PEER-REVIEW REPORT

Name of journal: World Journal of Clinical Cases
Manuscript NO: 85469
Title: Fournier’s gangrene after insertion of thermo-expandable prostatic stent for benign prostatic hyperplasia: A case report
Provenance and peer review: Unsolicited Manuscript; Externally peer reviewed
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Academic degree: MD, MSc, PhD
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Reviewer’s Country/Territory: Croatia
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SPECIFIC COMMENTS TO AUTHORS
All comments are put as "comments" in the original Word document of the manuscript.

-> I appreciate for your prudent comment. We replied your all comments in the below original word document.
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Professional title: Surgeon, Teaching Assistant

Reviewer’s Country/Territory: Slovenia

Author’s Country/Territory: South Korea

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Dear Authors, The topic of your paper is interesting. Below you can find my comments:

1) keywords: urethral stents instead of stents - you wrote:
   -> I appreciate for your prudent comment. We agreed your comment. We changed this word; urethra stent instead of stents.

2) An 88-year-old man presented to the emergency room with a complaint of a skin color change in the right scrotal area for 1 d. - what was color of the skin? red? brown/black? - you wrote:
   -> I appreciate for your prudent comment. This patient initially visited to another hospital for scrotal pain and red color change in right scrotal area for 1 day. However, his symptom aggravated for 7 days, and scrotal skin color was changed to black with foul-smelling. We described the sentence in case presentation part.

3) The patient was administered oral antibiotics for 1 week but the symptoms persisted. - which antibiotic? who prescribed the antibiotic? -
   -> I appreciate for your keen comment. This patient initially had the empirical antibiotics; fluoroquinolone (ciprofloxacin) in accordance with epididymitis. We described the sentence in case presentation part.

4) what about medicamentous therapy? (please add the medications that the patient was taking regularly) - why did you decide to insert stent? what about medicamentous therapy? - you wrote:
   -> I appreciate for your keen comment. This patient had α-blocker (silodosin 8mg) and 5-alpha reductase inhibitor (finasteride) for several years due to lower urinary tract...
symptom (LUTS). However, this symptom had persisted despite medications. We diagnosed refractory LUTS with bladder outlet obstruction (BOO). So, we decided to insert prostatic stent (Memokath 028). We described the sentence in case presentation part.

5) He was diagnosed with BPH and we planned a transurethral resection of the prostate (TURP). - you diagnosed BPH based just on TRUS and uroflowmetry? BPH is histopathological diagnosis!!! - you wrote:

-> I appreciate for your keen comment. We completely agree your comments. As mentioned above answer, this patient had α-blocker and 5-alpha reductase inhibitor for several years, but his symptom had persisted. IPSS was 26 points, and the prostate volume was 126cc. Therefore, we diagnosed refractory LUTS with BOO. We described the sentence in case presentation part.

6) Therefore, we performed MIS under local anesthesia and implanted a thermo-expandable urethral stent (Memokath 028) - what kind of local anesthesia? which aesthetic did you use?

-> I appreciate for your keen comment. We used the intraurethral lidocaine gel before procedure. Also, we used the analgesic drug injection intravenously during procedure. Another anesthetic procedure was not performed. We described the sentence in case presentation part.

7) what kind of CT did you performed? - you wrote:

-> I appreciate for your keen comment. We performed abdominal-pelvic enhanced CT in emergency room. We described the sentence in case presentation part.

8) Necrotic tissues throughout the right inguinal region, scrotum, and perineum were resected, and right orchiectomy was performed urgently; the Memokath 028 stent was removed simultaneously using cystoscopy - can you add more data about the urethra and bladder; did you find necrosis in urethra and bladder?

-> I appreciate for your keen comment. In cystoscopy, the anterior and posterior urethra were intact, but prostatic urethra was erythematous change after removal of stent. In bladder, multiple erythematous mucosal change was identified in cystoscopy. We
described the sentence in case presentation part.

9) have you send any samples (if yes, which) for microbiology evaluation?
>
-> I appreciate for your prudent comment. We performed the microbiological evaluation in urine, blood, wound, and prostatic stent. We described these result in table 1.

10) when did you start antibiotic treatment? which antibiotics/doses?
>
-> I appreciate for your prudent comment. We started antibiotics treatment before extended surgical debridement and persisted after debridement. As mentioned above case presentation part, we used meropenem (0.5g twice daily), vancomycin (1g twice daily), and clindamycin (0.6g thrice daily) intravenously. We described the sentence in case presentation part.

11) did you change antibiotic therapy? which microorganisms were isolated? - you wrote:
>
-> I appreciate for your prudent comment. We did not change antibiotics therapy, as a consultation of infectious disease. The type of isolated microorganism was described in table 1. We described the sentence in case presentation part.

12) The treatment of FG involves emergency surgical drainage and the use of extended broad-spectrum antibiotic. - in patients with FG we are performing necrectomy!!! not drainage
>
-> I appreciate for your prudent comment. We completely agree your comments. We performed the extended surgical debridement, not simple drainage. We changed the word in case presentation part.

>
-> I appreciate for your prudent comment. We marked the structures on CT Image using arrows (figure 3). Also, we cited your suggested article.
**PEER-REVIEW REPORT**

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**Reviewer’s code:** 02513151

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**Academic degree:**

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**Author’s Country/Territory:** South Korea

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**Review time:** 1 Hour

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**SPECIFIC COMMENTS TO AUTHORS**

Excellent manuscript

-> I appreciate for your prudent comment.
Abstract

BACKGROUND

Thermo-expandable urethral stent (Memokath 028) implantation is an alternative treatment for older patients with lower urinary tract symptoms and benign prostatic obstruction. Following prostatic urethral stent implantation, minor complications such as urinary tract infection, irritative symptoms, gross hematuria, and urethral pain have been observed; however, there are no reports of life-threatening events. Herein, we report a critical case of Fournier’s gangrene that occurred 7 years after prostatic stenting.

CASE SUMMARY

An 81-years-old man with benign prostatic hyperplasia (volume, 126 cc; as measured by transrectal ultrasound) had undergone insertion of a thermos-expandable urethral stent (Memokath 028) as he was unfit for surgery under general anesthesia. Additionally, the patient had undergone a suprapubic cystostomy for recurrent acute urinary retention 4 years after the initial procedure. We had planned to remove the Memokath 028; however, the patient was lost to follow-up. The patient presented to the emergency department 3 years after the second procedure with necrotic changes from the right scrotum to the right inguinal area. He was diagnosed with Fournier’s gangrene based on the physical examination and computed tomography findings. Therefore, he underwent emergency drainage and removal of the Memokath 028. Broad-spectrum intravenous antibiotics were administered and necrotic tissue debridement was performed. However, the patient died 14 days after surgery due to sepsis.

CONCLUSIONS

If Memokath 028 is ineffective for benign prostatic hyperplasia in older patients, its rapid removal may help prevent severe complications.

Keywords:
Stents, minimally invasive surgery, complication, Fournier’s gangrene, Benign
prostatic hyperplasia, case report

Core tip: Herein, we report a life-threatening complication occurring several years after Memokath 028 implantation in an older and frail patient with benign prostatic hyperplasia for the first time. Memokath 028 is a permanent stent and additional urinary diversion procedures, including suprapubic cystostomy, were performed on the patient 3 years before Fournier’s gangrene occurred. However, our report suggests that severe complications associated with genito-urinary organ infection may occur in patients with risk factors for Fournier’s gangrene unless the stent is removed. This report provides a good example of the management of patients with permanent or temporary prostatic stents for benign prostatic hyperplasia.

INTRODUCTION

Bladder outlet obstruction (BOO) associated with benign prostatic hyperplasia (BPH) is a common cause of lower urinary tract symptoms (LUTS). In men, the incidence of BOO with BPH increases with age, affecting up to 80% of men by 70 years of age[1]. Currently, the surgical treatment options for BPH vary among patients with BPH refractory to medical therapy[2]. Minimally invasive surgery (MIS) for frail and older patients with BPH has recently been developed[3]. Prostatic urethral stenting is an MIS technique used to treat BPH. This has evolved with the development of materials, procedures, shapes, and plasticity[4]. Memokath 028 (Pnn Medical, Denmark) is a non-epithelializing thermo-expandable prostatic urethral stent made of nickel and titanium[5]. In a previous study, Memokath 028 implantation reduced the International Prostate Symptom Score (IPSS) and improved uroflowmetry parameters[6]. It is also a feasible option for frail and older patients with refractory to medical treatment of BPH who are contraindicated for surgery under general anesthesia[7].

Some cases of minor complications following Memokath 028 implantation have been reported[8]. However, to our knowledge, there are no reports of fatal complications of
Memokath 028 implantation. Herein, we report a critical case of Fournier’s gangrene (FG) in a patient who had undergone Memokath 028 insertion for BPH.

CASE PRESENTATION

Chief complaints

An 88-year-old man presented to the emergency room with a complaint of skin color change in the right scrotal area for 1 d.

History of present illness

The patient had right scrotal pain for 1 week before presenting with a skin color change in the right scrotal area. The patient was administered oral antibiotics for 1 week but the symptoms persisted.

History of past illness

Seven years prior, the patient had visited the urology department for voiding dysfunction. The total IPSS score was 26, and the Quality of Life (QoL) score was 5. On uroflowmetry, the maximal flow rate ($Q_{\text{max}}$) was 6.5 mL/sec, voiding volume was 182 mL, and residual urine volume was 258 mL. The prostate volume was 126 cc on transrectal ultrasonography (TRUS). He was diagnosed with BPH and we planned a transurethral resection of the prostate (TURP). However, he was not suited for surgery under general anesthesia because of a high American Society of Anesthesiologists (ASA) score: history of myocardial infarction (MI), cerebrovascular accident (CVA), and chronic obstructive pulmonary disease (COPD). Therefore, we performed MIS under local anesthesia and implanted a thermo-expandable urethral stent (Memokath 028) (Figure 1). Six months after surgery, the $Q_{\text{max}}$ was 14.8 mL/sec and the residual urine volume was 85 ml. Thereafter, he did not visit our urology department. The patient had undergone a suprapubic cystostomy 4 years after the initial surgery at a local medical center.

Personal and family history

No relevant personal or family history was identified.
**Physical examination**

On physical examination, the patient’s blood pressure was 110/70 mmHg, heart rate was 90/min, body temperature was 36.0°C, and oxygen saturation was 96% in room air. The skin color change indicated necrosis and ranged from the right lower abdomen to the right scrotum (Figure 2). The left lower abdomen, left scrotum, and penis were normal.

**Laboratory examinations**

The levels of several serum inflammatory markers were elevated. The white blood cell count was 13.62 /μL, C-reactive protein level was 23.79 mg/dL, procalcitonin level was 7.12 ng/mL, serum lactate level was 3.5 mmol/L, serum creatinine level was 2.47 mg/dL, and serum glucose level was 33 mg/dL.

**Imaging examinations**

Computed tomography (CT) revealed emphysematous changes and inflammatory infiltration in the right inguinal, suprapubic, scrotal, and perineal regions (Figure 3). In addition, the prostatic urethral stent was observed in the enlarged prostate (Figure 4).

**FURTHER DIAGNOSTIC WORK-UP**

No further diagnostic work-up was required.

**FINAL DIAGNOSIS**

The final diagnosis was Fournier’s gangrene.

**TREATMENT**

Necrotic tissues throughout the right inguinal region, scrotum, and perineum were resected and right orchiectomy was performed urgently. The Memokath 028 stent was removed simultaneously using cystoscopy (Figure 4). After surgery, the patient's condition worsened, and he was promptly admitted to the intensive care unit (ICU).
for management. Mechanical ventilation, broad-spectrum antibiotics administration, and total parenteral nutrition were required in the ICU. Meropenem (0.5 g twice daily), vancomycin (1 g twice daily), and clindamycin 0.6 g thrice daily) were administered intravenously. Hemodialysis was initiated on postoperative day 1 due to the shutdown of urine output. Necrotic tissues were debrided several times postoperatively. Despite the intensive management, the patient’s condition did not improve and he died on postoperative 14 days.

OUTCOME AND FOLLOW-UP

On postoperative day 14, the patient died due to sepsis.

DISCUSSION

FG is a necrotizing fasciitis that involves the perineal, perianal, or genital areas. FG can progress rapidly and cause sepsis, multiorgan failure, and even death. The treatment of FG involves emergency surgical drainage and the use of extended broad-spectrum antibiotics. Despite a combination of well-timed surgical and medical treatments, the mortality rate associated with FG is high. The fatality rates of FG were reported to be approximately 16% and 8.8% in the 1900s and the 2000s, respectively. AEE et al. demonstrated that the comorbid risk factors for mortality in FG were diabetes, heart disease, renal failure, and kidney disease. Sugiha et al. reported that old age, sepsis, and a broad range of FG debridement were associated with a high mortality rate. The cause of death in FG has been associated with sepsis and multiorgan failure. Herein, the patient had diabetes and heart disease (MI).

As mentioned earlier, prostatic stents for LUTS with BOO have been developed over several decades and their application is feasible in frail and older men who are contraindicated for conventional BOO surgery. Perry et al. reported the long-term outcomes of older patients who underwent Memokath 028 placement for LUTS with BOO. This previous study demonstrated that Memokath 028 was a valuable treatment option for frail and older patients who could not undergo surgery. In our case, the patient was 81 years old and not suited for surgery because of a high ASA score. Although the prostate volume was large (approximately 126 ccs), the IPSS and...
uroflowmetry parameters improved after Memokath 028 implantation. In addition, no aggravation of symptoms was observed during the follow-up period after surgery. Meanwhile, the rate of complications following Memokath 028 placement was shown to be low in previous studies. Lee et al. reported that 3 of their 15 patients experienced minor complications after Memokath 028 implantation, such as dysuria and perineal discomfort[7]. In a study on the 8-year outcomes of Memokath 028 implantation, the majority of complications were minor, such as migration, pain, or incontinence[6]. Severe and fatal complications after Memokath 028 implantation have not been reported in previous studies. Herein, we report a life-threatening complication that occurred several years after Memokath 028 insertion for the first time. We concluded that the cause of death in our patient was sepsis due to FG from the right epididymo-orchitis associated with the Memokath 028.

Our patient had undergone a suprapubic cystostomy in a local urologic clinic 3 years before the diagnosis of FG for acute urinary retention. Despite the suprapubic cystostomy, FG occurred in this patient. Igawa et al. demonstrated that urethral catheterization was associated with epididymitis[14]. Our patient had a Memokath 028 implant, which might have provoked prostatitis and epididymitis, similar to urethral catheterization. Many studies on the efficacy of the Memokath 028 have reported that it is a permanent stent, and only minor complications occur during the indwelled state. To prevent severe complications, such as urosepsis or FG, we believe that the Memokath 028 stent should have been removed when the patient had undergone the suprapubic cystostomy. In addition, with the development of anesthetic techniques and MIS for BPH, other MIS techniques, such as anatomical endoscopic enucleation of the prostate or robot-assisted simple prostatectomy, may have been effective in this patient who had a large prostate volume exceeding 100 cc.

**CONCLUSION**

Although most complications after Memokath implantation 028 for BPH are minor, life-threatening complications, such as FG, can occur in older and frail patients. To avoid severe complications, when Memokath 028 is ineffective, its rapid removal may be helpful in older and frail patients.
ACKNOWLEDGMENTS

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REFERENCES


9. Hakkarainen TW, Kopari NM, Pham TN, Evans HL. Necrotizing soft tissue
infections: review and current concepts in treatment, systems of care, and outcomes.


Footnotes

Informed consent statement: Informed written consent was obtained from the legal representative of the patient for the publication of this report and any accompanying images.

Conflict-of-interest statement: The authors declare that they have no conflict of interest to disclose.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).
Figure Legends

Figure 1

The insertion of thermo-expandable prostatic stent (Memokath 028) in cystoscopy (A) and C-arm view (B).

(A)

(B)

批注 [GA65]: Is it normal to see the stent throughout the cystoscopy view. Please clarify in the main text or figure text

批注 [영금66R65]: This cystoscopy was conducted 7 years ago during the insertion of thermo-expandable prostatic stent. He had only 'kissing sign'. Please re-check following sentence to this figure 1.
Figure 2

The initial finding of necrotic skin lesion in right scrotum and inguinal area.

批注 [GA67]: The skin changes look necrotic. What does not resemble FG clinically is that the area of necrosis is homogenous and there is no redness and edema in the surrounding tissues.

批注 [영김68867]: He had symptom of redness and swelling of right scrotum initially. However, he initially visited another hospital and administrated antibiotics. After that, this symptom was aggravated and skin color of right scrotum changed to as this figure. The evidence of diagnosis for FG was CT findings (abscess formation and gas-forming appearance in right scrotum) and clinical course of disease (initially redness and swelling of right scrotum).
Figure 3

The initial computed tomography of this patient. (A) showed the emphysematous and inflammatory change in right scrotum and perineum. (B) revealed the thermo-expandable prostatic stent (Memokath 028) in huge prostate.

(A)

(B)
The gross findings after emergent surgical drainage of Fournier’s gangrene in right inguinal, scrotum, and perineum.

批注 [GA69]: This is inadequate excision for FG. All necrotic tissue should be removed. Completeness of excision is confirmed with vital (bloody) borders. In other words, some bleeding should be visible. Also, what is telling against FG, is the absence of the reddish-brown, foul-smelling fluid (“dishwater fluid”). Please again consult the reference Rectal cancer and Fournier’s gangrene - current knowledge and therapeutic options - PubMed (nih.gov)

批注 [영상70869]: Initially, we incompletely performed the extended surgical debridement and excision of necrotic tissue because of unstable vital sign during operation. However, foul-smelling fluid was identified in necrotic tissue during operation. We attached your recommended article in reference part.