Algorithm Proposal to Remove a Non-Deflatable Bladder Catheter

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ABSTRACT

Objective: Thousands of patients must carry Foley catheter during their hospital stay or at home. Sometimes it is impossible to remove it, due to the inability to deflate the balloon. There is no clear protocol about what to do, who should do it and in what order. We present a proposal for action to face this type of situation. Material and methods: We searched the databases of medical publications (Pubmed, Medline, Embase) using the following keywords: Bladder catheter removal, Non-deflatable, retained catheter, obstructed catheter. Results: Twentyfour articles that fulfilled the requirements of the search were detected. Only ten which propose steped actions were finally included for review. Discussion: The only standardized proposal for action was published 17 years ago and it has never been updated, probably because these problems are considered "isolated cases". We review the knowledge on the subject and propose an action algorithm that would reduce costs and avoid displacement if this situation arises.

Keywords: catheter, non-deflatable, urinary bladder

1. INTRODUCTION

It is estimated that between 10% and 15% of patients admitted to a hospital will have a probe placed at some point during their stay or will be temporarily or definitively bearers after discharge. A rare complication of the use of Foley catheters is the failure to deflate the balloon.

If the way to solve it is unknown in primary care, we would have to refer the patient to a hospital. However, there are some simple and safe procedures that can allow the nursing staff to solve the problem in many cases avoiding patient displacements and added costs.

Many times the problem is due to a manufacturing failure of the valvular mechanism of the probe. However, sometimes we have created the problem by clamping the probe with a clamp in a section through which passes the thin duct through which the balloon is filled or emptied (Fig 1).
On other occasions, it is due to an obstruction of the inflation channel by debris or debris when filling the balloon with a previously used syringe to wash a venous catheter or inject lipid medications that can coagulate within the fine light and trigger the problem. Although it is believed that the origin of the obstruction is the crystallization of sodium chloride by filling the balloon with saline instead of distilled water, this hypothesis was ruled out in China where a randomized experimental comparative study was conducted with 4,000 catheters maintained for 21 days in a bath at 37 °C that showed no differences (p = 0.16) in the risk of obstruction between saline (8%) and distilled water (9.2%) (1).

The objective of this paper is to present clear rules about what we should do if we can not empty the balloon. At present, there is no clear protocol at the nursing, primary care and even urology level on who, and when they should use the different resolution options that are described in the literature. There is a flow chart published 17 years ago by Shapiro et al. (2) and that we will try to update in the light of current knowledge (Fig 2).

**Figure 1:** A.- Correct and incorrect locking of a probe. B.- The correct cut off of the probe. C. Cut section of the probe D.- Folds of the balloon when emptying

**Figure 2:** Extraction protocol of urethral catheters with non-deflatable balloon

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2. ACTING PROTOCOL

The initial maneuver (Fig 2, Step 1) would be to cut the inflation channel just above the level of the valve (Fig 1B), allowing the exit of the filling liquid in case of failure of this, but if the problem is due to improper clamping of the probe we could cut the probe further down, up to a few centimeters above the urethral meatus (Fig 1B) where we would cut the track for the balloon and the main track (Fig 1C). This technique is simple, resolutive in a large number of cases and can be performed by nurses or primary care physicians without having to refer the patient to a urologist (3).

The second option to try to empty the balloon is the deconstruction of the detritus channel or salt deposits (Fig 2, Step 2). To do this, we will introduce a guide into the track for the balloon and let it empty by gravity or by aspiration (4).

When this technique is not effective, it is necessary to resort to maneuvers that involve the rupture of the ball for which there are several options that we have to summarize into 3 groups (Fig 3 Step 3): Chemical dissolution (3a), ball puncture (3b) and hyper filling (3c). Each of them has advantages and disadvantages (2,4).

The dissolution of the ball wall with chemical substances (3a) includes various substances such as ether, chloroform, benzene, acetone and mineral oil (2,3,4,5). Although it is a quick and effective system to break the globe, it presents some serious inconveniences. The necessary substances are not easy to find outside the hospital area and, above all, they have a high risk of producing chemical cystitis when the fluid used is poured into the bladder. Such cystitis may even result in vesical retraction, hematuria, and even death (3,4).

To avoid it, we must wash the bladder abundantly with 50 cc syringes that we try to fit into the cut probe or introduce a new probe and wash with 500cc of physiological saline.

At the present time, the only substance that is being used to dissolve the ball is mineral oil due to its almost zero vesical toxicity, achieving levels of success from 85 to 90% and without adverse effects (5).

The second way of breaking the ball is the puncture with a needle (3b). In some centers, it is usually one of the first solutions that are used (3,4,5,6). However, on many occasions, this system implies the use of an ultrasound scanner, transrectal or suprapubic probe, and lumbar puncture needles or similar ones that are not usually available in primary care. It is a procedure that can be more or less painful according to the route used and that it is not exempt from side effects. It is important to mention that, contrary to what could be thought, the appearance of intravesical fragments is not greater than with the chemical solution and much less than when exploded by overdevelopment (6,7).

In the case of women, the ball can be pinched with a simple lumbar puncture needle, introducing it in parallel to the uretral8 probe. During this maneuver, we will traction the probe to make the balloon locate closest to the bladder neck thus facilitating its puncture. It can also be punctured through the anterior vaginal wall by pinpointing the balloon through the previous vaginal wall. Finally, the balloon could be punctured by the suprapubic way with the help of an ultrasound scanner and filling up previously the bladder with at least 250 cc of saline to facilitate itschograph location.

In the case of men, the situation is more complicated. Urologists are used for prostate biopsies with a transrectal transducer. This makes it easy for them to locate the balloon and puncture it with a Chiba needle or similar that is thinner and less traumatic. The problem of transrectal puncture is that you can introduce rectum germs within the bladder and produce a urinary infection; For this reason, it is imperative to administer previously a wide spectrum antibiotic that will be kept a further 3 days after procedure (2,3,4,5,6). Given the potential risk of infection, the puncture with the transrectal transducer is recommended, but transperineal (9). Finally, as well as women the previous to the puncture is recommended to fill the bladder for better ultrasound location.

Another much more complex puncture option is to cut the probe as close as possible to the urethral meatus and then knot it with a strand of silk. Then we will introduce the whole probe inside the bladder with a cystoscopy, a Tieman probe or any instrument that allows us to pull it to the bladder interior. Then, we introduce a flexible cystoscopy (or a rigid one with an Albarrán nail), by the urethra to the bladder. Once we have located the ball, we will punctuate it directly by directing a needle through the working channel and we can extract any loose fragments after the puncture. The cystoscopy is removed and the probe is pulled by pulling the silk that we had tied at the cut edge (10).

The last option to deflate the balloon is done by hyperinflation with saline above its maximum capacity until its explode (3c). This system, only uses physiological saline and gets high efficiency, but also presents inconveniences. After the explosion of the balloon, there are fragments in the bladder up to 83% of cases8,9. Such fragments may result in the
formation of urinary calculi, urinary infections and microscopic difficulties, which forces a posterior control cystoscopy to remove any residual fragment (4,5,6). Regardless of the system used (chemical, puncture or hyperinflation), we must check the integrity of the balloon once removed. In case of suspicious residual fragments, it is necessary to make a cystoscopy for the extraction.

Another situation that prevents the withdrawal of the probe, but that is not due to the impossibility of emptying the balloon, is the formation of folds on the balloon wall after it is dissolved (Fig 1D). These behave like a hook that prevents the exit through the vesical neck or the urethra3. This situation occurs mainly in silicone catheters and more frequently in cases where the balloon was very inflated. The best way to prevent them is not to fill the probes with more than 20 cc and vacuum the balloon passively (let the syringe fill without vacuum) or empty it slowly. Once the folds are formed, the best technique to get rid of the probe is to fill the balloon with 1-2 cc, to undo the folds and to facilitate the withdrawal of the catheter (3).

3. CONCLUSION

The impossibility to remove a Foley catheter is an uncommon complication. The knowledge of the different options allows nursing staff to be adequate and ordered management based on the patient's characteristics and the available resources.

REFERENCES

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