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Management of Large Midline Incisional Hernia, Double Mesh Modification of Chevrel's Technique Versus OnLay Mesh Hernioplasty, A Comparative Study.

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ABSTRACT

Large mid line incisional hernia is a challenging surgical issue, skin flap necrosis, corsage feeling and chronic postoperative pain together with hernia recurrence are the most common complications of mid line incisional hernia surgery, we offered a double mesh modification of Chevrel technique for repair of mid line incisional hernia, our objective here is to test the efficacy and safety of this modification in comparison to the conventional on-lay mesh hernioplasty. In this study we compared two groups of patients with large midline incisional hernia, group A (22 patients) underwent double mesh modification of Chevrel technique and group B (21 patients) underwent on lay mesh hernioplasty, preoperative, operative and follow up data were collected and properly analyzed to draw the conclusion of the study. All patients completed the deemed procedures successfully and the follow up time, we reported non-significant differences regarding demographic data and intraoperative data, regarding the follow up data we detected statistically significant differences in favor of group A regarding drainage time, incidence of skin flap necrosis, chronic postoperative pain and corsage feeling. Double mesh modification of Chevrel technique is effective as on lay mesh hernioplasty in large midline incisional hernia with lower complications rate.

Keywords: Incisional hernia, double mesh modification, chevrel

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INTRODUCTION

Incisional hernia is defined as any abdominal wall gap in the vicinity of previous scar, diagnosed by clinical examination or imaging studies.^{1,2} Incisional hernia was classified in many ways according to site, recurrence, complications and size of real fascial gap, which is the most important point in planning for repair of incisional hernia, according to the defect diameter incisional hernia is classified into; Small (<5 cm in one diameter), Medium (5–10 cm in one diameter) and Large (>10 cm in one diameter),²⁻⁴ as the size of the defect increase the incidence of loss of abdominal domain increase and the treatment become challenging, till 1990 fascia duplication and fascia adaptation was the standard treatment of incisional hernia^{3,5}, fascial strengthening by implantation of autologous or allografts was reserved for monstrous hernias only, but many studies reported high recurrence rate, the introduction of mesh prosthesis for augmentation of hernia repair decreased recurrence rate significantly, nowadays it became the standard procedure^{4,6}, the site of mesh application differs according to hernia site, defect size and surgeon preference, laparoscopic intra peritoneal mesh plasty doesn't entail closure of hernia defect thus both recti muscles remain divaricated^{7,8}, pre peritoneal approach(Rives-Stoppa) is better reserved for lateral defects and entails large area of dissection^{9,10}, pre-aponeuretic approach(on-lay- Chevrel) doesn't require much intraperitoneal or preperitoneal dissection, helps re insertion of recti muscles to midline but entails wide area of subcutaneous dissection which may be hazardous to the perforating vessels^{3,4,6}, we developed a double mesh modification of Chevrel's technique that achieves tension free repair and helps decrease subcutaneous dissection, in this study we tried to test efficacy and safety of this modification in comparison with the on-lay approach in large midline incisional hernia.

PATIENTS AND METHODS

This comparative study was carried out in general surgery unit, Zagazig university hospitals, between January 2018 and December 2019, on 43 cases with large midline incisional hernia, patients were randomly allocated according to the deemed option of management, using computer generated cards, into two groups, group A; the modified Chevrel group, 22 patients, were treated by double mesh modification of Chevrel's technique, and group B, the on-lay group, 21 patients, were treated by anatomical repair and fixation of non-absorbable mesh in on-lay position.

Patients included in the study are those

- Above 18 years old suffering large midline incisional hernia.

Patients excluded are those with

- Complicated incisional hernia.
- Advanced cardiac, respiratory, liver and renal diseases
- Patients with abdominal and abdominal wall malignancy
- ASA III and IV

The study condition is the large midline incisional hernia defined as hernia following mid line incision, defect is 5cm or more in any of its diameters.

The main outcome of the study is recurrence of hernia and local complications mainly skin flap necrosis, seroma and hematoma formation, wound infection, chronic pain and corsage feeling.

All the study participants signed an informed written consent, the study was approved by our local ethical committee and institutional review board and registered in clinical trials with unique identifier **NCT04430816**.

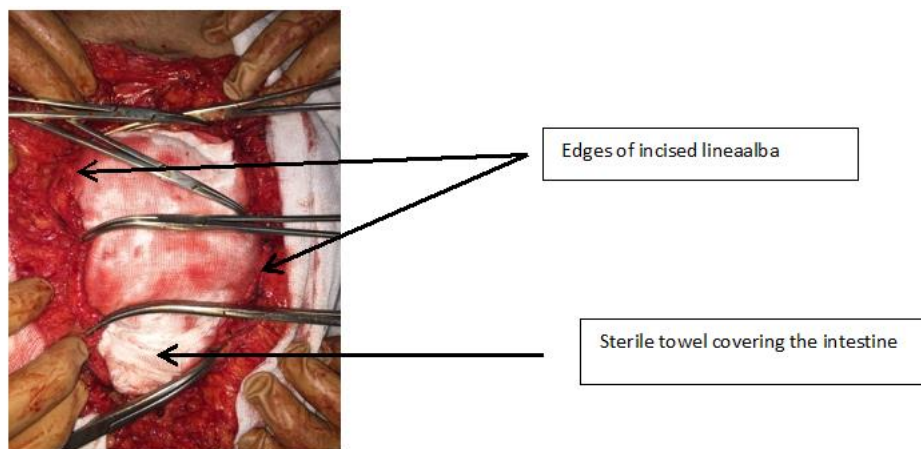
All the study participants were subjected to thorough history taking, full systemic and abdominal examination, chest X ray, abdomino-pelvic ultrasound examination, measuring of the defect by ultrasound or

abdominal CT if needed, preoperative routine laboratory tests, fractionated heparin was given when indicated as a prophylaxis for deep venous thrombosis (BMI >35, previous history of DVT), third generation cephalosporins prophylactic intravenous injection just before the induction of anesthesia.

Surgical procedures:

- In patients of the double mesh modification of Chevrel's technique, after excision of the previous scar, skin and subcutaneous tissue was dissected off the hernia sac, the sac was then opened, released off intra-abdominal adhesions and resected, the real defect size was measured, the skin and subcutaneous tissue was dissected off the anterior rectus sheath, dissection was limited to less than 2 cm lateral to the hernia defect edges. (fig1).

Figure 1: Minimal skin and subcutaneous dissection



Then, a bilateral vertical incisions of the anterior rectus sheath was done parallel to the midline and at maximum 2 cm far from it thus two medial anterior rectus sheath flaps could be created and dissected off the rectus abdominis muscles on both sides, dissection of both recti abdominis muscles was continued to be separated off the posterior rectus sheath opening the retro-rectus space, linea alba was reformed by suturing each of the newly formed medial anterior rectus sheath flaps to its fellow of the other side, using Vicryl sutures, the flaps help tension free closure of the defect and formation of a common posterior rectus sheath, (fig 2,3)

Figure 2: Midline closure and formation of new posterior rectus sheath

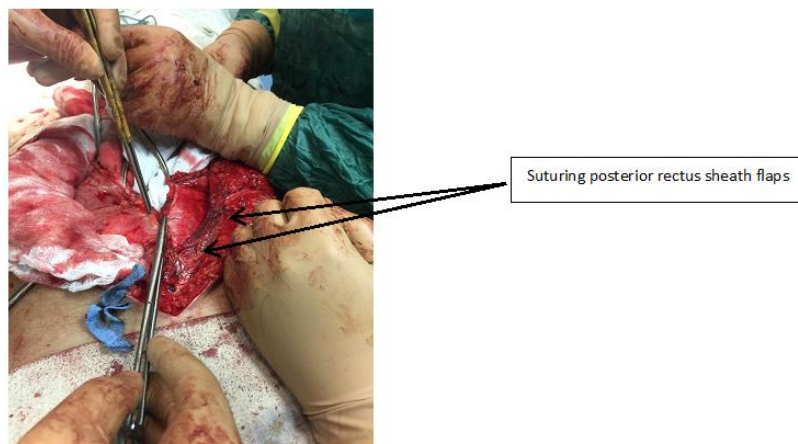
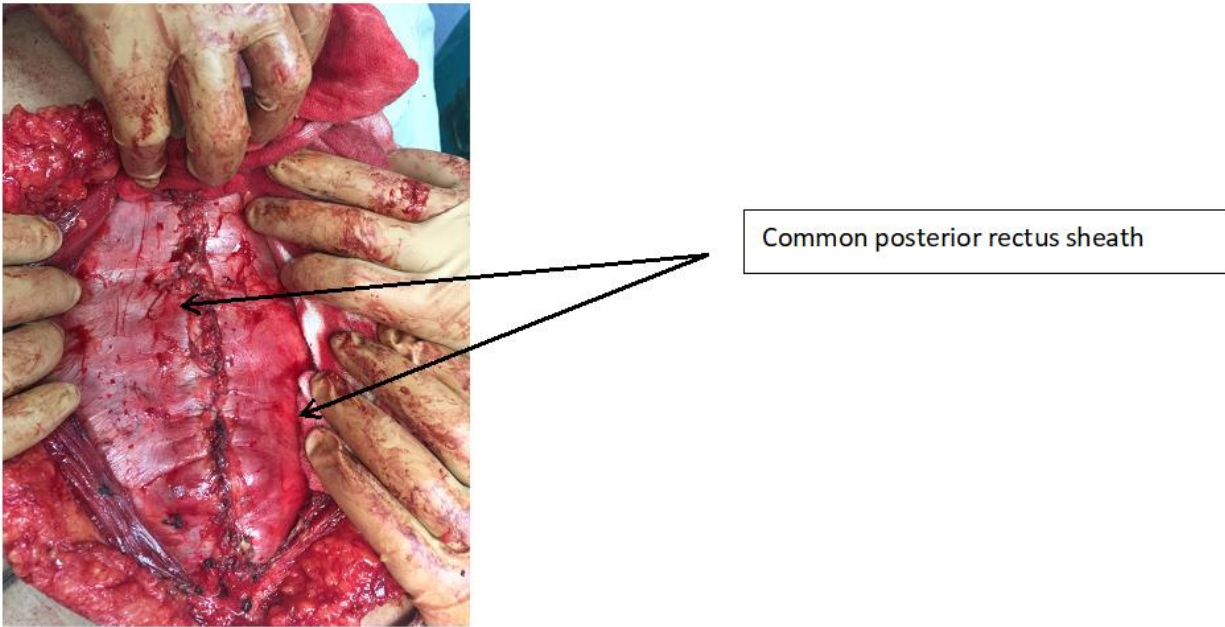
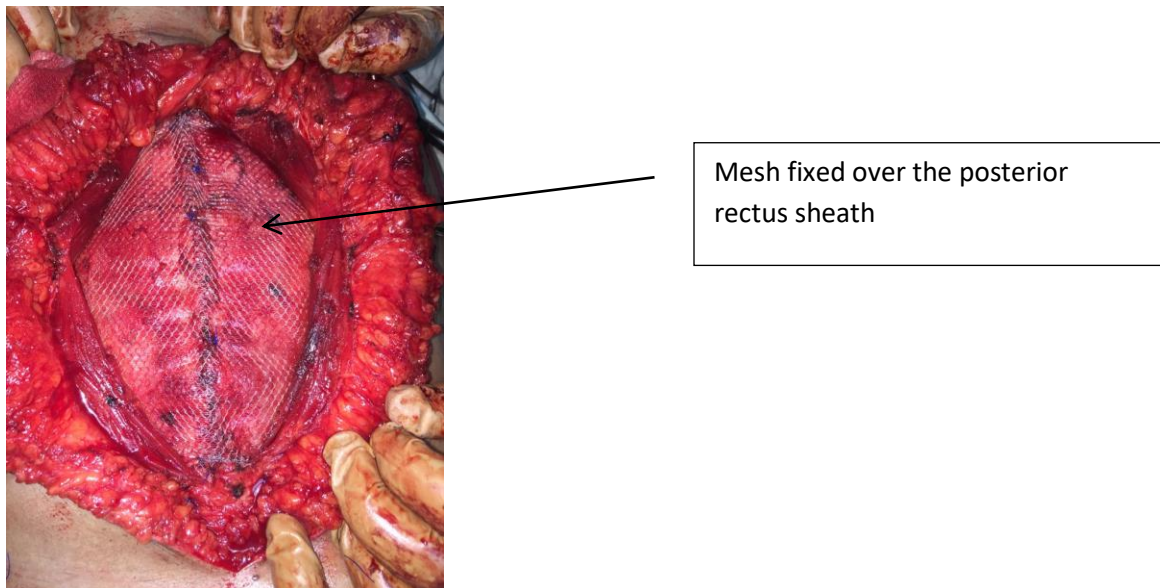


Figure 3: Reformed common posterior rectus sheath



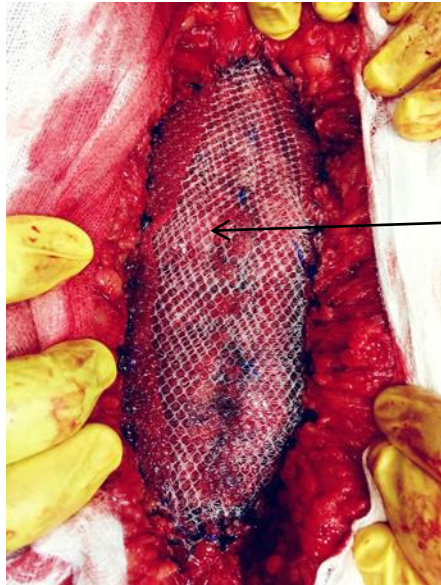
A polypropylene mesh was spread in the retro-rectus space, over the newly formed posterior rectus sheath, extending between its lateral ends, fixed to the posterior sheath with prolene sutures fig (4).

Figure 4: Mesh fixed in retro-rectus space



At the end the anterior rectus sheath was closed with prolene mesh tailored to the space between lateral flaps of anterior rectus sheath, and sutured to their medial edges with interrupted non absorbable sutures fig (5).

Figure 5: Mesh fixed to flaps of ant rectus sheath



Anterior mesh fixed to the lateral flaps of anterior rectus sheath

- In the group of on-lay mesh repair the old scar was excised, the sac was laid open at its fundus, adhesiolysis was done to free the abdominal viscera from the parietal peritoneum, the sac was excised, skin and subcutaneous tissue were dissected of the anterior rectus sheath till the linea semilunaris, taking care to preserve the perforating vessels, anatomical repair was done by midline closure with prolene 1\0 interrupted suture, a prolene mesh was fixed in on-lay position by prolene 2\0 sutures. Fig (6)

Figure 6: Mesh fixed in the on lay position



In both groups after proper hemostasis a suction drain was left over the mesh, subcutaneous tissue was approximated by vicryl 3\0 sutures, skin closed by prolene 3\0 sutures. In the postoperative period patients

received non-steroid pain killer according to need and third generation cephalosporin intravenous injection, wounds were observed after 24 hours for assessment of any local wound complications specially skin flap ischemia, after discharge patients were followed up in the outpatients clinic by the attending surgeon, follow up data including (wound complications as sloughing of skin flap, drainage amount and duration, corsage feeling, parasthesia of abdominal wall and chronic pain) were gathered in each visit, two months after operation an abdominal wall ultrasound examination was done for detection of early recurrence, a clinic visits or phone contact was done every 6 months till the end of the study.

Data was presented in mean and standard deviation, statistically analyzed using t test, z test, in SPSS program 22

RESULTS

Comparison between our study groups revealed non-significant differences regarding demographic data as presented in table 1, the mean age in group A was 52.36 ± SD 8.7 years while in group B it was 52.95 ± SD 8.08, male represented 54.5% in group A, while in group B male represent 42.86%, in group A BMI was 30.1± SD 2.8, while in group B 30.5 ± SD 3.5, we recorded 3 cases diabetic and one ischemic heart disease in group A , in group B we recorded 4 diabetic cases.

Table 1: Demographic data

		Group A (modified Chevrel) n= 22	Group B (On lay) n= 21	p
Age		52.36 ± SD 8.7	52.95 ± SD 8.08	0.41
gender	Male	12 (54.5%)	9 (42.86%)	0.44
	Female	10 (45.5%)	12 (57.14%)	
BMI		30.1± SD 2.8	30.5 ± SD 3.5	0.33
Associated comorbidity		4	4	0.94

P< 0.05= significant difference

All cases underwent successful surgeries in both groups, the recorded operative time in group A (114.1±SD=9.89 minutes) was non-significantly shorter than that in group B (118.1± SD 9.8 minutes), in group A, the mean diameter of hernia defect in group A was 8.4 ± SD 2.4 cm with multiple defects in 7 cases, in group B it was 8.8 ±SD 2.6 cm with multiple defect in 8 cases , we recorded zero intraoperative complications. The mean hospital stay in group A was 3.59 ± SD 1.47 days and in group B 3.52± SD 1.47 days with non-significant difference between groups. See table (2)

Table 2: Operative findings

	Group A (modified Chevrel) n= 22	Group B (On lay) n= 21	p
Operative time	114.1±SD=9.89minutes	118.1± SD 9.8 minutes	0.09
Defect diameter	8.4 ± SD 2.4 cm	8.8 ± SD 2.6 cm	0.27
Multiple defects	7	8	0.83
Hospital stay time	3.59 ± SD 1.47 days	3.52± SD 1.47 days	0.44

P< 0.05= significant difference

No cases missed the follow up, the mean follow up time was slightly longer in group B being 27.05± SD 3.09 months than in group A 26.5 ±SD 3.93 months without statistical significance. The recorded postoperative complications in group A were; seroma formation in 2 cases (9.1%) managed by sequential aspiration and compression, hematoma in 1 patient(4.5%) underwent evacuation under local anesthesia, partial wound dehiscence occurred in 1 case (4.5%) managed by frequent dressing and 2ry suture after 3 weeks, surgical site

infection (SSI) in 1 case (4.5%) the patient improved after intravenous 3rd generation cephalosporin injection, Chronic wound pain experienced for 6 months in 1 case (4.5%) we reported zero rate of corsage feeling, skin flap necrosis and recurrence. In group B, we recorded seroma formation in 5 cases (23.81%), two cases (9.52%) of hematoma formation and 1 case of partial wound dehiscence (4.76%), (SSI) rate was 3 cases (14.82%) and chronic wound pain for 6 months in 4 cases (19.05%) those complications were managed in the same way as in group A, even if the rate of those complications in group B is higher it didn't reach a statistical significance. Corsage feeling and skin flap necrosis were statistically higher in group B patients, as corsage feeling occurred in 4 cases (19.05%), and skin flap necrosis occurred in 5 cases (23.81%) the necrotic tissue underwent debridement and frequent dressing, the wound was left for healing by secondary intention in all cases. we recorded zero recurrent cases in group B.

Drainage time was statistically shorter in group A patients (mean 7.1 ±1.3 days) than group B patients (mean 10.7±3.9 days). Follow up data presented in table (3).

Tables 3: follow up data

	Group A (modified Chevrel) n= 22	Group B (On lay) n= 21	p
Follow up time months	26.5 ±SD 3.93	27.05± SD 3.09	0.31
Seroma	2 (9.1%)	5 (23.81%)	0.19
Hematoma	1 (4.5%)	2 (9.52%)	0.52
Wound dehiscence	1 (4.5%)	1 (4.76%)	0.97
SSI	1 (4.5%)	3 (14.82%)	0.27
Chronic pain	1 (4.5%)	4 (19.05%)	0.03
Corsage feeling	0 (0%)	4 (19.05%)	0.03
Drainage	7.1 ±1.3 days	10.7±3.9 days	0.001
Skin necrosis	0 (0%)	5 (23.81%)	0.015

P< 0.05= significant difference

DISCUSSION

Tension free repair is considered the most important surgical principle for treatment of any type of hernia, mid line incisional hernia is a complicated issue as the anatomy of the recti muscles on both sides favor their widening apart from mid line on hernia occurrence, leading to their divarication and loss of abdominal domain especially if the midline defect is large, this leads to some difficulties in the repair surgeries, as the repair may be under tension favoring recurrence of the hernia, many attempts throughout the surgical history took place for making the repair free of tension, in 1929 Gibson repaired hernia by suturing the refreshed defect edges, to release tension on the repair line he performed a vertical releasing incision on each side of the anterior rectus sheath parallel to the mid line repair¹¹ Rothschild in 1933 performed two transverse incisions above and below the defect, connected them by vertical incisions on the anterior rectus sheath the resulting medial flaps were sutured to each other closing the midline defect and resulting in an area of the rectus abdominis muscle without a covering anterior rectus sheath¹². Welti and Fudil performed two incisions as Gibson on the anterior rectus sheath, the resulting medial aponeuretic flaps were sutured to each other at the mid line¹³ in 1957 Rehn described his cutisplasty, the resulting defect of the anterior rectus sheath after the two aponeuretic flaps were sutured to each other was replaced by cutisplasty harvest from the thigh¹⁴. In 1979 Chevrel, Deitel and Vasic used Gibson technique with further reinforcement of the anterior rectus sheath by mersilene or marlex mesh overcoat sutured to the medial edges of the lateral rectus sheath flaps¹⁵⁻¹⁸, Chevrel and Rathin 1997 published details about Chevrel technique, after freeing the anterior rectus sheath off the subcutaneous tissue two incisions parallel to the midline on each side were performed the medial flap was dissected off the underlying rectus muscle the midline repair was done by suturing the resulting flaps to each other, the bare area of rectus muscle was covered by non-absorbable mesh fixed to the remaining part of the anterior rectus sheath 3 cm lateral to its medial edges, sometimes he used fibrin glue for mesh fixation with good results, the drawbacks of this technique is the further lateral dissection that may embarrass the blood supply of the skin flaps^{16,19}. In regards to the local wound complications of mesh

hernioplasty especially the skin flap ischemia, we developed a way to minimize the need for massive subcutaneous dissection following the principles of tension free hernia repair and strong reinforcement of the midline sutures, the double mesh modification of Chevrel's technique addresses these points as the reflected anterior rectus sheath flaps helps reformation of linea alba without any tension, the posterior layer of the mesh prosthesis inserted behind recti abdominis muscles in the newly developed common posterior rectus sheath further reinforce the repair, in our modification the dissection of the skin and subcutaneous tissue is minimal as the anterior mesh was tailored to be fixed to the edges of the lateral rectus sheath flaps thus minimizing the ischemic complications of the skin, further the use of non-absorbable mesh holding the anterior rectus sheath flaps of both sides to each other prevents future divarication of recti muscles.

In this study we recorded non-significant differences between both groups regarding the preoperative data, defect size, operative time and hospital stay, the drainage time is statistically longer in the onlay group, the presence of the anterior mesh between both anterior rectus sheath flaps allow drainage of any fluids to the retrorectus space where the dense preperitoneal lymphatics may help fluid absorption, seroma, hematoma, wound dehiscence, SSI shows non-significant differences between the study groups, the rate of these surgical site occurrences is comparable to other studies^{1,3,5,14,16,19,20} in our study we reported zero recurrence rate in both groups, chronic pain and corsage feeling are significantly better in the modified Chevrel group, chronic pain in the onlay group may be explained by the massive subcutaneous dissection and insertion of a large sized prosthesis, also corsage feeling may be explained by the same principle, the smaller size of mesh used in our modification allow the abdominal wall to be more flail than in the onlay larger mesh allowing the abdominal wall to move freely, we recorded zero rate of skin flap necrosis in our modification group, Mummerts et al and Mladenovikj et al reported a higher skin flap necrosis with the original Chevrel's technique,^{3,21} as we explained before the minimized dissection help protection of the supplying perforators to the skin flaps. In the onlay group we reported flap necrosis in five cases which is comparable to Devries et al and Warren et al^{22,23}

The conclusions derived from this study may be limited by small number of cases.

CONCLUSION

Double mesh modification of Chevrel technique is effective as onlay mesh hernioplasty in large midline incisional hernia with lower complications rate.

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