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International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Successful Foley catheter tamponade of an epigastric vessel trocar injury in a toddler – A case report

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ARTICLE INFO

Article history:

Received 6 March 2021

Received in revised form 12 March 2021

Accepted 12 March 2021

Available online 16 March 2021

Keywords:

Case report

Children

Foley catheter

Epigastric vessels

Bleed

Tamponade

ABSTRACT

INTRODUCTION AND IMPORTANCE: Injuries to the inferior epigastric vessels during laparoscopic surgery are rare but reported. They can lead to significant morbidity. We report the successful tamponade of a bleeding epigastric vessel during laparoscopic inguinal hernia repair in a child using a Foley catheter. A Foley catheter has not been routinely used in pediatric surgery for this indication so far.

CASE PRESENTATION: A 32-month-old boy underwent laparoscopic left inguinal hernia repair. During insertion of a 2 mm trocar, the left inferior epigastric vessels were lacerated, leading to a brisk bleed into the abdominal wall and into the abdomen through the trocar site during the procedure. When the hemorrhage was noted, the trocar was removed. The trocar tract was slightly dilated using a blunt forceps and a 12 F Foley catheter was introduced into the abdomen. The balloon was insufflated with 10 ml of water and the catheter was retracted towards the abdominal wall, tamponading the bleed. The inguinal hernia repair was completed, and after desufflating the catheter at the end of the procedure, the hemorrhage had stopped.

CLINICAL DISCUSSION: Postoperatively, the hemoglobin had dropped by 1.5 g/dl to 9.3 g/dl. The patient was observed and then discharged on the same day. Besides an additional 2 mm scar in the right lower quadrant, he had no further sequelae or adverse effects.

CONCLUSION: Hemorrhage resulting from trocar injury of the inferior epigastric vessels during laparoscopy can be controlled by Foley catheter insertion and tamponade in children. Pediatric surgeons should be aware of this useful maneuver to manage this complication.

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1. Introduction

Injuries to the abdominal wall vessels during laparoscopic surgery are rare but do occur in up to 2% of cases [1]. They may lead to significant morbidity. There are numerous maneuvers to manage trocar-induced vessel injuries, including Foley catheter tamponade [2]. This method, however, is not widely employed in pediatric surgery. We report the successful tamponade of a bleeding inferior epigastric vessel during laparoscopic inguinal hernia repair in a toddler using a Foley-catheter. The following report complies with the SCARE 2020 guidelines [3].

2. Presentation of case

The patient was a 32-month-old otherwise healthy boy who was scheduled for a laparoscopic, percutaneous hernia repair on the

left side. There was no family history of a bleeding disorder. At the beginning of the procedure, a 3 mm optic trocar was inserted into the umbilicus. Inspection of the internal inguinal rings revealed a normally closed right side and an inguinal hernia on the left. A 2 mm working trocar for a grasper was placed in the left lower quadrant. Shortly after, hemorrhage was noted in the abdomen. The brisk bleed could be traced back to the site of the 2 mm working trocar, where the inferior epigastric vessels were lacerated (Fig. 1A).

The instrument and the trocar were pulled back. The trocar track was gently dilated using a blunt mosquito forceps and a 12 French urinary Foley catheter (4 mm) was advanced into the abdomen (Fig. 1B). At this point, the vessel injury was still actively bleeding. The Foley catheter balloon was insufflated using 10 mL of water. The catheter was then retracted towards the abdominal wall, tamponading the bleed (Fig. 1C). After the Foley catheter was pulled back, it was secured on the outside using a clamp and a gauze providing counter-pressure to stop the hemorrhage (video 1).

As soon as the hemorrhage was under control, the inguinal hernia repair was continued (video 2). Proceeding with caution, a 2 mm working trocar was placed on the right side, respecting

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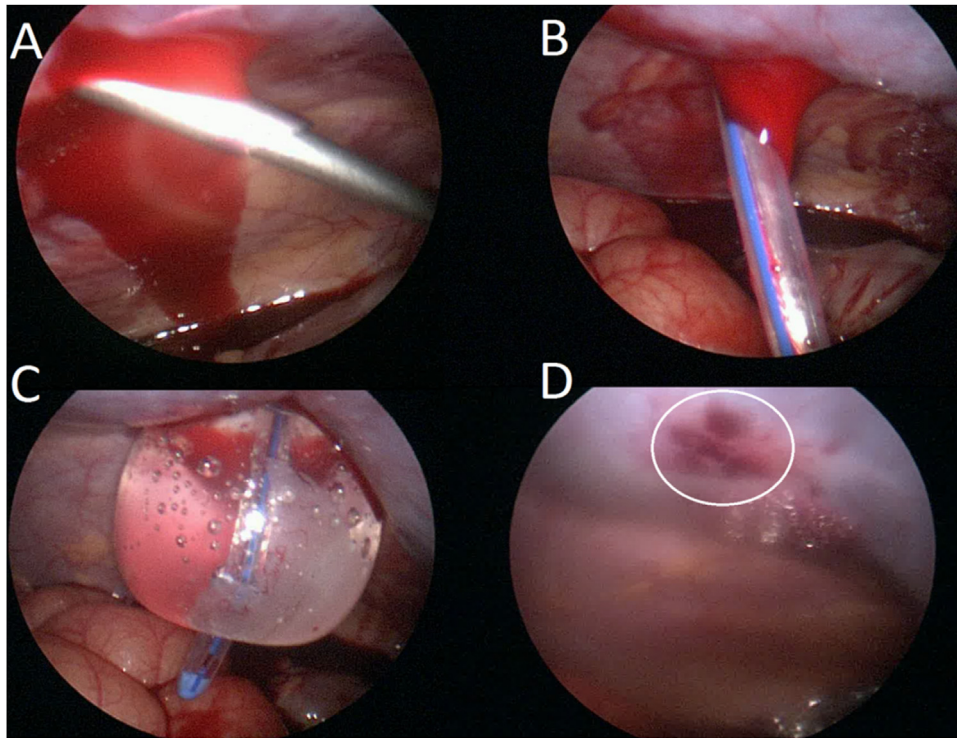


Fig. 1. Hemorrhage control during laparoscopic inguinal hernia repair using a Foley catheter to tamponade the bleed. The brisk bleed from the inferior epigastric vessels was noted after trocar insertion (A). The trocar was exchanged for a Foley catheter (B). The balloon was insufflated and pulled against the abdominal wall (C). At the end of the procedure, the bleeding from the site (circle) had stopped (D).

the epigastric vessels. Subsequently, the hernia repair was performed with a 17 g Tuohy needle. The needle was placed in the subperitoneal space around the medial aspect of the inguinal hernia and passed over the vas deferens and testicular vessels using hydrodissection. The needle then perforated into the abdominal cavity through the peritoneum. A loop of 4-0-polypropylene was passed through the abdomen and grasped with the working trocar's instrument. Next, the Tuohy needle was passed along the lateral aspect of the inguinal hernia and through the first loop of polypropylene. A second loop of polypropylene was placed into the abdomen and again clasped with the grasper. It was lassoed around the inguinal hernia and the inguinal hernia was closed using the suture.

At the end of the procedure, the hemorrhage had stopped (Fig. 1D, circle). The Foley catheter was deflated and removed. The blood in the abdomen was aspirated and the procedure was finalized. Postoperatively, the patient was clinically stable. His hemoglobin level had decreased by 1.5 g/dl to 9.3 g/dl. The patient was observed and then discharged on the same day. Apart from an additional 2 mm scar on the right lower quadrant, there were no further adverse effects.

3. Discussion

Trocar injury to the abdominal wall vessels is an infrequent complication but does occur in 0.2% to 2% of laparoscopic procedures [1]. Undoubtedly, the most common trocar-induced abdominal wall injury is a hemorrhage of the epigastric vessels [1], a serious and potentially preventable complication.

The presented case underscores the importance of planned and careful trocar placement. A thorough anatomical understanding of the anterior abdominal wall is crucial, but due to anatomical varia-

tions, strategies for managing trocar injuries are equally important. Superficial vessels may be detected by transillumination of the skin, whereas deep vessels are commonly identified by direct laparoscopic inspection through the umbilical trocar [4].

Gaining control of trocar-induced vessel injuries is critical to prevent significant blood loss. Several methods of treatment exist: conservative management [5], suturing – for instance with a Reverdin [6] or Stamey needle –, electrocautery, and Foley catheter tamponade [2]. However, an enlargement of the incision and placement of sutures is still widely considered the classical method [7]. However, the Foley catheter is an effective tool to control abdominal wall bleeding with multiple advantages:

- It allows the hemorrhage to be controlled by creating **counter pressure**, against which the vessel can be compressed.
- The placement of a Foley catheter is time-efficient. A study suggests that suturing takes 11 min on average, whereas placement of a Foley catheter can be performed within 30 s [8].
- A study reports that the placement of a Foley catheter may be associated with lower postoperative pain. Conservative treatment of hematomas, on the other hand, has been linked to an increase in pain [9], also because the hematomas may expand and become infected.

In our case, the use of a Foley catheter did not result in a prolonged hospital stay. In fact, the patient was clinically stable following the procedure, had no unusual pain, and therefore was discharged on the same day. Other treatment methods, such as conservative treatment of hematomas, may result in a delayed discharge [9]. The patient also did not require a blood transfusion, which is more commonly needed with conservative treatment [9]. Apart from an additional 2 mm scar in the right lower quadrant

from the second lateral trocar, the patient had no further sequelae or adverse effects.

Although the patient in question was not overweight, a case report from bariatric surgery addresses the difficulty of suturing vessel injuries in morbidly obese patients [7]. The urinary catheter tamponade may be an effective alternative for blocking hemorrhages in obese patients.

The authors of one study consider the placement of a Foley catheter less safe than suturing the vessel with a Reverdin needle, despite the former being easier and more time-efficient [6]. A similar publication, however, suggests that Foley catheter tamponade is equally safe to the use of a Reverdin needle [8].

This case report describes the use of a Foley catheter tamponade in a toddler. Although there are accounts of this technique in obstetrics and gynecology [10], bariatric surgery [7], and orthopedic surgery [11], the method has not been reported in pediatrics, apart from the Foley catheter tamponade of an intercostal hemorrhage in a preterm infant, following the laceration of an intercostal artery during chest tube insertion to treat a pneumothorax [12].

When using a Foley catheter in a child, the caliber of the catheter and the duration of the tamponade must be adapted to the size of the patient. Since the patient was a toddler, a 12 French urinary Foley catheter was employed. In adults, however, a 14–24 French catheter is used depending on the size and weight of the patient [7,11]. Even though younger and smaller patients generally require smaller catheters, the catheter must be large enough to still provide adequate counter pressure.

Since the hemorrhage was successfully stopped during the operation, the catheter was removed at the end of the surgery. Depending on the intensity of the bleed, and the condition of the patient, the Foley catheter tamponade may remain up to 48 h in adults [7].

4. Conclusion

Precautionary measures to prevent vessel injury during trocar insertion should be advocated and implemented during every laparoscopic procedure. Trocar-induced hemorrhage of the inferior epigastric vessels during laparoscopy can be controlled using a Foley catheter in children. Pediatric surgeons should be aware of this maneuver to manage this complication. The Foley catheter tamponade is considered a comparatively safe, fast, and efficient method to control abdominal wall bleeding.

Declaration of Competing Interest

All authors declare that they have no conflicts of interest regarding this case report.

Sources of funding

The study was only funded intramurally- There was no external funding.

Ethical approval

Written informed consent was obtained from the patient's parents for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal upon request.

Consent

Consent for publication was obtained from the parents of the patient. There are no identifying details in the article, the images, or the videos.

Author contribution

NRM wrote the first draft of the article, complied the references, and images. EW performed the surgical case together with OM as his supervisor. He obtained the images and videos, cut the videos, and approved the manuscript. OM performed the operation, redacted the manuscript, narrated the videos, and approved the final draft of the manuscript.

Registration of research studies

Not applicable.

Guarantor

Oliver J. Muensterer, MD, PhD takes full responsibility for this work, the conduct of the study. All data regarding this case is available upon reasonable request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at <https://doi.org/10.1016/j.ijscr.2021.105779>.

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