

## BALLOON CUFFING AND MANAGEMENT OF THE ENTRAPPED FOLEY CATHETER

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### ABSTRACT

We have experienced the inability to remove silicone Foley catheters even after complete deflation of the balloon. This potential complication can result from cuffing of the catheter balloon. We present a description of this phenomenon and approaches for successful management of a Foley catheter that has become entrapped due to balloon cuffing. *UROLOGY* **61**: 825–827, 2003. © 2003, Elsevier Science Inc.

A total of 96 million indwelling urethral catheters are sold worldwide on an annual basis.<sup>1</sup> It is estimated that 24 million of these catheters are sold to hospitals in the United States and approximately 25% of hospitalized patients will have a urinary catheter placed at some point during their hospital course.<sup>2</sup> A potential complication of Foley catheter use is entrapment of the catheter as a result of balloon malfunction, a faulty valve mechanism, malfunction of the inflation channel, or crystallization of fluid within the balloon. A common presentation of balloon malfunction is failure to deflate despite manipulation and repeated attempts at fluid aspiration. A number of reports in the literature have discussed approaches for management of a Foley catheter that has become entrapped due to failure of balloon deflation.<sup>3–5</sup>

Approximately 1.7 million catheters sold annually in the United States are constructed of 100% silicone. A desirable property of silicone catheters compared to latex catheters is improved durability. Silicone catheters may be better suited to patients who have undergone urologic procedures that may require vigorous irrigation or aspiration of clots. The silicone shaft tubing is less prone to collapse during manipulation compared to latex tubing. Silicone catheters are less elastic than latex catheters and may also be used in patients who require traction. Silicone catheters have a decreased tendency

for encrustation with calcium salts and theoretically can be allowed to remain indwelling for a longer duration compared to latex catheters.<sup>6</sup> Decreased inflammatory response, reduced urethral discharge, and lower risk of ascending urinary tract infections have also been reported as advantages of silicone catheters compared to latex catheters.<sup>7</sup> The use of silicone catheters is also indicated for latex-sensitive (ie, spina bifida) patients.

One problem we encountered while using silicone Foley catheters is entrapment with a deflated balloon due to the phenomenon of balloon cuffing. The cuff forms *after* successful and complete removal of the fluid contents from the catheter balloon. The rigid silicone balloon cuff may function like a hook and prevent removal of the catheter. The catheter can become entrapped with its tip located in the bladder (Fig. 1A) or in the urethra during the process of removal (Fig. 1B). In the latter situation, the cuff catches onto the soft tissue within the urethra, preventing complete removal of the catheter and causing great discomfort to the patient. Forceful removal of a catheter that has become entrapped due to balloon cuffing can result in extensive urethral trauma. We have observed balloon cuffing only with the use of silicone Foley catheters, although it is reasonable to assume that this phenomenon may occur with use of any type of indwelling catheter. The mechanism for balloon cuffing in silicone catheters may be the result of inherent differences in the material properties of silicone compared to latex (ie, hysteresis leading to balloon cuffing on deflation), differences in the manufacturing process between these types of catheters, or the manner in which fluid is aspirated from the balloon itself (see below). Formation of

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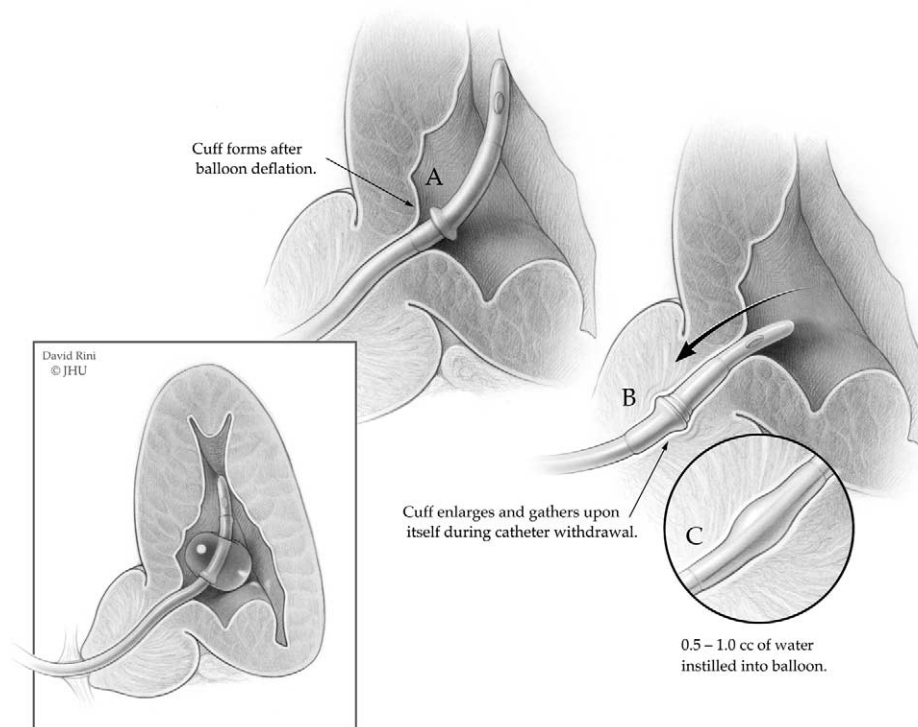


FIGURE 1. Mechanism of balloon cuffing and solution to the problem. (A) Formation of cuff after complete deflation of the balloon prevents catheter removal from the bladder. (B) The catheter may also become entrapped within the urethra due to balloon cuffing. (C) Instillation of 0.5 to 1.0 mL water into the balloon inflation port eliminates the cuff and creates a smooth catheter surface to permit removal. © Johns Hopkins University. Used with permission.

the catheter cuff may also be more likely to occur if the balloon is overinflated.

### PREVENTION AND MANAGEMENT OF BALLOON CUFFING

The first technique that can be used to minimize the incidence of balloon cuffing or to eliminate the cuff in the event of an entrapped catheter is quite simple: by very slow deflation of the catheter balloon or by passive deflation with a syringe. Urologists and healthcare providers typically deflate the balloon by an active process involving rapid evacuation of the fluid contents with an empty syringe. Slow removal of water from the balloon increases the probability of returning the silicone balloon to its preinflated shape as compared to rapid deflation that has been accelerated by aspiration of water. Cuffing may also be prevented by selection of the correct balloon size (10 mL versus 30 mL) and avoidance of balloon overinflation.

We have used a second technique to remove an entrapped catheter if passive balloon deflation fails to eliminate the cuff to permit removal. After complete evacuation of fluid contents from the balloon, approximately 0.5 to 1.0 mL of water is instilled back into the catheter balloon. This small amount of water is sufficient to fill the catheter inflation lumen and eliminate the balloon cuff, thus

smoothing out the retaining ridge that previously existed (Fig. 1C). The use of lubrication and slight manipulation of the catheter, such as twisting, may also be required for removal. We found that this technique results in virtually no urethral trauma and is well tolerated.

### COMMENT

The entrapped Foley catheter represents a problem that can be challenging for both patients and clinicians. It is important for urologists to understand the mechanism of balloon cuffing and recognize this as a possible reason for catheter retention after complete balloon deflation. Our recommendations should help to prevent balloon cuffing and permit easy and efficient removal of a Foley catheter that has become entrapped as a result of this phenomenon.

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