Research Article / Araştırma Makalesi

A New Method And An Algorithm For Non-Deflating Foley Catheter Balloons

İndirilemeyen Foley Kateter Balonları İçin Yeni Bir Yöntem ve Algoritma

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Abstract

Background: In rare cases, the catheter balloon cannot be deflated during catheter removal or replacement. In this study, we aimed to create a treatment algorithm for patients whose catheter balloon could not be deflated and to evaluate the effectiveness of a newly applied method.
Materials and Methods: 55 male patients who applied to our clinic between January 2020 and July 2023 because the foley catheter could not be removed were evaluated. The methods applied in line with the algorithm we applied in our clinic were evaluated in terms of complications. However, a new method that has not been described before in the literature was evaluated in terms of complications and effectiveness
Results: A total of 55 patients were included in the study. The average age of the patients was 73.8 years. The average foley catheter stay was 14.9±8 days. When we examine the reasons for patients' catheterization; A catheter was placed in 5 patients, due to neurogenic bladder, 30 patients due to immobility, and 10 patients due to inability to urinate due to bladder outlet obstruction. All patients were successfully treated with the algorithm we applied.
Conclusions: In rare cases, failure to deflate the foley catheter balloon is a very disturbing situation for patients. However, complications, mostly minor, may occur during treatment. We think that this method and algorithm we have described is a method that can be used safely like other methods.

Keywords: Catheter, Balloon, Algorithm

Öz

Amaç: Nadir durumlarda, foley kateter çıkarma veya değiştirme sırasında foley kateter balonu indirilemez. Bu çalışmada, foley kateter balonu indirilemeyen hastalar için bir tedavi algoritması oluşturmayı ve yeni uygulanan bir yöntemin etkinliğini değerlendirmeyi amaçladık.
Materyal ve Metod: Ocak 2020 ile Temmuz 2023 arasında kliniğimize foley kateterin çıkarılamaması nedeniyle başvuran 55 erkek hasta değerlendirildi. Kliniğimizde uyguladığımız algoritma doğrultusunda uygulanan yöntemler komplikasyonlar açısından değerlendirildi. Ancak, literatürde daha önce tanımlanmamış yeni bir yöntem de komplikasyonlar ve etkinlik açısından değerlendirildi.
Bulgular: Toplam 55 hasta çalışmaya dahil edildi. Hastaların ortalama yaşı 73,8 yıl olarak bulundu. Ortalama foley kateter kalış süresi 14,9±8 gündü. Hastaların kateterizasyon nedenlerine baktığımızda; 5 hastaya nörojenik mesane, 30 hastaya hareket kısıtlılığı ve 10 hastaya mesane çıkım obstrüksiyonu nedeniyle idrar yapamama sebebiyle kateter takılmıştı. Tüm hastalar, uyguladığımız algoritma ile başarıyla tedavi edildi.
Sonuç: Nadir durumlarda foley kateter balonunun söndürülememesi, hastalar için oldukça rahatsız edici bir durumdur. Ancak, tedavi sırasında çoğunlukla hafif olan bazı komplikasyonlar meydana gelebilir. Tanımladığımız bu yöntem ve algoritmanın, diğer yöntemler gibi güvenle kullanılabilecek bir yöntem olduğunu düşünüyoruz.

Anahtar Kelimeler: Foley kateter, Balon, Algoritma

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Introduction

Foley catheter placement is used for follow-up of intake output chart, treatment of acute retention, hematuria monitoring in patients with macroscopic hematuria, and drainage in immobile patients. However, when they remain in place for 30 days or more, complications such as urinary tract infection, calcification of the catheter, bladder stone formation, failure to deflate the foley catheter balloon, encrustation, obstruction of the foley catheter, and urethral stenosis often occur (1,2). These complications are more common in long-term foley catheter use, but can also be seen in short-term foley catheter use. The most important reason for this is the faulty valve system of the foley catheter balloon. In rare cases, the foley catheter balloon cannot be deflated during foley catheter removal or replacement, and urology consultation is required.

Various techniques have been described in the literature regarding the failure to deflate the foley catheter balloon. Popping the balloon by over-inflating it, deflating the balloon by cutting the distal part of the balloon channel, lowering the balloon from the balloon channel using chemicals such as ether and chloroform, and deflating the balloon by sending a guide wire through the balloon channel are some of the reported techniques (3-6). Direct bursting of the balloon via transrectal or suprapubic route with a needle is among other methods (7,8). Popping the balloon under direct vision using cystoscopy is also among the reported methods (9). The primary aim is to keep patient comfort at the highest level while removing the catheter without leaving any pieces behind.

In this study, we aimed to evaluate the methods used in the treatment of patients whose foley catheter balloon could not be deflated and to evaluate the effectiveness of the treatment algorithm we applied in our clinic.

Materials and Methods

The data of 55 male patients who applied to our clinic between January 2020 and July 2023, because the catheter could not be removed were evaluated retrospectively.

The patients' ages, reasons for catheterization, complications, visual pain score (VPS) and length of stay with the catheter were recorded. Catheters whose balloon could not be deflated were treated within the framework of the algorithm used in our clinic and our own method (Figure 1).

The new method we defined: The bladder was inflated with 200 cc of SF, then the balloon was inflated with 30 cc of air, allowing the balloon to approach the anterior bladder wall with the effect of the air in the bladder, and it was easily popped with a dental needle using USG. In this process, the reason why the balloon is not inflated until it is popped with air is that as the volume of the balloon increases, the probability of balloon fragments forming increases, resulting in bladder pain due to stretching. Therefore, in this method we have described, the balloon is inflated with a maximum of 30 cc of air and the possibility of balloon fragments is reduced. No fragments were formed in any of the 35 patients to whom this method was applied.

The catheter balloons of patients whose catheter balloons were removed were carefully evaluated for residual balloon fragments. Cystoscopy was performed in 3 of the 11 patients whose balloon was burst by inflating the balloon with water, which was the first method, and in 1 of the patients, whose balloon was burst by the fifth method, TRUS, in whom residual fragment was suspected. Before applying TRUS method, the patient was administered a single dose of second generation cephalasporin. Residual fragment was removed. Other patients were not considered to have residual fragments. Complications seen in patients to whom these methods were applied are summarized in Table 1.

Statistical Analysis

For statistical evaluation study data from IBM's SPSS Statistics 22 (IBM SPSS) program was used. As descriptive statistical methods; Mean, standard deviation and frequency were used. Since there was no control group, comparative analysis was not performed.

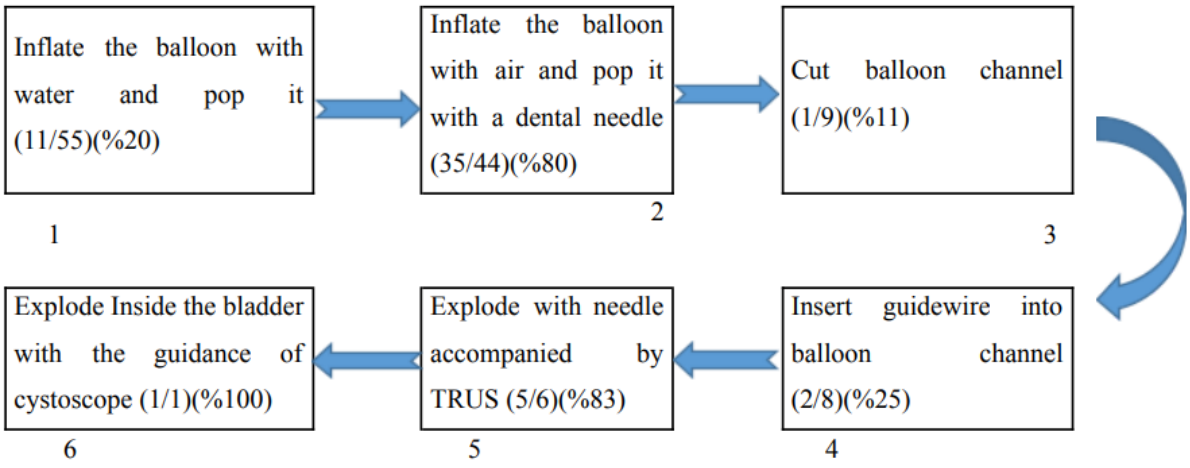

Figure 1: Treatment algorithm and success rates in catheters whose balloon cannot be deflated

Table 1. Complication Rates According to the Method Applied

Method	Pain (VAS scor)	Hematüria	Rectal bleeding	Residue Fragman	Fever
Inflate the balloon with water and pop it (11 patients)	4	1	0	3	0
Inflate the balloon with air and pop it with a dental needle (35 patients)	3	1	0	0	0
Cut balloon channel (1 patient)	1	0	0	0	0
Insert guidewire into balloon channel (2 patients)	1	0	0	0	0
Explosion with needle accompanied by TRUS (5 patients)	6	2	2	1	1
Explode in the bladder with the guidance of cystoscope (1 patient)	4	1	0	0	0
Total		**5**	**2**	**4**	**1**

Results

A total of 55 patients were included in the study. All Foley catheters that were used in patients and could not be removed were latex. The average age of the patients was 73.8 years. The average catheter stay was 14.9±8 days.

When we examine the reasons for patients' catheterization; A catheter was placed in 5 patients, due to neurogenic bladder, 30 patients due to immobility, and 10 patients due to inability to urinate due to bladder outlet obstruction (BOO) (Table 2).

Table 2. Reasons for catheter insertion

	Total
Tracking of Intake and Output	5
Neurogenic Bladder	10
Immobile Patient	30
Bladder Outflow Obstruction	10
Total	**55**

In all of these patients, the method of popping the balloon by inflating it with water was first tried, and it was successful in 11 (20%) patients. In these patients, the VPS score was seen as 4, and in 3 patients, cystoscopy was performed and residual fragments were removed due to suspicion of residual fragments. In the other 44 patients, the second step was taken because the balloon could not be inflated. 35 (80%) of the remaining 44 patients were successfully treated with our newly described method. In patients where this method was used, VPS was 3 and only one patient had minimal hematuria that did not require treatment. In 9 patients in whom air did not pass through the catheter balloon channel, the third step in the algorithm was started. In this step, the valve of the balloon channel is cut and an attempt is made to eliminate any obstruction due to the valve. This step was successful in only 1 of 9 patients (11%). In the fourth step, the hard part of the sensor guide is sent through the balloon channel, which is cut, and possible encrustation is attempted to be opened within the balloon channel. This method was successful in 2 of 8 patients (25%). No complications were observed in any patient with this method and VPS was found to be 1. In the next stage, the patient is guided by transrectal ultrasound and a prostate biopsy kit is used to pass the Chiba needle through the prostate and target the balloon in the bladder. This method was successful in 5 of 6 patients (83%). The average VAS in patients using this method was 6. In addition, hematuria was observed in two patients, rectal bleeding was observed in 2 patients, and high fever above 38^{o} was observed in one patient after the procedure. In a patient in whom all these methods failed, the catheter was pushed into the bladder using a cystoscope under spinal anesthesia and the balloon was burst with a laser. In this method, the patient's VPS score was 4 after the procedure and temporary hematuria was observed.

Discussion

Foley catheter is used in patients for many purposes in daily practice. Approximately 15-20% of hospitalized patients have a foley catheter inserted (10). One of the rare complications of foley catheter insertion, in addition to complications such as infection, hematuria, urethral stricture and urethral injury, is the inability to remove the catheter as a result of the balloon not being deflated. Since patients are consulted to urologists after various unsuccessful manipulations to remove the catheters, some simple methods to deflate the balloon cannot be applied (11). Therefore, the need to create such an algorithm arose. One of the reasons why the balloon cannot be deflated may be due to faulty manufacturing of the valve mechanism in the inflation channel. Another reason is the isotonic inflation of the balloon and the obstruction of the canal as a result of the crystallization of this fluid (12).

Popping the catheter balloon by inflating it with water is another simple method. First of all, the bladder is filled with 200 cc of water to minimize bladder trauma. The catheter balloon is inflated with water until it bursts, usually 10 to 15 times its capacity (13). The main complications of this technique are bladder rupture and residual fragment formation. If a residual fragment is suspected, the residual fragment should be removed with a cystoscope and foreign body forceps (14). In this study, it is included as the method that should be applied in the first step of our algorithm. Additionally, this method was successful in 11 (20%) of the 55 patients to whom we applied it. In 3 of the patients, cystoscopy was performed due to suspicion of residual fragments and residual

fragments were removed. Additionally, the VPS score in patients due to balloon inflation was 4. In this method, if the balloon channel is obstructed due to encrustation, the method fails because there will be no water passage.

The biggest advantage of the radiological methods used to lower the catheter balloon is that it bursts the catheter balloon under direct vision. The most commonly used method for this purpose is USG. Popping the catheter balloon with a 22 G needle through the suprapubic route using USG is one of the frequently used methods (15, 16). However, the disadvantage of this method is that the balloon is deep and it is difficult to pop it due to the movement of the balloon when popping it with a needle. When studies in the literature are examined, the catheters of the patients were removed successfully and no complications were reported (2,17). This method is modified and the balloon is inflated with 30 cc of air and the bladder is inflated with 200 cc of sf. The balloon containing air approaches the anterior bladder wall with the buoyant force of the water and can be easily popped with a dental needle under USG guidance. Additionally, since the balloon is not inflated too much, the possibility of residual fragments is reduced. In this study, this method was successful in 35 (80%) of 44 patients.

The VPS score of our patients was 3, and minimal bleeding hematuria that did not require any treatment was observed in 1 patient. No residual fragments occurred in any of our patients. For these reasons, we include this new method in the second step of our algorithm. When we compared the method we described with other methods in the literature in terms of complications and success, we saw that the new method we used was safe and gave successful results.

When we examine the catheter balloon deflation methods in the literature, cutting the inflation port distally is one of the simplest methods. By cutting the inflation port distally, the fluid inside the balloon is drained and the catheter is removed. If the obstruction is more proximal, this method will fail (13). In our study, this method was used in 9 patients and was successful in 1 patient. In our algorithm, this method is in the third step. Because after the balloon channel is cut, inflation with water or air becomes difficult. Therefore, other methods should be tried without cutting the balloon channel.

In a series of 11 patients, Bui et al. used a hydrophilic guidewire to deflate the catheter balloon. They resolved the obstruction by sending a hydrophilic guide wire through the catheter balloon channel and allowed the water in the balloon to drain (18,19). The disadvantage of this method is the possibility of damaging the bladder since the hard side of the guidewire is used (18,19). In our study, the catheter was removed using this method in 2 of 8 patients (25%), and no complications were observed in any of the patients. The VAS score was 1 in these patients.

Among the methods using USG, transrectal USG (TRUS) and catheter balloon descent method have also been used. In a study, the catheter balloon was burst using TRUS and an 18 G trucut needle, and no complications were observed in any patient (8). However, some potential complications are possible in the application of this method. Serious side effects such as intestinal injury and acute prostatitis may occur (20). In addition, compared to other methods, it is quite uncomfortable in terms of patient comfort. In our study, this method was successful in 5 of 6 patients (83%). It was observed that the VPS score in these patients was 6, higher than all other methods. Temporary hematuria occurred in 2 patients, transient rectal bleeding in 2 patients, residual balloon fragment in 1 patient, and high fever due to acute prostatitis in 1 patient.

If all these methods are ineffective, the last method is to cut the catheter as proximally as possible, enter it with a cystoscope under spinal or general anesthesia, and burst the balloon with laser or foreign body forceps (9). Although the application of anesthesia in this method is seen as a disadvantage of the procedure, it is very effective in terms of evaluating residual fragments and patient comfort. This method is applied in the last step of our algorithm. In this study, this method was applied to only 1 patient where all other methods failed, and it was successful. A transient hematuria was observed in this patient and the VPS score was 4.

Study Limitations

The fact that the study is retrospective is a shortcoming of our study. We think that our study is valuable because a new method was used in our study and this method gave similar results to other methods in the literature. In addition, we think that our study is valuable in terms of the number of patients and the limited number of patients in the literature on the subject. Thus, the fact that it has introduced an algorithm for catheters whose balloons cannot be deflated also makes our study valuable.

Conclusion

Although the failure to deflate the catheter balloon is not common, it is a situation that disturbs patients greatly. However, complications, mostly minor, may occur during treatment. We think that this method we have described is an effective and safe method to use, like other methods described in the literature.

Ethical Approval:*The study was approved by the Local Ethics Committee of Uşak University (Approval date and number: 2023/246-246).*

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Concept: H.T., E.A.
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