status, interventions and outcomes. Results: A total of 12 patient’s records were analysed. All of them were discharged without any evidence of malnutrition. Conclusion: The sample size in our study is much less. However we have not encountered any nutritional imbalance in these patients at the time of discharge using ’Malnutrition universal Screening Tool’ (Must).

Keywords: Malnutrition; Burns; MUST.

Introduction

Malnutrition describes excess, deficiency and imbalance of a wide range of nutrients causing adverse outcomes [1]. In general the term malnutrition is used as a synonym for undernutrition [2]. 30%-40% of all patients admitted are found to be undernourished and are prone to further deteriorate during their hospital stay [3]. Protein malnutrition is common in burns patients who are prone for longer stay in hospital due to hyper metabolic state, loss from raw area, infection, poor intake etc. [4]. Malnutrition affects both physical and psychological functions and delays patient recovery thus increasing morbidity and mortality [5]. So employing a screening method will help in early detection of malnutrition in burns patient and will also reduce the adverse outcomes.

Materials and Methods

This study is a retrospective analysis of thermal burn patient’s records who were admitted in burns ward, Jipmer - Tertiary burn care centre and were screened using ’Malnutrition universal Screening Tool’ (Must) and intervene over the period of one year (2015-2016). The analysis was done by collecting the information from medical registration department and hospital information system of Jipmer. Height, weight, Body Mass Index (BMI) and their nutritional status, associated co-morbidities, duration of stay in hospital were noted during admission and periodically during their stay in the hospital. If the patient has no nutritional intake for five days, it was also noted. Any unplanned weight loss during past 3-6 months was noted from patient’s old records and from patient’s history. Patient’s nutritional status on discharge was noted. Total number of patients analysed were 12 ranging from 24 to 65 years of age. Based on the data, risk of malnutrition was categorised and the patients were managed according to Must score. Minimum body surface area involved by burns was 20% and maximum was 65%. All the patient details are described in Table 1.
Table 1: Patient demographics

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Age(Yrs)/Sex(M/F)</th>
<th>Total Body surface area(TBSA) of burns(%)</th>
<th>BMI (kg/m²)</th>
<th>Acute disease effect</th>
<th>Weight loss score (during stay)</th>
<th>Duration of stay in hospital (Days)</th>
<th>MUST score / Risk level (Low, Medium, High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24/F</td>
<td>40</td>
<td>24</td>
<td>2</td>
<td>2</td>
<td>35</td>
<td>4(High)</td>
</tr>
<tr>
<td>2</td>
<td>42/M</td>
<td>35</td>
<td>28</td>
<td>-</td>
<td>2</td>
<td>23</td>
<td>2(High)</td>
</tr>
<tr>
<td>3</td>
<td>48/M</td>
<td>30</td>
<td>29</td>
<td>-</td>
<td>2</td>
<td>20</td>
<td>2(High)</td>
</tr>
<tr>
<td>4</td>
<td>31/F</td>
<td>50</td>
<td>31</td>
<td>2</td>
<td>2</td>
<td>46</td>
<td>4(High)</td>
</tr>
<tr>
<td>5</td>
<td>36/M</td>
<td>30</td>
<td>29</td>
<td>2</td>
<td>1</td>
<td>23</td>
<td>3(High)</td>
</tr>
<tr>
<td>6</td>
<td>33/F</td>
<td>55</td>
<td>31</td>
<td>2</td>
<td>2</td>
<td>52</td>
<td>4(High)</td>
</tr>
<tr>
<td>7</td>
<td>35/F</td>
<td>40</td>
<td>33</td>
<td>2</td>
<td>2</td>
<td>35</td>
<td>4(High)</td>
</tr>
<tr>
<td>8</td>
<td>65/F</td>
<td>15</td>
<td>34</td>
<td>-</td>
<td>2</td>
<td>28</td>
<td>2(High)</td>
</tr>
<tr>
<td>9</td>
<td>52/M</td>
<td>35</td>
<td>29</td>
<td>2</td>
<td>2</td>
<td>23</td>
<td>4(High)</td>
</tr>
<tr>
<td>10</td>
<td>43/F</td>
<td>40</td>
<td>30</td>
<td>2</td>
<td>2</td>
<td>33</td>
<td>4(High)</td>
</tr>
<tr>
<td>11</td>
<td>20/F</td>
<td>20</td>
<td>26</td>
<td>-</td>
<td>1</td>
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<td>1(Medium)</td>
</tr>
<tr>
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<td>24/F</td>
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<td>24</td>
<td>-</td>
<td>1</td>
<td>20</td>
<td>1(Medium)</td>
</tr>
</tbody>
</table>

Results

There were 12 cases in the burns ward screened with MUST during the study period. Out of which 8 (67%) were female and 4 (33%) were male. The mean age of the study population was 37.75 yrs. All the patients had BMI >20 and so BMI score was 0 for all the patients. Nearly 60% of patients had acute disease effect or no nutritional intake for more than five days. 75% of patients had weight loss more than 10% and 25% of patients had 5-10% weight loss. According to MUST risk assessment, 83% had score between 2 to 4 and were categorized as high risk. 17% were grouped under medium risk. In our study population there were zero patients under low risk.

Discussion

Burns patients are at a higher risk for developing malnutrition due to their prolonged stay in hospital and this affects the patient’s outcome [6]. MUST score was used as a screening tool for early detection and treatment of malnutrition across all health care settings. The malnutrition universal screening tool was developed by the multi-disciplinary Malnutrition Advisory Group of the British Association for Parenteral and Enteral Nutrition [1]. MUST score is an easy and reliable screening tool which uses only 3 criteria namely BMI, Weight loss and Acute disease effect for screening and calculating malnutrition risk [7]. MUST score was noted within 72 hours of admission of burns patient’s and the patients were treated accordingly. Patient’s with MUST score of 0 were given routine clinical care and screened again periodically. MUST score of 1 were grouped as medium risk patients and are kept under strict observation. Dietary intake of medium risk patient’s was documented for next three days and treated accordingly. Patients with MUST score of 2 or more were categorised as high risk patients. They are referred to dietician and nutritional support was given accordingly [8,9]. All the study patients were screened, categorised and treated based on MUST score. The nutritional status of the patients were analysed based on BMI, Haemoglobin, Serum total proteins, Albumin and Transferrin levels at the time of discharge and found to be satisfactory.

Conclusion

Burns patients are more prone for developing malnutrition. So individualised risk assessment and specific treatment based on their nutritional status are mandatory in reducing the patient’s morbidity and mortality. In this study, risk assessment and treatment was based on MUST screening method and the incidence of malnutrition was 0% even in high risk group. The Sample size of this study is small, further large randomized control trials are required to validate the results.

References

Epidemiology of Burns: Application of JIPMER Burn Proforma

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Abstract

Objective: To study the epidemiology of burn patients attending Jipmer Tertiary Burn Care centre, Management and Outcomes using 'Jipmer Burn Proforma'. Methods: Retrospective analysis of all the burn patients proformas admitted to our Burn Unit over the period one year (January – December 2016). Results: 306 patients were admitted for burns. Male to female ratio was 1:1.2. Majority of the burns due to scald and flame burns, 21-40 years age group is the commonest age group involved. Poor educational and socioeconomic status was consistently associated. Child group (0-10 years) associated with poor housing standards. Fluid lag noted was around 40-50%. Conclusion: This study suggests the importance of public education on burns and improving the quality of first aid for burn patients and following the comprehensive burn injury documentation method.

Keywords: Burn proforma; Burn epidemiology.

Introduction

Burns is one of the major causes of morbidity and mortality in burns patients. Treatment of burns depends on various factors like age, depth of burns, body surface area affected, cause of burns, duration, weight, patient’s nutritional status etc. [4,5,6]. So a detailed individualised assessment of the patient using an comprehensive burns proforma will definitely bring a change in the treatment of burns patients.

Materials and Methods

This study is a retrospective analysis epidemiology of burn patients records who were admitted in burns ward, Jipmer - Tertiary burn care centre and were examined and treated using a detailed proforma over the period of one year (2015-2016). The proforma was used to collect details on patient demographics, the cause and site of the burn, initial assessment, adequacy of first aid, time lag and fluid lag before commencing treatment, management and patient outcome. The analysis was done by collecting the information from the stored proformas in the Plastic Surgery department. Nutritional Management of Burn patients: Our Experience

Jipmer Tertiary Burn Care Centre

Burns proforma:

Name.......................... Age.............................. Sex....
Hosp No.................... Educational Status:..............
Tele Medicine No:............ Income:........................
Marital Status (Married/Unmarried) ............
Date & Time of Burns:..............................
Date & Time of Admission:..............................

Corresponding Author: Ravi Kumar Chittoria, Professor & Registrar (Academic), Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Pondicherry 605006, India.

E-mail: drchittoria@yahoo.com
Received on 02|05|2017, Accepted on 03|12|2018
Height in cms:..........Weight in kgs:.................
Time & Fluid Lag:...........Address: ......................

**Admission Status:**
- Treatment as Outpatient
- Acute New admission transferred from another hospital/burn unit
- Readmission for reconstruction
- Readmission for reconstruction/rehabilitation

**Referral Source**

**How did Burn Injury Happen?**

**Type of Burn:**
- □ Accidental
- □ Suicidal
- □ Homicidal

**Etiology of Injury:**
- □ Fire/Flame
- □ Scalds
- □ Contact
- □ Chemical
- □ Skin disease
- □ Electricity
- □ Other burns
- □ Unknown

**Place:**
- □ Indoors
- □ Outdoors
- □ Unknown

**Location of Injury:**
- □ Home
- □ Other Private Dwelling
- □ work
- □ Other Building
- □ Conveyance
- □ Other
- □ Unknown

**Remarks:**

**Circumstances:**
- □ Accident (Work/Non Work related)
- □ Suspected Assault
- □ Suspected self-inflicted
- □ Suspected arson
- □ Unknown
- □ Other

**Pre-Injury Conditions:**
- □ None
- □ Pulmonary/Thoracic
- □ Infection
- □ Neurological
- □ Abdomen
- □ Psychiatric
- □ eyes
- □ Genitourinary
- □ Hematologic
- □ Ears
- □ Musculoskeletal
- □ Multitrauma
- □ Cardiovascular
- □ Metabolic/Endocrine
- □ Amputation
- □ Other

**Pre-Exsisting Disability (Yes/No)**

Inhalation Injury (Yes/No)

**Must Score and Risk Level**

**Caprini Risk Score**

**Investigation**

**Date**

**Hemoglobin**

**Blood Culture**

**Blood Transfusion**

**Urine Routine**

**Urine Culture**

**X-ray Chest/Limb**

**ECG**

**Wound Culture**

**Body Weight**

**Calories Intake**

**HIV/HBSAg**

**Other**

**Number of days with Ventilator Support**

**Number of days in Hospital**

**Total Burn Wound Procedures**

**Total Surgical Procedures**

**Total Burn Surface Area (%) [Lund-Browder Chart]**

At admission:

Reassessment after 24-48 hours

**Disposition**

- □ Died
- □ LAMA
- □ Discharged
- □ Extended Care
Facility □ Referred to other Center □ Other

Date of Disposition

Thromboprophylaxis yes/no
If yes, give details

Cause of Death
□ Treatment Withheld □ MOSF/Metabolic □ Burns Shock Pre-Existing Illness □ Pulmonary Failure/Infection □ Burn Wound Infection □ Cardiovascular Failure □ Other

Remarks: .................................................................

Results

The demographic details of the burn patients are shown in Table 1 & 2.

Total number of patients admitted was 306. Male to female ratio was 1:1.2. Of all, 0-10 years age group was 23.8%, 11-20 years age group was 12.1%, 21-40 years age group was 48.3%, 41-60 years age group was 10.8% and above 60 years of age was 4.9% (Table 1).

Thermal burns were the most common etiology 93.4%. Of 73 patients of 0-10 years age group 49 patients (67.1%) were due to scalds burns. Of 148 patients of 21-40 years age group 95 patients (64.1%) were due to fire/flame burns. Of total 19 electrical burn patients 13 (68.4%) were in the 21-40 years age group. (Table 2).

Of all burn patients, patients with neurological comorbidities (stroke, seizure disorders, post traumatic sequel) were 13 patients. 9 patients sustained burn injury during seizure episode and for most of them depth was full thickness burns.

Of 306 burn injuries 262 were occurred in indoor area (85.6%). And in such patients with fire/flame burn injuries significant proportion had (81 out of 149) inhalational injury.

Of 306 burn injuries majority (195) were due to accidental occurrence (63.7%). Suicidal burn injuries were 101 (33%). Almost all of the burn injuries in 0-10 year’s age group were accidental and most of them occurred in indoor (63 out of 73). And many of the paediatric burn injuries were associated with poor housing facilities (lack of separate kitchen and living room, not having raised platform for cooking etc.).

12 of 19 electrical burn injuries occurred in 21-40 years age group and all of them were accidental and many of them due to work related.

Incidence was more towards the end of the year

Table 1:

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male: Female</th>
<th>0-10 years</th>
<th>11-20 years</th>
<th>21-40 years</th>
<th>41-60 years</th>
<th>Above 60 years</th>
<th>Type of Burn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Thermal</td>
<td>Electrical</td>
<td>Chemical</td>
<td>Thermal</td>
<td>Electrical</td>
<td>Chemical</td>
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<td>21</td>
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<td>0:6</td>
<td>0:4</td>
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<td>0:4</td>
<td>0:0</td>
<td>0:21</td>
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<tr>
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<td>10:14</td>
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<td>0:1</td>
<td>0:13</td>
<td>0:1</td>
<td>0:0</td>
<td>0:24</td>
</tr>
<tr>
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<td>10:14</td>
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<td>0:13</td>
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</tr>
<tr>
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<td>0:4</td>
<td>0:3</td>
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<td>9:9</td>
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<tr>
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<td>19</td>
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<tr>
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<td>0:148</td>
<td>0:33</td>
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</table>

Table 2:

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<tr>
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<th>Scalds</th>
<th>Contact</th>
<th>Fire/Flame</th>
<th>Electrical</th>
<th>Chemical</th>
<th>Place</th>
<th>Mode of injury</th>
<th>Total</th>
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<tr>
<td>0-10</td>
<td>49</td>
<td>9</td>
<td>14</td>
<td>1</td>
<td>-</td>
<td>Indoor</td>
<td>Suicidal</td>
<td>72</td>
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<tr>
<td>11-20</td>
<td>17</td>
<td>5</td>
<td>12</td>
<td>3</td>
<td>-</td>
<td>Outdoor</td>
<td>Accidental</td>
<td>30</td>
</tr>
<tr>
<td>21-40</td>
<td>27</td>
<td>13</td>
<td>95</td>
<td>12</td>
<td>1</td>
<td>Indoor</td>
<td>Homicidal</td>
<td>195</td>
</tr>
<tr>
<td>41-60</td>
<td>8</td>
<td>3</td>
<td>19</td>
<td>3</td>
<td>-</td>
<td>Outdoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60</td>
<td>4</td>
<td>2</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>Indoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>32</td>
<td>149</td>
<td>19</td>
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<td></td>
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</tr>
</tbody>
</table>
last 4 months 128 patients compared to 180 patients in first 8 months. Majority of patients belonged to low socioeconomic group and poor educational qualification. Along with the demographics of burn injuries, adequacy of first aid were assessed and fluid lag were documented. Average time lag noted at presentation was around 3-3.5 hours and fluid lag noted was around 40-50% of the requirement of the time lag period based on Parkland formula.

Venous thromboembolism risk assessment calculated through Caprini risk assessment scale and prophylactic measures were given [7].

Nutritional assessment was done during admission & periodically and intervention given [8].

Number of surgical procedures and requirement of ventilator support were documented.

Investigation chart was incorporated in the burn proforma for documenting serial blood investigations.

Discharge details were also documented.

Discussion

Though burn injuries are relatively common in our country their assessment and documentation are not upto the standards. The comprehensive proforma used in burns patients includes all the datas which makes the monitoring and treatment easy. Assessing the weight of the patient plays a vital role in fluid resuscitation calculation. But weighing burns patients is usually missed in general set up so weight was included in the proforma. Treatment and prognosis of the patient highly depend on the total body surface area. Surface area assessment is based on Lund Browder chart for accurate assessment during admission and reassessment after 24-48 hours [9,10,11]. Body surface area is depicted in picture format to make it easily accessible. Investigation chart is included in the proforma itself and the course of change during stay in hospital can also be known seeing the investigation chart. Venous thromboembolism occurs commonly in burns patients due to prolonged stay in hospital. Caprini risk assessment tool is used in the proforma for early detection and risk assessment of thromboembolism. Malnutrition is another common problem encountered by burns patients. So malnutrition universal screening tool (MUST) score is included in the proforma for calculating malnutrition risk and treatment. Poor documentation of burn injuries may have medicolegal implications especially in homicidal, work spot injury etc [12]. Time delay associated with transportation, inadequate fluid resuscitation associated with sub-optimal first aid are also recognized and documented for future reference and medicolegal implications.

Conclusion

This study suggests the importance of public education on burns and improving the quality of first aid for burn patients and following the comprehensive burn injury documentation method. Proper assessment of burn injury and patient status will minimise the morbidity and mortality and facilitates the rehabilitation of burn patient. Individualised risk assessment and specific treatment based on a comprehensive proforma is mandatory in patients with burns. Finally, comprehensive documentation will always be helpful in medicolegal aspects.

References

Colorectal Anastomotic Leakage: A Review of Predictability Factors, Early Detection and Appropriate Management

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¹Post Graduate Trainee ²Professor and Head of the Department, Department of General Surgery, Institute of Post Graduate Medical Education and Research, Kolkata, West Bengal 700020, India.

Abstract

Objective: The purpose of this review article is to provide an insight to the recent recommendations in the field of colorectal surgery to yield a better outcome following colorectal anastomosis. Background: Anastomotic leak following colorectal resection surgery is associated with high rates of morbidity, mortality, and escalated healthcare expenditures. Knowledge about the factors predisposing patients to anastomotic leak is vital to its early detection and decision making for surgery. Early detection of the complications and its methodical management is vital for patient survival. Methodology: A literature search on colorectal surgery was carried out using PubMed, COCHRANE library and MEDLINE. Results: Current practice however should comprise pre-operative risk assessment and its optimization, subsequent adaptation of appropriate operative technique when necessary, intraoperative testing of the integrity of the anastomosis, use of diverting stoma in specific situations, avoid unnecessary use of pelvic drains and avoid preoperative bowel preparation. Absolute vigilance is a must for early detection of an anastomotic leak. Appropriate investigations and post-operative clinical scoring systems acts as a guide to help us salvage the situation. Conclusion: Anastomotic leaks still occur despite advancements made in preoperative optimization of the patient, surgical techniques, equipments, and post-operative management. Many attempts are being made to enhance the healthcare systems in regards to dealing with the anastomotic leaks and other colorectal surgery complications. Additionally future studies should aim at identification of other factors that may lead to anastomotic leak.

Keywords: Colorectal anastomosis technique; colorectal anastomotic leak; defunctioning stoma; Charlson Comorbidity Index; Colon Leakage Score (CLS); leak test; bowel preparation; drains in colorectal surgery; Dutch Leakage (DULK) Score.

Introduction

Despite many advances in colorectal surgery, the aim to achieve an uneventful healing of the intestinal anastomosis still remains a farfetched dream.

The prevalence of anastomotic leak has been reported to be between 0.5% and 21% after colon and rectal resections [1-3].

The incidence of clinically significant anastomotic leak after colorectal surgeries is between 1% and 12% overall and is particularly high in low colorectal resections up to 14% [5-8].

Most incidents of anastomotic leaks are difficult to predict, since they manifest with short notice as fever and sepsis [4].

Anastomotic leaks can lead to life threatening complications like - infection, fistula or abscess formation and peritonitis [9].

In cases of malignancy, presence of anastomotic leaks is also associated with increased rates of local cancer recurrence and decreased five year survival [10].

The rates of morbidity and mortality significantly
increase after AL, with the rate ranging in between 12% and 27% [11-13].

Multiple reoperations and stoma creation are often necessary to control the leak, which significantly increases health risks and health care costs up to 5 times that of patients with no leak [14].

Despite a great numbers of studies on the rate of anastomotic leak, risk factors, and preventive techniques; a uniform definition of an “anastomotic leak” is still missing. Additionally, the incidence has not decreased.

However, comparison of rates between medical institutions remains difficult and depends on the use of standard definitions and methods of measurement.

Minor leaks are silent without any systemic manifestations and can only be diagnosed using radiologic studies [15].

Major leaks present with systemic symptoms as fever, hemodynamic instability, sepsis, and peritonitis requiring additional surgery.

Knowing about the factors predisposing to anastomotic leak is the key to its early detection and anticipating postoperative complications, surgical intervention and managing preoperative risk factors.

Methodology

A literature search on colorectal surgery was carried out using PubMed, COCHRANE library and MEDLINE.

Evaluating Certain Risk Factors of Anastomotic Leak

1. Preoperative Considerations

Identification of significant preoperative risk factors guides the proposed treatment and allows modification of risk.

Preoperative alteration of lifestyle and/or treatment may not always be possible, particularly in the emergency setting.

However, consideration of risk factors is relevant in the decision making process with regard to whether an anastomosis is a safe option, and whether a defunctioning (or permanent) stoma should be considered.

Factors like poor general nutritional status (albumin <3.5 gm% or weight loss >5kg/3 months), degree of immunosuppression, (chemotherapy, high dose steroid therapy), general medical condition (DM, COPD, IHD, CKD etc.) [18].

Other independent significant factors that can contribute to higher leak rates include leukocytosis, sepsis, technically challenging anastomosis, bowel obstruction and peritonitis [22-23].

Recent colorectal studies have used Charlson Comorbidity Index (CCI) to measure the influence of various preoperative comorbidities on some postsurgical outcomes [16,63].

The overall CCI score was significantly higher in patients with leak and patients with CCI of 3 or more were 3.5 times more likely to develop a leak than those with CCI of less than 3 [18].

Another remarkable contribution in the objective testing of the risk of anastomotic leaks was by Dekker et al. (2011), who developed and tested the Colon Leakage Score (CLS).

Multiple risk factors were collected and points were assigned to the patients per risk factor. This scoring tool is unique in its ability to detect patients at risk of developing anastomotic leaks preoperatively and objectively assess the need for diverting ileostomy or nonrestorative surgery [17].

2. Role of Drugs

Schrock et al. (1973) found that administration of corticosteroids did not increase significantly incidence of clinical anastomosis leakage (retrospective study) [19].

From experimental study Furst et al. (1994) reported that steroids do have an adverse effect on colonic anastomotic healing [20]. Therefore it requires further clinical as well as experimental investigations to analyze a definite relationship.

Hence, caution should be shown while using steroids in patients scheduled for lower gastrointestinal surgery with anastomosis [55].

Neostigmine which reverses the effect of the curare-type relaxants might evoke active contraction of the intestine after completion of the anastomosis and subsequently might result in its disruption.

Current evidence suggests, that neostigmine should be avoided during colorectal surgery even with combination with atropine [21].

Halothane anaesthesia, however, abolished this
neostigmine adverse effect.

3. Anastomotic Technique

The technique used to fashion a colorectal anastomosis is largely based on surgeon preference. In order to achieve an adequate colonic anastomosis with a low rate of postoperative anastomotic leak or stricture formation, certain basic surgical principles must be met [24].

First, the technique utilized for the anastomosis must assure an adequate lumen.

Second, an adequate blood supply must be maintained for both the proximal and distal colon after resection.

Finally, the anastomosis must be performed so that there is no tension to pull it apart (i.e., the surgeon must assure adequate mobilization of the proximal and distal colon).

   a) Conventional suturing by absorbable or non-absorbable suture, interrupted or continuous, double or single layered technique can be used. We should take deeper muscularis and minimal mucosa during anastomosis.

   Good approximation all layers of bowel wall is important.

   b) For stapled anastomosis – Use the largest caliber of stapler the anastomosis can accommodate.

   After placing of the purse-string the excessive bulk of tissue should not appear around shaft.

   The purse-string can be snagged up close to the shaft.

   Reinforce the purse-string if one is concerned about the possibility of a gap.

   Repair any identified defect.

   Till date, no single technique, single layer suture, double layer suture or stapling has ever been definitely demonstrated to be superior in preventing anastomotic leaks [25-26].

4. Role of Leak Test

Once anastomosis is performed the pelvic cavity is filled with saline, intestinal clamp is applied proximal to the anastomosis and 50-100 ml of air is slowly and gently injected through the anus.

No bubbles mean anastomotic tightness.

If bubbles appear additional suture on the anastomotic line needs to be taken.

In the group of patients to whom intraoperative air test was performed by Bielecki K. et al. 23% cases of air leak was observed and additional stitches placed to secure anastomosis.

On 10th postoperative day the radiological leak in 7.5% of cases was showed and overall mortality in this group was 2%.

In contrast, in group of patients to whom intraoperative air test was not performed, postoperative radiological leak was found in 23.5% of cases with 10% mortality [62].

In patients with high ligation of the inferior mesenteric artery while resection of the left colon there is 3.8 times higher chance of leak, than those who underwent low ligation [18].

This finding most likely represents the extent of the surgical procedure in patients with left-sided surgery with more extensive lymphovascular dissection.

Creating a tension-free low rectal or colorectal anastomosis with a good blood supply is often not possible without performing a high ligation of the inferior mesenteric vessels.

Therefore, the choice of high ligation of the inferior mesenteric artery may be influenced by a variety of factors including: level of anastomosis (how much reach is needed to the rectum), degree of atherosclerosis in the mesentery, or whether or not there are intact marginal vessels in mesentery of colon.

5. Whether Stapled Anastomosis is More Tight and Reliable than Conventional Hand-Sewn Anastomosis?

In earlier studies the reported leak rates after stapled and hand-sewn anastomosis were 8% and 27% respectively [28].

A Cochrane database systemic review of the RCT’s comparing stapled versus hand sewn anastomotic technique was published in 2012.

The evidence found was insufficient to demonstrate any superiority of stapled over hand sewn techniques in colorectal anastomosis surgery, regardless of the level of anastomosis, even with the expanding advances of surgical technology [29].

In double-stapled technique and other intersecting staple lines may have a higher predisposition to the leaks than single-stapled or hand-sewn anastomosis [30].

6. Laparoscopy Versus Open Anastomosis

Laparoscopic or laparoscopically assisted approach to colorectal surgery is not associated
with a higher risk of anastomotic leaks.

Morbidity and mortality rates with this method approximate those seen with conventional colorectal surgery [31,36].

The advantages obtained with the laparoscopic technique, with no significant differences in severe complications, indicate that this approach is preferable to the traditional technique [32].

7. Role of Diversion

Some surgeons prefer to create a defunctioning stoma in order to prevent fecal contamination of an anastomosis and to reduce the consequences of an anastomotic leak.

There is no evidence that protective stoma prevents the anastomotic leak.

In case a leak does take a place in patient having a diverting stoma, the septic complications resulting from the anastomotic dehiscence are significantly reduced.

Wessex (Grabham) colorectal audit showed that a defunctioning colostomy reduced the frequency of anastomotic leak from 11.4% to 6.5% [37].

Reoperation was needed more frequently where there was no protective stoma (7.3% vs. 3.0%).

Postoperative mortality was greater following a leak, where no diversion was performed (10.4% vs. 4.1%).

Therefore a diverting colostomy decreases both the frequency and consequences of anastomotic leakage following anterior resection.

Gastinger et al. conducted a prospective multicentre study between January 2000 and December 2001 where 881 (32.3 per cent) of 2729 patients received a protective stoma after low anterior resection.

Overall anastomotic leak rates were similar in patients with or without a stoma (14.5 versus 14.2 per cent respectively).

The incidence of leaks that required surgical intervention was significantly lower in those with a protective stoma (3.6 versus 10.1 per cent; p < 0.001), as was the mortality rate (0.9 versus 2.0 per cent; p = 0.037) [38].

Logistic regression analysis showed that provision of a protective stoma was the most powerful independent variable for avoiding an anastomotic leak that required surgical correction.

Hence, more experienced surgeons prefer a defunctioning stoma for low rectal anastomosis.

A diverting stoma should be considered in any high risk anastomosis like coloanal, colorectal < 6 cm from the anal verge or in any patient with severe malnutrition, significant immunosuppression or purulent peritonitis or pelvic sepsis.

Special considerations should be made for patients with gross comorbidities having compromised physiological reserve necessary to tolerate an anastomotic leak if that happens.

8. Role of Peritoneum and of the Omentum

Surgeons have attempted several intraoperative techniques in hopes of lowering anastomotic leak rates.

One is “omentoplasty” which involves wrapping the anastomosis with omentum. This was prospectively studied by the French Associations for Surgical Research [33].

In their randomized study of 705 patients, omentoplasty did not decrease the anastomotic leak rate or the clinical severity of anastomotic leaks compared to the patients without omentoplasty.

However, several surgeons do this maneuver whenever the integrity of an anastomosis is in doubt.

9. Does Preoperative Radio (Chemo)Therapy Increase Anastomotic Leakage?

Neo-adjuvant chemotherapy does not seem to increase anastomotic leak rate following restorative proctocolectomy, possibly because of the tendency of most surgeons to cover it with a proximal stoma.

Earlier RCTs, in fact, recommends protecting stoma in patients with neoadjuvant short course radiation for rectal cancer as it reduces the need for a surgical intervention should an anastomotic leak occurs.

Changjiang Qin et al. conducted a meta-analysis where 7 randomized controlled trials with 3375 patients were included. 1660 patients forming the group undergoing preoperative radiotherapy or chemoradiotherapy versus 1715 patients undergoing operation without preoperative radiotherapy or chemoradiotherapy.

The meta-analyses found that pR(C)T was not an independent risk factor for anastomotic leakage (OR 1.02, 95% CI 0.80–1.30).

Subgroups analysis was performed and the result was not altered.

Current evidence demonstrates that pR(C)T did not increase the risk of postoperative anastomotic
leak after rectal cancer resection in patients [34]. Hananel and Gordon in their experimental study demonstrated the 5-fluorouracil and leucovorin introduced in several regimens have no effect on the colonic anastomosis healing.

Surgery, at least in experimental animals, can be performed safely during and shortly after chemotherapy [35].

10. Role of Mechanical Bowel Preparation

The importance of efficient mechanical bowel preparation in preventing infectious complications and anastomotic dehiscence after colorectal surgery has been a dogma among surgeons for more than a century (Halsted 1887; Thornton 1997). This rigidity of concept was based more on observational data than on solid evidence.

Several well designed prospective randomized trials have shown that preoperative bowel cleaning does not prevent anastomotic leakage or wound infection in patients undergoing open or laparoscopic colorectal surgery [39, 40, 41]. As shown by Cochrane database systemic review 2005, inadequate mechanical bowel preparation leads to liquid bowel contents and increases the rate of intraoperative spillage which may increase the rate of postoperative infectious complications [42, 43]. Some surgeons consider that bowel preparation might decrease operating time by improving bowel handling during anastomosis and might help in intestinal palpation necessary for identification of a lesion [44]. Therefore bowel preparation is not routinely recommended.

11. Role of Pelvic Drains

Role is still controversial.

Prevention of collection of fluids or hematoma in the pelvis minimizes the risk of Anastomotic Leak. Recent large RCTs and metaanalysis, has not shown any benefit nor any harm.

A systematic review and meta-analysis of randomized controlled trials by D R Urbach et al. using four randomized controlled trials, including a total of 414 patients, compared the routine use of drainage of colonic and/or rectal anastomoses to no drainage.

Use of a drain did not significantly affect the rate of any of the outcomes examined, although the power of this analysis to exclude any difference was low. Comparison of pooled results revealed an odds ratio for clinical leak of 1.5 favoring the control (no drain) group. They concluded that any significant benefit of routine drainage of colon and rectal anastomosis in reducing the rate of anastomotic leakage and other surgical complications can be excluded with more confidence based on the pooled data than from the individual trials alone [45].

Recent report from Dutch TME trial, a large randomized control study comparing TME with and without preoperative radiation, demonstrated by multivariate analysis that lack of pelvic drainage was an independent risk factor for anastomotic leakage after TME [46].

The reported leakage rate was 9.6% in patients with pelvic drainage, which was much lower than 23.5% in those without a pelvic drain [47].

12. Role of Epidural Analgesia

Earlier case reports showed a risk of early anastomotic leakage in patients receiving epidural analgesia with local anesthetic agents.

There was data documenting a stimulatory effect of epidural block on gastrointestinal motility, leading to more leaks.

Review of controlled, randomized clinical trials aiming to investigate postoperative complications in which continuous postoperative epidural local anesthetic was administered in patients scheduled for colorectal surgery with an anastomosis by Holte K et al. showed that there is no statistically significant evidence to indicate an increased risk of anastomotic breakdown [48]. However, relatively few patients have been included in randomized trials, indicating a need for more studies to secure valid conclusions.

How to Manage a Colo-Rectal Anastomotic Leak?

Müller (1994), gave a definition of anastomotic leak;
1. Fecal fistulas to the skin or vagina
2. Fever > 38°C or septicemia
3. Radiological or endoscopic signs of anastomotic leakage
4. An intraperitoneal abscess or peritonitis in the presence of an anastomotic leak [49].

It is typically discovered around 5 to 7 days after surgery and hind sight usually reveals earlier signs that should make the surgeon more suspicious.
of a leak include fever, leukocytosis, localised or generalised tenderness, generalised ileus with abdominal distension and tachycardia.

It is usually necessary to obtain objective tests of anastomotic integrity because of the early non-specific clinical signs.

Complimentary radiologic studies such as computed tomography (CT scan) or contrast water-soluble enemas can be used to confirm the diagnosis.

CT scan is superior to the latter in showing abscess formation in the pelvis [51].

The presence of a collection of fluid and gas adjacent to the colonic suture/staples indicates an anastomotic leak.

If suspicions persist, the leak can be more illustrated with intestinal opacification and using fluoroscopic imaging.

Conventional contrast enemas pursued with a supplementary CT examination at the same time that might show an intestinal wall defect with communication of the intraluminal and extraluminal compartments [52].

Anastomotic leaks may be divided into those which are clinically significant and those which are not.

Anastomotic leaks can also be classified as; Free or Contained leak.

Free leak are characterized by symptoms of fever, tachycardia, leucocytosis, diffuse peritonitis, feculent fluid may present through the incision or the pelvic drain, hypotension and other signs of sepsis.

Whereas contained leaks are more benign in their natural history and is contained in a small cavity around the anastomotic site [50].

To achieve an uniform guideline for the detection and management of colorectal anastomotic leaks M. den Dulk et al., combined the clinical features into a clinical scoring system, the Dutch Leakage (DULK) Score.

Here the patients are scored every day.

Separate points are assigned to certain clinical manifestations and symptoms (i.e., fever, heart rate, respiratory rate, urinary output, and mental status), nutritional status (kind of intake), local findings (such as signs of ileus, gastric retention, fascial dehiscence) and laboratory findings (i.e., CRP level, kidney function test, leucocyte level).

After applying, the scoring system retrospectively on a historical cohort, the score was used prospectively.

It was noted that patients with a higher score were more susceptible to anastomotic leaks so required intensive medical care or radiological evaluation.

This scoringsystem decreased the delay in detecting the anastomotic leak from 4 to 1.5 days, decreasing the false negative diagnostic imaging which is considered a major factor in the delay of diagnosis [53,54].

Routine measurement of C-reactive protein (CRP) postoperatively has been used for detecting the presence of any infectious complications after surgery and in particular anastomotic leaks.

Warschkow et al. in a meta-analysis showed that a cut-off of 135 mg/L on day 4 post surgery was resulting in a negative prediction value of 89% for infections and complications [56].

**Treatment of Colorectal Anastomotic Leaks**

For major leaks patient requires immediate intervention with resuscitation for hemodynamic instability, IV antibiotics, monitoring with central lines, urinary catheters, and arterial lines in an ICU.

Once stabilized, laparotomy with lavage and drainage is mandatory, followed by the formation of a de-functioning stoma.

In right sided colonic leaks, the anastomosis can be refashioned and then a drain is placed.

In left colonic leaks, based on the condition of the anastomosis, the surgeon has to take a decision.

If the anastomosis has a small clear defect, it is closed and a stoma is fashioned with adequate drainage of the abdominal cavity.

Primary repair may be attempted in very small colorectal leak, with a covering stoma and placed beneath the midline incision.

If the anastomosis has total dehiscence, the proximal end is brought out as a colostomy and the distal end is kept as a Hartman’s stump.

Alternatively it can be brought out as a mucous fistula [57].

For leaks with localized collections, treatment is conservative with IV antibiotics, bowel rest and observation.

If the leak is contained in a large cavity, then the best approach is to do a percutaneous drainage under radiologic guidance with a success rate of 80% being documented [58].
If non-surgical drainage is not feasible, then laparotomy may be necessary [57].

Long-Term Functional Outcome Anastomotic Leakage

In patients with leak as the results of pelvic sepsis, fibrosis may develop which can eventually lead to narrowing of the distal bowel or can form a stricture [60].

Stricture formation in the site of the anastomosis is seen due to anastomotic leak, ischemia or due to cancer recurrence [61].

The stricture is repaired when there is luminal obstruction, need to reverse a proximal stoma, or defecatory symptoms.

Neorectal volume at distension pressures of 40 and 50 cm H2O and compliance at sensation of filling urgency maximum tolerated volume were significantly reduced in patients with anastomotic leak.

The impaired anorectal function is measured by, increased urgency, increased frequency of bowel movements, increased incontinence score and impaired evacuation.

Anastomotic leak may increase the risk of locoregional neoplastic recurrence [59].

Conclusion

Colorectal anastomotic leaks are serious complications following surgery that alter the desired outcome and is a burden on patients, putting healthcare practitioners under pressure and dilemmas regarding its’ appropriate management.

Surgeons should keep in mind the risk factors for colonic anastomotic leaks.

Colonic anastomotic leak can be avoided by the use of proper surgical technique.

In fashioning a colorectal anastomosis, some basic surgical techniques must be followed to limit the complications.

Presence of adequate blood supply to the anastomosis, minimal contamination, absence of tension in the anastomotic line and no distal obstruction.

The use of either sutures or staples to create a colorectal anastomosis do not significantly alter the anastomotic leak rate.

The use of preoperative mechanical bowel preparation is decreasing as its’ utility has been questioned by findings from several recently performed randomized prospective studies.

The anastomosis should be tested intraoperatively and if needed should be covered by a de-functioning stoma.

Even when excellent surgical technique is used, a small percentage of leaks are inevitable on account of the many known and unknown factors.

The clinicians must have a high index of suspicion to diagnose an anastomotic leak early to adequately salvage the situation.

Leakage scoring systems and clinical laboratory tests contribute strongly to the early detection of leaks.

Treatment is based on the patient’s conditions and the magnitude of the leak.

Anastomotic leaks therefore remain a challenging complication which require further investigation and research.

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Extra Adrenal Paraganglioma: A Case Report with Review of Literature

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Abstract

Paragangliomas (extra-adrenal pheochromocytomas) are rare tumours that arise from extra adrenal chromaffin cells. Paragangliomas originate from para-ganglia at number of anatomical sites, including the head, neck, thorax and abdomen. Paragangliomas are characterized by secretions of excessive catecholamines. However, between 40 and 50% of paragangliomas are non-functional and/or potentially functional. Functional and potentially functional (difficult to diagnose preoperatively) paragangliomas during intra-operative handling of the tumour may cause a sudden release of catecholamines, leading to disastrous consequences [1]. We present a case of a middle aged male presenting with abdominal mass and pain was found to be a potentially functional paraganglioma intraoperatively. With this report we aim to raise awareness that a paraganglioma should be considered in differential diagnosis for intra-abdominal tumours.

Keywords: Hypertensive crisis; Pheochromocytoma; Paraganglioma.

Introduction

Pheochromocytoma /paraganglioma (PCC/PGL) as rare neuroendocrine tumours that arise from sympathetic and parasympathetic paraganglia. Paraganglioma comprises an extra-adrenal subset of PCC and is often characterized by secretion of catecholamines, although sometimes are biochemically inactive. This makes diagnosis challenging [2]. About 25% are hereditary or have a family relation and are associated to the multiple endocrine neoplasia type 2 (MEN 2), Hippel-Lindau syndrome, neurofibromatosis, Carney triad or mutations in the oncogenes suppressors of the Succinate dehydrogenase (SDHB, SDHC, SDHD) [3]. Clinical presentation includes symptoms related to catecholamine hypersecretion and/or tumour mass effect. Surgical resection with appropriate perioperative management of catecholamine-related symptoms remains the treatment of choice [2].

Case Report

A 46-year-old male presented with history of pain abdomen of one and a half months duration, occasional palpitations and sweating and was recently diagnosed to have diabetes mellitus. However, patient denied history of any headache. On examination pulse rate was 84 per minute, blood pressure was 130/80 mm of Hg, with a vague mass of 6 x 5 cm in the left hypochondrium. CT abdomen and pelvis suggested a well defined heterogeneously enhancing soft tissue density mass lesion measuring 10 x 8 x 7 cm in the left upper quadrant, a retroperitoneal tumour possibly GIST (Fig. 1).

On exploration, a retroperitoneal tumour of size 15 x 10 cm found to the left of lumbar vertebra below the splenic flexure between descending colon and root of the mesentery near the left renal hilum (Fig. 2). Left suprarenal gland appeared
normal. Patient pre-op blood pressure was 160/100 mm Hg. Increased to 260/150 mm Hg on handling the tumour. Hypertensive crisis was managed effectively by anaesthesiologist with nitro-glycerine, Metoprolol, and Propofol. However, patient was hypotensive immediately following resection of the tumour for which he was initiated on adrenergic support. Patient was continued on adrenergic support for two days following surgery. Patient was asymptomatic and normotensive and his blood sugars were in the normal range following surgery without any medications. Subsequent post-op recovery was uneventful. Patient discharged on postoperative day seven with advice to follow-up regularly.

Specimen consisted of a single globular mass measuring 12 cm in diameter (Fig. 3). External surface is congested, nodular, well encapsulated, soft in consistency with cystic areas. Cut surface shows multilobulated tan yellow areas with areas of haemorrhage seen. Multiple sections studied from mass shows tumour cells arranged in solid and trabecular pattern. Cells surrounded by capillaries showing Zellballen appearance. These cells had rounded nucleus with coarse clumped chromatin with granular amphophilic cytoplasm (Fig. 4). The features are suggestive of Paraganglioma.

![Fig. 1: Image showing a well-defined heterogeneously enhancing soft tissue density mass lesion measuring 10 x 8 x 7 cm in the left upper quadrant. (a- coronal view, b- sagittal view)](image1)

![Fig. 2: Intraoperative image of paraganglioma found to the left of lumber vertebra below the splenic flexure between descending colon and root of the mesentery near the left renal hilum.](image2)
Discussion

Pheochromocytomas are tumours arising from chromaffin cells of the adrenal medulla. They are called paraganglioma if chromaffin-cell tumours originate from extra-adrenal sites along the sympathetic and/or the parasympathetic chain [4]. Extra adrenal paraganglioma can occur in four types of locations—branchiomeric, intravagal, aorticosympathetic and visceral autonomic. The branchiomeric and intravagal tumours are found in head and neck region and are rarely functional. The aorticosympathetic tumours are found along the length of aorta, between the renal arteries, around the iliac bifurcation and include the organ of Zuckerkandl. The visceroaautonomic paraganglioma occurs in association with blood vessels or visceral organs like the bladder. The aorticosympathetic and visceroaautonomic tumours are mostly functional. Extra-adrenal sympathetic paraganglioma most commonly arise from chromaffin tissue around the inferior mesenteric artery and aortic bifurcation and less commonly from chromaffin tissue at other sites, whereas the extra-adrenal parasympathetic paraganglioma are most commonly found in the head and neck region [6]. Clinical incidences of pheochromocytomas have been estimated to range from 0.4 to 9.5 per million per year, and approximately 1.5 per million per year in terms of paragangliomas [5]. Long-term follow-up has shown that PCCs/PGLs exhibit a 15–20% 10-year probability of recurrence and up to 20% malignancy rate [8].

Patients may present with symptoms secondary to secretion of excess norepinephrine and epinephrine. Up to 25% of cases will be entirely asymptomatic. The classic triad of palpitations, headache, and diaphoresis is present in less than a quarter of patients. A majority of patients will have hypertension, but it can be intermittent in 50% [7].

The best screening tests for initial assessment is measurement of free plasma and urinary fractionated metanephrines. Imaging modalities used for the detection of primary or metastatic PCCs/PGLs include computed tomography (CT) and magnetic resonance imaging (MRI) [8]. Functional imaging techniques, including 123 I-meta-iodobenzylguanidine (MIBG) scan and somatostatin receptor scintigraphy, in combination with CT or MRI scans may be used to improve the sensitivity and specificity of diagnosis [1].

Surgery is the treatment of choice for paraganglioma. Before surgery, appropriate medical preparation with α-blocking and β-blocking agents is very crucial to avoid intraoperative hypertensive crisis. Use of β-blockers prior to α-blocker can lead to unopposed α-adrenergic vasoconstriction that predisposes to hypertensive crises. Preoperative volume expansion with saline infusion is often used to prevent postoperative hypotension secondary to chronic volume contraction [6]. The laparoscopic excision should be considered for small PGL tumours with a favourable surgical location [3]. In the case of malignant paragangliomas postoperative radionuclide treatment should be initiated to eradicate the residual tumours or micro
metastases [4]. In patients with metastatic disease, palliative chemotherapy with cyclophosphamide, dacarbazine and vincristine is recommended [6]. Approximately one third of patients have persistent or recurrent paragangliomas, and long-term follow-up is important [9].

Conclusion

The biggest problem of PGL is to suspect it in the first place. Functional PGL are evaluated preoperatively by biochemical and imaging modalities. The principle challenge arises in making the diagnosis of non-functional and potentially functional PGLs. Clinically and biochemically silent paragangliomas may cause hypertensive crisis and result in serious consequences when they are manipulated intraoperatively and certainly this case represents a good example. When there is a clinical suspicion the diagnosis could be made by the determination of high catecholamines and metanephrines in plasma and urine and locating the tumour through imaging studies. Alert anaesthesia team to anticipate and manage hypertensive crisis and post-operative care is paramount in good outcome.

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