

Pathogenesis of peritoneal drain complications; a case report of evolving adnexal evisceration following difficult retrieval of a retained peritoneal drain

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Abstract

Background: Intra-peritoneal drainage dates back to the time of Hippocrates when long bone tissue, metal, and glass tubes were employed. The benefit of routine intra-peritoneal drainage however remains debatable in contemporary times. Retained drains may be outward manifestations of more sinister or latent complications and how an entrapped surgical drain is removed, may determine the occurrence of further complications.

Case Presentation: We report here the case of a 32-year-old primipara who had a retained improvised peritoneal drain, which was inserted during the cesarean section for continued oozing of serosanguineous fluid. Omental tissue found at laparoscopy, to have plugged a fenestration in the drain, was promptly relieved. A loop of the Fallopian tube was however later observed trapped in another fenestration and herniating into the stab incision of the drain tube towards the exterior, this was freed with an atraumatic laparoscopic grasper and drain tube retrieval completed under laparoscopic visualization.

Conclusion: Insertion of the peritoneal drain during cesarean section should be carefully considered, when necessary; it should be done with the most appropriate drainage systems. Retrieval of the peritoneal drain is a risk factor for visceral herniation. Entrapped drains should be retrieved, under direct visualization, to prevent iatrogenic injuries.

Keywords: Hernia, laparoscopy, peritoneal drains, retention

Background

Peritoneal drains are widely employed in a diverse range of surgeries involving the abdominal cavity. The use of drainage tubes in humans dates back to the time of Hippocrates when long bone tissue, metal, and glass tubes were used (1).

Surgical drains are appliances that are used to channel collections or potential collections of blood, pus, or other body fluid from cavities or potential spaces, to the exterior, to prevent the formation of abscesses and allow tissue apposition and good wound healing (1, 2). Peritoneal drains could be therapeutic when an abscess cavity is encountered de-novo;

diagnostic, for post-operative intraperitoneal hemorrhage for instance after myomectomy or hysterectomy; they could be prophylactic by preventing abscess formation and palliative in cases where continuous peritoneal drainage of ascitic fluid is required for example in chronic liver disease (3). A particular drain could serve any combination of these purposes.

Intra-peritoneal drain placement is however associated with some risks ranging from minor unnoticeable, through life-altering such as infertility, to life-threatening as in the case of visceral evisceration or perforation (3, 4, 5, 6). The benefit of routine drain placement for different varieties of abdominal surgeries has

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remained a debate in contemporary times (4, 5, 7, 8). The growing knowledge that drains are not as innocuous as earlier considered, calls for careful consideration of the decision to place them. The findings from studies remain controversial, thus leading to discordant recommendations. The major factor driving these studies is the risk of adverse outcomes from drain placement (7).

Retained drains may be the outward manifestation of more sinister intra-peritoneal drain complications and how an entrapped surgical drain is removed, may determine the outcome of other complications associated with it.

Minimal access gynecologic surgery is fast becoming popular in low and middle-income countries. Successful laparoscopic management of cesarean section complications has also been well documented (9, 10, 11).

We present here a 32-year-old para 1, who had laparoscopic retrieval of an entrapped post-cesarean section (CS) peritoneal drain, together with detection of an evolving iatrogenic second complication.

Case Presentation

A 32-year-old primipara, who had an emergency cesarean section at 36 weeks gestational age, on account of severe preeclampsia was referred to the gynecologic endoscopic surgery unit. She had undergone an emergency appendectomy eight years earlier, which was complicated by adhesions that were encountered during the cesarean section, blunt and sharp adhesiolysis was done and an improvised closed tube external drain fashioned from a size 18Fr nasogastric tube was inserted into the right iliac fossa, through a stab wound in the anterior abdominal wall. The nasogastric tube was adapted for use by the creation of eight oval-shaped fenestrations, on different sides of the tubal surface using Mayo scissors. Each of the fenestrations measured approximately 5mm in the widest diameter. The tube was then connected to a sterile drainage bag. The drain placement was indicated by the fact of the adhesiolysis and continued serosanguineous fluid collection intra-operatively. The effluent from the drain tube however progressively reduced, from 350ml immediately postoperatively, through 120ml after 24 hours, to 60 milliliters, after 48 hours of the cesarean section. Attempts to remove the drainage tube which was longer active on the third postoperative day, by the usual gentle traction, however, proved abortive.

She was then scheduled for laparoscopic peritoneal drain retrieval. At this time, she had made a good postpartum recovery, her blood pressure was 124/78 mmHg and her uterine size was 14 weeks. Urinalysis was negative for protein and glucose, the electrolytes and urea, creatinine, and liver enzymes were within normal ranges.

Laparoscopy was done under general anesthesia, on the 4th post-CS day, with carbon dioxide insufflation at a flow rate of 1.5L/min, with a pre-set pressure of 15mmHg. Entry was through a transverse incision in one of the skin creases skirting the umbilicus superiorly, with the surgeon working from the left side of the patient, a 10mm port was used to convey the telescope in, and two ipsilateral 5mm accessory ports, 4cm and 8cm above the left iliac crest respectively were used.

An initial diagnostic laparoscopy was done and a segment of omental tissue was found sucked into and plugging one of the improvised fenestrations in the drain tube for a 1cm length within it (Fig 1). The adjoining portion of the omentum was cauterized with monopolar diathermy and excised, leaving the gangrenous portion within the drainage tube for removal (Fig 2). Traction was then applied on the extra-abdominal portion of the tube to aid extraction, at this time, the uterus was allowed to rest momentarily, against the posterior Cul-de-sac, while the tube was being extracted, then another important observation was made; a loop of Fallopian tube had herniated into another fenestrated portion and traction on the drain was dragging the right Fallopian tube into the tract of the stab incision of the drain tube towards the exterior (Fig 3). Traction was immediately stopped and the Fallopian tube was freed from the drain tube with the aid of an atraumatic laparoscopic grasper; drain removal was then completed under laparoscopic visualization (Fig 4). The drainage stab wound was repaired under vision with a Storz-type port closure device and the CO₂ gas was let out by releasing the valves on the accessory cannulas, which were subsequently removed under direct vision. The primary cannula was then removed over the telescope, such that the telescope was extruded last, to prevent port site hernia. The two fascial ends of the primary entry point were then grasped with Allis' clamps and closed in a continuous fashion using polyglactin size 1 suture while the subcutaneous layers of all the entry ports were closed with a continuous technique using polyglactin size 2/0. The skin incisions were repaired with a subcuticular continuous technique using the same suture. She was

administered analgesics and antibiotics and then discharged home on the second day of laparoscopy. She was seen in the postnatal clinic twice and had no complaints.

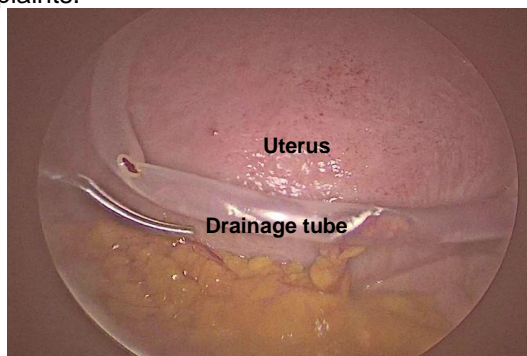


Fig 1: Laparoscopic view of omental tissue sucked into the improvised drain fenestration

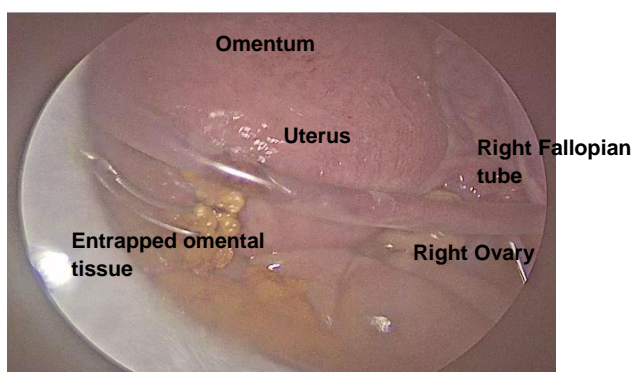


Fig 2: The entrapped omental tissue was excised with monopolar cautery

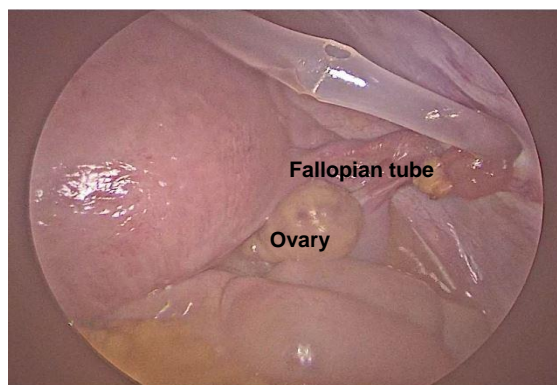


Fig 3: Evolving evisceration of the Fallopian tube into the drain skin incision on the anterior abdominal wall.

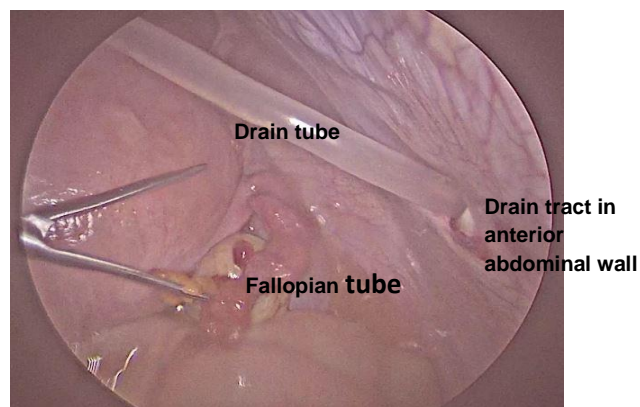


Fig 4: The Fallopian tube and ovaries were freed with an atraumatic laparoscopy grasper and the drain tube was removed gradually under the direct laparoscopic vision and the peritoneal cavity was inspected.

Discussion

Peritoneal drain placement may be indicated when hemostasis is in doubt or when surgery has been difficult (12). The patient being presented falls into such a category, as she had peritoneal adhesiolysis, which was followed by continued intraoperative peritoneal fluid collection. Routine peritoneal drain placement after cesarean section however remains debatable. A prospective study has found that routine peritoneal drain placement for CS, portends a greater risk of adverse outcomes, than non-placement and thus should be stopped (4). A systematic review also concluded that there is no benefit for routine wound drainage for cesarean section (13). Routine drain placement after a variety of abdominal surgeries also remains controversial (5, 7).

Pelvic drains have been placed in cases where the source of the peritoneal fluid collection could not be found (14). Idiopathic allergic or inflammatory fluid collection has been hypothesized as a reason for peritoneal fluid collection (14). In retrospect, however, continuous transudation of fluid into the third space like the peritoneal cavity may be the reason for this as this patient had preeclampsia, which is associated with high capillary hydrostatic pressure and varying degrees of vascular endothelial damage both of which could result in fluid transudation into the third spaces (15).

The complications of peritoneal drains are often mechanical, ranging from drain migration to evisceration of structures like the omentum, loops of the small intestine, and appendages of the large bowel during drain removal (5). Omentum could have been pulled out of the drain stab wound, or iatrogenically transected with resultant undetected bleeding, if greater force had been applied to the entrapped drain, in our case presentation. Visceral evisceration requiring a second laparotomy had been reported in a case that ended as a fatality (16). Migration of drain tubes into a diverting loop ileostomy has also been reported (17).

Drain site hernia is a later complication that typically occurs after the drain tube had been removed (6). Structures that have been observed in a drain site hernia include small bowel loops, omentum, and the appendix with the risk of obstruction or strangulation (4, 5, 6). Herniation of the Fallopian tube and ovary could have complicated drain removal in our case with the risk of strangulation, gangrene,

tubal blockage, and infertility, which may never be detected if the drainage tube had been pulled out without visualization. Fallopian tube herniation through the drain site is a recognized complication as found in a case report (18) and in a prospective study investigating routine drain placement for cesarean section, where an incidence of 1.6% was observed (4).

Other complications of peritoneal drain insertion include; intestinal adhesions and obstruction (5), which resulted in a fatality from prophylactic placement for persistent ascites of chronic liver disease (3). Drain site infection is another recognized complication of peritoneal drain insertion (4, 7, 13, 16). Peritoneal drainage has been associated with a significant increase in the requirement for intravenous antibiotics, late onset of oral feeding, longer operative time, and increased length of hospital stay (19). Early complications of post-cesarean section peritoneal drainage include; bleeding from the drain site requiring surgical intervention, drain kinking, drain avulsion, drain fracture, and persistent leakage of fluid from drain site after removal (4, 5).

The pathogenesis of these complications could be explained by the relative changes in intra-abdominal pressure and movements; from respiratory excursions to the peristaltic waves and peritoneal fluid turnover. These movements may result in the occlusion of drain fenestrations or tissue wrapping around them. The suction pressure created by active drains such as the Jackson-Pratt drain creates a theoretical risk for entrapment of structures within the drain fenestrations. Judicious use of these drains for the appropriate purposes largely reduces this risk as the drainage schedule could be low continuous, low intermittent, or high suction drainage (8, 22). In a postpartum abdomen, the reduction of uterine size, following uterine involution could allow for omentum and loops of the small bowel to drop into the posterior cul de sac, the most dependent portion in the pelvis, where drains are usually inserted, as occurred in the case being presented. Traction on the drain tube could drag the entrapped viscus towards the stab wound of the anterior abdominal wall leading to evisceration, which may be obvious immediately or much later if it does not reach the exterior, leading to a drain site hernia.

The predisposing factors for drain complications include; the use of improvised

drainage tubes as in our case presentation, which may have some defects including varying numbers and sizes of fenestrations, wider fenestrations predispose to entrapment of tissues within the lumen. Kinking of the tube at insertion, the size, and direction of the drain stab wound, and some patient characteristics like general debilitating illness, steroid therapy, and post-operative increase in intra-abdominal pressure are also recognized risk factors. A longer duration of drainage is also an independent risk factor for drainage complications (3, 4, 6, 21).

In the past, entrapped drainage tubes were managed with laparotomy (3, 4). Balloon angioplasty inserted through the drain site for removal has also been tried (23).

Successful laparoscopic retrieval of retained whole and fractured peritoneal drains after appendectomy has been reported (21). The laparoscopic approach has been applied successfully for a broad range of cesarean section complications such as abscess drainage, pelvic adhesiolysis, and repair of isthmocoele (9, 10, 11).

Laparoscopy is less invasive and provides an opportunity to retrieve the drainage tube under direct vision to prevent further complications of retrieval as observed in this case. It does not add to the duration of hospital stay and would not increase the risk of further drain placement from iatrogenic laparotomy injuries. The risk of postoperative infection is also less (9, 10, 21).

Conclusion

Insertion of peritoneal drains during cesarean section should be carefully considered, when necessary, it should be done with the most appropriate drain system, that allows for easy removal and with minimal risk of retention. Retrieval of the peritoneal drain is a risk factor for a visceral herniation in the case of an entrapment; it is recommended that drain retrieval should be done by laparoscopy, to prevent further complications.

List of abbreviations

CS: Caesarean section
cm: centimetre
FR: Flow rate
L/min: Litres per minute
mm: millimetres
mmHg: millimetres of Mercury

Declarations

Ethics consideration

Ethical approval was obtained from the institutional health and research ethics

committee with protocol number: BUHREC717/21.

Consent for publication

The authors hereby give consent for the publication of this work under the Creative Commons CC Attribution. Non-commercial 4.0 license. Signed informed consent for publication was obtained from the patient.

Availability of data

Patient case records are available in the case files and hospital records.

Competing interests

The authors declare that they have no conflicts of interest.

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Authors' Contributions

JOI: concept, data acquisition, article writing, and final review

FAO: article writing and final review

CCN: data acquisition and final review

OA: data acquisition and final review.

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