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Case Report

Retained Endoloop ligature plastic tube, an unusual complication post appendicectomy

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ABSTRACT

Laparoscopic appendicectomies are one of the most common emergency operations. The use of ligatures is considered a safe technique for securing the appendiceal base. We describe a rare but important complication of this technique, with retention of the plastic tube from a polydioxanone (PDS) ligature in the abdominal cavity of a patient. A 64-year-old male presented with acute on chronic abdominal pain seven months following a laparoscopic appendicectomy. A CT demonstrated a bizarre linear tract extending from the bowel mesentery and right liver with associated pleural effusion. The patient underwent an exploratory laparoscopy, which identified a chronic peritonealised tract containing a plastic Endoloop® (Ethicon, Bridgewater, NJ, USA) sheath, traversing through the small and large bowel mesentery, through the right liver and diaphragm. The hard plastic tube was retrieved from the abdomen and the diaphragm repaired laparoscopically. The patient's severe chronic pain resolved immediately postoperatively. The use of Endoloop® ligatures provides a simple and affordable method for appendiceal stump closure. Notably in many Australian hospitals, the Endoloop® plastic sheaths are not part of the final instrument count in an appendicectomy. Retention of the plastic ligature tube is a rare complication, with the literature only reporting one other case of this occurring following a cholecystectomy. This rare case of retention of the Endoloop® plastic sheath led to significant pain and morbidity and a second operation in this patient. This is the first reported case of this complication in the literature following an appendicectomy.

Keywords: Appendicectomy, Appendectomy, Foreign body, Endoloop®

INTRODUCTION

Acute appendicitis is the most common intra-abdominal surgical emergency in the world and thus appendicectomies are the most common emergency surgical procedure.[1,2] In Australia, approximately 29,000 emergency appendicectomies are performed each year.[2]

Closure of the appendiceal base is a crucial step in a laparoscopic appendicectomy and there are several recognised methods to do this.[1,3] These can be broadly categorised into mechanical devices (such as staplers, electrothermal devices and clips) and ligatures, including intracorporeal or extracorporeal ligatures such as Endoloops® (Ethicon, Bridgewater, NJ, USA).[4] In a 2017 Cochrane review comparing these methods, which consisted of eight randomised controlled trials, there was found to be no difference in intra-operative or post-operative complication rates or other clinically significant outcomes (such as length of hospital stay or postoperative pain).[4] Endoloops® are considered a safe and cost-effective option for securing the base. Stapler devices, by comparison, are at least four times more expensive.[1,4] Some disadvantages of Endoloops® include that they are more technically demanding, requiring a level of laparoscopic dexterity.[1] In addition, Endoloops® cannot be used when there is an unhealthy appendiceal base.[1,3] The Endoloop® consists of a long PDS or Vicryl ligature in a plastic tube. The suture is formed in a ligature loop with a slip knot (Figure 1). Plastic tube demonstrated.

Once the ligature is correctly placed around the appendiceal base, it is tightened and plastic tube is retrieved from patient's abdomen.[5] It is worth noting, that Endoloop ligatures are not part of the final instrument count by theatre nursing staff at the end of the operation in most Australian Hospitals.

Figure 1: Endoloop® ligature by Ethicon, including packaging.

In this case, we describe a rare but important complication of this technique, with retention of the plastic tube from an Endoloop® ligature in the abdominal cavity of a patient, leading to significant patient suffering and morbidity and the need to return to theatre. This complication following a laparoscopic appendicectomy has never been previously described in the literature.

CASE REPORT

Background

A 64-year-old male underwent a laparoscopic appendicectomy. Operative findings were concordant with final histopathology, demonstrating acute uncomplicated appendicitis, and the patient was discharged home two days after.

Past medical history consisted of obesity (BMI of 32) and Parkinson's disease with a deep brain stimulator (DBS) *in situ*.

Following the operation, the patient represented to the same institution twice and a large tertiary hospital six times with recurrent episodes of right sided abdominal pain. He underwent a computed tomography (CT) abdomen and pelvis twice and an abdominal ultrasound, all which were reported as normal by the radiologists.

Current presentation

He presented to our institution with new severe, sharp, right sided pleuritic chest pain on a background of chronic abdominal pain over the prior seven months. A chest x-ray showed a pleural effusion, and he was discharged from the emergency department with a diagnosis of a lower respiratory tract infection on oral antibiotics.

He represented four days later with worsening right upper quadrant abdominal pain.

Investigations

Laboratory investigations demonstrated a normal haemoglobin (140 g/dL), normal white cell count (6.3×10^9 cells/L) and mild elevation in C-reactive protein (12 mg/L).

A CT scan of the abdomen and pelvis with intravenous contrast revealed a peripherally enhancing linear tract extending from the right bowel mesentery through the liver, diaphragm and into the pleural space with associated right pleural effusion (Figure 2). We postulated that it could represent either a chronic inflammatory or infected sinus tract, artefact or foreign body from the previous appendicectomy.

Figure 2: (A) Coronal contrast enhanced CT image showing the plastic ligature tube sheath migrating in a cranial fashion; the white arrow indicates the ligature tube sheath lying in an oblique angle; (B) Multiplanar reformation coronal CT image of the ligature tube sheath migrating through the liver in a complete penetrating injury; the pointed sharp end of the sheath has erupted through liver capsule and into the right diaphragm.

Management

Initial management consisted of analgesia, intravenous fluids and intravenous antibiotics. The decision was made to perform an exploratory laparoscopy given the CT findings and patient's significant distress and pain. This demonstrated a peritonealised fibrotic tract, which traversed through the small and large bowel mesentery, peritonealised to and running along the lateral aspect of the gallbladder, through liver and diaphragm (Figure 3). There was an inflammatory reaction but no pus or evidence of infection.

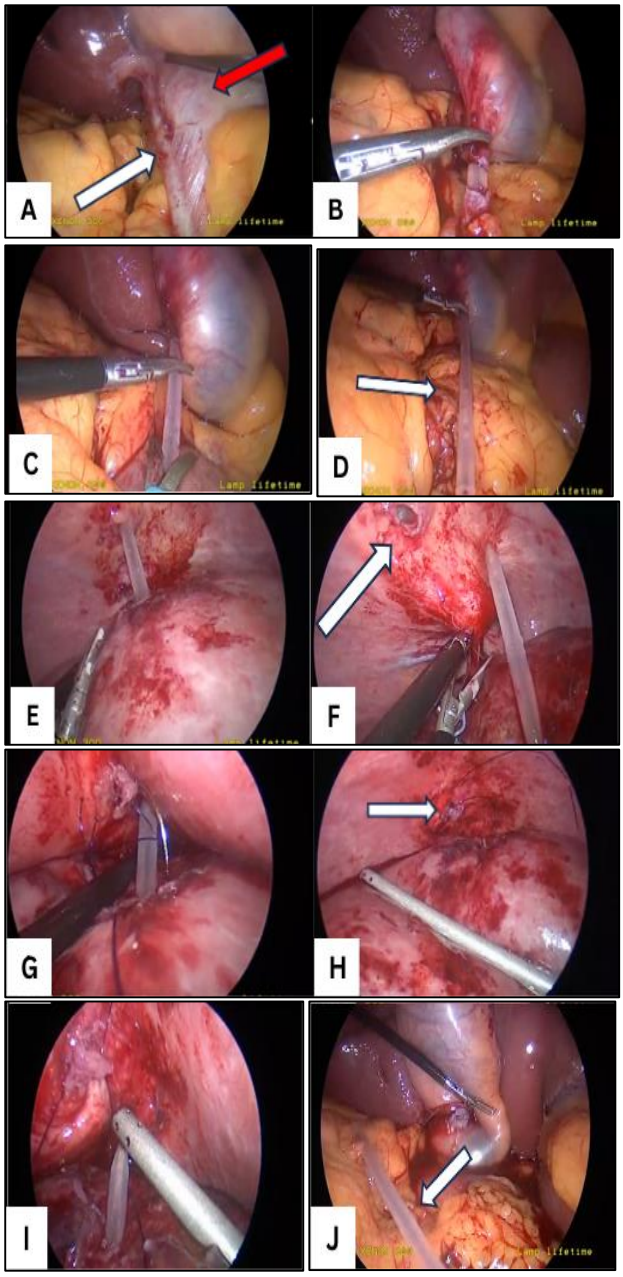

Figure 3 (A-J): Peritonealised fibrotic tract (white arrow) traversing through small and large bowel mesentery, and through liver (upper left of image) and adjacent to gallbladder (red arrow). Laparoscopic instrument used for retraction in upper right of image. Dissection and opening of fibrotic tract, revealing plastic tube inside. Endoloop® plastic tube visualised penetrating through liver, adjacent to gallbladder. Once the fibrotic tract was completely opened, the inferior end of the plastic tube was able to be visualised (white arrow). Plastic tube traversing through liver (inferior) into diaphragm (superior). Tip of Endoloop® freed with visualised defect in diaphragm visible (white arrow). Suture repair of diaphragmatic injury. Suture repair of diaphragm complete (white arrow). Plastic tube pushed back through liver. Plastic tube completely free (white arrow).

Dissecting open the tract beside the gallbladder revealed a plastic Endoloop® tube, which would have been used to secure the base of the appendix in the patient's previous appendicectomy but had clearly not been removed at the time of the surgery. The sharp end of the sheath had passed through the centre of the right liver vertically and worked its way through the diaphragm, gradually pushing further in with respiration. On careful removal of the sheath from the base of segment five of the liver, no blood or bile was encountered, only a fibrotic tract passing through the liver.

The diaphragmatic defect was repaired laparoscopically using 3-0 PDS sutures (Figure 3). Ventilation was ceased for short periods to allow for closure, given the high and posterior location on the diaphragm. Carbon dioxide was suctioned from the chest as the suture was pulled closed to minimise capnothorax. The tube was subsequently retrieved from the abdomen without evidence of bleeding, bile leakage or bowel bowel perforation (Figure 3). There was also a serosal tear where the small bowel was dissected off the fibrotic tract that was repaired with 3-0 PDS and two abdominal drains were placed (one lateral drain near the diaphragmatic injury and another inferiorly at the point of liver injury). There was no haemodynamic compromise throughout the operation.

Post-operative care

The patient remained on intravenous antibiotics post-operatively to avoid secondary infection. The patient was closely monitored post-operatively, however noted immediate relief from his severe pain of many months in recovery following surgery. He made an uneventful recovery and was discharged home on day five post-operatively.

Follow-up

On short term outpatient follow up, and two years from surgery, the patient remains pain free, with no long-term complications. The patient is passionate about his story being shared, so that this complication can be avoided in other patients in the future.

DISCUSSION

Laparoscopic appendicectomy is a key procedure in the skillset of any general surgeon.[2] Closing the remaining appendiceal stump in a laparoscopic appendicectomy is a critical step, which needs to be performed properly to avoid leakage of bowel contents. As discussed, no study has demonstrated that one technique of securing the base of the appendix is superior.[4]

The use of Endoloops® to secure the base of the appendix is the standard technique utilised in many Australian hospitals for patients with uncomplicated appendicitis. This part of the procedure is often used as a training opportunity for junior surgeons, allowing them to learn

and improve their laparoscopic skills through the dexterity required to deploy the endoloops.[1] It is considered a safe and cost-effective technique, with minimal described complications. One of the potential complications or drawbacks associated is that this technique can only be utilised in patients with a healthy appendiceal base, as otherwise this could lead to improper closure or "cheese-wiring" and risk of stump leakage.[1,6]

Retained surgical items and their associated sequelae can result in major complications, including bowel fistulisation, perforation of viscera, bowel obstruction, and abscess formation.[7] The complication described in this case report, where an Endoloop® plastic tube was left in the abdominal cavity of a patient following an appendicectomy, has never been previously documented. As a result of this, the patient suffered significant morbidity, with months of unexplained abdominal pain and multiple hospital visits and admissions. In addition, the plastic tube led to iatrogenic injury to the bowel mesentery, liver and diaphragm. This led to a second surgery for this patient so that the plastic tube could be removed, and injuries repaired. Although this patient made a full recovery, he suffered major physical and psychological harm from a set of events that were avoidable.

The only other description of an Endoloop® ligature plastic tube being retained in a patient was in a case report in South Korea after a laparoscopic cholecystectomy.[8] This patient had a laparoscopic cholecystectomy one year prior to presentation and had suffered recurrent episodes of right sided abdominal pain since the procedure. In this case, a CT scan demonstrated localised peritoneal infiltration around an air-containing tubular structure in the right lower quadrant and the patient was initially misdiagnosed with appendicitis. However, operative findings demonstrated localised peritonitis related to a retained Endoloop® ligature plastic tube used in the cholecystectomy, and the appendix was normal.[8]

These cases highlight the difficulty of making the diagnosis of a retained surgical foreign body clinically, given that it is rare and often unsuspected by clinicians or radiologists, therefore not usually considered as a differential diagnosis. They also show the challenge of correctly identifying non-radiopaque foreign bodies on imaging. In the case by Ahn et al a CT abdomen and pelvis had initially been performed at one month following the operation when the patient presented with pain, and the radiologists did not identify the foreign body despite its presence on the retrospective review of imaging.[8] Correct interpretation on imaging of a retained surgical foreign body can also be challenging as foreign bodies frequently elicit a reaction leading to a fluid collection that can mimic other diagnoses, such as abscess formation.[8,9] Similarly our patient had two CT scans post appendicectomy, which on retrospective review demonstrate a linear non-radiopaque density consistent with the retained Endoloop®, however this was not detected at the time of the scan (Figure 4).

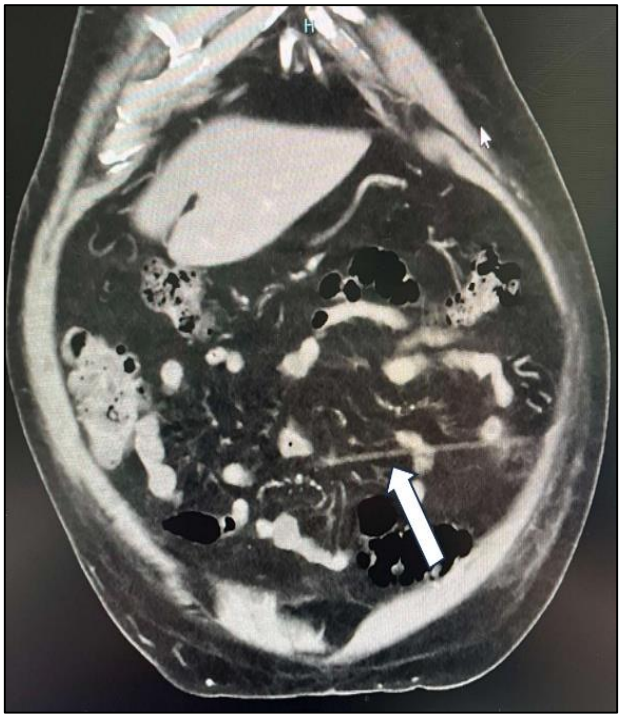

Figure 4: Coronal contrast enhanced CT image performed one month following the appendicectomy showing the ligature tube sheath lying horizontally across the left side of the abdomen (white arrow).

Unintentionally retained surgical instruments are a serious issue, leading to significant patient morbidity and mortality rates from 11-35%.[9] Abdominal surgery has the highest risk of a retained surgical item.[7] Retained surgical foreign bodies are more likely to occur where a case is prolonged, there is a large amount of intra-operative blood loss or an unexpected change of events during the procedure.[7] However our case demonstrates that a retained foreign body can occur at any time, even in operations that are uncomplicated.

One major effort to prevent the number of retained surgical items is to do a pre-operative and post-operative instrument count by the operating room nurses. There are three main categories of surgical materials counted, which include instruments, gauzes and sharps.[7,10] Notably, in most hospitals in Australia, the Endoloop® ligatures are not part of the final instrument count. The reason for this is unclear. Since this case, the hospitals within the health service of where this appendicectomy occurred and several surrounding hospitals, including our institution, now perform a mandatory inclusion of Endoloops® and their components in the instrument count. This takes the onus solely away from the operating surgeon and allows a systemic approach to minimise the risk of this event occurring in other patients in the future.[10]

CONCLUSION

In this case report, we describe a rare complication following laparoscopic appendicectomy, where a retained Endoloop® plastic sheath caused significant morbidity and pain. Despite the technique's common use and recognized safety, it was not recognised that the plastic tube was left in the abdominal cavity at the time of the procedure or considered as a possibility by subsequent clinicians and multiple CT scans. This led to pain, subsequent injury to the bowel mesentery, liver, and diaphragm and necessitated a return to theatre. This case highlights the need for clinicians to consider the diagnosis of a retained non-radiopaque foreign body in any post-operative patient with unusual symptoms or pain. It also underscores the importance of including Endoloops® in the surgical instrument count. The patient ultimately had an unremarkable recovery, but this incident demonstrates the need for heightened awareness and procedural safeguards to avoid retained surgical items, even in uncomplicated operations such as appendicectomy.

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