

## Case Report

# Progressive preoperative pneumoperitoneum in a patient with giant inguinal hernia: report of a case

José Miguel Huerta-Velazquez<sup>1\*</sup>, Alexa Jimenez-Curiel<sup>2</sup>, Guillermo Avalos-Gonzalez<sup>2</sup>

<sup>1</sup>Department of General Surgery at Mexican Social Security Institute, Guadalajara, Mexico

<sup>2</sup>Autonomous University of Guadalajara, Zapopan, Mexico

**Received:** 14 June 2023

**Accepted:** 13 July 2023

### \*Correspondence:

Dr. José Miguel Huerta-Velazquez,

E-mail: jose.miguel.hv@hotmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

Giant hernias have chronic abdominal wall defects that slowly and progressively grow and alter the normal physiology of the abdominal wall. The clinical case we report is a 76-year-old male who began 7 years ago with protrusion in the left inguinal area with progressive increase in volume until reaching the inability to walk is presented. The protocol is followed by pneumoperitoneum insufflation with 500-1000 milliliters (ml) of carbon dioxide daily for 10 days. The treatment of large hernia defects of the abdominal wall produces a large increase in intra-abdominal pressure during visceral reduction, which entails an alteration in cardiorespiratory biomechanics by elevating the diaphragm and reducing venous return. This technique would be indicated in hernias greater than 10 centimeters (cm), as well as in large inguinal and umbilical hernias, with irreducible sacs, with "loss of domain". It is protocolized with preoperative preparation with pneumoperitoneum for 10 days, for subsequent inguinal plasty with Lichtenstein technique, during which a minimum of adhesions were found, managing to preserve the ipsilateral testicle, reducing surgical time and hospital stay, with no data on compartment syndrome in the abdomen after surgery, providing a good alternative in this type of condition.

**Keywords:** Giant inguinal hernia, Pneumoperitoneum, Preoperative, Loss of domain

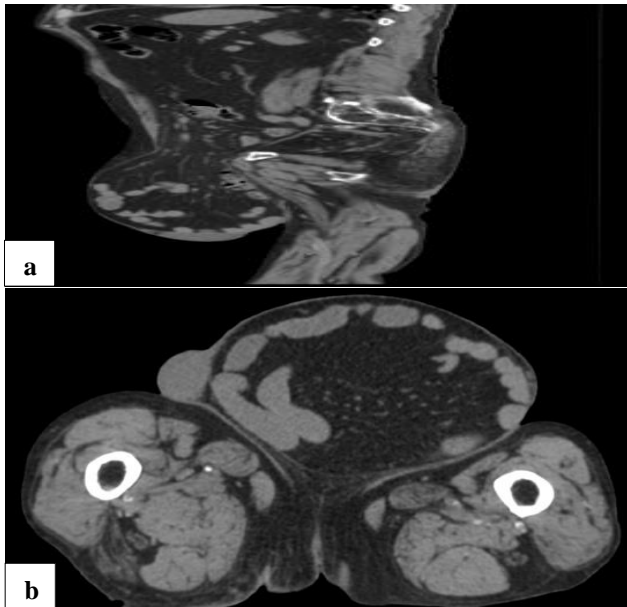
## INTRODUCTION

The work has been reported in line with the surgical case report (SCARE) criteria.<sup>1</sup> According to data published in the Lancet, the lifetime prevalence of inguinal hernias is estimated to be 27-43% in men and 3-6% in women.<sup>2</sup> Worldwide, 20 million inguinal hernia repairs are performed annually, of which inguinal hernia repair is the most common of all abdominal wall hernia operations. It is among the most prevalent surgical procedures among general surgeons. Approximately 500,000 surgical corrections of inguinal hernia are performed annually in the United States, considering it one of the main causes of ambulatory surgery in that country.<sup>3</sup> We present the clinical case of a male patient with a giant inguinal hernia.

## CASE REPORT

This is a 76-year-old male patient, originally and resident of Jalisco, Mexico, married, Catholic, pensioner. Significant pathological personal history refers to previous cervical spine surgeries in 2003 secondary to a car accident, and right knee arthroplasty in 2014, both without complications. He began his current condition 7 years ago when he noticed a bulge in the left inguinal region, which protruded and increased with effort, without color changes, presenting a progressive increase in size, for which he went to see a family doctor who referred him to our unit for treatment and follow-up by the general surgery department, already with an imaging study (Figure 1). At the time of his medical consultation, a catheter is placed in the upper left quadrant of the abdomen and between 500

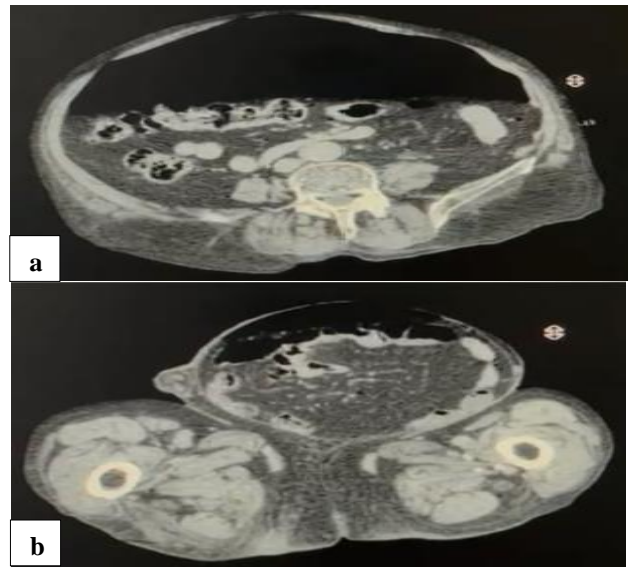
and 1000 ml of nitrous oxide is insufflated for 10 days (Figure 2). During subsequent appointments, he reports episodes of pain, discomfort when walking, and denies obstructive symptoms. On examination, a male patient of apparent age was found, conscious, oriented in time, place, and space; adequate coloration and mucotegumentary hydration. Cylindrical neck, without palpable lymph nodes. Lung fields with adequate widening and widening movements, ventilated, without rales. Precordium rhythmic heart sounds, of good intensity, without audible murmurs. Globose abdomen at the expense of tympanic pneumoperitoneum, not painful on superficial or deep palpation, with a catheter in the left upper quadrant. Increased volume is observed in the left inguinal region and scrotal bag at the expense of the hernial sac, which measures approximately 15×20 cm, displacing both testicles and penis, painful on movement. Intact extremities, without edema, without distal neurovascular compromise. He is protocolized for hernioplasty with mesh placement after having completed 10 days with controlled pneumoperitoneum.



**Figure 1: (a) Simple tomography of the abdomen and pelvis in coronal section prior to the PPP, and (b) simple tomography of the abdomen and pelvis in axial section prior to the PPP.**

The patient was hospitalized the same day of the surgical event with an 8-hour fast and was transferred directly to the operating room area (Figure 3). Under regional anesthesia and previous asepsis and antiseptics, sterile fields are placed, a transverse incision is made in the inguinal region of approximately 10 cm, we proceed to dissect by planes until finding external oblique aponeurosis, which we proceed to incise until reaching deep inguinal ring. The hernial sac is dissected until the hernial sac is found, which is incised, and the content is returned to the abdominal cavity without apparent complications. The hernial sac is completely dissected,

releasing cremaster muscle fibers to identify and separate elements of the spermatic cord, which is separated with an umbilical tape. We proceed to repair the pelvic floor with 2-0 vicryl continuous suture, the pubic tubercle is identified to which a polypropylene mesh of approximately 7×15 cm is fixed, which is fixed with a running suture to the inguinal ligament and fixation points are given in joint area. The aponeurosis is closed with continuous 2-0 vicryl suture, drenovac is placed, hemostasis is confirmed, and the aponeurosis is closed by planes with 2-0 continuous vicryl suture and skin with 2-0 nylon sarnoff midpoints, sterile dressing is placed and the procedure is terminated, the stable patient goes to the recovery room.



**Figures 2: (a) and (b) Simple tomography of the abdomen and pelvis in axial sections after performing PPP.**



**Figure 3: Giant left inguinal hernia with presence of transillumination after PPP.**

Surgical findings include an inguinoscrotal hernia with a sac of approximately 30 cm with a hernial ring of approximately 15 cm, containing intestinal loops and omentum, with the presence of laxity in pelvic floor

tissues. After recovering from anesthesia, he was transferred to the floor for 24-hour surveillance, which progressed without complications, so it was decided to discharge the day after the surgical intervention without pain, tolerating a normal diet by mouth, channeling gasses and with uresis present (Figure 4).



**Figure 4: Inguinal plasty surgical site.**

## DISCUSSION

Inguinal hernias can be classified based on the anatomic location of the abdominal wall defect. Several such classification schemes exist for inguinal hernias, but the simplest and most useful system separates inguinal hernias into direct and indirect inguinal hernias.<sup>4,5</sup> Indirect inguinal hernias are the most common type of hernia in both men and women.<sup>6,7</sup> Indirect hernias bulge into the internal inguinal ring, which is the site where the spermatic cord in men and the round ligament in women exit the abdomen. The origin of the hernial sac is lateral to the inferior epigastric artery. Indirect hernias develop more frequently on the right side in both men and women, thought to be due to posterior descent of the right testicle in men and asymmetry of the pelvis in women. Indirect inguinal hernias are classified as lateral hernias in the European Hernia Society classification system for inguinal hernias.

Direct inguinal hernia accounts for 30-40% of inguinal hernias in men, but approximately 14-21% of inguinal hernias in women.<sup>6,7</sup> Direct inguinal hernias bulge medially to the inferior epigastric vessels within Hesselbach's triangle, which is formed by the inguinal ligament (Poupart's ligament) inferiorly, the inferior epigastric vessels laterally, and the rectus abdominis muscle inferiorly medial part. Direct hernias are classified as medial hernias in the European Hernia Society classification system for inguinal hernias.

Giant hernias have chronic abdominal wall defects that slowly and progressively grow and alter the normal physiology of the abdominal wall. Repair of these defects can lead to serious pathophysiological problems such as abdominal compartment syndrome, produced by the sudden introduction of herniated abdominal contents into

a cavity that has already chronically decreased in size and does not have space to accommodate said contents. An acute respiratory compromise is then produced secondary to the sudden increase in intra-abdominal pressure. Hence the importance of adequate preparation, which favors the progressive readaptation of all systems to the reintroduction of visceral content and the reconstruction of the abdominal wall.<sup>8-11</sup>

The treatment of large hernial defects of the abdominal wall produces a large increase in intra-abdominal pressure during visceral reduction, which entails an alteration in cardiorespiratory biomechanics by raising the diaphragm and reducing venous return. This technique would be indicated in hernias greater than 10 cm, as well as in large inguinal and umbilical hernias, with irreducible sacs, with "loss of domain". This allows relaxation by progressive distension of the abdominal wall musculature, which is retracted, since it increases the abdominal capacity progressively, avoids sudden elevation of the diaphragm and facilitates return venous circulation.<sup>12-15</sup>

Preoperative progressive pneumoperitoneum (PPP) is a technique that has been used since 1947 to expand the volume of the abdominal cavity, for the preoperative preparation of patients with large hernias. PPP attempts to restore lost abdominal cavity space to allow reintroduction of chronically out-of-control viscera, a problem that prostheses do not solve when dealing with large defects and huge hernial sacs. Prosthetic meshes cannot prevent tension-free abdominal closure or the risk of intra-abdominal hyperpressure.<sup>8</sup> The classic indication for performing a PPP is a hernia due to loss of domain (HLD), a ventral or inguinal hernia of many years of evolution that presents with a giant visceral sac that cannot be reduced to the abdominal cavity, due to loss of abdominal volume capacity.

HLD accounts for up to 21% of all midline hernias and has systemic consequences such as inspiratory and expiratory restriction, difficulty defecating (due to lack of intra-abdominal pressure elevation and obstructive effect), bladder detrusor muscle dysfunction, and low back pain, among other less frequent complications. Likewise, there are local consequences such as shortening of the abdominal wall muscles, decreased abdominal volume, loss of visceral protection, direct mechanical irritation, decreased venous and lymphatic return, and ulceration and infection of the skin, and the subcutaneous tissue. Some of these consequences can be minimized preoperatively precisely by performing a PPP for a better surgical result.<sup>8,10</sup>

The patient to be treated in this article presents a ventral hernia with a large defect with a Tanaka index of >20% (46.5%) and a defect <100 mm (66 mm), which is protocolized with preoperative preparation with prior performance of PPP for 10 days, for subsequent inguinal plasty with the Lichtenstein technique, during which a minimum of adhesions were found, managing to preserve



the ipsilateral testicle, reducing surgical time and hospital stay, with no data on compartment syndrome in the abdomen after surgery, providing a good alternative in this type of suffering.

The primary indication for a PPP is an HLD at any location. A relative indication may be large hernias with a transverse hernia defect greater than 10 cm. The recommended technique is placement by the anatomical method with a multipurpose catheter, supplemented with local anesthetics at a Palmer point. An imaging guide may facilitate device placement. Insufflation can be performed daily, with 200-1300 ml of ambient or filtered air. The PPP could be maintained from 7 to 21 days, with preventive medical measures to try to reduce complications.<sup>16</sup> The original technique has evolved over the years to such an extent that there are currently multiple variants for its performance.<sup>17</sup>

## CONCLUSION

Performing a PPP provides benefits in preparing patients with large hernias for surgery, especially in cases of loss of control, as in our patient. While the procedure is safe, it is not without its complications, most of which are minor, but the benefits in terms of increasing the abdominal cavity to achieve hernia repair outweigh the risks involved. Before submitting a patient to PPP, they must be adequately protocolized with a complete clinical history with all their important history, imaging studies (preferably simple abdominal tomography) and evaluation by anesthesiology and/or internal medicine in case of having significant comorbidity. An adequate protocolization of the patients leads to assessable success rates at the time of performing the PPP, followed by a plasty with mesh placement.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

## REFERENCES

1. Agha RA, Borrelli MR, Farwana R, Koshy K, Fowler A, Orgill DP, For the SCARE Group. The SCARE 2018 Statement: Updating Consensus Surgical CAse REport (SCARE) Guidelines. *Int J Surg.* 2018;60:132-6.
2. Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. *Lancet.* 2003;362:1561.
3. Cullen KA, Hall MJ, Golosinskiy A. Ambulatory surgery in the United States, 2006. *Natl Health Stat Report.* 2009;1.
4. Zollinger RM Jr. An updated traditional classification of inguinal hernias. *Hernia.* 2004;8:318.
5. Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, et al. The European

- hernia society groin hernia classification: simple and easy to remember. *Hernia.* 2007;11(2):113-6.
6. Kark AE, Kurzer M. Groin hernias in women. *Hernia.* 2008;12:267.
7. Koch A, Edwards A, Haapaniemi S, Nordin P, Kald A. Prospective evaluation of 6895 groin hernia repairs in women. *Br J Surg.* 2005;92(12):1553-8.
8. Bueno-Lledó J, Torregrosa Gallud A, Jiménez Rosellón R, Carbonell Tatay F. Preoperative preparation of hernia. Progressive pneumoperitoneum and botulinum toxin type A. *Cir Esp.* 2017;95(5):245-53.
9. López-Juárez SE, Medina-Benítez A, Durán-Reyes R, Bagundo-Pérez BI, Fortuna-Sandoval OI, Trejo-García MS. Botulinum toxin A (IncobotulinumtoxinA) and pneumoperitoneum image-guided for hernia repair with loss of dominance. *Cir Cir.* 2023;91(1):117-21.
10. Martínez-Hoed J, Bonafe-Diana S, Bueno-Lledó J. A systematic review of the use of progressive preoperative pneumoperitoneum since its inception. *Hernia.* 2021;25(6):1443-58.
11. Alam NN, Narang SK, Pathak S, Daniels IR, Smart NJ. Methods of abdominal wall expansion for repair of incisional herniae: a systematic review. *Hernia.* 2016;20(2):191-9.
12. Elstner KE, Read JW, Rodriguez-Acevedo O, Ho-Shon K, Magnussen J, Ibrahim N. Preoperative progressive pneumoperitoneum complementing chemical component relaxation in complex ventral hernia repair. *Surg Endosc.* 2017;31(4):1914-22.
13. Said S, Thomas J, Montelione K, Fafaj A, Beffa L, Krpata D, et al. Tanaka score predicts surgical intensive care admission following abdominal wall reconstruction. *Hernia.* 2022;26(3):873-80.
14. Mancini A, Mougín N, Venchiarutti V, Shen Z, Risse O, Abba J, et al. Progressive preoperative pneumoperitoneum for giant hernias: a monocentric retrospective study of 162 patients. *Hernia.* 2020;24(3):545-50.
15. Elstner KE, Moollan Y, Chen E, Jacombs ASW, Rodriguez-Acevedo O, Ibrahim N, et al. Preoperative Progressive Pneumoperitoneum Revisited. *Front Surg.* 2021;8:754543.
16. Tanaka EY, Yoo JH, Rodrigues AJ Jr, Utiyama EM, Birolini D, Rasslan S. A computerized tomography scan method for calculating the hernia sac and abdominal cavity volume in complex large incisional hernia with loss of domain. *Hernia.* 2010;14:63-9.
17. Galeano F, Rascovan S. Nuestra experiencia con el neumoperitoneo preoperatorio progresivo en hernias y eventraciones. *Prensa Méd Argent.* 1957;154(31):2415-8.

**Cite this article as:** Huerta-Velazquez JM, Jimenez-Curiel A, Avalos-Gonzalez G. Progressive preoperative pneumoperitoneum in a patient with giant inguinal hernia: report of a case. *Int Surg J* 2023;10:1388-91.