



PEDIATRIC
SURGERY IN
TROPICS

A CALL FOR APPROPRIATE URINARY CATHETERS IN NEONATES

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Keywords Catheters Paediatric Knots Catheter knot Knotting of catheter Laparoscopy Anterograde cystostomy	Abstract Introduction: Urinary catheterization using feeding tubes is a common practice in neonates due to the unavailability of appropriately sized urinary catheters in many South African and low-income healthcare facilities. Although generally safe, complications such as intra-vesicular knot formation can occur, leading to significant clinical challenges. Case report: We report on a case of a premature twin neonate who presented with a small intestinal atresia requiring surgical intervention. A size 6Fr feeding tube was used as a urinary catheter intraoperatively, as our facility does not routinely stock 6Fr urinary catheters. Postoperatively, the catheter could not be removed, and further assessment suggested intra-vesicular knotting. Given the inability to remove the catheter via traction and the unavailability of endoscopic retrieval methods, laparoscopic-assisted cystostomy was performed. The procedure confirmed a true knot in the bladder, lodged in the proximal urethra. Discussion: Knot formation is a known but preventable complication of urinary catheterization, particularly with feeding tubes. Factors such as excessive insertion length and catheter material contribute to this risk. The case highlights the importance of using appropriately designed urinary catheters, optimizing insertion techniques, and increasing accessibility to

	minimally invasive interventions such as laparoscopy. Conclusion: This case underscores the need for proper catheter selection and insertion techniques in neonates. Advocacy for improved resource availability and training in catheterization methods is essential to minimize preventable complications and improve patient outcomes.
Abbreviations	NICU: Neonatal intensive care unit Fr: French

INTRODUCTION

Urinary catheterization using feeding tubes is a common practice in neonates. This is due to the lack of appropriately sized urinary catheters in most South African government health facilities and many health facilities in the low-income countries.⁽¹⁾

Urinary catheterization is used in neonates who undergo abdominal surgery to empty the bladder and prevent bladder injuries, as the bladder is intra-abdominal until after puberty.⁽²⁾ Additionally, it is used to monitor urine output as an indicator of perfusion.⁽³⁾

The lack of size 5 or 6Fr urinary catheters forces health care providers to substitute appropriately sized urinary catheters with the same French-sized feeding tubes to catheterize the bladder.⁽⁴⁾ Although the procedure is mostly safe, there are multiple complications associated with using feeding tubes as a substitute for an appropriately sized Foley's catheter, with one of these complications being intra-vesicular knot formation.⁽⁴⁾

We report a case of spontaneous knotting of the feeding tube within the bladder of a premature twin neonate who underwent laparoscopic removal of a knotted intra-vesicular feeding tube.

CASE REPORT

Our patient was born prematurely via an emergency caesarean section, as the twins developed fetal distress at 35 weeks' gestation, necessitating early delivery. The patient was the firstborn

of a twin pregnancy, and the mother did not attend any antenatal visits during the pregnancy. The patient had a low birth weight of 1880g and was admitted to the neonatal intensive care unit (NICU) for early-onset neonatal sepsis and anemia.

While in the NICU, a nasogastric tube was inserted to drain dark bilious aspirates. A subsequent abdominal radiograph revealed a “triple bubble sign”, and a diagnosis of small intestinal atresia was made. ⁽⁵⁾ The patient was optimized and taken to theatre for exploratory laparotomy and repair of the atresia.

As part of the pre-operative management, a size 6Fr feeding tube was inserted in place of a transurethral catheter to monitor urine output and decompress the bladder. A transverse supra-umbilical incision was made, and a single Type 1 Jejunal atresia was found. The proximal jejunal atresia was resected, and a primary anastomosis was performed. The rest of the intestines were patent. The patient’s abdomen was closed, and the patient was sent back to the NICU for postoperative monitoring.

Day 1 post-laparotomy, the patient was clinically stable, abdomen soft with normal bowel sounds, and bilious aspirates were clearing. The clinical team opted to remove the feeding tube (in use as a urinary catheter) but failed.

The clinical team subsequently consulted the pediatric surgery team to attempt removal, but after multiple attempts, they were also unable to remove the catheter safely. We considered multiple differentials, including mucosal adherence, stricture formation and knotting. Considering that it was a recently inserted catheter, our working diagnosis was a knot in the catheter. (Fig 1)



Fig 1. The catheter cap close to the patient due to over insertion and can be noted in the bladder

The choice of a feeding tube was due to the unavailability of appropriately sized transurethral catheters during catheterization. Knowing the risk of knots forming from feeding tubes, and with the patient being clinically stable with no symptoms of urinary retention, we opted for a laparoscopic-assisted cystostomy for removal of the foreign body, as endoscopy was not feasible.

A diagnostic laparoscopy and antegrade cystostomy were performed, demonstrating a feeding tube coiled multiple times and forming a true knot in the bladder. (Fig 2-4) The knot was lodged in the proximal urethra and caused urethral obstruction with a dilated posterior urethra. After removing the tube, the urethra and the bladder mucosa were re-evaluated, and the bladder was closed as no further complications were found. A 6Fr silicone transurethral catheter was sourced and inserted intra-operatively.



Fig 2. Cystostomy and Catheter removed through cystostomy



Fig 3. Catheter as seen in bladder on laparoscopy

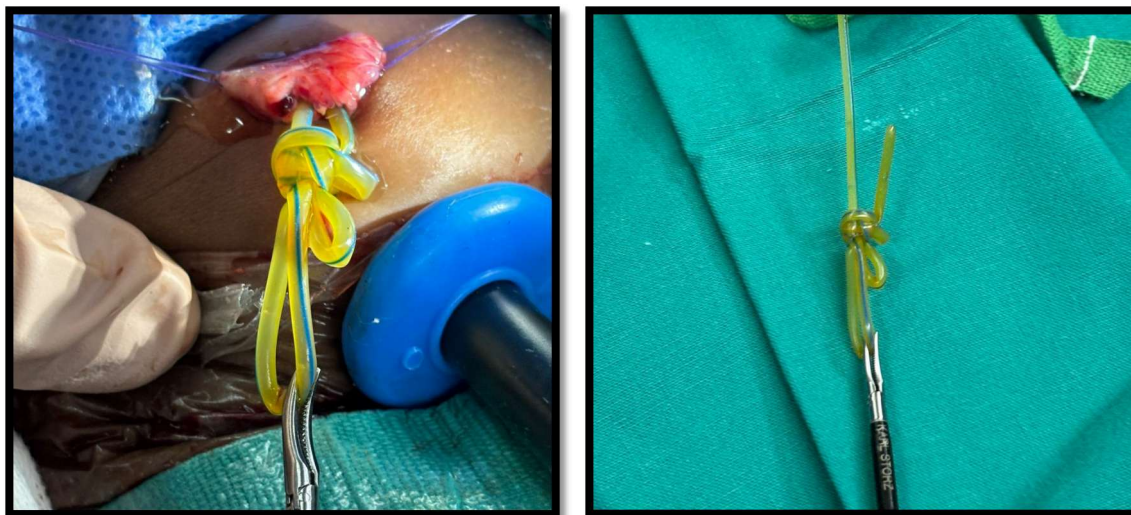


Fig 4. Multiple coiled loop of the catheter as it is removed and a True knot

The patient was monitored for urine output and was built up to full feeds. Urine output was normal without gross hematuria. The silicone urine catheter was removed on day 10 post-surgery.

DISCUSSION

Although there are many techniques for removing a knotted intra-vesicular catheter, we opted for the laparoscopic technique because we consider the constant traction technique too risky for urethral injury, and we didn't know the actual size of the knot. ^(8,10-11) The recommended endoscopic guide wire manipulation would not have been feasible as the knot was lodged in

the proximal urethra. Hence, laparoscopic cystotomy and catheter retrieval were the operative choices in this case, as they carried less risk of complications when removing the knot.

We favor a laparoscopic approach to cystostomy as it is the preferred minimal invasive technique in our facility. Furthermore, it is becoming more readily available in many South African facilities and can be easily taught as an option for managing these types of complications. Laparoscopy also provides a low-risk approach to visualizing and examining the bladder post-retrieval and repair, while preventing further urethral injury.

Urinary catheterization is an invaluable tool in the diagnosis and management of patients of all ages and is a safe, sterile and commonly performed procedure. It is, however, not exempt from complications such as those we described above. Multiple factors affect the risk of knot formation including age (predominant risk in children), male, catheter length, caliber, material, technique and anatomical factors.⁽⁶⁾

Feeding tube catheterization carries a four times higher risk of knot formation than that of an appropriate Foleys urinary catheter.⁽⁶⁾ However, catheterization techniques also play an integral role in the risk of knot formation. The most common reported reason for knot-formation is to insert the catheter more than 10 cm in a neonate.^(7,8) The length of the neonatal urethra ranges from 2-5cm at birth, resulting in the rest of the catheter coiling in the bladder. Bladder capacity is determined by age, and the depth of catheterization should also be considered before inserting a catheter.

CONCLUSION

One of the fundamental ethical principles instilled in us as doctors from the very first year of our studies is *Primum non nocere*—first, do no harm.⁽¹²⁾ This principle emphasizes the importance of prioritizing the prevention of harm when delivering care. However, we also recognize that complications during treatment are often unavoidable. In these instances, our

goal should be to choose the treatment option that minimizes harm while still addressing the patient's needs.

We know that intra-vesicular catheterization has complications, but we also know that there are a few factors we can control that minimize the risk of complications. Two key factors we can control are technique and the type of catheter used. ^(6,7,8) This case report aims to remind us of our responsibility to educate our colleagues and students on proper technique, while also advocating for the use of appropriate urinary catheters for neonates.

Declarations


Authors' contributions: JPP collected and analyzed patient data and wrote the manuscript. EAS collected patient data and was a major contributor in writing the manuscript. EM contributed to writing the manuscript. All authors read and approved of the final manuscript.

Oral presentation: This paper was presented orally and as a poster at the South African Association of Paediatric Surgeons Congress in East London, South Africa, in May 2025.

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