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Ramachandra's technique of giant incisional hernia repair-a novel method

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Abstract: Giant incisional hernia is an uncommon, but significant, complication following laparotomy. Anatomical correction of giant incisional hernia remains a surgical challenge due to various wound complications inherent with different techniques instituted. Inspite of the risk factors and controversies, it is impetuous that we advocate a standard surgical procedure for giant incisional hernias. The anatomical separation of components has been proposed as the best treatmentfor large abdominal wall defects. Successful correction with the use of large prostheses is associated with high rates of wound complications, dehiscence and recurrence. This is mainly because the abdominal wall does not resume its elasticity and compliance completely. Moreover, the components separation method alone seems insufficient for huge defects, in which it is impossible to re-approximate the rectus muscles without tension. For these cases, we illustrate a novel operation using a modified component separation technique. Here is our institutional experience in a 60-year old lady who presented with a giant obstructed incisional hernia.
Keywords: Giant abdominal hernia, herniorrhaphy/darning, hernioplasty/instrumentation, fascial duplication.

INTRODUCTION

Incisional hernia is defined as "any abdominal wall gap with or without bulge in the area of a postoperative scar perceptible or palpable by clinical examination or imaging". With more than 11% of all laparotomies developing incisional hernias, ventral hernia corrective surgery remains one of the most often performed interventions in the surgical setup [1]. The incidence of incisional hernia following laparotomy is much higher than adhesive bowel obstruction and is reported to be the most common indication for a re-operation.Several factors propound occurrence of incisional hernia including advanced age, obesity, malnutrition, multiple laparotomies, type of incision and placement, previous wound healing (primary or secondary intention), technique of closure and suture material used, placement of prosthetic mesh, postoperative surgical site infection along with presence of comorbid illness such as chronic obstructive pulmonary disease, diabetes and cardiac disease. These factors increase the risk of incisional hernias, chances of failure of surgery and recurrence following corrective procedure. Incisional hernia can be classified based on their localization, size, recurrence, reducibility and symptoms.

Chevrel and Rath

Proposed three criteria to classify abdominal incisional hernias based on location, size of the defect and length of the hernial sac. Hernia with a width of less than 5cm is considered small, between 5 and 10cm wide, 10 to 15 cm is very large and above this value is considered as giant hernias[1].

All incisional hernias need to be operated as 6%-15% of them undergo strangulation or obstruction [2]. As per the classification, our patient had a giant re-recurrent, irreducible, obstructed incisional hernia.

We describe here, a novel technique, used to treat such a case.

CASE REPORT

A 60-year old lady presented to the triage with sudden onset abdominal pain and multiple episodes of bilious vomiting since one day. She had a gradually progressive, irreducible anterior abdominal swelling of twelve years duration. She had undergone a hysterectomy fifteen years back for symptomatic fibroids. She had multiple surgeries for incisional hernia, one dating 12 years back and one done 2 years back. She was a diagnosed case of paranoid schizophrenia and chronic obstructive pulmonary disease on medication. There was a history of erratic behavior in the form of trichobezoar and phytobezoar and she had had recurrent bouts of constipation in the past. On clinical examination, she had tachycardia with tachypnea and respiratory distress as evidenced by arterial blood gas analysis showing SPO2 of 86 percent on 60 percent venturi.

Abdominal examination revealed a healed Pfannenstiel incision measuring 10 cm placed transversely across the lower abdomen. She had a 40 x 50cm abdominal swelling involving all quadrants, falling to the left side of the abdomen, tense and irreducible, nontender with no cough impulse (Fig-1). Per rectal examination was empty with no bowel sounds on auscultation. We arrived at a clinical diagnosis of obstructed irreducible incisional hernia. An ultrasound abdomen showed multiple fluid filled bowel loops showing normal color uptake and peristalsis within the hernial sac with no evidence of strangulation. She was taken up for emergency exploratory laparotomy and incisional hernia repair.

OPERATIVE PROCEDURE

She underwent a standard laparotomy via a midline incision. The hernial sac was behaving as a second abdomen, contents of which included omentum with distal stomach, duodenum, entire small intestine and large intestine except for a small part of the descending colon and rectum. There was malrotation of the gut with superior mesenteric artery and vein (SMA and SMV) running behind third part of the duodenum (D3), with a mobile caecum and ascending colon.

A single staged multistep procedure was planned. The contents of the hernia sac were reduced and identified. The entire course of the gastrointestinal tract from gastro-oesophageal junction till the rectum was traced and the following things of interest were noted (Fig-2).

- Extensive lengthening and thickening of the mesentery in view of long standing hernia
- Malrotation of the gut with the superior mesenteric vessels traversing behind D3
- Free floating caecum and ascending colon
- Hernial sac contents included: distal end of stomach, duodenum, jejunum, ileum, caecum, ascending colon, transverse colon, proximal part of the descending colon.
- The peritoneum was thinned out with stretched out skin of the abdominal wall overlying the hernia.

Lords dilatation was done and the entire bowel was milked and two litres of feculent material was drained out. Omentectomy was done and the remaining collapsed bowel loops and hernial contents were returned to the abdominal cavity and the salvaged peritoneum was used to cover these re-introduced structures. A prolene mesh was placed (preperiotneal mesh) and fixed to the lateral abdominal wall and superiorly to the costal margin and inferiorly to the pubic symphysis and coopers ligament using absorbable tackers. Another prolene mesh was placed over this and secured to the lateral edge of the divergent recti on both sides with interrupted prolene sutures. An additional darning was done between the recti with number 1 prolene suture. Two suction drains were placed over this and subcutaneous layer approximated with 2.0 vicryl sutures. Redundant skin was excised and skin closure was done with closely placed mattress sutures with 2.0 Ethylon (Fig-3). The closure was tension free and patient was extubated after intraop ABG showed good ventilation and patient showed good respiratory effort. She was shifted on 60% venturi to post op ICU for monitoring.

Postoperative period

In view of pre-existing COPD, patient had recurrent attacks of bronchospasm and tachypnea, which were managed with bronchodilators and oxygen supplementation. She persisted to have tachypnea and tachycardia for the first 5 postoperative days (PODs) but showed no signs of abdominal compartment syndrome. Bowel sounds were heard on POD 4 and she was started on clear fluids. Repeat portable chest x-ray was done to rule out atelectasis and by POD5 she was slowly weaned of oxygen support. Abdominal distension persisted for two weeks postoperatively and gradually settled by POD 21. She was mobilized and started on normal diet gradually and after suture removal on POD 24 she was discharged with advice to use an abdominal binder. On follow up after 6 weeks, she was asymptomatic and showed no signs of recurrence of hernia with adequate wound healing.

DISCUSSION

Late into the early 20th century, fascia-duplication and fascia-adaptation were considered the gold standard in surgical treatment of incisional hernia. Mayo's duplication procedure was the mainstay treatment modality and strengthening the anterior abdominal wall with prosthetic mesh was done only in giant incisional hernias. However the unacceptably high recurrence rates, 25% to 55%, after simple reconstruction mandated the search for newer techniques and the imbibition of prosthetic mesh into the repair of incisional hernias began[1]. According to experts' recommendation, the fascia duplication should only be used for small incisional hernias. This further propagated the prefascial prosthetic implantation technique for incisional hernia, Chevrel's technique [1,2]. This onlay technique (Chevrel-technique) of surgical treatment of incisional hernia proposed the placement of a pre-fascial prosthetic mesh. It also recommended a fixed distance of 5 cm from the suture line in all directions. If recurrence was the disadvantage of the simple closure technique, the onlay method had the main disadvantage that the mesh was in direct contact with the environment during wound revision, which can cause wound healing complications. Recurrence rates of the onlay technique, from various studies, varied between 2.5 percent and 13.3 percent. These were most often due to inadequate size of the mesh or displacement of the mesh. Most of the recurrences were "sub-prosthetic hernia" due to

persistence of fascia rupture and laxity of the anterior abdominal wall. The alternative to the onlay technique was the subfascial or preperitoneal implantation of prosthetic material (sublay technique) [1, 4]. The disadvantages with the sublay technique were the long learning curve and need for an experienced surgeon for doing the procedure. Then came about the autodermal hernioplasty technique, which used locally acquired skin flap and postoperative scar after treatment with boiling normal saline for 5 seconds followed by rinsed the flap in normal saline after treating it with 96% ethanol. According to recent literature, the recurrence rates of the autodermal hernioplasty and onlay and sublay were comparable [1]. Our technique (Ramachandra's technique) employed the sublay and modified inlay technique for closure of the incisional hernia. The main advantage of our technique was that the prosthetic mesh was not in direct contact with the environment (as in onlay technique) and it also used principle of the onlay technique in the form of a second prosthetic mesh secured to the edge of the rectus abdominus on either sides. Subcutaneous drains were placed in both flanks, avoiding direct contact with the mesh. Our novel method incorporated the advantages of the techniques described earlier and was less complicated than the later described autodermal hernioplasty.

Table-1: Comparing described procedures in literature and our technique.

	Complications	Recurrence rates	Hernia types
Simple reconstruction	Very high recurrence rates "Gold standard"	25%-55%	Use in small incisional hernias
Onlay technique	Direct contact of the prosthesis with the environment during wound revision	2.5%-13.3%	
Sublay technique	Long learning curve Experienced surgeon	5.0%-15% (as per data from several other studies) NO RANDOMIZED STUDY available	Oblique hernias because the aponeurosis of the obliqus externus muscle can be easily removed from the muscular tissue
Autodermal hernioplasty	Induces low quality scar tissue Impossible to acquire a sufficient amount of cutis with high plastic qualities "Biological procedure" Long learning curve Experienced staff surgeon Harvested cutis placed as ONLAY/SUBLAY/INLAY	3.2%-7.6% (as per data from several studies) May lead to high recurrence rates	
Our technique	Less chance of overlying skin necrosis and wound dehiscence secondary to tension on closure of the rectus	No recurrence (2 year followup)	Giant incisional hernias

Various randomized trials have proposed the causes for late appearance of incisional hernias. These include advanced age, increased weight, deterioration of the patients' physical status, breach in the approximated recti, which usually starts in the first week post surgery [1, 4]. They concluded that adequate care in both anatomical closure and mesh placement with adequate tension free approximation of fascial planes was required for prophylaxis of wound dehiscence and recurrence. Furthermore, large hernias are associated with thinned out myo-aponeurotic tissue and muscular atrophy which is unable to maintain the homeostasis in case of sudden increase in intra-abdominal pressure thus leading to the anatomical and physiological changes which leads to respiratory compromise and a synergistic change in the abdominal wall and thus the development of an incisional hernia [1,2]. However, in patients with low respiratory reserve, all preoperative care must be taken to prevent postoperative atelectasis and respiratory failure.

Large incisional hernias tend to progressively increase the traction of the lateral rectus muscles, caused by the antagonist action of the lateral muscles of the abdomen, with the consequent enlargement of the hernia fibrotic ring, small resistance offered by the hernia sac and the herniated contents by their own weight [3]. In large hernias the amount of viscerae, which progressively stretch and hold the hernia sac is such that it can form a "second abdomen". This "LOSS OF DOMAIN" implies that a proportion of the abdominal contents reside permanently in the second abdominal cavity, outside their natural compartment and returning these contents will require significant physiological adaptation, mainly respiratory, especially if the hernia contents volume exceeds 15%-20% of this compartment [1, 3, 4].

The herniated viscera are adapted to local and extra-abdominal environment and the mesentery extends and becomes thickened by the difficulty of venous and lymphatic return. The growth of loops and its mesentery and retraction of the abdominal cavity cause the intestines to lose of their "right to housing" hindering the re-introduction into the cavity - in particular when trying to reconstruct the normal anatomy of the abdomen, intra-operatively, by approximation of the rectus muscles in the midline. The progressive expansion of the hernia sac causes the skin covering of the hernia to be thin, scarce and badly vascularized, therefore, frequent areas of necrosis, trophic ulcers and possible intestinal fistulae [1].

Our technique also addressed the risk of "abdominal compartment syndrome" which usually occurs secondary to returning the hernial contents into the abdominal coelom. With the use of the second prosthetic mesh and non-approximation of the recti we had provided adequate space for the return of these contents into the abdominal cavity thus providing the "right to housing" and also reducing the risk for atelectasis and respiratory distress. This patient was a known case of COPD with an increased risk of atelectasis and respiratory failure secondary to corrective surgery (Chevrel's technique), however our novel technique was able to overcome these grave complications and provide the patient with an uncomplicated postoperative period. She did not require postoperative ventilation and this reduced the risk of ventilator-associated pneumonia (VAP) and other morbidities, which are usually associated with these patients.

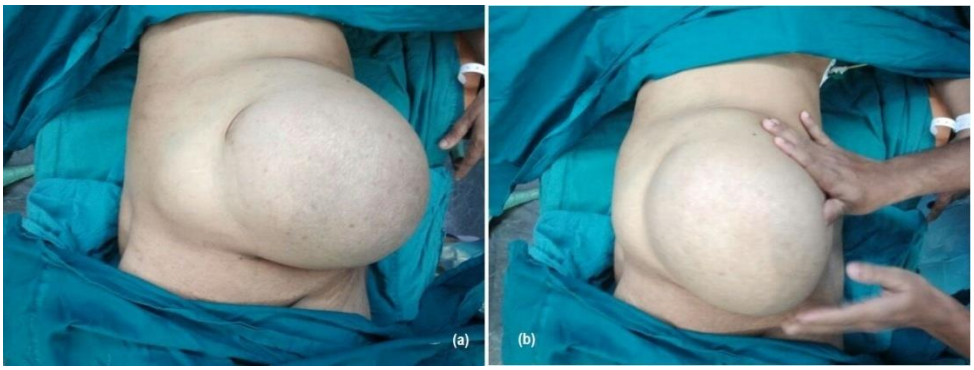

Fig-1: Pre-operative image showing the giant incisional hernia (a) end on view and (b) propped up hernia sac

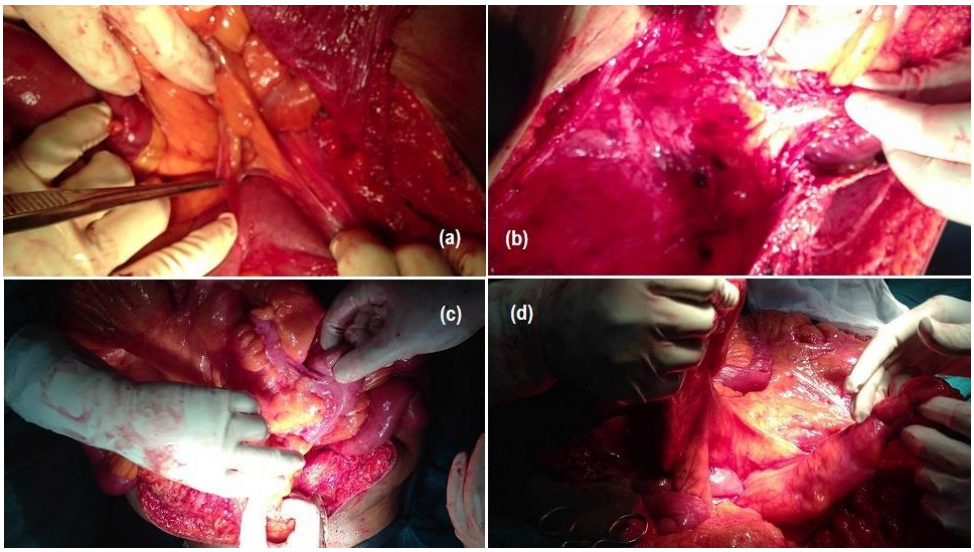

Fig-2: Intraoperative images showing, a)D3 segment in front of superior mesenteric vessel, b)Large hernia sac after reducing contents, c)Mobile caecum and ascending colon, d)Elongated, thickened mesentery

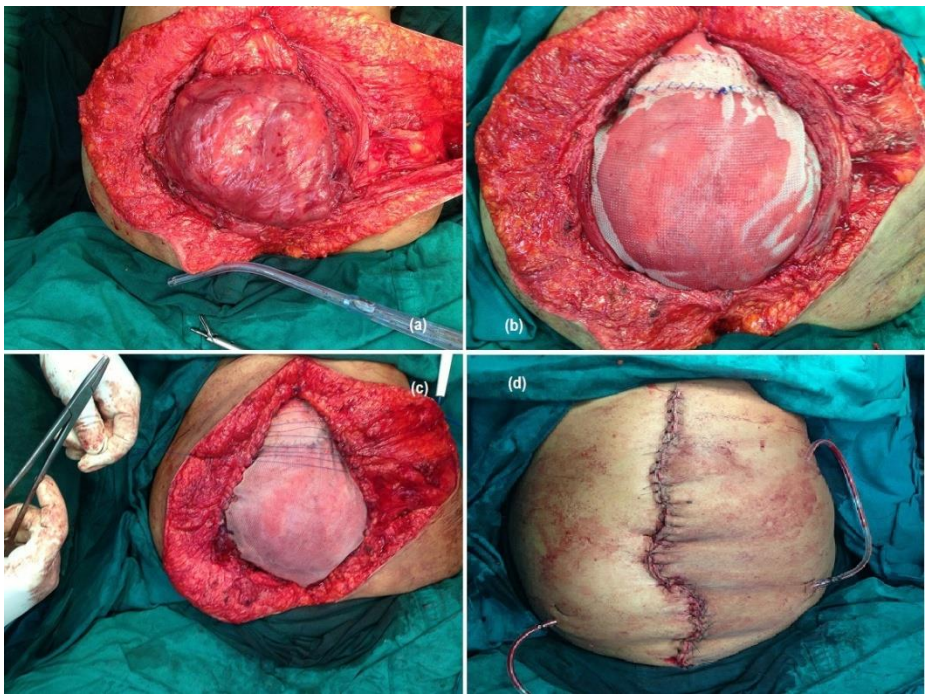

Fig-3: Intraoperative images showing (corrective surgery), a)Hernial contents reintroduced into the abdominal cavity with peritoneal cover, b)Sublay mesh placement securing it laterally with non-absorbable sutures to the lateral abdominal wall, c)Inlay placement of prosthetic mesh and securing with non-absorbable sutures and darning of the bilateral recti, d)Abdomen after skin closure with 2.0 Ethylon.

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