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Midline abdominal Incisional hernia repair by component separation technique augmented with prosthetic mesh- Prospective study

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Abstract---Background: Raised intra-abdominal pressure (IAP) makes laparostomy mandatory initially and abdominal wall approximation cannot be completed due to compromised state in most cases. Objectives: To determine the feasibility of component separation technique (CST) with mesh augmentation. Methods: 50 patients were subjected to CST with mesh augmentation. Preoperative defect size mapping, Pre- and post-operative monitoring of IAP were done. Pain scoring by visual analogue scale (VAS), early and late complications was noted. Patients were followed up for 60 months. Results: Out of 50 patients, 17 patients had seroma formation, 2 patients developed skin necrosis, 1 patient had wound dehiscence and none had Hematoma formation. There were 33 females and 17 males and accounts to 66% of female patients. Out of 50 patients 36 patients were operated under General anaesthesia accounting to 73% of patients whereas rest of the 14 patients got operated under Combined Spinal Epidural anaesthesia. 36 out of 50 patients had split thickness skin cover, accounting for 72% of the patients whereas rest of the 14 patients had intact skin cover. The mean age of the patients in our group was 42.62±3.6 years and the majority of patients are of 40-60 years age group. There is a direct relationship between BMI, Blood flow and defect size. BMI of >30 kg/m² had an average blood

loss of 455ml and an average defect size of 244.66 cm². Patients with BMI between 25 kg/m² and 30 kg/m² had an average blood loss of 450 ml and an average defect size of 230.4 cm². Conclusion: Physical acceptance of stable abdominal wall gives a psychological boost to patients with early recovery in form of ambulation and early return to work.

Keywords---Incisional hernia, Mesh repair, IAP, CST, seroma, skin graft.

Introduction

Incisional hernia is defined as any abdominal wall gap with or without bulge in the area of post-operative scar, perceptible or palpable by clinical examination or imaging.[1,2] Incisional Hernia is frequent complication of abdominal surgery (11%) that can remain asymptomatic (8-29%)[3] and may result in significant functional impairment as they enlarge, in addition to presenting obvious cosmetic concerns with abdominal bulge that cause pain and complications as incarceration or strangulation.[3] If the abdominal wall cannot resist IAP, a hernia may form. Scar tissue from incisional hernias expressed more soluble (immature) collagen, increased ratios of early wound matrix collagen iso-forms (collagen III), and increased tissue matrix metalloprotease levels and decreased ratio of type I: type III collagen mRNA and protein. Failure of recovery of the abdominal fascia can be influenced by biological and surgical factors [4,5] The objective of abdominal wall reconstruction include restoring structural support, providing stable soft-tissue coverage, and optimizing aesthetic appearance while minimizing morbidity and postoperative disability. [6,7] Diagnostic tools such as ultrasonography or computed tomography may be useful in diagnosing small and early hernias. Hence the proposed study was intended to see the feasibility of repair by CST augmented with prosthetic mesh and to study the early and late complications.

Materials and Methods

This was a Prospective Study conducted from October, 2019 to March, 2022 in Department of General Surgery. 50 patients of Midline Abdominal Incisional Hernia regardless of the etiology were included. Sample size calculation was done as per the study "Repair of Giant Midline Abdominal Wall Hernias: Components Separation Technique versus Prosthetic Repair Interim Analysis of a Randomized Controlled Trial" by de Vries Reilingh.[8] For feasibility of the repair by CST and augmentation by mesh prosthesis the operative time along with seroma formation were two primary parameters along with many other parameters

Pregnant women, children below 12 years and elderly above 75 years of age, presence of associated groin or other hernias, Patients on steroid therapy, coagulopathies, Patient with associated malignancy, local tissue irradiation were considered under exclusion criteria.

Methodology

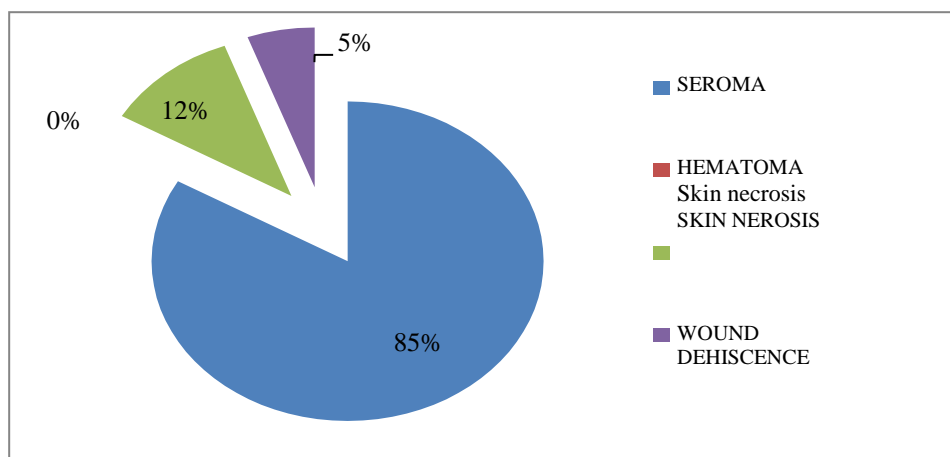
IAP monitoring once preoperatively then after the operation and first post-operative day was done. Hernia repair was performed in the standard fashion by incising the aponeurosis of the external oblique muscle longitudinally about 2 cm laterally of the rectus sheath and dissecting the external oblique muscle until the internal oblique fascia was encountered. Plication of the midline abdominal wall from the xyphoid to the pubis was performed, thereby approximating adjacent fascia over the hernia repair, reinforcing the repair, and improving the contour and tone of the lax abdominal wall using an uninterrupted 2/0 polydioxanone suture (Vicryl, Ethicon, Inc). Suction drains were used routinely. Using a Foley Catheter an intravenous infusion set, a 50 ml syringe, a measuring scale and a hemostat, provides a low-cost assessment of the IAP. The connector of the intravenous infusion set was detached from the infusion tubing and was connected to a syringe filled with 50 ml saline. This was then connected to the main drainage channel.

Statistical Analysis

Analysis of data was done by using SPSS software ver. 22. Data were statistically described in terms of mean (\pm SD), frequencies (number of cases) and percentages when appropriate. Comparison of quantitative variables between the study groups was done using Student t test for independent samples if normally distributed. For comparing categorical data, Chi square test was performed. A probability value (p value) less than 0.05 was considered statistically significant.

Results

Figure 1- Distribution of Early and Late complications among study participants



As per figure 1 Out of 50 patients, 17 patients had seroma formation, 2 patients developed skin necrosis, 1 patient had wound dehiscence and none had Hematoma formation. The formations of seromas/hematomas were not included in the failures as those were managed conservatively. When there was collection

in the wound, the discharge was sent for culture and sensitivity tests and dressing was changed twice a day. If the discharge was found to be sterile, it was labelled as seroma and if there was purulent discharge and bacterial growth was found on culture, it was termed as wound infection.

Table 1- Demographic and Clinical Presentation of Study patients

Parameters	Number (%)	p-value
Gender	Males	17 (34)
	Females	33 (66)
General Anesthesia	36 (72%)	0.07
Epidural Anesthesia	14 (28)	
Split thickness skin cover	36 (72)	0.07
Intact skin cover	14 (28)	
Complications	20 (40)	0.31
Mean age	42.62±3.6	-
Mean BMI	25.88±6.4	-
Mean Hernia defect size	215.42±32	-

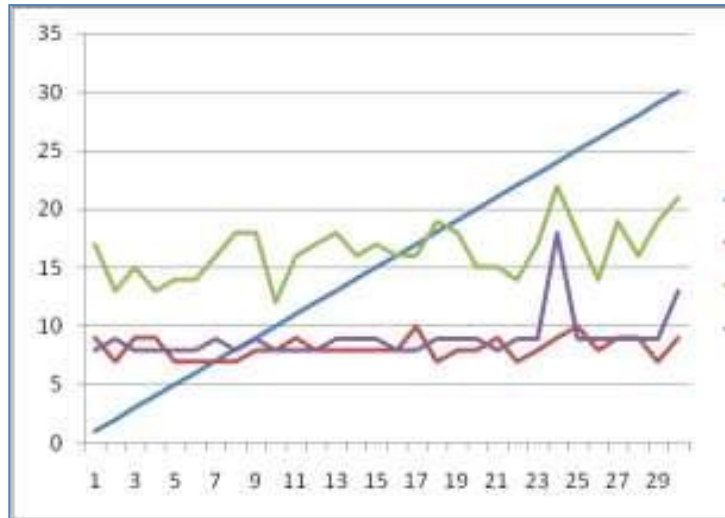
As per table 1 there were 33 females and 17 males and accounts to 66% of female patients. Out of 50 patients 36 patients were operated under General anaesthesia accounting to 73% of patients whereas rest of the 14 patients got operated under Combined Spinal Epidural anaesthesia. 36 out of 50 patients had split thickness skin cover, accounting for 72% of the patients whereas rest of the 14 patients had intact skin cover. The mean age of the patients in our group was 42.62±3.6 years and the majority of patients are of 40-60 years age group. The mean BMI of the patients was 25.88±6.4 Kg/m². The mean hernia defect size was 215.42cm². Mean operative time in our study was 170.4 minutes and majority of the patients got operated within the time span of 120 minutes to 210 minutes.

Table 2- Relationship between BMI, Blood loss and Defect size.

BMI (Kg/m ²)	Blood flow (ml)	Defect size (cm ²)	p-value
18.5-25	350	204	0.01
25-30	450	230.4	0.01
>30	455	244.66	0.01

As per table 2 it shows there is a direct relationship between BMI, Blood flow and defect size. BMI of >30 kg/m² had an average blood loss of 455ml and an average defect size of 244.66 cm². Patients with BMI between 25 kg/m² and 30 kg/m² had an average blood loss of 450 ml and an average defect size of 230.4 cm². Patients with BMI between 18.5kg/m² and 25 kg/m² had an average blood loss of 350 ml and an average defect size of 204 cm². P-value was significant.

Figure 2- IAP measurements in Pre and Post Operative periods



As per figure 2 IAP measurements were seen Red: pre-operative IAP, Purple: Immediate post-operative IAP, Green: post-operative day 1. Prolonged increased pressure was not noted except in 4 cases of immediate post operative period. The mean hospital stay was 5.4 days.

Discussion

Jason et al in their study of 200 patients with incisional hernia repair sub divided them into 3 groups.[1] Repair only by CST had a recurrence of 33.6% in comparison to repair by component separation augmented with biological mesh with a recurrence of 22.8% and when component separation segmented by polypropylene mesh the recurrence was 0%. This authentication further enforced us to use soft polypropylene mesh augmentation in all cases of incisional hernia repair by component separation technique.

Geffen et al in their study reported mesh augmentation CST reduced recurrence rate to 4% and without mesh it was 17% in a follow up period of 37 months. [9]

Reilingh et al published their randomized trial in 2007 done at Department of Surgery, Radboud university, Nijmegen medical center, Netherlands on reconstruction of giant midline abdominal hernias by CST and prosthetic repair in 39 patients who were randomized with 19 patients in CST group and 18 in prosthetic repair (two patients were excluded perioperatively due to gross contamination). [8]

Jacobus et al at Erasmus University did a prospective study in 181 patients between 1992-1998, their study was compatible with our study of 30 patients. [10] They had divided their groups into incisional hernia repair by mesh and another group where repair was done by only suturing. Though the gender ratio was equal in suture group by randomisation and 1.5: 1:: male: female ratio in

other group of meshplasty but our study had four times more females likely because of nonrandomisation in our study.

Lowe et al in their study of 30 patients of incisional hernia operated by CST augmented with meshplasty.[11] The gender ratio was equal in their series while female outnumbered in our series ratio of 1:4 probably because post gynaecological intervention incisional hernia was seen in 40% of our study group.

The hospital stay in their series was 12.5 days which is related to obesity which increases seroma formation in early post-operative period which is an important detrimental factor for increase in hospital stay and also adds to the morbidity in early postoperative period and increases the cost of the hospital stay. In their study they also noted 10% recurrence rate in follow up period of 9.5 months while we have not reported any case of recurrence in our series in follow up of 60 months. [12] Midline ischemia was 20% and infection rate of 40% noted in their series while in our study only 2 cases of midline ischemia with skin necrosis were noted. Morbid condition prior to hernia repair, increase surface area of hernia repair further to ischemia as mobilization of bilateral rectus and perforator preservation is cumbersome. However, ideal surgical handling of tissue can combat these two inter-related complications. This may lead to increase hospital stay and also disrupting the final cosmesis which is believed to be achieved. [11,12] The wound dehiscence is again co-related to midline ischemia and infection which was reported as 43% in their series while again corresponding to 3.3% in our study which again signifies that midline ischemia is a stage short of wound dehiscence. Midline ischemia and infection if timely controlled with antibiotics and surgical intervention results in reduced rate of wound dehiscence.

Conclusion

Patients of midline abdominal incisional hernia repaired by CST augmented with prosthetic mesh was found to be feasible and better than the routine primary repairs & mesh hernioplasties though the procedure required more time than regular repairs but, in the end, stable and durable abdominal wall was achieved with minimal scarring. Higher BMI was found to be associated with increased blood loss & increased operative time and seroma formation. Monitoring of the Pre- and post-operative IAP was found to be significant in deciding the management in emergency settings and at the time of definitive repair to avoid abdominal compartment syndrome. Shorter hospital stays and early recovery to work made this procedure acceptable in our patients.

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Conflict of Interest- None declared

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