

Urethral catheter knotting: Be aware and minimize the risk

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ABSTRACT

Urethral catheterization is a technique frequently used in the pediatric emergency department. Intravesicular knotting of the catheter is a rare but potentially preventable complication that can involve significant morbidity. However, because of the relative rarity of this complication there remains a persistent lack of awareness in the pediatric clinical community. The risk of intravesicular catheter knotting can be reduced with proper technique and the correct choice of catheters. We present a case report and list recommendations to minimize the risk of occurrence.

Key words: pediatric urine catheter complications, urinary tract infection diagnosis

RÉSUMÉ

Le cathétérisme urétral est une technique fréquemment utilisée au département d'urgence pédiatrique. La formation de nœuds dans le cathéter intravésiculaire est une complication rare mais potentiellement évitable qui peut se traduire par une morbidité importante. Cependant, comme cette complication est rarement rencontrée, la communauté pédiatrique y est très peu sensibilisée. On peut réduire le risque de formation de nœuds dans le cathéter intravésiculaire grâce à une technique et à un choix de cathéter appropriés. Nous présentons une observation et dressons une liste de recommandations afin de minimiser le risque d'une telle complication.

Introduction

Urethral catheterization is a frequently used method for obtaining urine for culture in the pediatric emergency department (ED) setting. In 1999 the American Academy of Pediatrics' (AAP) recommended that urine cultures be collected exclusively by supra-pubic aspiration (SPA) or by urethral catheterization for the confirmation of a diagnosis of urinary tract infection (UTI).¹

Urethral catheterization is also performed to relieve urinary retention in the neurologically impaired, to monitor fluid balance in the critically ill, and for radiological evaluation of the lower genitourinary tract. In these settings, complications related to infection and catheter trauma have been reported.² In

the select group where brief (in-and-out) catheterization is performed to obtain urine for culture, the literature reports only microscopic hematuria as a frequent complication.³ There are no evidence-based reports documenting risk of nosocomial infection, but this complication has been reported in a leading pediatric emergency medicine textbook.²

Intravesicular catheter knotting is an infrequently reported complication; a review of case reports was published in 1997.⁴ Although this complication is rare, it can involve significant morbidity. Due to the relative rarity of this complication there remains a persistent lack of awareness in the pediatric clinical community. The risk of intravesicular catheter knotting may be reduced with proper technique and the correct choice of catheters.

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Received: June 27, 2001; final submission: Nov. 28, 2001; accepted: Dec. 5, 2001.

This article has been peer reviewed.

Case report

A 10-year-old boy with severe global developmental delay secondary to a liposomal storage disease presented to the ED with a 1-day history of vomiting, fever and decreased oral intake. He had no documented history of UTI or genitourinary anomalies. The patient was alert, had good colour, and his vital signs were normal. No focus of infection was found on physical exam.

A urethral in-and-out catheterization to obtain a urine specimen for culture was ordered to determine a potential source for the fever. The first attempt at insertion, using a 10 French urinary catheter, failed. A second attempt, using an 8 French feeding tube lubricated with jelly, was successful. A small amount of clear urine was obtained and sent for urinalysis and culture. At the end of the procedure the nurse felt resistance while attempting to withdraw the catheter. Repeat gentle attempts by physicians were also unsuccessful, and a pediatric urologist was consulted. The catheter was removed using local and systemic analgesia and gentle steady traction. A double knot was found 9 cm from the tip of the catheter (Fig. 1). The patient was voiding clear urine spontaneously and comfortably within 4 hours of the episode.

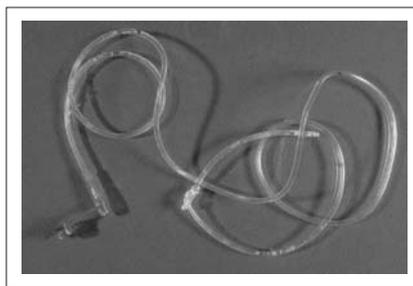


Fig. 1. 8F feeding tube with double knot 9 cm from tip of catheter

Discussion

The AAP practice parameter published in 1999 states that less invasive methods such as collecting urine specimens for culture from a bag applied to the perineum have an unacceptably high false-positive rate due to contamination.¹ In children who cannot provide clean-catch specimens, catheterization or SPA are then the only acceptable means to establish a diagnosis of UTI. Although SPA under ideal circumstances is the gold standard, in the ED setting it has a low success rate.⁵ In-and-out catheterization is therefore preferred because it has comparable sensitivity and specificity and is less invasive.¹ This AAP recommendation has most likely increased the frequency of in-and-out catheterizations, therefore an increased incidence of both usual and unusual complications of catheterization can be expected.

The principal author of this paper (B.A.) conducted an informal telephone survey of the 16 tertiary care pediatric EDs in Canada in the spring of 2001. At the same time, a smaller local survey of 8 general EDs in Quebec was conducted. At each centre the ED charge nurse or head nurse was asked the following questions.

- What device is used for in-and-out catheterization at your centre?
- Is this device used by common practice or by protocol?
- If your centre uses feeding tubes, why are feeding tubes used instead of catheters?
- Are you aware of any complications?

The survey revealed that 14 of 16 pediatric EDs in Canada were routinely using feeding tubes for in-and-out catheterization. All 8 of the local general EDs surveyed also used feeding tubes. The respondents commonly cited 2 reasons for choosing feeding tubes over catheters: 1) facility of use because they are more rigid; and 2) the cost of feeding tubes versus catheters. (In the institute where this case is reported from, a 5F feeding tube costs \$0.38 per unit and a 5F catheter costs \$1.13 per unit.) None of the respondents were aware of any related adverse events, and none of the centres had protocols established regarding in-and-out catheterizations. Of the 2 centres that do not use feeding tubes it is because of established protocol. However, neither centre was aware of any adverse events related to the use of feeding tubes in catheterization; their protocols were established because it was believed that feeding tubes are too rigid and physically traumatic to use in infants.

Small feeding tubes (size 5F or 8F) are typically used for routine catheterization of this type in the outpatient setting in small, young children. Similarly, in older children in whom traditional catheters cannot be inserted, small feeding tubes are also used as a substitute.

Urethral catheter knotting is a rare event. There is no information regarding its risk of occurrence in the ED. At several provincial and national educational presentations, one author of this paper (D.M.) brought up the experience of this case, and there was a complete lack of awareness of this event among both pediatric and general emergency physicians. In a group of patients followed by a pediatric urology service, many of who performed frequent clean intermittent catheterization, the incidence was estimated at 0.2 per 100 000 catheterizations.⁶ Although catheter knotting has been reported in the evidence-based urology literature, it is not discussed in most leading pediatric urology or emergency medicine texts or in recent pediatric emergency department empirical literature.^{3,7-9} The potential for catheter knotting has only recently been addressed in the pediatric nursing instructional literature.^{10,11}

It has been hypothesized that urethral catheters become knotted if an excessive length of flexible catheter is inserted

into the bladder and forms a loop. Subsequently, as the catheter is withdrawn a knot can form and tighten. A review of 18 cases reported in the literature described the modalities used to remove the knotted catheter. Manual extraction of the catheter through the urethra with gentle sustained traction under local or general anesthesia was successful in 6 cases. Manual extraction was facilitated by urethral dilatation with urethral sounds in 3 cases. The knot was uncoiled with a guide wire under fluoroscopy in 4 cases. Ultimately, suprapubic cystotomy was performed in 5 cases.¹²

Although knotting is rare, removal represents significant morbidity, such as general anesthesia, radiation exposure during fluoroscopy, and transient hematuria. Potential for further complications such as stricture formation also needs to be considered. The above reports did not identify follow-up in all of the cases. Five of the 6 children whose catheters were removed by gentle traction were reported as free of complications. Among the 5 children requiring cystotomy, one was described as having a prolonged convalescence requiring a urethral stent and a suprapubic catheter following stricture formation, 2 were stated as free of complications, and there was no comment on 2 others. There were no comments regarding complications or morbidity in children requiring urethral dilatation with sounds, nor those who required fluoroscopy.

In view of the potential for morbidity and complications, we recommend the following.

- 1) Avoid, if possible, the use of flexible feeding tubes.
- 2) Limit the length of inserted catheter by using short catheters, pre-measuring an estimated length, and inserting the catheter only as far as necessary to obtain urine flow.
- 3) Remove the catheter as soon as possible or tape it securely to prevent advancement if it will subsequently be left in place for fluid monitoring.
- 4) When removing the catheter, withdraw slowly and steadily.

As a result of this incident, the use of feeding tubes for urethral catheterization is now avoided not only in the ED

but in the entire hospital where this occurred. When it is absolutely necessary to use a feeding tube because of the patient's size or difficulties with catheterization, the above guidelines are strictly adhered to.

Urethral catheterization to obtain urine for culture is a procedure that will likely become more frequent. It is important that clinicians are alert to this rare but potentially preventable adverse event, and use proper technique and catheters to minimize the risk of its occurrence.

Competing interests: None declared.

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