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Hepatic and colonic eventration due to lumbotomy secondary to muscular denervation: A case report

Fernando E. Olvera[1], Fatima Medina[1], Luis M. Jimenez[1], Antonio Alvarado[2], Carmen Aburto[2]

Abstract

Hepatic and colonic eventration secondary to denervation following lumbotomy is a complex complication involving the protrusion of abdominal viscera through a defect in the lateral abdominal wall, caused by the loss of innervation to the abdominal muscles after a lumbotomy. Based on an exhaustive review of the medical literature, three well-documented cases of hepatic eventration secondary to lumbotomy have been identified. This article presents the case of a 50-year-old female patient (body mass index: 28.5 kg/m^2) who developed hepatic eventration and eventration of the hepatic flexure of the colon, through an area of muscular atony secondary to denervation from a previous lumbotomy. Bacteriologic investigation of the perirenal abscess indicated growth of *Escherichia coli*. The authors repaired the defect with a muscular plication without mesh placement given the presence of an actively infected surgical field (Centers for Disease Control and Prevention [CDC] wound class IV). At the 6-month follow-up, no clinical or radiographic evidence of recurrence was observed. Although denervation following lumbotomy is common, hepatic and colonic eventrations are rare and remain difficult to manage. Surgical treatment modalities are still not well defined, and there are no precise recommendations, which is likely due to the relative rarity of these cases. The rationale for mesh avoidance in a contaminated/infected field and the evidence supporting staged repair strategies are discussed.

Keywords:

Colonic eventration/colonic herniation, contaminated field, hepatic eventration/hepatic herniation, lumbar hernia, lumbotomy, mesh repair, muscular denervation, muscular plication, surgical repair, xanthogranulomatous pyelonephritis

Introduction

Surgical incisions can cause nerve injury, which induces muscle atrophy, abdominal wall weakness, and, on rare occasions, protrusion of the abdominal content without the presence of an actual underlying aponeurotic defect. This kind of pseudohernia can involve multiple abdominal organs. Hepatic and colonic eventration secondary to denervation following lumbotomy is a complex and very rare complication that can cause severe pain, intestinal obstruction, liver injury, and even strangulation of any of the organs involved. Based on an exhaustive review of the medical literature, three well-documented specific cases of hepatic eventration secondary to lumbotomy have been identified: (1) segmental hepatic incarceration (2007),[1] (2) incisional hernia with hepatic content (2024),[2] and (3) hepatic herniation post-renal surgery (2022).[3] Based on the aforementioned, this case is presented.

Case History

A 50-year-old female patient, with a body mass index (BMI) of 28.5 kg/m^2 (weight 72 kg, height 1.59 m), with no

[1]*Department of General Surgery, Hospital General de Querétaro, México,* [2]*Department of Transplant Surgery, Hospital General de Querétaro, Querétaro, México*

Address for correspondence:
Dr. Fernando Elí Olvera Camacho, Department of General Surgery, Hospital General de Querétaro, Querétaro 76134, Mexico.
E-mail: ferolvera_19@hotmail.com

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significant family or personal nonpathological history, presented with a background notable for recurrent urinary tract infections and subsequent diagnosis of xanthogranulomatous pyelonephritis. Her chronic medical history included type 2 diabetes mellitus of 4-year duration. She had previously undergone three surgical procedures: one laparoscopic cholecystectomy and two cesarean sections via Pfannenstiel incision.

The patient's current condition was preceded by a complicated episode of pyelonephritis with a renal abscess in 2022, which was initially managed with antibiotics without improvement. Consequently, image-guided drainage and pigtail catheter placement were performed. Due to persistent symptoms, the urology team attempted abscess drainage and a right-sided nephrectomy via lumbotomy, which was unsuccessful; only drainage of the abscess was achieved, followed by antibiotic therapy and apparent resolution, allowing outpatient management.

Three years after this hospitalization, the patient presented to the emergency department with progressively worsening pain at the lumbotomy site, reaching a severity of 10/10, accompanied by a palpable mass with induration, partial mobility, and no changes in skin color or temperature. Associated symptoms included fever (38 °C), dysuria, and increased urinary frequency. Physical examination revealed increased volume in the right dorsolumbar region, severe pain (10/10) exacerbated by movement, and a positive Giordano sign. During her stay in the Emergency Department, spontaneous discharge of the purulent exudate occurred through the surgical wound, prompting drainage of a superficial collection and scheduled wound care [Figure 1].



Figure 1: Purulent drainage through a surgical wound

Computed tomography (CT) revealed evidence of right-sided xanthogranulomatous pyelonephritis, a perirenal abscess, hepatic eventration (predominantly segment 6), and eventration of the hepatic flexure of the colon, with no signs of obstruction, air–fluid levels, or free fluid or air in the cavity [Figure 2]. Laboratory findings included leukocytosis with neutrophil predominance, mild anemia, normal creatinine, elevated acute phase reactants (C-reactive protein and erythrocyte sedimentation rate) , and no abnormalities in liver function tests. Urinalysis showed abundant bacteria and leukocytosis. Blood and urine cultures were obtained upon admission. Urine culture indicated growth of *Escherichia coli* (*E. coli*) sensitive to third-generation cephalosporins and carbapenems and resistant to ampicillin and trimethoprim–sulfamethoxazole. Blood cultures remained negative after 5 days of incubation. This microbiologic profile is consistent with the most frequently isolated organisms in xanthogranulomatous pyelonephritis, which include *E. coli*, *Proteus mirabilis*, *Klebsiella* spp., and *Staphylococcus* spp.[4]

Given these findings, surgical intervention was undertaken. A supra- and infra-umbilical midline incision was made, entering the peritoneal cavity without encountering free fluid. Numerous adhesions were identified and lysed using electrocautery and LigaSure. Mobilization of the ascending colon revealed eventration of the hepatic flexure and segment 6 of the liver, both of which were freed and reduced. The liver exhibited changes secondary to eventration, including a midline fold in the previously mentioned segment and an affected muscular area with a concave surface (approximately 12 cm × 6 cm) and a small wall defect (5 cm × 5 cm) through which the hernial sac and omentum protruded [Figure 3]; these were released with LigaSure. Prior to abdominal wall repair, a nephrectomy was performed, revealing a 50 mL perirenal abscess, extensive adhesions, and markedly inflamed tissue. The kidney was removed, showing areas of lysis due to infection, abundant purulent exudate, and loss of normal anatomy. Examination of the excised kidney revealed calyceal stenosis and macroscopic features of xanthogranulomatous pyelonephritis [Figure 4]. Intraoperative culture of the perirenal abscess also confirmed growth of *E. coli* with an identical sensitivity pattern to the preoperative urine culture. Histopathologic examination of the nephrectomy specimen confirmed xanthogranulomatous pyelonephritis with abundant lipid-laden foamy macrophages, necrosis, and mixed inflammatory infiltrates.

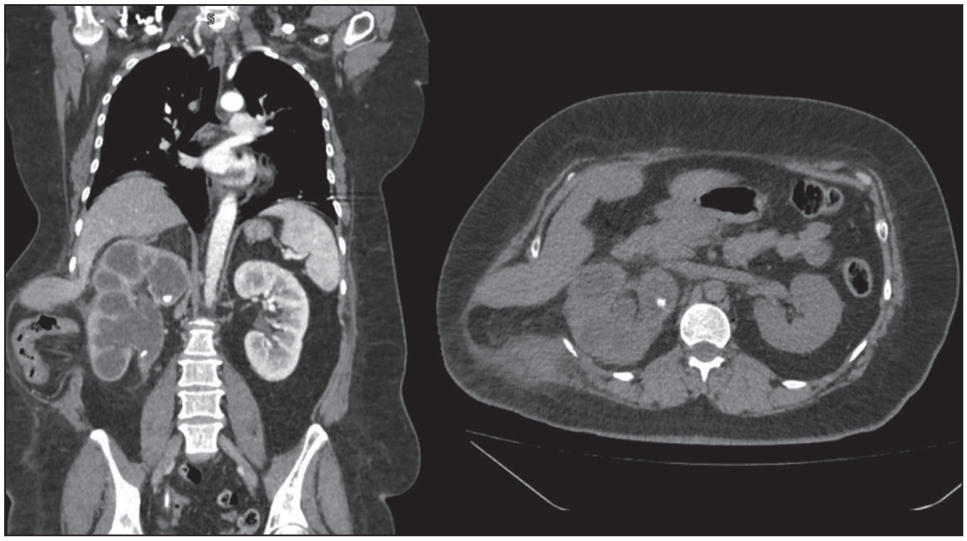


Figure 2: Computed axial tomography showing hepatic and colonic hernia, without defect in the abdominal wall

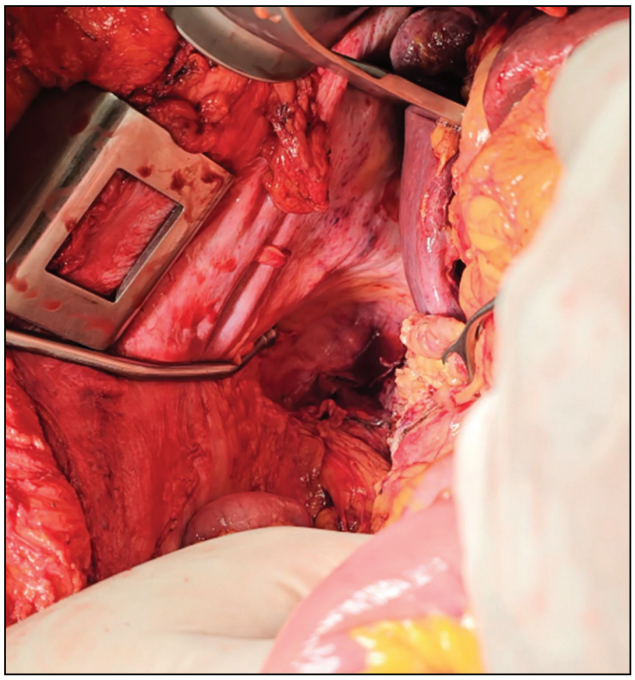


Figure 3: Muscular area with a concave surface (approximately 12 cm × 6 cm) and a small wall defect

Abdominal wall defect repair was performed without placement of a mesh due to the presence of active infection, corresponding to a Centers for Disease Control and Prevention (CDC) wound class IV (dirty/infected) and Ventral Hernia Working Group (VHWG) grade 4 classification. Plication of the transversalis fascia was undertaken, approximating the defect edges with 1–0 prolene tension-relieving sutures [Figure 5]. Adequate closure was confirmed, and the cavity was irrigated with a solution containing sodium chloride (0.85%), sodium hypochlorite (0.057%), and hypochlorous acid. A drain was placed, and the surgical procedure was concluded. The total operative time was 255 min.

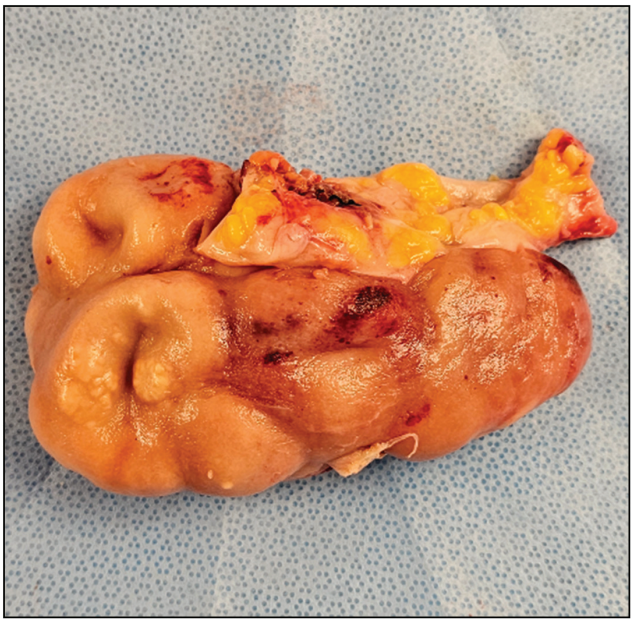


Figure 4: Macroscopic features of xanthogranulomatous pyelonephritis

The postoperative course was uneventful. The patient received intravenous targeted antibiotic therapy with ertapenem for 7 days based on the culture sensitivity results, followed by a step-down approach to oral ciprofloxacin for an additional 14 days. The drain was removed on postoperative day 4 after the output decreased to less than 30 mL/day with serous characteristics. Five days after surgery, the patient was discharged showing no symptoms and without evidence of eventration.

Follow-up was conducted at 1 month, 3 months, and 6 months postoperatively. At the 1-month visit, the patient reported mild incisional discomfort without bulging or palpable defects. The surgical wound had

healed without complications. At 3 months, the patient was asymptomatic and had returned to her daily activities. At the 6-month follow-up, clinical examination revealed a well-healed midline scar, no palpable defect or asymmetry of the lateral abdominal wall, and no increased protrusion with Valsalva maneuver. Follow-up contrast-enhanced CT imaging at 6 months demonstrated post-nephrectomy changes on the right, adequate position of the previously eventrated hepatic segment and colonic flexure, integrity of the fascial plication, and resolution of the soft tissue inflammatory changes observed on prior imaging. No evidence of recurrence or incisional hernia was identified. The patient remained clinically well with no functional limitations at the time of the last follow-up [Figures 6 and 7].

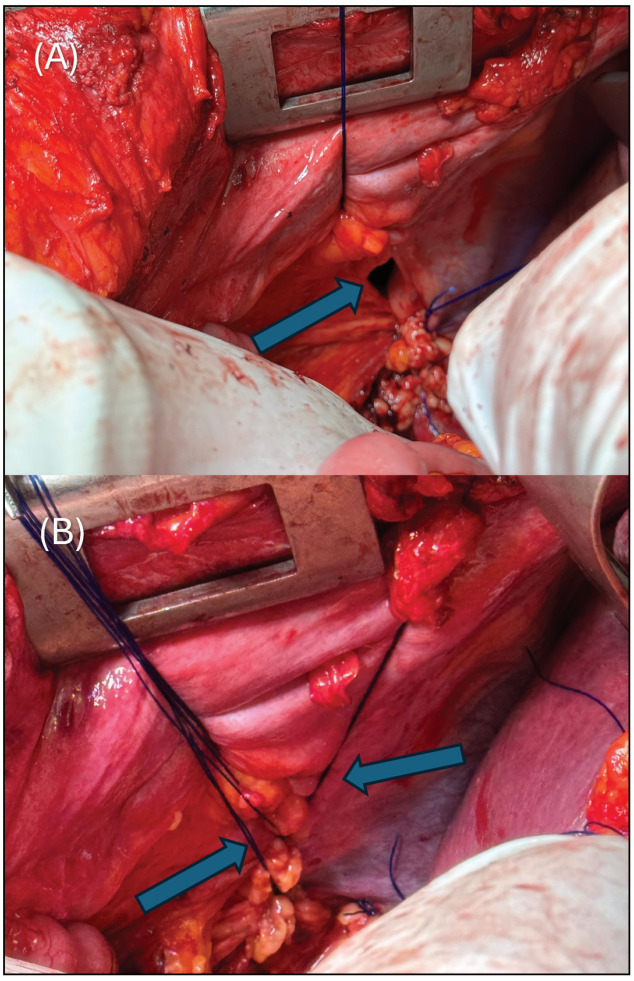


Figure 5: Plication of the transversalis fascia. (A) The area prior to plication. (B) Arrows indicate the plicated area, using prolene sutures placed with tensionrelieving stiches

Discussion

Lumbar eventration following lumbotomy has a prevalence of 31.3% according to the most comprehensive study conducted in 230 patients with a minimum follow-up of 2 years.[5] This figure is higher than that previously reported in the literature (10%–20%). Approximately 300 cases of lumbar hernia have been described in the literature since 1731.[6] Lumbar hernias account for 1%–2% of all abdominal hernias. Incarceration occurs in 30.8% of lumbar hernias.[7]

The abdominal musculature is innervated by branches of the intercostal nerves (T7–T11), the subcostal nerve (T12), and the iliohypogastric and ilioinguinal nerves (L1). During a lumbotomy, particularly a transcostal lumbotomy via the 12th rib, these nerve roots may be injured, resulting in denervation of the ipsilateral musculature.[7,8]

The transversus abdominis muscle is the deepest of the lateral abdominal muscles. Its fibers run transversely, acting as a natural girdle that stabilizes the lumbar spine, maintains intra-abdominal pressure, and provides support to the abdominal viscera. Neurotmesis-type injury to the intercostal nerves T11–T12 and/or the subcostal nerve leads to complete denervation of the

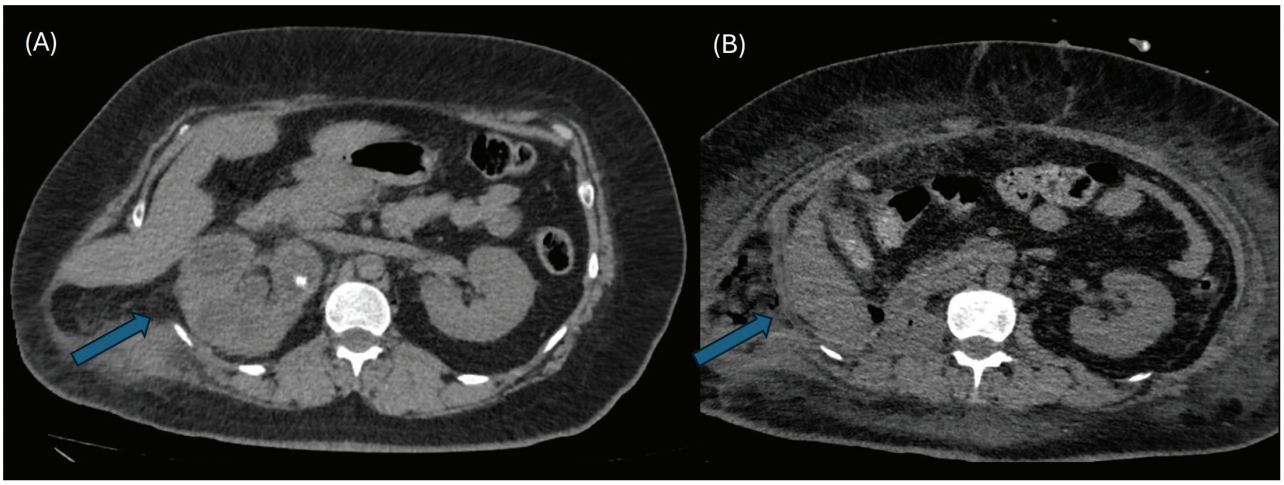


Figure 6: Preoperative computed tomography (CT) scan. (A) The muscular defect. (B) Arrows indicate the plicated area

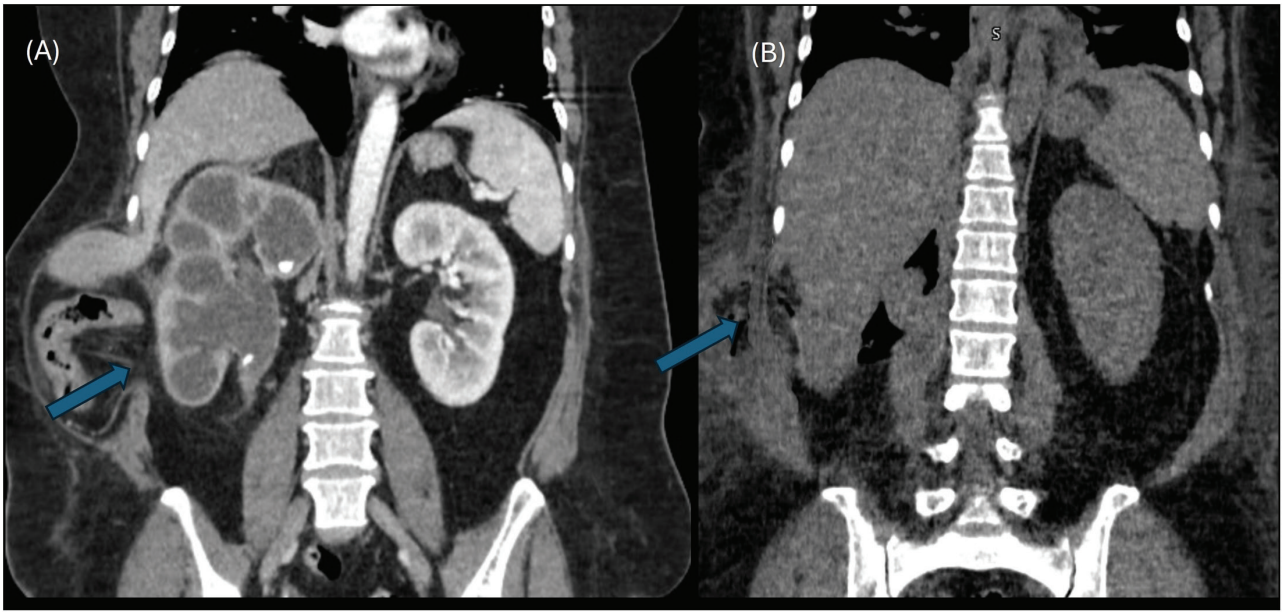


Figure 7: Preoperative computed tomography (CT) scan. (A) The muscular defect. (B) Arrows indicate the plicated area

transversus abdominis muscle, causing irreversible loss of muscular function (with no possibility of spontaneous reinnervation) and progressive weakness of the lateral abdominal wall.[9]

The most influential risk factors identified are age over 50 years, hypoproteinemia, surgical wound infection, and abdominal wall hematoma.[10] Notably, obesity (BMI > 30 kg/m^2) and diabetes mellitus are also recognized modifiable risk factors for mesh infection and hernia recurrence and should be carefully assessed during surgical planning.[10,11]

Approximately 80.5% of eventrations occur within the first year following surgery. Clinically, local symptoms include a visible bulge at the lumbotomy scar, deformity of the lateral abdominal wall, and pain or discomfort of variable intensity.[7] Systemic symptoms are mainly due to denervation of the stabilizing musculature, which may manifest as postural alterations with accentuated lumbar lordosis, respiratory problems due to altered respiratory mechanics, and disturbances of intestinal transit secondary to changes in the intra-abdominal pressure.[5] Visceral complications vary depending on the structure involved. In specific cases of hepatic eventration, vascular compromise of the herniated hepatic segment may be observed, with elevated levels of transaminases (alanine aminotransferase and aspartate aminotransferase) due to hepatic ischemia, and occasionally a risk of visceral strangulation, although this is less frequent than in true hernias.[10]

For diagnosis, physical examination typically reveals a visible bulge in the lateral lumbar region, a palpable defect in the abdominal wall, and increased protrusion with increased intra-abdominal pressure. CT is the investigation of choice, allowing characterization of the hernial defect, identification of visceral contents (liver, colon, and omentum), assessment of vascular compromise in hepatic eventrations, and precise measurement of the defect for surgical planning.[10]

Mesh versus nonmesh repair in contaminated and infected fields

The use of prosthetic mesh is generally considered the standard of care in ventral hernia repair due to its proven ability to reduce recurrence rates.[12] In a large Danish cohort study (n = 3242), mesh repair was associated with a significantly lower risk of reoperation for recurrence compared with nonmesh repair over a 5-year follow-up period.[12] However, the benefits of mesh utilization must be carefully weighed against the risk of mesh-related complications, particularly in contaminated and infected surgical fields.

The VHWG classification provides a framework for assessing infection risk and selecting the appropriate surgical strategy. Grade 4 (dirty/infected), which includes cases with active infection, abscess, or septic dehiscence, represents the highest risk category, and the use of synthetic nonabsorbable meshes is generally not recommended due to the high rates of mesh infection, the subsequent need for mesh removal, and consequent high recurrence rates.[11,13] Mesh reinforcement is the standard of care in clean fields, but infection extending to the mesh is a complex problem: modifiable risk factors include active smoking, poorly controlled diabetes, abdominal skin/wound issues, and obesity; operative factors

that further increase risk include prior hernia repair, enterotomy, and contamination of the surgical field.[11]

A landmark multicenter randomized clinical trial by Rosen *et al*.[14] compared the use of synthetic versus biologic mesh in 253 patients undergoing single-stage repair of clean-contaminated and contaminated ventral hernias (CDC classes II and III). At the 2-year follow-up (92% follow-up rate), use of a synthetic mesh significantly reduced hernia recurrence risk compared with use of a biologic mesh (5.6% vs. 20.5%; hazard ratio: 0.31, 95% confidence interval [CI]: 0.23–0.42; $P < 0.001$), with no significant difference in surgical site occurrences requiring procedural intervention (odds ratio: 1.22, 95% CI: 0.60–2.44; $P = 0.58$). Furthermore, synthetic mesh costs approximately 200 times less than biologic mesh ($105 vs. $21,539 median prosthetic cost).[14] However, it is critical to note that this trial specifically excluded CDC class IV (dirty/infected) cases, and therefore these favorable results for synthetic mesh cannot be directly extrapolated to actively infected fields.

The complex open bioabsorbable reconstruction of the abdominal wall study, a multicenter prospective longitudinal study of biosynthetic absorbable mesh in contaminated ventral hernia repair (CDC classes II and III, $n = 104$), reported a Kaplan–Meier hernia recurrence rate of 17% at 24 months. Notably, surgical site infections were associated with a significantly higher risk of recurrence ($P < 0.01$), underscoring the detrimental effect of infection on any mesh-based repair strategy.[15]

When polypropylene mesh is used to repair contaminated abdominal wall hernias, a high incidence of mesh-related chronic infection, drainage, erosion, and bleeding has been documented.[16] Absorbable polyglycolic acid mesh has been used as an alternative in contaminated fields, but postoperative hernia development occurred in six of eight patients (75%) in the original series by Dayton *et al*.,[16] although this complication was balanced against the more serious complications of fistula, bleeding, and chronic infection requiring mesh removal in 50%–90% of cases when nonabsorbable meshes were placed under contaminated conditions.

Contemporary reviews have highlighted that recent evidence supports the use of permanent synthetic mesh in CDC class I–III wounds, showing lower recurrence rates and similar infection risks compared with biologic mesh.[17] Two systematic reviews and meta-analyses comparing the use of synthetic and biologic mesh in contaminated fields reported that synthetic mesh use was associated with lower recurrence rates (10.3% vs. 24.5%; risk ratio : 0.44) and reduced rates of surgical site complications.[17] Nevertheless, the use of biologic or biosynthetic meshes was originally designed specifically for contaminated fields, and they remain an option when definitive repair with permanent mesh is not feasible.[17] Biosynthetic meshes such as Phasix™ (Becton, Dickinson and Company, New Jersey, USA) have shown a recurrence rate of 15.9% at 5 years with no mesh-related complications requiring explantation.[17] Importantly, a staged reconstruction approach—where nondefinitive repair is performed first, followed by definitive mesh-reinforced repair once infection has resolved—has been increasingly advocated, with some series reporting that up to 35.3% of patients undergoing nondefinitive repair do not experience radiographic recurrence.[17]

Rationale for nonmesh repair in the present case

In the present case, the surgical field was classified as CDC wound class IV (dirty/infected) and VHWG grade 4, given the presence of a perirenal abscess with confirmed *E. coli* growth, extensive purulent exudate, and markedly inflamed perinephric tissue encountered intraoperatively. Under these conditions, the placement of a permanent synthetic mesh was contraindicated due to the well-documented risk of chronic mesh infection, which carries an overall hernia recurrence rate of approximately 48%–50% following mesh explantation for infection, and sets a cascade of further surgical interventions.[11,18] Furthermore, biologic mesh was not available at our institution at the time of surgery, and its use in truly dirty/infected fields (as opposed to clean-contaminated) remains controversial, with evidence of high recurrence rates of 40%–80% in contaminated cases even with biologic products.[14,19]

The decision was made to perform a primary fascial plication with 1–0 prolene tension-relieving sutures, achieving tension-free closure of the relatively small fascial defect (5 cm × 5 cm). Although suture repair without mesh carries a higher recurrence risk compared with mesh-reinforced repair in clean fields, the risk–benefit analysis favored a nonmesh strategy in this setting.[12,20] The relatively small defect size and the adequacy of the available tissue for plication further supported this decision as recurrence risk correlates with defect size, with defects greater than 15 cm carrying a worse prognosis.[21] The patient was counseled regarding the possibility of a staged definitive mesh repair in the future should recurrence develop once the infectious process had fully resolved.[17]

Treatment modalities

Treatment generally depends on the patient's clinical status, associated symptoms, and the possible impact they may have on the patient's daily life including the aesthetic impact. Conservative treatment can be applied, with the use of supportive abdominal belts and physiotherapy. Multiple techniques for surgical management exist, including laparoscopic or open approach, fascial plicature, the use of retention

sutures, and the application of mesh in a preperitoneal, intermuscular, or onlay fashion. The double prosthetic repair technique is reported as the most effective. In this approach, the first mesh is placed in the preperitoneal space, and the second mesh is placed in the intermuscular plane and secured with transparietal sutures using polydioxanone, with subsequent plication of the oblique muscles when feasible, which is known as the "Sandwich" technique.[22] The site of the initial approach is a topic of discussion in many articles; one of the main problems regarding this is the loss of the normal anatomy of the abdominal wall due to fibrosis caused by the incision of the previous surgery; therefore, a midline laparotomy or a right flank approach should be considered and not only the approach just above the site of the eventration. The type of mesh used for most of the previously mentioned techniques is the polypropylene mesh with hyaluronic acid covering for the intraperitoneal plane and a simple polypropylene mesh for the preaponeurotic plane, usually with a wide margin compared to the size of the defect. Drainage placement is recommended before skin closure.

Should a visceral complication secondary to denervation arise, management will depend on its nature. In hepatic and colonic eventration, vascular compromise is the most feared complication; thus, in the presence of alarm signs, emergency surgery is indicated if there are signs of strangulation, with reduction of the herniated organ and repair of the defect using a dual-layer intraperitoneal mesh.[21]

The recurrence rate following such procedures is estimated at approximately 25% with mesh repair techniques, necessitating follow-up over several years to detect recurrences. Prognosis depends on several factors, the most relevant being defect size (defects greater than 15 cm have a worse prognosis), surgical technique (tension-free mesh techniques yield better outcomes), and the patient's general condition, including age and comorbidities.[21]

It is important to note that most publications on lumbar hernias correspond to individual case reports or small case series. There are no prospective multicenter studies dedicated specifically to hepatic and colonic eventration. The rarity of this complication means that experience is concentrated in isolated cases, and the largest studies (such as the one with 230 patients) report lumbar eventration in general, without specifying the visceral content.

Author contributions

F.O.: Concepts, design, content investigation, manuscript, writing. A.A.: Concepts, design, content investigation. F.M.: Concepts, design, manuscript. L.J.: Concepts, manuscript.

Ethical policy and institutional review board statement

This study was performed in line with the principles of the Declaration of Helsinki.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

All data generated and/or analyzed during this study are included in this published article

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Nil.

Conflicts of interest

There are no conflicts of interest.

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