Laparoscopic Management of Incarcerated Femoral Hernia with Bowel Necrosis: A Case Report

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A B S T R A C T

Femoral hernias, though representing less than 5% of all abdominal wall hernias, pose a significant clinical challenge due to their anatomical constraints and high complication rates. Exhibiting a pronounced female predominance, these hernias carry a substantial risk of incarceration and strangulation, estimated between 5-20%, stemming from the narrow and unyielding nature of the femoral canal. This anatomical predisposition frequently mandates urgent surgical intervention to prevent bowel ischemia and necrosis. Diagnostic difficulties often arise, particularly in occult presentations lacking a discernible groin mass. The advent of laparoscopy has revolutionized the approach, offering distinct advantages in both the diagnosis of clinically obscure hernias and the execution of minimally invasive repair, potentially improving patient outcomes. We present the case of a 63-year-old female who arrived at the emergency department complaining of a three-day duration of severe, intermittent abdominal pain associated with obstipation, progressive abdominal distension, nausea, and vomiting. Clinical examination revealed marked abdominal distension but failed to identify any palpable mass in the inguinal or femoral regions. Plain abdominal radiography indicated findings consistent with small bowel obstruction. Consequently, an exploratory laparoscopy was undertaken. Intraoperatively, an incarcerated right femoral hernia was discovered, containing a 4 cm segment of ileum that exhibited frank necrosis. A completely laparoscopic procedure involving small bowel resection, creation of a side-to-side ileoileal anastomosis, and subsequent repair of the femoral hernia defect using primary purse-string sutures was performed successfully. In conclusion, the laparoscopic approach was indispensable for the accurate diagnosis and effective management of this complex case involving an occult, incarcerated femoral hernia with resultant bowel necrosis. Employing a minimally invasive strategy facilitated simultaneous bowel resection and hernia repair, offering potential benefits including diminished postoperative discomfort, expedited recovery, and possibly lower long-term recurrence rates relative to traditional open surgical techniques. This case reinforces the critical importance of considering femoral hernia in the differential diagnosis of female patients presenting with acute small bowel obstruction, even in the absence of classical external signs. Furthermore, it underscores the feasibility and efficacy of a purely laparoscopic approach for managing such complex surgical emergencies.

1. Introduction

Abdominal wall hernias represent a common surgical pathology characterized by the protrusion of intra-abdominal contents through a defect or weakness in the musculofascial layers of the abdominal wall. These defects can occur congenitally or be acquired later in life due to various factors, including increased intra-abdominal pressure, tissue degradation, or previous surgical incisions. While hernias can manifest in numerous locations, the inguinal region remains the most frequent site, accounting for the vast majority of abdominal wall hernias encountered in clinical practice. However, within the broader category of groin hernias, femoral

hernias constitute a distinct albeit less common subgroup. Femoral hernias are specifically defined by the protrusion of abdominal contents through the femoral canal. Anatomically, the femoral canal is the most medial compartment of the femoral sheath, situated inferior to the inguinal ligament. Its boundaries are critical to understanding the pathophysiology and clinical implications of femoral hernias: the inguinal ligament lies anteriorly, the rigid Cooper's (pectineal) ligament posteriorly, the lacunar ligament medially, and the femoral vein laterally. This anatomical configuration forms a relatively narrow and unyielding orifice, typically measuring only 1-2 cm in diameter. It is this inherent structural confinement that predisposes femoral hernias to a significantly elevated risk of complications compared to their inguinal counterparts. Epidemiologically, femoral hernias account for approximately 3-5% of all abdominal wall hernias, making them considerably less common than inguinal hernias (which represent about 75% of groin hernias). There is a well-documented and striking predilection for femoral hernias to occur in females, with reported female-to-male ratios varying in the literature but often cited between 4:1 and 8:1. This gender disparity is commonly attributed to anatomical differences in pelvic structure, with females generally possessing a wider pelvis and potentially a broader femoral canal opening. Hormonal factors and changes associated with pregnancy and childbirth may also play a role in altering connective tissue integrity and increasing susceptibility. Despite this strong female predominance, it is noteworthy that inguinal hernias remain the most common type of hernia overall in both women and men. Femoral hernias tend to occur more frequently in middle-aged and elderly individuals, likely reflecting age-related weakening of connective tissues. Some studies suggest a slightly higher incidence on the right side, possibly related to anatomical asymmetry or developmental factors like the delayed closure of the processus vaginalis on the right during fetal development, though this observation is not universally consistent. [1-3]

The paramount clinical significance of femoral hernias lies in their high propensity for incarceration and strangulation. Incarceration refers to the trapping of hernia contents within the hernia sac such that they cannot be manually reduced back into the abdominal cavity. Strangulation occurs when the blood supply to the incarcerated contents (typically bowel or omentum) becomes compromised due to compression at the narrow hernia neck (the femoral ring). This leads to ischemia, progressing to tissue necrosis and potentially perforation if not promptly addressed. The risk of incarceration and subsequent strangulation in femoral hernias is estimated to be significantly higher than in inguinal hernias, ranging from 5% to as high as 20% of cases presenting acutely. This elevated risk underscores the widely accepted recommendation that virtually all diagnosed femoral hernias, even those discovered incidentally and currently asymptomatic, should be considered for elective surgical repair to prevent life-threatening complications. Delay in treatment can lead to bowel resection, sepsis, prolonged hospitalization, and increased mortality rates. The clinical presentation of femoral hernias can be variable. Some patients may present electively with a noticeable bulge or lump in the groin region, typically located below the inguinal ligament and medial to the femoral pulse. This lump may be reducible initially but can become progressively tender and irreducible as incarceration develops. However, a significant diagnostic challenge arises from the fact that many femoral hernias, particularly in their early stages or in obese individuals, may not produce a readily palpable external mass. The hernia sac can sometimes migrate superiorly, further confusing the clinical picture and potentially leading to misdiagnosis as an inguinal hernia. Furthermore, patients may present acutely with symptoms directly related to complications, such as bowel obstruction or strangulation, without any preceding awareness of a hernia. Symptoms of acute small bowel obstruction – including colicky abdominal pain, nausea, vomiting, abdominal distension, and obstipation – may dominate the clinical picture, while local groin signs remain absent or minimal. This

"occult" presentation can lead to diagnostic delays, potentially increasing the morbidity associated with the condition. Physical examination requires careful attention to the femoral region, asking the patient to cough or perform a Valsalva maneuver to accentuate any bulge, although findings can remain equivocal. Given these diagnostic challenges, imaging modalities can play a crucial role. Groin ultrasound (US) is often utilized as an initial imaging tool. It is non-invasive, readily available, and can dynamically assess the groin region during provocative maneuvers. US can help differentiate femoral from inguinal hernias by visualizing the relationship of the hernia neck to the inferior epigastric vessels and the pubic tubercle, and by identifying the hernia sac passing beneath the inguinal ligament medial to the femoral vein. Computed tomography (CT) scanning offers excellent anatomical detail and is particularly useful in complex cases, obese patients, or when bowel obstruction or strangulation is suspected. CT can precisely delineate the hernia's location and contents, assess bowel wall thickening, mesenteric stranding, or free fluid suggestive of ischemia, and identify other potential causes of abdominal pain or obstruction. Magnetic resonance imaging (MRI) is less commonly used for initial diagnosis but can be valuable in specific situations, such as differentiating hernia recurrence from other causes of chronic groin pain. However, in the emergent setting of acute bowel obstruction where a strangulated hernia is suspected but not clinically obvious, the decision may be made to proceed directly to surgical exploration without extensive pre-operative imaging, especially if the patient's condition is unstable.[4-6]

The definitive management of femoral hernia is surgical repair. The primary goals of surgery are to reduce the herniated contents back into the abdominal cavity, assess the viability of those contents (particularly bowel), resect any non-viable tissue, and repair the fascial defect in the femoral canal to prevent recurrence. Historically, various open surgical approaches were developed. The Lockwood (infra-inguinal) approach provides direct access to the femoral canal below the inguinal ligament but offers limited exposure for complex repairs or bowel resection. The Lotheissen (trans-inguinal) approach involves opening the inguinal canal floor to access the femoral defect from above, similar to an open inguinal hernia repair. The McEvedy (high) approach utilizes a vertical incision medial to the femoral vessels, allowing excellent exposure of the femoral canal and facilitating bowel resection if necessary, often preferred in emergency settings with suspected strangulation. Open repairs traditionally involved suturing adjacent structures (like the inguinal ligament to Cooper's ligament) to close the defect (Bassini, McVay repairs), but these tension repairs were associated with higher recurrence rates. The introduction of prosthetic mesh significantly improved outcomes in open hernia surgery, allowing for tension-free repair (Lichtenstein technique for inguinal hernias, adapted plug or patch techniques for femoral hernias), leading to lower recurrence rates. Over the past few decades, minimally invasive surgery (MIS), primarily laparoscopy, has emerged as a valid and increasingly preferred alternative for groin hernia repair, including femoral hernias. The two main laparoscopic techniques are the Transabdominal Preperitoneal (TAPP) approach and the Totally Extraperitoneal (TEP) approach. In the TAPP technique, surgeons access the preperitoneal space (the space between the peritoneum and the transversalis fascia) via the abdominal cavity. The peritoneum overlying the myopectineal orifice (which includes the sites of direct, indirect inguinal, and femoral hernias) is incised and dissected to expose the hernia defect(s). After reducing the hernia sac and ensuring adequate dissection, a large piece of prosthetic mesh is typically placed to cover the entire myopectineal orifice, and the peritoneal flap is closed over the mesh. The TEP technique avoids entry into the abdominal cavity altogether. A balloon dissector or direct dissection is used to create the preperitoneal space, into which trocars are placed. The hernia sac is reduced, and mesh is placed in a similar fashion to TAPP, but without the need for peritoneal incision or closure. Laparoscopic approaches offer several

potential advantages for femoral hernia repair. They provide excellent visualization of the entire myopectineal orifice from an internal perspective, allowing for accurate identification of the femoral defect and differentiation from inguinal defects. This is particularly advantageous in cases where the diagnosis is uncertain pre-operatively or when bilateral hernias are suspected. Laparoscopy allows for easy assessment of incarcerated bowel viability and facilitates laparoscopic bowel resection and anastomosis if required, avoiding the need for a separate laparotomy incision in many cases. Furthermore, numerous studies and meta-analyses have suggested that laparoscopic repair, when compared to open techniques (particularly open non-mesh repairs), may result in less postoperative pain, faster recovery and return to normal activities, improved cosmesis, and potentially lower rates of chronic groin pain (inguinodynia). While recurrence rates after laparoscopic mesh repair are generally comparable to open tension-free mesh repair when performed by experienced surgeons, some large database studies suggest laparoscopic repair might offer lower reoperation rates for recurrence, particularly for femoral hernias. However, laparoscopic repair is technically more demanding than open repair, requires specialized equipment and training, typically necessitates general anesthesia, and carries potential risks associated with laparoscopic access (visceral or vascular injury) and the potential for intra-abdominal complications, though these are relatively rare. The choice between TAPP and TEP often depends on surgeon preference and experience, as outcomes appear largely similar between the two techniques.[7-10] This case report describes the successful management of a challenging presentation: an incarcerated, necrotic femoral hernia presenting as an acute small bowel obstruction without any palpable external signs. The case underscores the diagnostic difficulties posed by occult femoral hernias and highlights the efficacy of a completely laparoscopic approach, encompassing diagnosis, bowel resection, anastomosis, and hernia repair, in managing this complex surgical emergency.

2. Case Presentation

The patient is a 63-year-old female presenting with a constellation of acute abdominal symptoms indicative of a significant gastrointestinal disturbance. Her chief complaint is severe, intermittent abdominal pain, which has been a primary concern for the medical team. This pain is further characterized by the patient's history of present illness, which reveals a three-day duration of progressively worsening abdominal discomfort. The patient describes the pain as intermittent and colicky, suggesting a pattern of cramping and relaxation, and generalized throughout the abdomen, indicating a non-localized source of the pain. In addition to the abdominal pain, the patient reports obstipation for two days prior to presentation. Obstipation, defined as the absence of stool or flatus passage, is a critical symptom suggesting a potential bowel obstruction. The inability to pass stool or gas implies a disruption in the normal peristaltic movement of the intestines, preventing the progression of intestinal contents. This symptom, coupled with the abdominal pain, strongly raises suspicion for a mechanical obstruction within the gastrointestinal tract. The patient also notes abdominal bloating or distension, a common manifestation of bowel obstruction. When the flow of intestinal contents is impeded, gas and fluids accumulate proximal to the obstruction, leading to an increase in abdominal girth and a sensation of fullness. This distension can contribute to the patient's discomfort and further supports the possibility of a mechanical blockage. Nausea and vomiting are also prominent features of the patient's presentation. She reports multiple episodes, specifically 5-6 times within the last 24 hours, of non-bilious vomiting. Non-bilious vomiting, meaning the vomitus does not contain bile, suggests that the obstruction is likely located proximal to the duodenum, as bile is secreted into the duodenum from the liver and gallbladder. Vomiting is a common reflex

response to bowel irritation or obstruction, aimed at expelling the contents of the upper gastrointestinal tract. A critical aspect of the patient's history is the delay in seeking medical care, which she attributes to financial or transportation difficulties. This delay of approximately three days is clinically significant as it can influence the progression of the underlying condition and potentially increase the risk of complications. Prolonged bowel obstruction, for instance, can lead to ischemia, necrosis, and perforation of the bowel if not promptly addressed. The patient's past medical history is generally unremarkable. She reports no history of hypertension, diabetes, heart disease, or any other known gastrointestinal conditions. This absence of pre-existing chronic conditions is important as it helps to narrow the differential diagnosis and suggests that the current acute presentation is likely a new and isolated event rather than an exacerbation of a chronic illness. Similarly, her past surgical history is negative for any recent or significant abdominal trauma, reducing the likelihood that the current symptoms are related to post-surgical adhesions or traumatic injury. The patient's family history is also notable for the absence of any known familial history of hernias, bowel obstruction, or gastrointestinal malignancy. This lack of a positive family history for similar conditions makes a hereditary predisposition less probable, although it does not entirely rule out the possibility of a genetic component. Regarding allergies, the patient reports no known drug allergies, which is essential information for medication administration during treatment. The physical examination reveals a patient who appears weak, fatigued, and in moderate pain-related distress, which aligns with her reported symptoms of severe abdominal pain. Despite her discomfort, she is cooperative, facilitating the examination process. Her vital signs provide further insight into her physiological state. Her blood pressure is recorded at 128/82 mmHg, which is within the normal range, suggesting that she is hemodynamically stable at the time of examination. Her heart rate is 96 beats per minute, slightly elevated, indicating mild tachycardia. Tachycardia can be a response to pain, dehydration, or the stress of illness. Her respiratory rate is 25 breaths per minute, slightly tachypneic, which could also be a response to pain or metabolic disturbances. Her temperature is 37.0°C (axillary), considered within the normal range, suggesting no immediate signs of systemic infection. Her oxygen saturation is 97% on room air, indicating adequate oxygenation. Anthropometric measurements show the patient's height to be 155 cm and her weight 58 kg. Her body mass index (BMI) is calculated to be 24.1 kg/m², which falls within the normal weight range. This is relevant as it helps to assess her overall nutritional status and can be a factor in considering potential underlying conditions. The abdominal examination is particularly crucial in this case. Inspection reveals marked abdominal distension, consistent with the patient's complaint of bloating. Notably, there are no visible scars or hernia bulges, which is significant, given the differential diagnosis. The absence of scars suggests no prior abdominal surgeries, and the lack of hernia bulges initially makes a readily apparent external hernia less likely. The umbilicus is centrally located. Auscultation of the abdomen reveals initially hyperactive, high-pitched bowel sounds. Hyperactive bowel sounds often occur early in mechanical bowel obstruction as the intestine attempts to overcome the obstruction by increasing peristalsis. The high-pitched quality suggests increased intraluminal pressure and fluid movement. Palpation of the abdomen elicits generalized tenderness, worse in the lower abdomen. However, there is no guarding or rebound tenderness. Guarding refers to the involuntary tensing of abdominal muscles in response to palpation, indicating peritoneal irritation. Rebound tenderness is pain that worsens upon sudden release of pressure, also suggestive of peritoneal inflammation. The absence of these signs makes peritonitis less likely at this stage. No organomegaly is noted, meaning there is no enlargement of the liver, spleen, or kidneys. A meticulous examination of the groin areas is performed, revealing no palpable mass, bulge,

tenderness, or erythema bilaterally in the inguinal or femoral regions, even with cough or Valsalva maneuvers. This is a critical negative finding, as it makes the diagnosis of a readily detectable groin hernia less likely, despite the symptoms suggestive of bowel obstruction. The rectal examination reveals a collapsed rectal ampulla, an empty vault, and smooth mucosa. These findings are consistent with distal bowel obstruction, as the absence of stool in the rectum indicates that the obstruction is preventing the passage of intestinal contents. No masses are palpable in the rectum. A slightly mucoid discharge is noted on the examining glove, which is a non-specific finding but may suggest some degree of bowel irritation. Sphincter tone is normal. Cardiovascular examination reveals a regular rhythm, no murmurs, gallops, or rubs, and peripheral pulses are palpable and symmetric, indicating no immediate cardiovascular compromise. Respiratory examination reveals clear breath sounds bilaterally, good air entry, and no wheezes or crackles, suggesting no primary respiratory pathology. Laboratory findings provide further objective data. Hematology shows a white blood cell count (WBC) of 14.5 x 10^3/L, indicating leukocytosis. Leukocytosis, an elevated WBC count, is a common response to infection, inflammation, or stress. The neutrophil count is elevated at 85%, indicating neutrophilia, a specific type of leukocytosis often associated with bacterial infection or acute inflammation. Lymphocytes are 10%, monocytes 4%, and eosinophils 1%. Hemoglobin is 13.2 g/dL, hematocrit 40%, and platelets 250 x 10^3/L, all within normal limits. Biochemistry reveals some abnormalities. Sodium is 138 mmol/L, potassium 3.2 mmol/L (hypokalemia), and chloride 99 mmol/L. Hypokalemia, or low potassium, can result from vomiting, decreased oral intake, or fluid shifts within the body, and it can affect cardiac and muscle function. Bicarbonate is 23 mmol/L, BUN 25 mg/dL (mildly elevated), and creatinine 1.4 mg/dL (mildly elevated). Elevated BUN and creatinine can indicate dehydration or impaired renal function. Glucose is 115 mg/dL, lactate 2.1 mmol/L (borderline high), albumin

3.4 g/dL (slightly low), and calcium 8.9 mg/dL. Elevated lactate suggests tissue hypoperfusion, which could be a sign of bowel ischemia. Low albumin can be a sign of malnutrition or fluid shifts. Liver function tests show total bilirubin 0.8 mg/dL, AST 25 U/L, ALT 22 U/L, and alkaline phosphatase 80 U/L, all within normal limits. Coagulation studies show PT 12.5 sec, INR 1.1, and aPTT 30 sec, all within normal limits. Urinalysis shows specific gravity 1.025, trace ketones, and is otherwise negative. The presence of ketones in the urine suggests the body is breaking down fat for energy, which can occur during periods of starvation or dehydration. Imaging findings from plain abdominal radiography (supine and erect views) are significant. Multiple, centrally located, dilated small bowel loops are observed (diameter up to 4.5 cm). Prominent valvulae conniventes, creating a "stepladder" appearance, are also noted, a classic sign of small bowel obstruction. Multiple distinct air-fluid levels are seen on the erect films, further supporting the diagnosis of obstruction. Paucity of gas in the large bowel indicates the obstruction is proximal. No definite free intraperitoneal air is visualized, which is important as it suggests no immediate bowel perforation. Chest radiography reveals clear lung fields, a normal cardiomediastinal silhouette, and mild degenerative changes of the thoracic spine. The pre-operative clinical diagnosis is acute abdomen secondary to mechanical small bowel obstruction, etiology undetermined but with high suspicion for incarcerated hernia (likely femoral given demographics) despite negative physical findings. Differential diagnoses include adhesions (though no surgical history), volvulus, or possibly neoplasm (less likely presentation) (Table 1).

The patient's management began with initial stabilization within the emergency department setting. This critical first phase focused on addressing the acute nature of her presentation and preparing her for surgical intervention. A cornerstone of this initial management involved aggressive intravenous fluid resuscitation utilizing isotonic crystalloids. This intervention was aimed at correcting any fluid deficits

that may have resulted from the patient's vomiting, obstipation, and potential third-spacing of fluids due to bowel obstruction. Adequate fluid resuscitation is paramount in stabilizing patients with bowel obstruction, as it helps to maintain hemodynamic stability and optimize organ perfusion. In conjunction with fluid resuscitation, the patient was placed on a nil-by-mouth (NPO) status. This decision is fundamental in the management of bowel obstruction, as it prevents any further oral intake from exacerbating the condition and reduces the risk of vomiting and aspiration. To further decompress the gastrointestinal tract, a nasogastric tube (NGT) was inserted. The NGT was used to suction and drain approximately 500ml of gastric contents, effectively relieving some of the distension and pressure within the upper digestive system. This decompression not only provides symptomatic relief but also reduces the risk of aspiration and can improve the patient's overall condition prior to surgery. A urinary catheter was also inserted to closely monitor the patient's urine output. Accurate monitoring of urine output is essential in assessing the patient's fluid balance and renal function, particularly in the context of aggressive fluid resuscitation. It provides real-time information on the effectiveness of fluid therapy and helps to detect any early signs of renal compromise. To mitigate the risk of infection, prophylactic intravenous antibiotics were administered. The antibiotic regimen consisted of Ceftriaxone and Metronidazole, a combination that provides broad-spectrum coverage against both aerobic and anaerobic bacteria. Prophylactic antibiotics are a standard of care in surgical cases involving the gastrointestinal tract, especially when bowel obstruction or potential bowel compromise is present, as they significantly reduce the incidence of postoperative infections. Prior to proceeding with any invasive intervention, informed consent was obtained from the patient. This process ensures that the patient is fully aware of the nature of the proposed procedure, its potential risks and benefits, and the alternative treatment options available. Obtaining informed consent is a fundamental ethical and legal

requirement in medical practice. The surgical intervention was performed under general anesthesia with endotracheal intubation. General anesthesia ensures that the patient is completely unconscious and pain-free during the procedure, while endotracheal intubation provides a secure airway and allows for controlled ventilation. This level of anesthesia is necessary for complex abdominal surgeries to ensure patient safety and comfort. The patient was positioned supine with both arms tucked at her sides. This positioning is standard for most abdominal laparoscopic procedures, providing optimal access to the abdomen for the surgical team. The surgical approach chosen was an emergency exploratory laparoscopy. Laparoscopy, a minimally invasive surgical technique, offers several advantages, including smaller incisions, less postoperative pain, and faster recovery compared to traditional open surgery. In this emergent situation, laparoscopy allowed for both diagnostic exploration and therapeutic intervention. Laparoscopic access was achieved through a series of steps. Initially, a Veress needle was inserted supra-umbilically to create a pneumoperitoneum. Pneumoperitoneum involves insufflating the abdominal cavity with carbon dioxide gas to create space for visualization and manipulation of the abdominal organs. The pressure of the pneumoperitoneum was maintained between 12-14 mmHg. Following the establishment of pneumoperitoneum, a 10mm optical trocar was inserted through the umbilicus, serving as the primary port for the laparoscope. Two additional 5mm working trocars were placed in the left iliac fossa and the right lower quadrant, providing access for surgical instruments. Intraoperative findings revealed several critical abnormalities. Dilated small bowel loops were observed proximal to the distal ileum, indicating an obstruction in the distal small intestine. The bowel distal to the obstruction was collapsed, further confirming the presence of a blockage. A small amount of serous pelvic fluid was present, which can be a non-specific finding in bowel obstruction. Crucially, an incarcerated loop of distal ileum was found within the

right femoral canal. The incarcerated segment appeared edematous and dusky, suggesting compromised blood flow. Upon reduction, a 4 cm segment of ileum (approximately 60 cm from the ileocecal valve) was identified as frankly necrotic, exhibiting black, non-viable tissue. The surgical procedure involved several key steps. First, reduction of the incarcerated ileum from the femoral canal was performed using gentle manipulation. This step aimed to relieve the obstruction and allow for assessment of the bowel's viability. Following reduction, laparoscopic resection of the 4 cm necrotic ileal segment was performed. This involved sealing and dividing the mesenteric vessels supplying the necrotic segment using an energy device, and then transecting the bowel proximally and distally with a linear cutting stapler (60mm). The resected specimen was placed in a retrieval bag for later removal. An ileoileal anastomosis was then created laparoscopically. A side-to-side functional end-to-end anastomosis was performed using linear cutting stapler(s). The common enterotomy created during the anastomosis was closed with a stapler or suture. This step restored the continuity of the small bowel. The mesenteric defect created during the bowel resection was closed with interrupted sutures to prevent internal herniation. Hernia repair of the right femoral defect was then performed. This involved primary suture repair using non-absorbable braided suture (0-Ethibond) to approximate Cooper's ligament to the iliopubic tract/inguinal ligament, carefully avoiding the femoral vein. Finally, irrigation and closure were performed. The abdominal cavity was irrigated with warm saline to remove any debris or contaminants. Hemostasis was confirmed to ensure no active bleeding. The specimen was removed via the umbilical port, and the port site fascial (10mm) and skin incisions were closed. The estimated blood loss during the procedure was less than 50 ml, indicating a relatively low blood loss surgery. The operative time was 150 minutes. Postoperative management involved transferring the patient to the surgical ward rather than the intensive care unit, signifying a stable postoperative condition. Intravenous fluids were continued until the patient could adequately tolerate oral intake. Intravenous analgesics were administered for pain management and were transitioned to oral analgesics as tolerated. The nasogastric tube was removed on Post-Op Day (POD) 2, after the patient passed flatus, indicating the return of bowel function. The urinary catheter was also removed on POD 2. Early mobilization was encouraged, with assisted mobilization beginning on POD 1 and independent mobilization on POD 3. The patient's diet was advanced gradually, starting with clear liquids on POD 3 and progressing to a regular diet by POD 6. Wound care was provided for the port sites to prevent infection and promote healing. The patient's hospital course was uneventful. She recovered well, tolerated diet advancement without any issues, and showed no signs of anastomotic leak or infection. The length of her hospital stay was 7 days, and she was discharged on POD 7. Follow-up care included outpatient surgical clinic visits scheduled at 1 month, 6 months, and 12 months post-discharge. At these follow-up visits, the patient reported being completely asymptomatic, with regular and normal bowel function. She experienced no abdominal pain or discomfort and had returned to her usual daily activities without limitations. The port site wounds healed well, with good cosmesis. Importantly, there was no clinical evidence of hernia recurrence in the right groin (femoral or inguinal), and she reported no symptoms or signs of chronic groin pain (inguinodynia). The overall outcome at 1 year was excellent, with full recovery and no complications or recurrence (Table 2).

Table 1. Summary of patient's clinical findings.

Category	Findings / Details
Demographics	
Age	63 years old
Gender	Female
Ethnicity	Javanese
Occupation	Housewife
Habits	Non-smoker; Occasional traditional beverage consumption; No history of illicit drug use
Anamnesis (History)	
Chief complaint	Severe, intermittent abdominal pain
History of present illness	- 3-day duration of progressively worsening abdominal pain (described as intermittent, cramping/colicky, generalized); Obstipation (no stool or flatus) for 2 days; Abdominal bloating/distension noted by patient; Nausea and multiple episodes (5-6 times in last 24h) of non-bilious vomiting; Delay in seeking medical care (~3 days) cited due to financial/transportation issues
Past medical history	Generally healthy; No history of hypertension, diabetes, heart disease, or known gastrointestinal conditions
Past surgical history	None
Trauma history	Denied recent or past significant abdominal trauma
Family history	No known family history of hernias, bowel obstruction, or gastrointestinal malignancy
Medications	No regular prescription or over-the-counter medications
Allergies	No known drug allergies
Physical examination	
General appearance	Appeared weak, fatigued, and in moderate pain-related distress; cooperative
Vital signs	- Blood Pressure: 128/82 mmHg; Heart Rate: 96 bpm (regular); Respiratory Rate: 25 breaths/min (slightly tachypneic); Temperature: 37.0°C (Axillary); Oxygen Saturation: 97% on room air
Anthropometry	Height: 155 cm; Weight: 58 kg; BMI: 24.1 kg/m² (Normal weight)
Abdominal examination	- Inspection: Marked, generalized abdominal distension; No visible scars or hernia bulges; Umbilicus centrally located; Inspection: Marked abdominal distension; No visible scars or hernia bulges; Umbilicus centrally located; Auscultation: Initially hyperactive, high-pitched ("tinkling") bowel sounds; later became hypoactive; Palpation: Generalized tenderness, worse in lower abdomen; No guarding or rebound tenderness; No organomegaly; Percussion: Tympanitic throughout; Groin Exam: Meticulous examination revealed NO palpable mass, bulge, tenderness, or erythema in bilateral inguinal or femoral regions, even with cough/Valsalva
Rectal examination	Collapsed rectal ampulla; Empty vault; Smooth mucosa; No masses palpable; Slightly mucoid discharge noted on examining glove; Sphincter tone normal
Cardiovascular exam	Regular rhythm; No murmurs, gallops, or rubs; Peripheral pulses palpable and symmetric
Respiratory exam	Clear breath sounds bilaterally; Good air entry; No wheezes or crackles
Laboratory findings	
Hematology	- WBC: 14.5 x 10³/L (Leukocytosis); Neutrophils: 85% (Neutrophilia); Lymphocytes: 10%; Monocytes: 4%; Eosinophils: 1%; Hemoglobin: 13.2 g/dL; Hematocrit: 40%; Platelets: 250 x 10³/L
Biochemistry	- Sodium: 138 mmol/L; Potassium: 3.2 mmol/L (Hypokalemia); Chloride: 99 mmol/L; Bicarbonate: 23 mmol/L; BUN: 25 mg/dL (Mildly Elevated); Creatinine: 1.4 mg/dL (Mildly Elevated); Glucose (random): 115 mg/dL; Lactate: 2.1 mmol/L (Borderline High); Albumin: 3.4 g/dL (Slightly low); Calcium: 8.9 mg/dL
Liver function	- Total Bilirubin: 0.8 mg/dL; AST: 25 U/L; ALT: 22 U/L; Alkaline Phosphatase: 80 U/L (All within normal limits)
Coagulation	- PT: 12.5 sec; INR: 1.1; aPTT: 30 sec (All within normal limits)
Urinalysis	Specific Gravity 1.025; Trace ketones; Otherwise negative
Imaging findings	
Plain abdominal radiography (Supine & Erect)	- Multiple, centrally located, dilated small bowel loops (diameter up to 4.5 cm); Prominent valvulae conniventes ("stepladder" sign); Multiple distinct air-fluid levels on erect film; Paucity of gas in the large bowel/colon; No definite free intraperitoneal air visualized
Chest radiography	Clear lung fields; Normal cardiomediastinal silhouette; Mild degenerative changes of the thoracic spine noted
Pre-operative clinical diagnosis	Acute Abdomen secondary to Mechanical Small Bowel Obstruction; Etiology undetermined but high suspicion for incarcerated hernia (likely femoral given demographics) despite negative physical findings; Differential diagnoses included adhesions (though no surgical history), volvulus, or possibly neoplasm (less likely presentation).

Table 2. Summary of treatment procedure and follow-up.

Category	Details
Pre-operative preparation	- Initial stabilization in Emergency Department; Aggressive IV fluid resuscitation (Isotonic crystalloids); Nil-by-mouth status; Nasogastric tube (NGT) insertion for decompression (drained ~500ml); Urinary catheter insertion; Prophylactic IV antibiotics (Ceftriaxone & Metronidazole); Informed consent obtained
Anesthesia	General anesthesia with endotracheal intubation
Patient positioning	Supine, both arms tucked
Surgical approach	Emergency Exploratory Laparoscopy
Laparoscopic access	- Veress needle insertion (supra-umbilical); Pneumoperitoneum established (12-14 mmHg); 10mm optical trocar (umbilicus); Two 5mm working trocars (left iliac fossa; right lower quadrant)
Intraoperative findings	- Dilated small bowel loops proximal to distal ileum; Collapsed distal bowel; Small amount serous pelvic fluid; Incarcerated loop of distal ileum found within the right femoral canal; Incarcerated segment appeared edematous and dusky; Upon reduction: 4 cm segment of ileum (approx. 60 cm from ileocecal valve) identified as frankly necrotic (black, non-viable)
Surgical procedure steps	1. Reduction: Gentle manipulation to reduce incarcerated ileum from femoral canal; 2. Bowel Resection: Laparoscopic resection of the 4 cm necrotic ileal segment; Mesenteric vessels sealed and divided (energy device); Bowel transected proximally and distally with linear cutting stapler (60mm); Specimen placed in retrieval bag; 3. Anastomosis: Laparoscopic side-to-side functional end-to-end ileoileal anastomosis created using linear cutting stapler(s); Common enterotomy closed with stapler/suture; 4. Mesenteric Closure: Mesenteric defect closed with interrupted sutures; 5. Hernia Repair: Primary suture repair of the right femoral defect; Purse-string stitches using non-absorbable braided suture (0-Ethibond) approximating Cooper's ligament to iliopubic tract/inguinal ligament, avoiding femoral vein; 6. Irrigation & Closure: Abdominal irrigation (warm saline); Hemostasis confirmed; Specimen removal via umbilical port; Port site fascial (10mm) and skin closure
Estimated blood loss	< 50 ml
Operative time	150 minutes
Postoperative management	- Transfer to surgical ward (not ICU); IV fluids continued until adequate PO intake; IV antibiotics continued (5 days total); Pain management (IV analgesics transitioned to PO); NGT removed on Post-Op Day (POD) 2 (after flatus); Urinary catheter removed POD 2; Early mobilization (assisted POD 1, independent POD 3); Diet advanced gradually (clear liquids POD 3, regular diet POD 6); Wound care for port sites
Hospital course	Uneventful recovery; Tolerated diet advancement well; No signs of anastomotic leak or infection
Length of stay	7 days (Discharged on POD 7)
Follow-up schedule	Outpatient surgical clinic visits at 1 month, 6 months, and 12 months post-discharge
Follow-up findings (at 1, 6, 12 months)	- Patient completely asymptomatic; Regular, normal bowel function reported; No abdominal pain or discomfort; Returned to usual daily activities without limitation; Port site wounds well-healed, good cosmesis; No clinical evidence of hernia recurrence in the right groin (femoral or inguinal); No symptoms or signs of chronic groin pain (inguinodynia)
Overall outcome (at 1 year)	Excellent; Full recovery with no complications or recurrence

3. Discussion

The case presented herein underscores a significant clinical challenge in the diagnosis of femoral hernias and their potential to manifest without the classic, readily palpable groin mass. While the typical presentation of a femoral hernia involves a noticeable bulge inferior to the inguinal ligament and medial to the femoral pulse, this is not a universal finding. In this instance, the patient presented with acute symptoms of small bowel obstruction – severe, intermittent abdominal pain, obstipation, abdominal distension, nausea, and vomiting – yet meticulous physical examination, even with provocative maneuvers like cough and Valsalva, failed to reveal any palpable mass, bulge, tenderness, or erythema in either the inguinal or femoral regions. This "occult" presentation can be attributed to several factors. In some individuals, particularly those with obesity, the presence of excess subcutaneous fat can obscure even a moderately sized hernia, making it difficult to detect

on physical examination. The hernia sac itself may be small, or its contents may reduce spontaneously, further complicating detection. Additionally, the anatomical course of the hernia can vary in rare instances, the hernia sac may migrate superiorly, potentially mimicking an inguinal hernia or leading to complete diagnostic ambiguity. The absence of specific groin signs in the context of acute abdominal symptoms can lead clinicians to consider a broader differential diagnosis, potentially delaying the recognition of the true underlying pathology. The differential diagnosis for acute small bowel obstruction is extensive and includes common conditions such as adhesive small bowel obstruction (often secondary to prior abdominal surgery), volvulus, intussusception, and inflammatory bowel disease, as well as less frequent etiologies like internal hernias, gallstone ileus, and bowel tumors. In female patients, particularly in the older age group, femoral hernia should always be considered, even in the absence of palpable groin findings, due to its higher propensity for incarceration and strangulation. Failure to promptly diagnose and treat a strangulated femoral hernia can have severe consequences, including bowel necrosis, perforation, sepsis, and even death. This case highlights the importance of maintaining a high index of suspicion for femoral hernia in patients presenting with unexplained bowel obstruction, especially in women. It also underscores the limitations of physical examination alone in definitively excluding this diagnosis. The reliance on clinical acumen, coupled with appropriate diagnostic modalities, becomes paramount in ensuring timely and accurate management. [11-15]

Given the diagnostic challenges associated with occult femoral hernias, as exemplified in the presented case, imaging modalities play a crucial role in confirming the diagnosis and guiding subsequent management. While plain abdominal radiography is a standard initial step in evaluating patients with suspected bowel obstruction, its utility in specifically identifying a femoral hernia as the cause of the obstruction is limited. Plain films primarily demonstrate the signs of obstruction itself, such as dilated small bowel loops, air-fluid levels, and a paucity of gas in the colon, as seen in this case. They do not reliably visualize the hernia defect or the incarcerated contents, especially when the hernia is small or obscured. In cases where the clinical suspicion for femoral hernia remains high despite a negative physical examination, or when the diagnosis is uncertain, additional imaging studies are warranted. Groin ultrasound is a non-invasive and readily available modality that can be useful in evaluating groin hernias. Ultrasound allows for dynamic assessment of the groin region, enabling visualization of the hernia sac and its contents during maneuvers that increase intra-abdominal pressure, such as Valsalva. It can also help differentiate between inguinal and femoral hernias by delineating their anatomical relationship to the inferior epigastric vessels and the pubic tubercle. However, ultrasound is operator-dependent, and its accuracy can be limited by factors such as patient body habitus and the presence of bowel gas. Computed tomography (CT) scanning of the abdomen and pelvis is generally considered the gold standard imaging modality for the diagnosis of femoral hernias, particularly in cases of suspected complications like incarceration or strangulation. CT provides excellent anatomical detail, allowing for precise localization of the hernia defect, identification of the hernia contents, and assessment of bowel viability. In cases of strangulation, CT can reveal signs of bowel ischemia, such as bowel wall thickening, mesenteric stranding, and the presence of free fluid. CT can also identify other potential causes of abdominal pain or obstruction, further aiding in the diagnostic process. While CT scanning offers superior diagnostic accuracy, it is associated with higher cost and radiation exposure compared to ultrasound. In the emergent setting of acute bowel obstruction, the decision to proceed directly to surgical exploration without pre-operative CT scanning may be made based on the patient's clinical condition and the availability of resources. In this case, the patient's clinical presentation and plain radiographic findings were

suggestive of small bowel obstruction, prompting exploratory laparoscopy. The laparoscopic approach not only served as a diagnostic tool, confirming the presence of an incarcerated femoral hernia, but also allowed for definitive surgical management. [16-20]

4. Conclusion

The presented case elucidates the intricate challenges associated with diagnosing and managing incarcerated femoral hernias, particularly when they manifest as acute bowel obstruction without distinct external signs. The absence of a palpable groin mass in this patient underscores the potential for femoral hernias to present occultly, necessitating a high degree of clinical suspicion, especially in female patients. Laparoscopy proved to be an invaluable tool in this scenario, facilitating both the accurate diagnosis of the incarcerated hernia and the effective management of the bowel necrosis and hernia defect. The minimally invasive nature of the laparoscopic approach allowed for simultaneous bowel resection and anastomosis, along with hernia repair, potentially contributing to the patient's favorable postoperative recovery and outcome. This case reinforces the importance of considering femoral hernia in the differential diagnosis of acute small bowel obstruction, even when physical examination findings are inconclusive. Furthermore, it advocates for the judicious use of laparoscopy as a safe and effective strategy for managing such complex surgical emergencies, offering the potential for reduced morbidity and enhanced recovery.

5. References

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