Pneumoperitoneum as management adjunctive treatment in an obese patient with loss of domain hernia. A case report

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Case Report

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Background

Obesity is an important risk factor for development of hernias on the anterior abdominal wall[1] Incisional Abdominal wall hernias have been appearing at 13% secondary to laparotomies.[2] However, some types of hernias require advanced and challenging pre or perioperative management, particularly in the case of giant hernias or a hernia associated with loss of domain.[3-4] Challenges for the specialized surgeons are multiple. They must assure a successful tension-free closure of the fascial defect. Also to prevent surgically abdominal compartment syndrome caused for induced quickly the visceras and finally avoid recurrence of the hernia .[5-6]

Early preoperative progressive pneumoperitoneum (PPP) is a technique that helps in big eventrations with loss of domain to reintroduce protruded organs. PPP is a technique that pursues the prevention of abdominal hypertension syndrome. PPP acts as a pneumatic tissue expander.[7] A muldisciplinary team can improve decision making and therefore reduce the risk of a long-term complication. We show a case where PPP was performed in no acute painful, reducible with high risk of incarceration, morbid obesity with high risk to infection and complications, showing the benefic of PPP in our patient.

Keywords: Incisional hernia; complex incisional hernia; Loss of domain hernia; Preoperative progressive pneumoperitoneum(PPP); Ventral hernia; morbid obesity; Goni Moreno.

Incisional hernias are among the most frequent complications of abdominal surgery. The management of complex hernia is difficult to repair that depends of location size of the hernial defect. The dimensions of the hernial sac or local processes added to the hernia represents an unusual condition that requires in most of the cases preoperative preparation or adjuvant technique of prehabilitation. Hernias with loss of dominance present significant muscles retraction [8]. When this condition becomes chronic, it is associated with significant volumetric growth, leading to abdominal hypertension and loss of domain, ensuring prompt surgical intervention.[9] Surgical repairment of chronic abdominal wall eventrations with loss of domain represents a challenge for the surgeon. Reintroducing the extruded contents into the abdominal cavity may cause catastrophic complications such as abdominal compartment syndrome, precipitating multi-organ failure, including acute respiratory failure.[10] There are several adjuvant methods like the use of tissue expanders, progressive preoperative pneumoperitoneum, infiltration of botulinic toxic or the combination of the above, mainly describes the management that was offered to our patient.[11]

Diagnostic evaluation

CT is the gold standar d and primary study. It is taken initially with and without contrast too. It shows dynamic images with measurements of maximum diameters of hernial defect, length of straight muscles and lateral complex (muscle oblique and transverse) , maximum diameter and volume of the abdominal cavity and hernial sac. There are indices described (Tanaka, Sabbagah,etc.).[12] It should be assessed if the patient is candidate for a component separation. If muscle denervation is suspected, electromyography should be requested.

Radiological definition of hernia with loss of address is a between hernial volume and the volume of the abdominal cavity more than 20% which causes a visceral traumatic reintroduction to the cavity.[13] Giant ventral incisional hernias: if the maximum hernia sac is 10 to 15 cm, or a large hernia sac volume (greater than 100-200cc) repair is a technical challenge with a 5% post-surgical mortality, morbidity (34-

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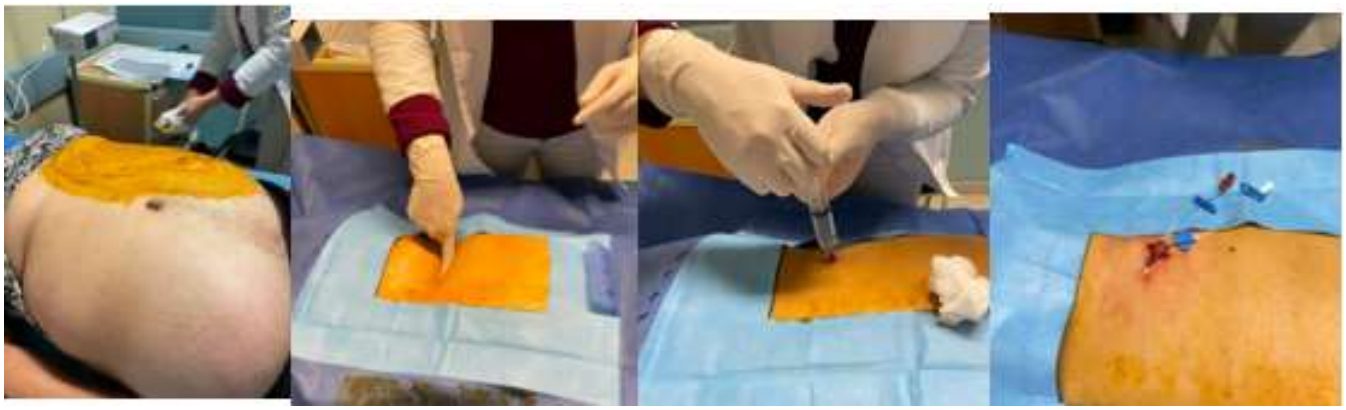

Figure 1. Placement of the Veress needle and catheter at the Palmer point (left subcostal: area with less risk of visceral perforation and area with fewer adhesions) using the Seldinger technique.

50%, recurrences in 50% Concept of "loss of right to domicile" or loss of domain (LOD) Ratio between hernial sac volume (HSV) and abdominal cavity (ACV) is 20-30% depending on the method used. It is associated with prolonged hospitalizations and recurrence.[14]

The most fearful complication is abdominal compartment syndrome caused by perfusion impairment and cardiopulmonary failure.[15] CT also provides an assessment of the diameter of the abdominal defect, the symmetry of the abdominal musculature and hernial angle >20 degrees, representing greater technical difficulty and recurrence.[16]

LOD >25% progressive pneumoperitoneum is recommended
HSV o ACV=0.50xaxbxc. ABC: Cavity abc: hernia sac volume.
A: longitudinal
B: transverse
C: anteroposterior.
Tanaka method HSV/ACV = 0.25 (25%) (LOD) and Sabbagh use 0.20 to described hernia with loss of domain. <20% support with botulinum toxin, >20% candidate for progressive preoperative pneumoperitoneum. [17]

Preoperative progressive pneumoperitoneum

Preoperative progressive pneumoperitoneum (PPP) is a strategy that has been proposed to prevent the development of potentially fatality complications. Goñi Moreno described it in 1940, and its primary function is to promote a volumetric expansion of the abdominal cavity, leading to a physiological reintroduction of the abdominal organs and less challenging and more tolerable surgical procedure. [18]
Main indication for hernias with loss of domain, it the procedure depends that most increases the volume of the abdominal cavity (35-40%) .[19] They aim to increase intra abdominal pressure by 35-40%, muscle elongation, lysis of intestinal adhesions. Improves the return of portal and lymphatic circulation, and reduces edematous visceral volume by up to 47% .[20] (Table 1).
The objectives of the adjuvant methods increased progressive distension of the abdominal wall to be able

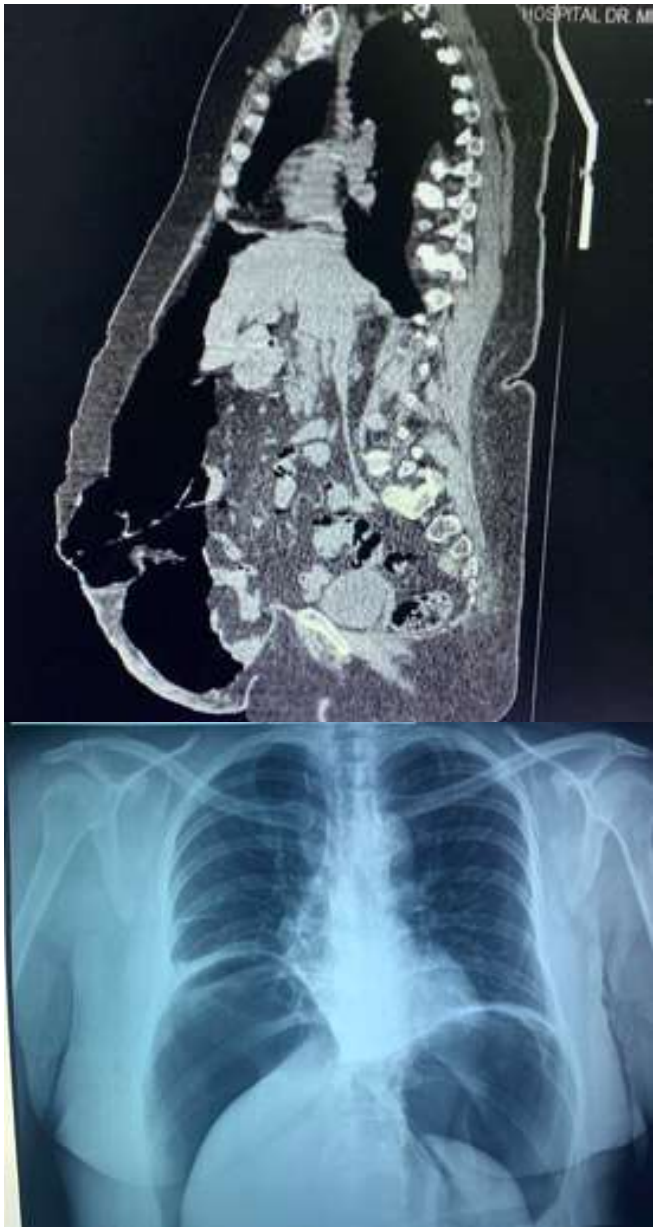

Figure 2. CT (upper) and X ray (lowe) after neumoperitoneum.

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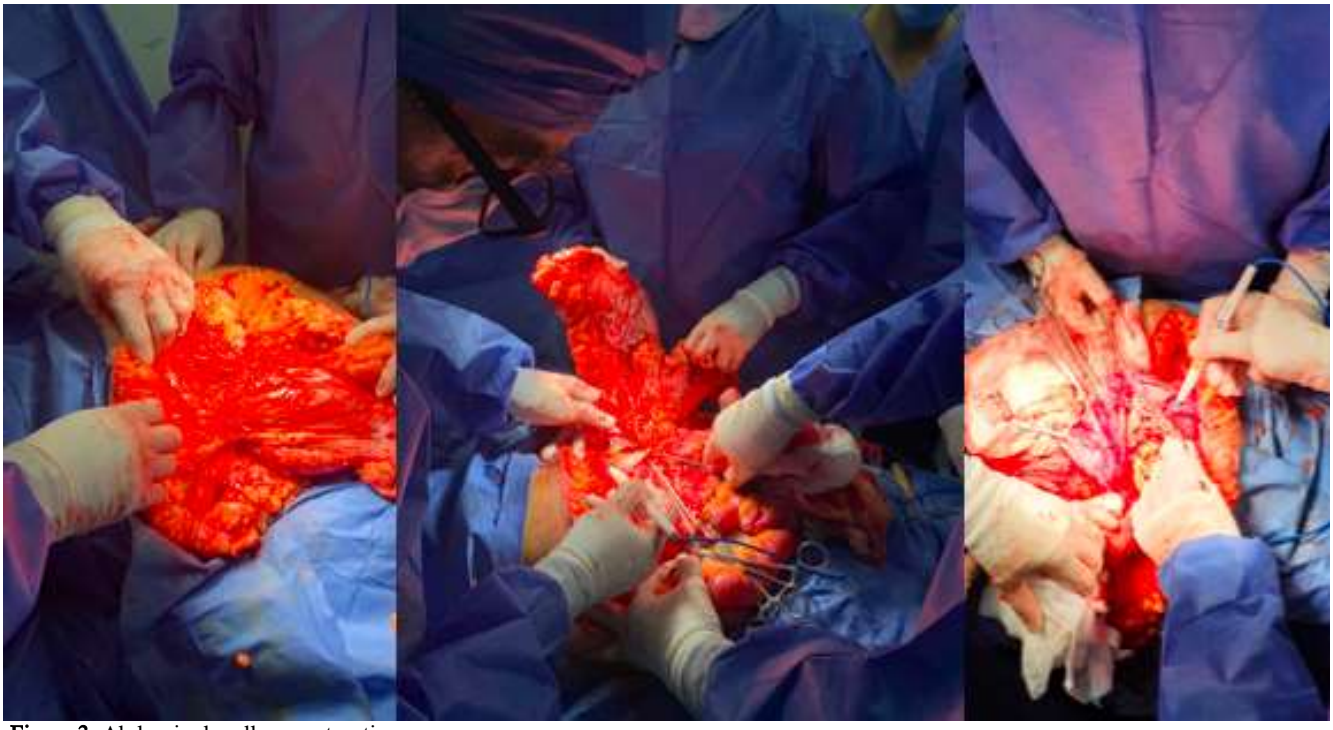

Figure 3. Abdominal wall reconstruction

to close the hernial defect with the least possible tension in the surgical act, stabilizing the shape and diaphragmatic function, improving the ventilatory function. Elongation of muscles and increasing volume of the abdominal cavity, pneumatic dissection of bands and adherence with the ease of reintroduction of intestinal loops into the abdominal cavity. It causes peritoneal irritation and local reactive vasodilatation, with an increase in macrophages the first days of application, improving healing capacity.[21] Complications are various but infrequent as like intestinal perforation, solid organ puncture to catheter placement for insufflation, hematoma abdominal wall, subcutaneous emphysema, pneumothorax, mediastinal emphysema and gas embolism. [22-24]

63-year-old female, diabetes, grade IV obesity, positive smoking for 20 years. Three previous abdominal surgeries. Prepneumoperitoneum CT measurements: Anteroposterior 150mm, transverse 286mm, sacral promontory 185.6mm, hernia sac 221.7mm, anteroposterior sac 87.1mm, distance between rectus muscles 105.7mm. post pneumoperitoneum: Anteroposterior 277.3mm, promontory of the sacrum 277.5mm.

It was decided that the patient would benefit of PPP because resolution of chronic and Complex incisional hernia, high risk of hernia complication. After PPP, subsequent elective surgical repair in hospital was planned. The surgery led and performed by a general surgeon with special training in abdominal wall repair. The patient underwent intraperitoneal catheter placement by Seldinger tenchique and PPP was initiated with a maximum insufflation of 10,000 cc. Air insufflation was progressively increased based on patient tolerance, with an average of 1000cc per day. There was a difficult to breath after twelve days, reason why we stopped to insufflation, but no laboratory signs of deterioration appeared.. Under general anesthesia, an incision like elongated Pfannenstiel. A 40x20 cm composite local skin flap stalk was removed for excess of skin and subcutaneous tissue. We identified the healthy fascia and herniated sac was opened. Adequate integrity of the small and large bowels was assured, all adhesions were released. Subsequently, Carbonelli Bonafé type 2 maneuver was used to reconstruct the abdominal wall. The rectus abdominis aponeurosis is incised in its most medial part to free the retromuscular space up to the arcuate line or arc of Douglas. The lateral dissection can only be extended to where the rectus sheath ends just before the neurovascular pedicles that supply the rectus abdominis. Achieving an advance of 12 cm in the epigastrium, 20 cm in the mesogastrium and 10 cm in the hypogastrium, bilateral dissection.[25-26] The entire sac was selected. , leaving the medullary muscle complexes of the rectus abdominis muscle borders free. The big local cutaneous flap removed showed the aponeurotic muscle was continued, freeing the crescent line on both sides and identifying and separating the oblique muscle from the lesser oblique bilaterally, This stem of flaps allowed closure at the midline, achieving a release of 8 cm on both sides. The primary midline closure was perfomed with prolene 0 stitches “in X” technique,. Before of this We also put a 40x40cm double principle effect mesh for the history of intestinal occlusion due to adhesions, intraperitoneal onlay mesh 30x 35 cm with aseptic technique. We affront the wall without problem, which closed the remaining tissues and conducted

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Risks and benefits of performing PPP in acutely ill patients with giant abdominal incisional hernias.

Benefits of PPP	Potential risks of PPP
Availability of a multi-disciplinary approach by abdominal wall group led by an expert surgeon	Acute complications of PPP
Stay in an fourth level hospital with core in vascular care	Patient obesity
Clinical team support due to complex surgical background	Previous medical history of thoracoabdominal anuerysm repair
Integrated surgical intervention with the abdominal wall team, interventional radiology, plastic and vascular surgery	Risks associated to polonged hospitalization
Close monitoring and surveillance for PPP insufflation response.	
*All of this considerations were evaluated in the abdominal wall committee by means of a multidisciplinary approach	

Table 1. Risks and benefits of performing PPP in acutely ill patients with giant abdominal incisional hernias.

several flaps for the excess skin. The patient was treated for General Surgery service, showed satisfactory in hospital evolution and was discharged our patient from the hospital after 5 days after surgery. Also, the patient referred and improved in her quality of life in her postoperative controls with good tolerability of the procedure.

Discussion

Loss of domain refers to the apparent impossibility of reintroducing the organs of the hernia sac into the abdominal cavity. This phenomenon is caused by two simultaneous processes: the reduction of volume in the abdominal cavity and the increase of volume in the hernia sac. Based on computed tomography, the ratio between these two parameters (hernia sac volume/abdominal cavity volume) was described in 2010, known as the Tanaka index. [27] Recent publications have shown the experience with PPP in cases of hernias with loss of domain. [28] However, the patient that was included in these studies was clinically stable and received elective procedures. [29]

Conclusion

Goni Moreno PPP is an effective procedure that allows a high rate of fascial closure (95.7%)[30]. Current scientific consensuses suggest that PPP should be used as adjuvant therapy for elective procedures associated with lower surgical complications and morbidity.[31-33]

Therefore, literature on the preparation and repair in obesity patient with giant abdominal incisional hernia with loss of domain without clinical symptoms is safe. But the careful selection of patient and individualized approach is necessary. The volume of pneumoperitoneum was controlled in terms of the best actual evidence. This case shows that this technique can reduce the side effects of reintroducing abdominal content of these types of hernias.

Conflicts of interests

The authors declare no conflicts of interests.

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