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Acute Surgical Repair of Large Incisional Hernia with Significant Loss of Domain: Case Report and Review of Literature

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Abstract

Introduction: Incisional abdominal hernias develop up to 11.5 % of laparotomy incisions. The most difficult to repair are hernias with significant loss of domain. The basic principle of treating abdominal incisional hernia entails restoring the anatomical and physiological integrity of the wall. Ideally, thisinvolves the use of local musculo-aponeurotic tissue with a good blood supply and innervations. In the case of large defects, it is necessary to use alloplastic materials in order to reduce the tension load on the suture itself. Emergency surgery is indicated especially in the case of intestinal obstruction or strangulation.

Presentation of Case: The present report describes the case of emergency surgical treatment of intestinal obstruction in large abdominal incisional hernia by 77-year old man. We used reposition and onlay technique with with biodegradable mesh to repair the abdominal wall.

Discussion: Emergency surgery for bowel obstruction primarily aims to resolve bowel obstruction and restore intestinal viability. In this case we present that techniques without bowel resection or stoma are safer as the other. Large hernias with loss of domain can be repaired only by an open method and the onlay method is the simplest and most versatile technique in this case.

Conlusions: Emergency surgery in incisional hearnias is a challenging surgical problem due to risk of the preoperative and postoperative complications. Team involving general and plastic surgeons and anaesthetist is required.

Keywords: Hernia; Laparotomy incisions; Surgical repair

Introduction

Incisional hernias represent a relatively frequent iatrogenic complication of abdominal surgery, with an incidence between 3.8 to 11.5% [1]. The underlying causes vary. Risk factors mainly include older age, obesity, bowel surgery, wound infection, immunosuppression, smoking and chronic obstructive pulmonary disease. Treatment of large incisional hernias is associated with a number of risks and complications. These primarily include acute respiratory failure, acute renal failure associated with an abdominal compartment syndrome, disorders of intestinal motility and circulation. Late complications may include recurrence of hernia- in up to 30-50% of cases involving defects larger than 6 cm [2,3]. Incisional hernias with significant loss of domain are hernias where >15-20% of the abdominal contents reside permanently outside their natural compartment, and returning these contents will require significant physiological adaptation (mainly respiratory) [4]. Emergency surgery is indicated especially in the case of ileus and intestinal obstruction or if signs of intestinal ischaemia within the hernial sac appear. The basic principle of treating abdominal incisional hernia entails restoring the anatomical and physiological integrity of the wall. Ideally, this involves the use of local musculo-aponeurotic tissue with a good blood supply and innervations [5]. In the case of large defects, it is necessary to use alloplastic materials in order to reduce the tension load on the suture itself. Such materials include classical inorganic materials [6], which are however associated with a higher risk of complications such as infection and intestinal fistula [7]. Thus, biodegradable materials containing porcine small intestinal submucosa (SIS) are more advantageous. These materials promote healing, scar remodelling, angiogenesis at the site of the scar and represent an effective barrier against bacterial invasion [8].

Presentation of Case

A 77 year old man was admitted to our institution suffering from abdominal pain, nausea, repeated vomiting of stagnant gastric content and elevation of inflammatory parameters. The underlying cause was bowel obstruction within a gigantic irreducible hernia. The patient had undergone cholecystectomy via a classical midline laparotomy 17 years previously with subsequent incisional hernia repair 5 years later. No further surgery was indicated given the patient´s comorbidities- CAD, COPD, hypertension and diabetes. A conservative approach consisting of a hernia truss was recommended. The patient´s risk factors for developing an incisional hernia included: obesity (height 170 cm, weight 117kg, BMI 40), COPD, diabetes, increased tension of the abdominal wall in a former professional trumpet player. The CT scan (Figures 1a,1b) revealed bowel obstruction in an otherwise well-vascularised small intestine loop and the right large intestine, which were pulled into the hernial sac. The X-ray series (Figures 2a,2b) described dilation of the small intestine loops and the contrast dye failed to progress at the level of the ileum. Acute surgical intervention for progressive ileus was indicated and commenced following necessary preparations including the insertion of a nasogastric tube and correction of the present mineral imbalance.

A central venous catheter and a Foley catheter were inserted once the patient was under general anaesthesia. Amoxicillin/clavulanic acid

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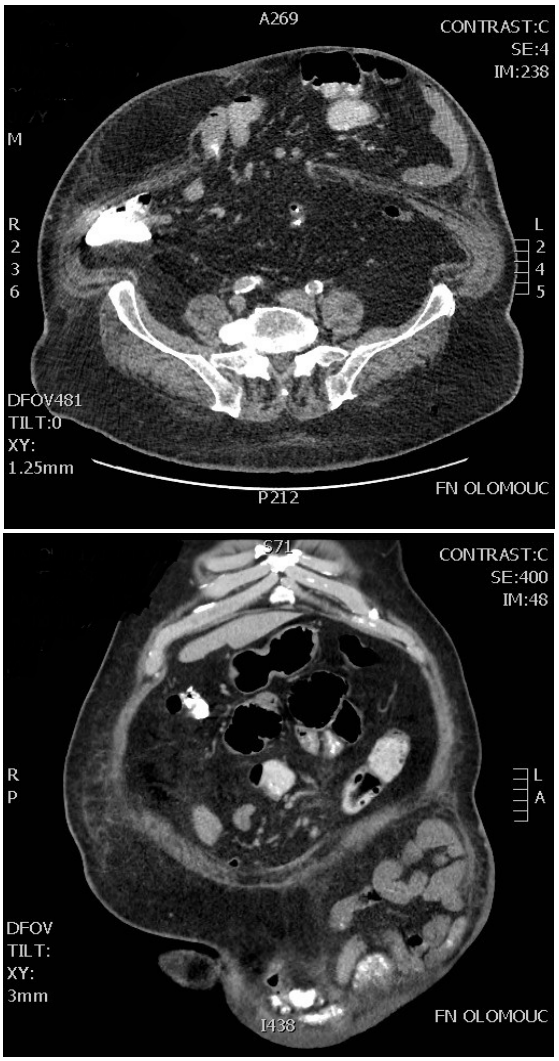

Figure 1 (a,b): CT scan of large incisional hernia.

was administered prophylactically. Then was the skin prepared and disinfected using a solution containing povidone-iodine. The incision was made through the initial site of the midline laparotomy dislocated to the right. The bulky hernial sac was identified and separated from the skin and subcutaneous structures. The hernial sac contained loops of the jejunum and ileum, the caecum, ascending colon and hypertrophied omentum. The intestinal loops were viable and only slightly distended. The hernia defect with a diameter of 20 cm was viable and firm musculo-aponeurotic structures were exposed. The omentum was resected and subsequently the loop of the small intestine and the colon were repositioned back into the abdominal cavity. Also the hernial sac was partially resected as well and its remains were used to cover the defect using interrupted absorbable sutures. The abdominal wall was closed using interrupted non-absorbable sutures and an onlay SIS mesh was placed on this suture. This was fixed using two continuous non-absorbable sutures. Further interrupted sutures were placed and fixed at the positions of 1,3,5,7,9,11 o'clock. Two Redon drains were placed subcutaneously between the onlay and the skin. The skin was closed using interrupted sutures and was not reduced. It was not possible to extubate the patient immediately after surgery as he developed acute respiratory distress. Thus, the patient was extubated at the ICU 6 hours after surgery, when his spontaneous ventilation was sufficient. Subsequently, we closely monitored his ventilation parameters, the onset of bowel movement and possible signs of intestinal ischaemia. The following parameters were also monitored. (Table I)

Ventilation parameters were tested before surgery and then on the 6th day after surgery and no fundamental changes were recorded (Table II). The drains were removed on the 5th day after surgery, once minimal secretion had been noted.

Bowel movement resumed on the third day after surgery. Hospitalisation was complicated by worsening of cardiac functions with right-sided heart failure that necessitated a change in the patient´s medication, which led to improvement of the patient´s condition. The patient was discharged on the twelfth day. No further complications occurred. Six-months and one year after surgery, the patient is symptom-free, the abdominal wall is firm and there are no signs of hernia recurrence.

Discussion

The systemic review of the literature targeting to the treatment and complications of incisional hernias with significant loss of domain and postoperative complication after this surgical techniques in Cochrane database and PubMed was created. Incisional hernias represent one of the most frequent iatrogenic complications of abdominal surgery. Several risk factors promote the development of these hernias. The ideal means of repairing abdominal incisional hernias involves midline reconstruction using native musculo-aponeurotic tissues [9]. Treatment of complex abdominal incisional hernias should be conversant with the different methods of placement of prosthetic materials and be able to deploy the techniques of abdominal components separation,

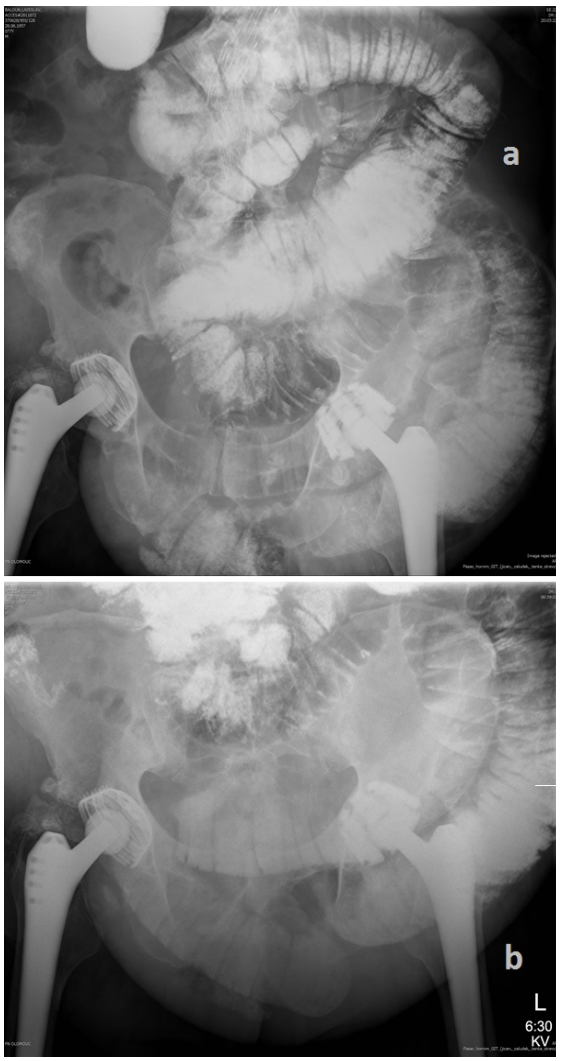

Figure 2 (a,b): X-ray series.

Table I: Extract of laboratory values.

Parameters	Norm		Postoperative day				
			0	1	2	3	6
Hemoglobin	135-175	g/L	120	117	114	108	111
Leukocytes	4.0-10.0	10^9/L	12.5	11.6	13.4	11.69	10.45
pH	7.35-7.45		7.33	7.42	7.4	7.43	7.41
Lactate	0.5-3.4	mmol/L	5.1	3.5	1.1	1.5	1.6
Potassium	3.5-5.1	mmol/L	3.37	4.23	4.01	4.2	3.9
Urea	2.8-8.1	mmol/L	12.3	7.2	11.6	14.2	10.3
Creatinine	64-104	µmol/L	137	110	143	171	117
IAP	0-20	mm Hg	21	23	12	12	10
CRP	0-5	mg/L	220	180	167	117	89

Table II: Respiratory parameters.

Parameters	VC max	FEV1	MEF25	TLC	RV	Raw
Normative	3.56	2.59	1.1	6.5	2.69	0.3
Preoperative	3.15	2.16	0.45	6.02	3.08	0.48
Postoperative	3.33	2.44	0.55	6.1	3.03	0.44

tissue expansion, local and distant muscle flaps, free tissue transfer and vacuum-assisted closure [10]. If such natural structures cannot be used for reconstruction, prosthetic materials such as onlays or inlays are used to reduce tension [2,4,6]. However, the use of these inorganic materials is associated with the risk of infection, extrusion, protrusion and intestinal fistula [7]. New biodegradable materials containing SIS allow midline reconstruction with minimal or no tension, especially given that they act as a mechanical binder that protects the sutured midline when intra-abdominal pressure increases [11,12]. These materials also stimulate the re-growth of the fascia and collagen growth and production, thus accelerating wound healing. They also reduce the risk of foreign material associated infection [7]. Incisional hernias with a hernia defect less than 6 cm in diameter are ideal candidates for reconstruction with minimum risk of recurrence. These small hernias can be repaired successfully by a laparoscopic approach [1]. Larger hernias are associated with a higher risk of recurrence, which is described in up to 50% of cases. By using alloplastic materials, the incidence of recurrence decreases to 10% and less [2,3]. Large hernias with loss of domain can be repaired only by an open method and the onlay method is the simplest and most versatile technique in this case [1].

Large incisional hernias with significant loss of domain represent a significant problem [4]. These hernias are usually encountered in patients in whom planned surgery had been contraindicated mainly because of patient comorbidities and anaesthesiological or surgical risk at the time or in patients who had been avoiding medical care. The most serious complication of these hernias is intestinal obstruction or strangulation. Resolution of acute conditions associated with gigantic hernias represents one of the most complicated cases in emergency surgery. Apart from the objective findings, diagnosis is based on a CT examination that determines the extent of herniation, the contents of the hernial sac and the perfusion of the intestinal wall. Laboratory parameters that we monitor include the leukocytes, CRP, lactate and pH, whereby pathological values usually indicate a disorder of intestinal perfusion. Monitoring of intraabdominal pressure as an indicator of intra-abdominal hypertension and the abdominal compartment syndrome in postoperative care is very necessary [13]. Abdominal compartment syndrome refers to organ dysfunction caused by intraabdominal hypertension. Intraabdominal pressure (IAP) is the steady state pressure concealed within the abdominal cavity [14]. For most critically ill patients, an IAP of 5 to 7 mmHg is considered normal. In a prospective cohort study of 77 supine hospitalized patients, the IAP averaged 6.5 mmHg and was directly related to body mass index [12]. Intraabdominal hypertension (IAH) is defined as a sustained intraabdominal pressure ≥12 mmHg [14]. Intraabdominal pressure can be further graded as follows: Grade I = IAP 12 to 15 mmHg; Grade II = IAP 16 to 20 mmHg; Grade III = IAP 21 to 25 mmHg; Grade IV = IAP >25 mmHg [15]. Abdominal compartment syndrome (ACS) is defined as a sustained intraabdominal pressure >20 mmHg (with or without APP <60 mmHg) that is associated with new organ dysfunction. IAH can impair the function of nearly every organ system (cardiovascular — IAH decreases cardiac output by impairing cardiac function and reducing venous return, pulmonary — mechanically ventilated patients with IAH have increased peak inspiratory and mean airway pressures, which can cause alveolar barotrauma, they also have reduced chest wall compliance and spontaneous tidal volumes, which combine to cause arterial hypoxemia and hypercarbia, and gastrointestinal with reduced mesenteric blood flow and intestinal mucosal perfusion). The goals of supportive care in patients with intraabdominal hypertension include reduction of intraabdominal volume through evacuation of intraluminal contents, evacuation of intraabdominal space-occupying lesions (eg, ascites, hematoma) when possible, and measures to improve abdominal wall compliance with ventilatory and hemodynamic support. Surgical decompression is indicated for all patients whose intraabdominal pressure is greater than 25 mmHg [16]. Most surgeons perform decompression and then maintain an open abdomen using temporary abdominal wall closure. Several techniques for temporary abdominal closure are available, including patch closure, negative pressure systems (towel and sponge-based), and silo closure. Each of these techniques has advantages and disadvantages with respect to their ability to control fluid loss, frequency of dressing changes, minimizing loss of domain, ease of use, and cost. The patch or silo technique can be used alone or in combination with a negative pressure system. Skin-only closures are an option but are rarely used in contemporary practice [17].

We present here the case report of a man with a gigantic incisional hernia and signs of small bowel strangulation as an example of the extreme symptomatology of such a hernia in a patient with a number of comorbidities. Nonetheless, despite the monstrous size of the hernial sac, emergency surgery enabled the reposition of the organs back into the abdominal cavity as well as the repair of the abdominal wall with no negative consequences during the post-operative course [4].

In these types of emergency procedures, it is mandatory in the days following surgery to monitor the patient´s ventilation parameters as well as to prevent the development of the intra-abdominal compartment syndrome or the progression of bowel obstruction and development of intestinal ischemia.

Conclusions

Incisional abdominal hernias develop up to 11.5% of laparotomy incisions. The basic principle of treating abdominal incisional hernia entails restoring the anatomical and physiological integrity of the wall. Large hernias with loss of domain can be repaired only by an open method and the onlay method is the simplest and most versatile technique in this case. Emergency surgery is indicated in case of intestinal obstruction and strangulation and is acquired with increasing

risc of postoperative complications. Emergency surgery for bowel obstruction primarily aims to resolve bowel obstruction and restore intestinal viability. In this case we present that techniques without bowel resection or stoma are safer as the other. Emergency surgery in incisional hearnias is a challenging surgical problem and should be managed by a skilled team of general surgeons, plastic surgeons, anaesthetists and intensivists.

Key Learning Points

- Timing of indication for surgical repair in patients with large incisional hernia with significant loss of domain
- Prevention of development of IAH and ACS after hernia´s repair with using damage control techniques such as open abdomen closure
- Primary aims for emergency surgical repair of large incisional hernia with significant loss of domain are to resolve bowel obstruction and restore intestinal viability. Reconstruction of the abdominal wall is secondary goal.

Conflict of interests

Authors have no conflict of interests to declare

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