World Journal of Surgery and Surgical Research

Case Report
Published: 10 Jun, 2024

Surgical Procedures for Repairing Artificial Urethral Sphincter Exposed Outside the Scrotum: A Case Report

*Wang J, Meng L, Wang X, Jing J, Yan Z, Wang X, Zhang J and Zhang Y**

Department of Urology, Beijing Hospital, National Center of Gerontology, Institute of Geriatric Medicine, Chinese Academy of Medical Sciences & Peking Union Medical College, China

Abstract

Background: Artificial Urethral Sphincter (AUS) has been considered as the golden standard for Post-Radical Prostatectomy Urinary Incontinence (PRPUI). The urological diagnosis indicated AUS device must be removed from body when implant-related infection happens and the new device needs to be implanted 3 to 6 months later. However, whether the device is supposed to be completely removed from body for all types of AUS related infections wasn't clearly described in the guidelines, besides, the method of repair surgery wasn't clearly presented.

Case Report: This case report described a surgical method of repairing AUS device, which indicated that it is possible to perform repair surgery for AUS device under the condition of adequate antibiotic irrigation during the operation rather than remove the entire device for the situation of control pump exposed outside the scrotum. In addition, the clinical promotion of this surgical method was supposed to enrich the surgical treatment system of AUS and reduce the medical expenditure of patients. After half of 1 year's follow up, the patient's scrotal skin healed perfectly and didn't have symptoms of systemic infection, besides, the patient uses a maximum of 1 pad per day currently, resulting in particular satisfaction with the treatment effect.

Conclusion: Based on the successful repair of this case, we indicated that AUS device can be repaired rather than removal complete in the case of local infection. This clinical promotion of the surgical method will enrich the surgical treatment system of AUS and reduce the medical expenditure of patients.

Keywords: Artificial Urethral Sphincter (AUS); Post-Radical Prostatectomy Urinary Incontinence (PRPUI); Repairing operation

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Correspondence:
Yaoguang Zhang, Department of Urology, Beijing Hospital, National Center of Gerontology, Institute of Geriatric Medicine, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing 100730, China, Tel: +86-13031099662;

Received Date: *06 May 2024*
Accepted Date: *27 May 2024*
Published Date: *10 Jun 2024*

Citation:
Wang J, Meng L, Wang X, Jing J, Yan Z, Wang X, et al. Surgical Procedures for Repairing Artificial Urethral Sphincter Exposed Outside the Scrotum: A Case Report. World J Surg Surgical Res. 2024; 7: 1552.

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Introduction

Artificial Urethral Sphincter (AUS) has been considered as the golden standard for Post-Radical Prostatectomy Urinary Incontinence (PRPUI) because it achieves the best curative outcomes compared with behavioral therapy and pharmacotherapy [1,2]. Generally, the average lifespan of AUS is 7 years, which lead to the possibility of re-operation during long-term implantation [3-5]. Common causes of re-operation are usually described as trauma, infection, urethral atrophy and urethral erosion. In addition, the urological diagnosis and treatment guidelines indicated AUS must be removed from body when implant-related infection happens and the new device needs to be implanted again after 3 to 6 months [6,7].

At present, the type of AUS 800™ is most widely used in the treatment of PRPUI and patients' symptoms have been relieved to a great extent [8]. However, whether the devices are supposed to be completely removed from body for all types of AUS related infections hasn't been clearly described in the guidelines. Moreover, a number of patients refuse to undergo secondary surgical implantation when the implant-related infection happens due to the high cost and 3 to 6 months of waiting greatly affected patients' quality of life. Hence, we have been exploring the possibility of repairing implant in specific situations.

Last year, our group successful repaired a case of PRPUI patient whose control pump of AUS 800™ was exposed outside the scrotum. The device was successfully activated 1 month later and patient got satisfactory outcome, which indicated that it is possible to repair AUS device in the presence of local infection instead of removing the entire device. In this article, we'd like to complement the treatment options for this type of disease by sharing the whole process of treatment and surgery details.

Case Presentation

Basic information of patient

A 75-year-old male patient developed urinary incontinence for 2 years because of the robot-assisted radical prostatectomy. According to the patient's description, neither behavioral therapy nor pharmacotherapy was responded to him in the course of past treatments. In general, six pads were used for symptom relief daily. The patient was treated with endocrine therapy for two years after prostate cancer surgery, besides; he had a history of hypertension and renal surgery. After preoperative evaluation, the above-mentioned diseases had no effect on AUS surgery. Table 1 presents the details of patients' basic information.

The patient underwent urodynamic examination and cystoscopy before the first AUS 800™ surgery, which indicated that he had normal a bladder capacity and good urethral condition. In addition, urodynamic examination showed Valsalva Leak Point Pressure (VLPP) was 72 cmH_2O and the Cough Leak Point Pressure (CLPP) was 132 cmH_2O. The patient's Maximum Urethral Pressure (MUP) before primary surgery was 91 cmH_2O, and the Maximum Urethral Closure Pressure (MUCP) was 51 cmH_2O. Table 2 presents the details of urodynamic information. Finally, the patient underwent the first surgical treatment of AUS 800™ and the incision healed completely 2 weeks after surgery due to the poor skin condition of scrotum (Figure 1A showed the scrotal state 10 days after first AUS surgery). In addition, endocrine therapy leaded to testicular atrophy and small scrotal space in patients, which become potential risk factors for AUS pump prolapsing from the scrotum.

Repairing operation

The patient accepted a repairing operation of AUS 800™ on account of the scrotum's traumatic impact, besides, trauma exposed the AUS 800™ device outside the scrotal skin one month after the initial surgery (Figure 1B showed the condition of AUS 800™ after injury). Before the repairing surgery, we performed a rigorous evaluation of the patient's physical status and didn't reveal systemic symptoms of infection. Although the patient had a local infection in the scrotal skin, there was no significant damage to the AUS 800™ pump. After full evaluation and consultation with the patient, we decided to performed the repairing operation of AUS 800™.

Three days before the repairing operation, iodophor disinfectant was applied daily to disinfect the surgical skin and the exposed AUS 800™ pump, besides, patients were required to accepted skin preparation of the surgical area on the day of surgery. Meanwhile, vancomycin (1000 mg) and levofloxacin (500 mg) were administered 24 h before repairing surgery. During surgery, the scrotal skin was incised along the original surgical incision and the scar was separated by adequate dissection to completely expose the intrascrotal AUS 800™ connection channel (Figure 2). In addition, the skin around the AUS pump and tissue inside the scrotum which were at risk of infection should also be completely removed. Antibiotic saline (vancomycin plus amikacin), hydrogen peroxide, and diluted iodophor saline were used to adequately flush the surgical area and AUS device (Figure 2A). Because of limited skin in the right scrotum, we recreated the pouch between the left scrotal carnosa and the testicular fascia to store AUS 800™ device (Figure 3A). Finally, the

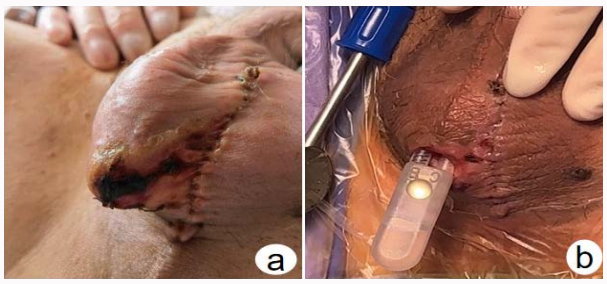

Figure 1: A) The scrotal state 10 days after first AUS surgery; B) The condition of AUS 800™ after injury.

Table 1: Baseline characteristics of the patient.

Type	Characteristic
Gender	Male
Age (years)	75
BMI (kg/m^2)	24.49
Course of disease (years)	2
The number of pads (before treatment)	6

BMI: Body Mass Index

Table 2: Urodynamic information during AUS surgery.

Medical examination	Consequence
Bladder capacity (ml)	300
Residual urine volume(ml)	0
CLPP (cmH_2O)	72
VLPP (cmH_2O)	132
MUP (cmH_2O)	91
MUCP (cmH_2O)	51
Q-max (ml/s)	13
Urethrostenosis	No

MUP: Maximum Urethral Pressure; MUCP: Maximum Urethral Closure Pressure; VLPP: Valsalva Leak Point Pressure; CLPP: Cough Leak Point Pressure

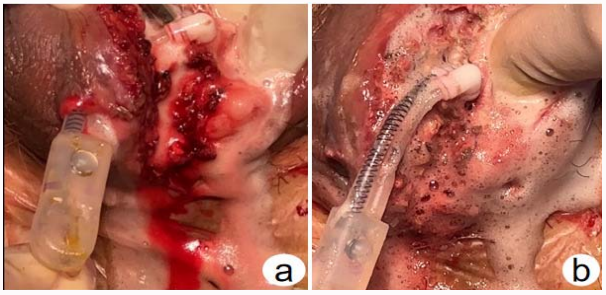

Figure 2: A) Irrigating the surgical area with mixed fluids; B) Tissue removal and exposure of the AUS device.

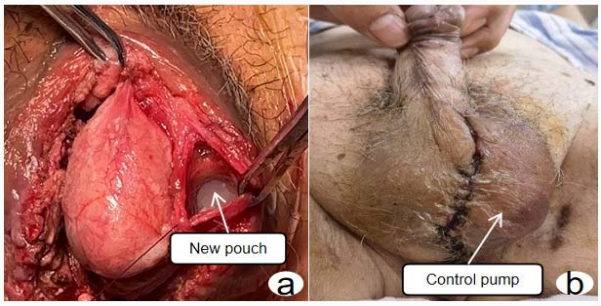

Figure 3: A) The location of the new pouch; B) The new pouch and device were sutured.

surgical area was sutured completely (Figure 3B). After operation, we confirmed the device's function by briefly activating AUS pump and measuring urethral pressure of patients (The MUCP is 156 cmH_2O and the MUP is 172 cmH_2O).

Postoperative management and result

After repairing operation, the surgical area needed to be sterilized once every two days until the wound was healed (Figure 1B showed the skin state after healing). Then, vancomycin (1000 mg) plus levofloxacin (500 mg) were administered intravenously once daily to the patient for 1 week after repairing surgery. After that, antibiotic therapy was changed to oral levofloxacin for further treatment of the infection. Patient was asked to activate the AUS 800™ control pump 6 weeks later and achieved success. Finally, after half of 1 year's follow up, the patient's scrotal skin healed perfectly and didn't have symptoms of systemic infection, besides, the patient uses a maximum of 1 pad per day currently, resulting in particular satisfaction with the treatment effect.

Discussion

Recent years, AUS 800™ has been widely used in clinical operation, which has led to clear options for the treatment of patients with urinary incontinence [9], especially for PRPUI. Although the AUS 800™ has been widely applied to clinical practice, the surgery-related treatment system is still relatively limited. For example, current guidelines clearly stated that the AUS device should be removed and re-implanted in the cases of patients with severe infection and urethral erosion [10]. However, few cases have been reported on the surgical approach in AUS with local infection or traumatic conditions and it is not clear whether the removal and replacement of AUS device are necessary for different degrees of infection. Therefore, exploratory cases are needed in clinical treatment to further enrich the treatment approach for this disease.

Infection and inadequate blood supply are critical factors affecting the success of any repair procedures [11]. For this patient, poor scrotal skin condition, necrotic tissue surrounding the AUS device (internal and external), and the risk of infection caused by external exposure to AUS pump were key points affecting the success of surgical repair. In order to resolve the above situations, we paid full attention to the application of antibiotics and the skin care of the surgical area, which became the cruxes to the success of repair surgery.

Escherichia and *Staphylococcus* are common strains causing infection during artificial urethral sphincter surgery [12,13]. In this case, on the premise of intravenous targeted application of sensitive antibiotics, we also combined with mixed antibiotic solution to irrigate the wound and AUS devices. In addition, we considered the disinfection effect of hydrogen peroxide and diluted iodophor in implant surgery and used them for intraoperative irrigation of surgical wounds and AUS devices [14,15]. Based on this successful case of repair operation, we believe that under the premise of thorough removal of inactivated tissue and suspected infected tissue, this combined irrigation method can be used for the clinical promotion of this type of repair surgery in the future.

For postoperative management of such surgery, the urethral pressure measurement should be included as another key step in this type of repair procedure [16], which can be performed after the incision is closed to evaluate the function of the AUS device and to initially evaluate the surgical effect. In addition, observing the healing of the surgical area is directly related to the success of the patient's repair surgery. For example, we attach great importance to the disinfection and nursing of the surgical area during the period, which is the key to the success of the operation. Secondly, for this type of repair, we still advocate activating the AUS device after 6 weeks, which can further avoid external contamination of the wound.

This single-case repair operation still has some limitations. First of all, the procedure and details of the operation need to be further optimized in more similar cases. Then, the patients need more long-term follow-up to observe the subsequent treatment effect. Finally, we reattached the AUS control pump to the contralateral scrotum due to insufficient scrotal skin and space on the surgical side, which increased the patient's adaptation time. Therefore, the re-implantation site of the control pump is preferred to the dominant hand side of patients if the scrotal skin and space are suitable.

Conclusion

Based on the successful repair of this case, we indicated that AUS device can be repaired rather than removal complete in the case of local infection. The key point of the surgery is the adequate disinfection of the device during the operation. This clinical promotion of the surgical method will enrich the surgical treatment system of AUS and reduce the medical expenditure of patients.

Funding

Non-profit Central Research Institute Fund of Chinese Academy of Medical Sciences (2023-JKCS-21).

References

1. Cordon BH, Singla N, Singla AK. Artificial urinary sphincters for male stress urinary incontinence: Current perspectives. Med Devices (Auckl). 2016:9:175-83.
2. Khouri RK Jr, Ortiz NM, Dropkin BM, Joice GA, Baumgarten AS, Morey AF, et al. Artificial urinary sphincter complications: Risk factors, workup, and clinical approach. Curr Urol Rep. 2021;22(5):30.
3. Elliott DS, Barrett DM. Mayo Clinic long-term analysis of the functional durability of the AMS 800 artificial urinary sphincter: A review of 323 cases. J Urol. 1998;159(4):1206-8.
4. Rehder P, Pinggera GM, Mitterberger M, Pelzer AE, Gozzi C, Herwig R. Urethral support with PelviSoft after artificial urinary sphincter erosion at revision procedures. Wien Med Wochenschr. 2007;157(7-8):170-2.
5. Wilson SK, Delk JR 2nd, Henry GD, Siegel AL. New surgical technique for sphincter urinary control system using upper transverse scrotal incision. J Urol. 2003;169(1):261-4.
6. Dupuis HGA, Bentellis I, El-Akri M, Brierre T, Cousin T, Gaillard V, et al. Early efficacy and safety outcomes of artificial urinary sphincter for stress urinary incontinence following radical prostatectomy or benign prostatic obstruction surgery: Results of a large multicentric study. Eur Urol Focus. 2022;8(4):1053-9.
7. Mock S, Dmochowski RR, Brown ET, Reynolds WS, Kaufman MR, Milam DF et al. The impact of urethral risk factors on transcorporeal artificial urinary sphincter erosion rates and device survival. J Urol. 2015;194(6):1692-6.
8. Montague DK. The artificial urinary sphincter (AS 800): Experience in 166 consecutive patients. J Urol. 1992;147(2):380-2.
9. Myers JB, Brant WO, Hotaling JN, Lenherr SM. Urethral strictures and artificial urinary sphincter placement. Urol Clin North Am. 2017;44(1):93-103.
10. Amend B, Toomey P, Sievert KD. Artificial sphincter. Curr Opin Urol. 2013;23(6):520-7.

11. Negut I, Grumezescu V, Grumezescu AM. Treatment strategies for infected wounds. Molecules. 2018;23(9):2392.

12. Werneburg GT, Hettel D, Adler A, Mukherjee SD, Lundy SD, Angermeier KW, et al. Biofilms on indwelling artificial urinary sphincter devices harbor complex microbe-metabolite interaction networks and reconstitute differentially *in vitro* by material type. Biomedicines. 2023;11(1):215.

13. Sun HH, Callegari M, Zhou E, Rhodes S, Brant A, Jesse E, et al. Trends over 20 years of antimicrobial prophylaxis for artificial urinary sphincter surgery. Neurourol Urodyn. 2023;42(6):1421-30.

14. Pan S, Rodriguez D, Thirumavalavan N, Gross MS, Eid JF, Mulcahy J, et al. The use of antiseptic solutions in the prevention and management of penile prosthesis infections: A review of the cytotoxic and microbiological effects of common irrigation solutions. J Sex Med. 2019;16(6):781-90.

15. Capriotti K, Capriotti JA. Topical iodophor preparations: Chemistry, microbiology, and clinical utility. Dermatol Online J. 2012;18(11):1.

16. Meng LF, Liu XD, Wang M, Zhang W, Hou HM, Zhao SY, et al. [Application of urethral pressure profilometry in artificial urinary sphincter implantation]. Zhonghua Yi Xue Za Zhi. 2020;100(26):2044-8.