

Management of a Voluminous Incisional Hernia – Case Report and Brief Review

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ABSTRACT

Introduction: Massive ventral hernia repairs may lead to abdominal compartment syndrome, which is associated with increased morbidity and mortality, and is caused by an acute rise in intra-abdominal pressure, frequently leading to multi-organ failure and possibly death. This report presents a case with a voluminous incisional hernia associated with intestine obstruction and the issues surrounding emergency surgical treatment. **Case report:** An overweight 67-year-old patient with a medical history of diabetes and multiple cardiovascular pathologies presented to the emergency department complaining of abdominal distension, pain, nausea, vomiting, and lack of intestinal transit for 48 hours. A clinical diagnosis of bowel obstruction was established, caused by a large ventral hernia. During surgery, a tension free abdominal wall reconstruction was performed with a peritoneal flap from the hernia sac and retromuscular Prolene synthetic mesh. A Redon-type drainage of the posterior rectus compartment and subcutis was applied for 48 hours. After the operation, the patient was transferred to the intensive care unit for monitoring. During the follow-up, continuous monitoring of arterial blood pressure, oxygen saturation, renal function, daily diuresis, lactic acid values, and intraabdominal pressure was performed. On the 9th postoperative day, the patient was released in good general health, stable from a cardiorespiratory point of view, with a clean, healing surgical wound. **Conclusion:** The repair of large ventral hernias is technically challenging. The management of giant incisional hernias is complex, requiring thoughtful preoperative evaluation with CT imaging and volumetry calculation, which can help establish the surgical strategy.

Keywords: voluminous ventral hernia, intraabdominal pressure monitoring, abdominal compartment syndrome

INTRODUCTION

Incisional hernias represent a common complication after laparotomy and a major medical burden. Despite advanced techniques for abdominal wall closure, the incidence of ventral hernia following laparotomy is still 15% to 20%. The natural evolution of these abdominal wall defects is progressive enlargement

over time, but they frequently have a tendency for complications such as strangulation or incarceration. Another common encounter is represented by voluminous incisional hernias, which may be challenging due to difficult wall closure and may lead to impaired postoperative evolution. One of the most dreaded complications that can occur after surgical repair of large ventral hernias is abdominal compartment syndrome, which is triggered by an acute elevation in intra-abdominal pressure (IAP), frequently leading to multi-organ failure and death.¹⁻³

CASE PRESENTATION

An overweight 67-year-old female patient with a medical history of diabetes and multiple cardiovascular associated pathologies, including hypertension, ischemic cardiac disease, and congestive heart failure, was admitted from the emergency department where she complained of painful abdominal distension associated with nausea and hyperemesis, and also lack of intestinal transit in the last 2 days. Upon physical examination, the patient showed a distended abdomen, absent intestinal murmur, dullness upon percussion, and a palpable large tumoral mass located in the umbilical and hypogastric regions, indicative of a ventral incisional hernia, with an associated ulcerative lesion on the skin (Figure 1).

After blood sampling for laboratory testing, a nasogastric tube was placed and an abdominal X-ray was performed, both presenting suggestive signs for bowel occlusion. Conservative treatment with antibiotics, analgesics,

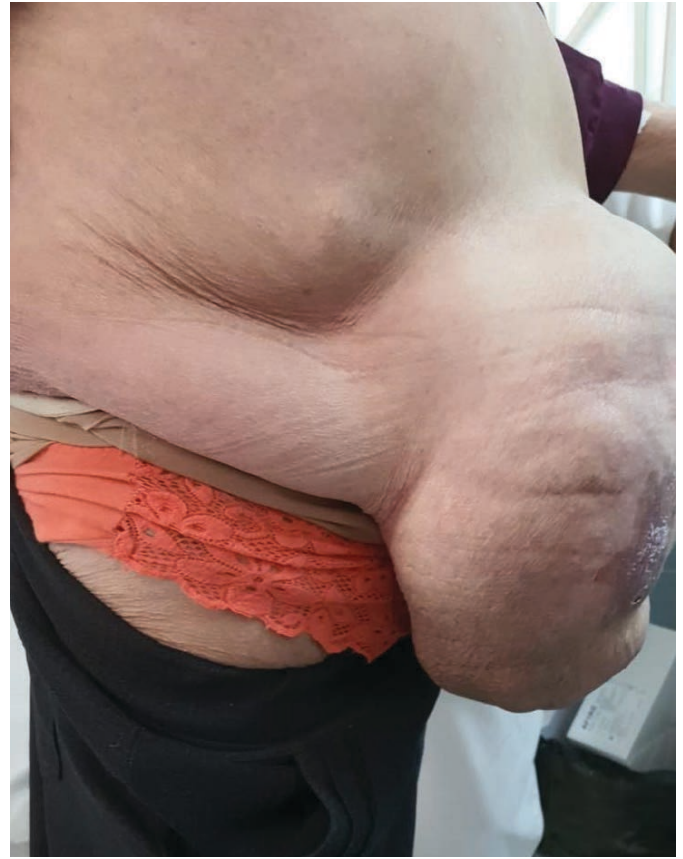


FIGURE 1. Voluminous ventral hernia

antispastics, and electrolytes was initiated. The patient presented a favorable response, and intestinal transit resumed after 12 hours. As an emergency surgical intervention was no longer necessary, careful preoperative investigations

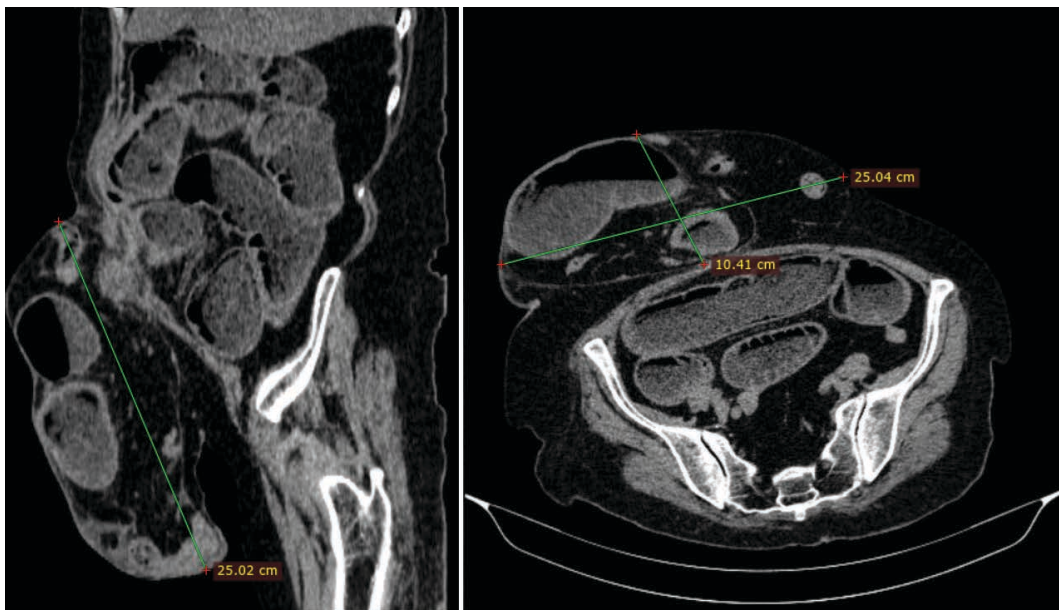


FIGURE 2. Abdominal CT scans with volumetric assessment of the hernia sac



FIGURE 3. Giant incisional hernia with skin ulcerations

and preparation were now possible. The patient was recommended a liquid-based diet, conservative medication was continued, and cardiac and pre-anesthesia evaluations were conducted in order to establish the operative risk. The preoperative computed tomography (CT) examination revealed a large abdominal wall defect measuring 9.50 cm, causing a voluminous ventral hernia (APD: 10.41 cm; LLD: 25.04 cm; SD: 25.02 cm) with omental, enteral, and large intestinal component in the hernia sac (Figure 2).

Based on the CT scans, abdominal volumetry was calculated, with a hernia sac volume (HSV) of 3,410.63 cm³, an abdominal cavity volume (ACV) of 11,377.06 cm³, and a total peritoneal cavity volume (TPCV) of 14,787.69 cm³. Based on the above-mentioned parameters, the following ratios were calculated: the HSV/ACV ratio, which was under 0.25, and the HSV/TPCV ratio, which was higher than 20%. From the two ratios, only the HSV/TPCV was

higher than 20%, therefore the decision of surgical treatment was taken.

The development of abdominal compartment syndrome was a possibility, but multiple surgical treatment strategies were planned and prepared in order to minimize its risk. Preoperative hypoalbuminemia and low total protein values were partially corrected. Forty-eight hours after hospital admission, the surgical intervention was carried out (Figure 3).

A midline incision was performed, and the hernia sac was prepared and opened. After careful dissection, the content of the hernia sac was explored: the right colon, partial transverse colon, small intestine, and greater omentum all presented to be viable, without signs of ischemia. In order to reduce IAP, the endured, edematous greater omentum was resected. A tension-free abdominal wall reconstruction was performed with a peritoneal flap from

TABLE 1. Most important postoperative parameters in the ICU

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Blood pressure (mmHg)	90/55	95/60	110/65	120/70	135/70	140/75	145/80
Heart rate (beat/minute)	82	78	82	73	68	70	73
Body temperature (°C)	35.4	35.2	35.6	36.2	36.3	35.8	36.4
O ₂ saturation (%)	93	94	94	95	97	98	98
Diuresis (24 hours)	600	900	900	1,200	1,100	2,000	1,700
Creatinine (μmol/L)	88.9	75.2	70.7	71.2	72.9	74.1	74.4
Urea (mmol/L)	25.6	16	11.08	10.04	9.6	8.2	7.4
Lactic acid (mmol/L)	0.7	0.62	0.54	0.51	0.44	0.47	0.42

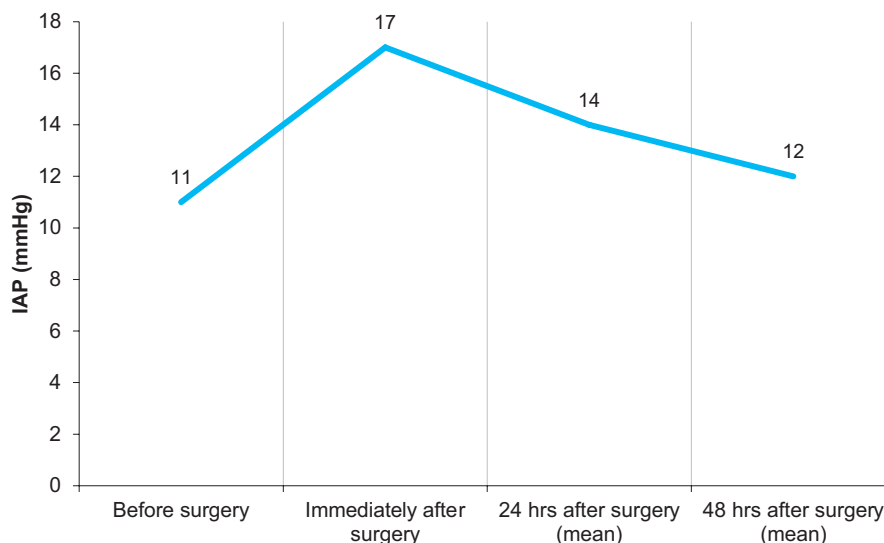


FIGURE 4. Daily IAP measurements

the hernia sac and a Prolene synthetic mesh placed in a retromuscular position. A Redon-type drainage of the posterior rectus compartment and subcutis was applied for 48 hours. Ulcerative lesions and excess skin were cut out while closing the skin.

After surgery, the patient was transferred to the intensive care unit (ICU) for monitoring of vital functions, where she received antibiotics, anticoagulants, analgesics, and antiemetic treatment. The monitoring process also included daily arterial blood gas (ABG) tests and

other laboratory tests, based on which hypoproteinemia, anemia, and decreased sodium and potassium values were corrected. During the postoperative follow-up, blood pressure, oxygen saturation, renal function, diuresis, and lactic acid values were also evaluated. In the first three days, the patient required vasoactive medication with continuous noradrenaline drip, with a mean arterial blood pressure of 98/60 mmHg. Oxygen saturation was continuously stable, and with O₂ supplementation via a facial mask, saturation values increased steadily. Renal function was minimally impaired, with increased urea levels in the first few days, but diuresis was present, with satisfying amounts (Table 1).

Intra-abdominal pressure was also monitored and correlated with the evaluated parameters and the patient's clinical status, in order to predict the development of abdominal compartment syndrome. The measurements were made indirectly, using a Foley catheter and an AbViser IAP Monitor, the day before surgery, immediately after surgery, and on the first and second postoperative day. Each measurement was repeated three times, and only the average value was considered valid (Figure 4).

A liquid-based diet was applied from postoperative day one, gradually increasing the consistency and type of alimentation. After surgery, the patient spent six days in the ICU, after which she was transferred back to the General Surgery Department for another two-day recovery. On the 9th postoperative day, the patient was released in good general health, stable from a cardiorespiratory point of view, and with a clean, healing surgical wound (Figure 5).



FIGURE 5. Postoperative results

DISCUSSIONS

Voluminous ventral hernia and abdominal compartment syndrome

According to the classification of the European Hernia Society, incisional hernias between 4–10 cm are classified as voluminous abdominal wall defects.⁴ The repair of these large parietal defects faces two major challenges: (1) the difficulty of surgical treatment; (2) the possibility of a substantial increase in intra-abdominal pressure with subsequent respiratory, vascular, and visceral complications that could lead to abdominal compartment syndrome.^{5,6} Lindmark *et al.* highlighted a strong correlation between the size of the parietal defect and the occurrence of postoperative complications, indicating that the size of the abdominal defect is of great importance in preoperative risk evaluation.⁷ Intraabdominal hypertension and abdominal compartment syndrome have been increasingly recognized as significant causes of morbidity and mortality. Increased IAP causes impairment of renal, pulmonary, and cardiovascular systems, leading to decreased urine output, hypoxemia, and decreased cardiac output, which ultimately lead to death.⁸

CT-based volumetry and intra-abdominal pressure monitorization

In case of large abdominal wall defects, a detailed preoperative assessment represents the cornerstone of success. Computed tomography of the abdominal wall represents an excellent tool for the evaluation of ventral hernias and allows volumetry calculation based on the CT scans. Preoperative CT measurements can also be used to predict immediate and long-term postoperative evolution.⁹ Sabbagh *et al.* underlined the importance of this preoperative imaging technique in establishing the correct surgical procedure.¹⁰ Tanaka *et al.* observed the presence of pneumoperitoneum by using CT imaging prior to surgery.¹¹

Another important parameter in detecting abdominal compartment syndrome is increased IAP, for which several direct and indirect methods are available. Transvesical IAP measurement has become the preferred method, due to its simplicity, efficacy, and absence of side effects.¹² Kirkpatrick *et al.* have also highlighted the importance of IAP monitorization in order to avoid postoperative complications.¹³

Surgical management

The repair of complex abdominal wall defects continues to be a challenging area in general surgery. The surgical inter-

vention becomes complex when the large size of the parietal defect could cause physiopathological modifications that may lead to abdominal compartment syndrome.¹⁴ An important way to prevent high IAP is the choice of surgical technique, with an appropriate selection of mesh type, dimension, and positioning.¹⁵ Currently, there is a wide palette of surgical procedures for abdominal wall reconstruction. However, most of these procedures are not feasible for voluminous incisional hernias, and there is still no consensus about the most appropriate surgical technique for this class of abdominal wall defect. Many surgeons prefer the sandwich technique, which uses the peritoneal flap and synthetic prosthesis for hernioplasty.^{16,17} This type of intervention has a relatively low recurrence rate, but a high rate of wound complications. Other studies emphasize the benefits of the component separation technique,¹⁸ which provides a reliable, autologous reconstructive modality for treating large abdominal wall defects. Additionally, mesh reinforcement can decrease the rate of recurrences without increasing the rate of major intraoperative or postoperative complications.¹⁹ On the other hand, Lasses Martínez *et al.* recommend the use of composite mesh substitution,²⁰ which is still debatable due to contact between the surgical prosthesis and the intestines.

CONCLUSIONS

The surgical repair of large ventral hernias is technically challenging for the surgeon and a major operation for the patient. Abdominal compartment syndrome presents a high mortality; therefore, the management of these voluminous incisional hernias is complex, and a careful evaluation and patient selection is needed to ensure a favorable risk-benefit ratio. A thoughtful preoperative evaluation with CT imaging and volumetry calculation can aid in establishing the surgical strategy. The measurement of urinary bladder pressure can also be useful in identifying patients with a higher risk of developing abdominal compartment syndrome.

CONFLICT OF INTEREST

Nothing to declare.

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