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Case report: failure of foley catheter balloon deflation in a patient undergoing intravesical gemcitabine instillation

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ABSTRACT

***Introduction**: Intravesical gemcitabine instillation using a Foley catheter is a common therapeutic approach in bladder cancer management. Although rare, failure of Foley catheter balloon deflation can complicate clinical management and compromise patient safety.* ***Case presentation**: A 46-year-old male was admitted for intravesical gemcitabine instillation. A 14F Foley catheter was inserted, and the balloon was inflated with 10 ml of sterile water before gemcitabine was instilled. At the end of the dwell time, the nurse was unable to aspirate the balloon fluid, preventing catheter removal. Multiple attempts-including syringe replacement, stronger suction, and reinflation-were unsuccessful. The primary doctor and a urologist were consulted. Balloon tubing was cut, but no fluid was released. While awaiting cystoscopic intervention, spontaneous leakage occurred, allowing easy removal of the catheter. Post-removal inspection revealed normal balloon function. The patient was addmited for overnight observation; he voided normally without dysuria or pain and was discharged in the next monring, completing treatment of intravesical chemotherpy.* ***Conclusion**: The cause of balloon deflation failure in this case remained unclear, but the problem was resolved spontaneously. Multidisciplinary collaboration ensured comprehensive evaluation and avoided unnecessary invasive intervention. This case also highlights the importance of cytotoxic handling precautions when cutting the Foley balloon channel during intravesical chemotherapy.*

***Keywords**: Foley catheter, non-deflating balloon, intravesical gemcitabine, urological complication, case report*

INTRODUCTION

Gemcitabine is a chemotherapeutic agent used intravesically to reduce recurrence rates in non-muscle-invasive bladder cancer [1]. This approach delivers the drug directly into the bladder, minimizing systemic exposure and improving local control. In clinical practice, Foley catheters (commonly 14–16F) are widely used to deliver and retain the drug in the bladder as a closed system for 1–2 hours, after which the drug is drained [2, 3]. This closed-system technique is simple and widely adopted in oncology units.

In addition to the known adverse effects of intravesical gemcitabine, complications related to Foley catheters may occur. These include catheter-associated urinary tract

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infections, bladder spasms, and mechanical problems such as kinking, twisting, encrustation, balloon rupture, or non-deflating balloons [4, 5]. Although non-deflating Foley balloons are rare, they have been described in case reports and retrospective reviews [4, 6]. For instance, Hollingsworth et al. identified 13 such cases, in which management ranged from simple syringe attachment to invasive cystoscopic removal. Among these, 23% deflated spontaneously with syringe attachment, 31% resolved by cutting the inflation channel, 15% were managed with guidewire puncture, and 31% required invasive puncture [6].

Reported causes include mechanical obstruction of the inflation channel by clots, tissue fragments, or debris [7 – 9]; mineral deposition or crystallization (particularly when saline rather than sterile water is used) [10]; and malfunction of the balloon valve or manufacturing defects[8]. Notably, in previously reported cases, catheterization was performed for indications such as surgery, immobility, or fluid balance monitoring [6, 8].

To our knowledge, no provious case has documented balloon deflation failure during intravesical gemcitabine instillation. We report such a case encountered in the Department of Medical Oncology, Vinmec Times City Hospital, to descibe its clinical course, discuss potential mechanisms, and highlight practical management as well as safety considerations for cytotoxic handling.

CASE PRESENTATION

Patient information: A 46-year-old male was incidentally found to have a bladder mass on ultrasound during a routine health check. He had no urinary symptoms. Transurethral resection of the bladder tumor revealed high-grade papillary urothelial carcinoma without invasion (TaN0M0). The patient was scheduled for intravesical gemcitabine instillations postoperatively. The previous five cycles, performed with 14F or 16F Foley catheters, were uneventful. During the sixth cycle, balloon deflation failure occurred.

Clinical course and intervention: Summary of the treatment process and the sixth instillation event is presented in Table 1.

Table 1. Summary of six gemcitabine instillations and sixth-cycle complication

Cycle	Catheter	Procedure	Events / Outcome	Remarks
1–5	14F or 16F Foley	Gemcitabine instilled intravesically as per protocol.	No issues. Catheter removed easily.	Uneventful procedures.
6	14F Foley	Balloon inflated with 10 mL sterile water. Gemcitabine instilled for 2 hours.	Balloon could not deflate. - Tried syringe change, suction, reinflation → failed. - Informed the physician and a urologist. - Cut inflation channel → no fluid. - Planned cystoscopy. Approximately 15 minutes later, spontaneous leak → catheter removed easily.	No pain or distress. Balloon intact, no debris or defect (Fig. 1).

In the sixth instillation, a 14F Foley catheter was inserted, and the balloon was inflated with 10 ml of sterile water. Gemcitabine was instilled without incident. After two hours, attempts to aspirate the balloon fluid failed. The nurse attempted syringe replacement, stronger suction, and reinflation, but all attempts failed.

The event was escalated to the primary physician and a urologist. Further maneuvers were unsuccessful. The inflation channel was transected, but no fluid was released. As the procedure involved a catheter containing cytotoxic material, all steps were performed under standard precautions for handling hazardous drugs, including the use of personal protective equipment and absorbent pads to prevent contamination. The patient was prepared for cystoscopic balloon puncture in the operating room. However, approximately 15 minutes later, spontaneous leakage occurred through the transected channel, and the catheter was removed easily. The patient experienced no pain and remained stable. Inspection revealed a structurally intact, normally functioning balloon with no obstruction or debris (Figure 1).

Figure 1. Foley catheter after removal

(1) *Balloon channel transection site*

(2) *Green balloon inflation port indicating a 14 Fr Foley catheter*

(3) *Catheter balloon*

DISCUSSION

Balloon deflation failure has been documented in numerous case reports and retrospective studies. A Canadian survey between May 2002 and January 2003 identified 13 such cases[6]. In Turkey, 55 cases were reported over three years in a urology clinic [11]. Indications for catheterization included neurogenic bladder, fluid balance monitoring, immobility, acute urinary retention, medical comorbidities, or non-urological surgery [6, 11]. A distinguishing feature of this report is that catheterization was performed not for urinary reasons, but for intravesical gemcitabine instillation in bladder cancer treatment. This highlights that balloon deflation failure can occur not only in surgical or medical patients, but also in oncology treatment contexts.

Mechanisms of balloon deflation failure: Several mechanisms have been proposed. Mechanical obstruction of the inflation channel is common, caused by clots, tissue fragments,

or crystallization-especially when saline is used instead of sterile water [8, 10, 12]. In our case, sterile water was used, making crystallization unlikely. Another mechanism involves valve malfunction or structural defects of the inflation lumen [7, 8]. This mechanism may explain the gradual leakage of fluid when a syringe is attached to the balloon port [6], or cases in which cutting the balloon channel branch of the catheter subsequently leads to urinary leakage [8]. In the clinical situation we report, the delayed leakage of fluid after cutting the balloon channel strongly suggests this as the most likely cause. In addition, the literature also describes other possible causes of balloon deflation failure, such as cases where the catheter is inadvertently inserted into the ureter [13, 14], or when the catheter becomes knotted[15] making balloon deflation impossible.

Although balloon deflation failure has been well documented, there is no published evidence directly linking gemcitabine to catheter valve obstruction or crystallization. Gemcitabine is highly water-soluble and chemically stable in aqueous solution [16], and no studies have reported precipitation or material degradation affecting silicone or latex catheters during intravesical use. Reported obstruction mechanisms mainly involve crystalline biofilms from urease-producing bacteria, rather than drug-related crystallization or chemical reactions with catheter materials [17]. Nevertheless, prolonged contact between cytotoxic solutions and catheter surfaces could theoretically influence material elasticity or valve performance after repeated exposures. In the present case, sterile water was used for balloon inflation, and the catheter was structurally intact after removal, suggesting that the event was more likely mechanical or valve-related rather than drug-induced.

Management of the complication of non-deflating balloon in patients with indwelling urinary catheter: The management strategy in our case was generally consistent with the recommendations in the literature [6, 8, 11, 18] : The steps included: attempting aspiration and reinflation, collaborating with the treating physician and urologist for evaluation, cutting the balloon inflation channel when valve obstruction was suspected, and preparing for invasive intervention in the operating room if necessary. In practice, the attempt to reinflate failed, most likely due to an obstruction in the inflation channel. Some retrospective studies do not recommend reinflation with the purpose of rupturing the balloon, as this maneuver may cause pain, bladder injury, or rupture of the balloon leading to debris in the bladder [6, 11, 19]. Hollingsworth et al proposed attaching a syringe to the inflation port and leaving it in place for a period of time, with the expectation that the balloon would gradually deflate [6]. In our case, cutting the balloon channel resolved the problem, although balloon deflation was slow. This solution has also been reported as successful in several other retrospective studies [6, 8, 11]. However, the context of intravesical Gemcitabine instillation raised the risk of leakage of cytotoxic fluid when cutting the balloon channel, thereby requiring strict safety control procedures for healthcare workers.

To our knowledge, there are currently few reports describing non-deflating balloon complications in the context of intravesical gemcitabine instillation. Therefore, this case provides rare real-world evidence, emphasizing the need for caution in the use of Foley catheters during bladder cancer treatment, as well as the importance of multidisciplinary collaboration and adherence to standard management protocols. The publication of this experience may help raise awareness and support healthcare professionals in clinical practice.

CONCLUSION AND LESSONS LEARNED

Balloon deflation failure is a rare but important complication that can occur even with proper technique and intact catheter structure. Clinicians performing intravesical chemotherapy should be aware that, even with sterile water inflation, balloon deflation failure may occur. A structured, stepwise approach and strict adherence to cytotoxic handling protocols are essential. Simple maneuvers should be attempted first, followed by multidisciplinary evaluation before any invasive intervention. Strict cytotoxic precautions must be observed when cutting or handling catheters after gemcitabine instillation to prevent occupational exposure. Effective teamwork and systematic management help ensure patient safety and support institutional learning.

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