

Functional medicine

## World record: Single AMS 800 artificial urinary sphincter functioning uninterrupted for 29 years in male paraplegic patient

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## ABSTRACT

Lapides has revolutionized the treatment of neurogenic patients by introducing routine intermittent catheterization in 1971. This drastically lowered mortality from urosepsis. Scott introduced the artificial urinary sphincter (AUS) in 1972. This gave a completely new perspective for incontinent patients by dramatically increasing the quality of life. In patients with neurogenic urinary incontinence, the principles of care are preserving renal function, maintaining a low-pressure reservoir, allowing unobstructed urine flow and providing continence. We describe a male patient that received an AUS with a bladder neck cuff that functioned without revision for 29 years. After 30 years, AUS exchange proved successful.

## Introduction

To report the record long-term function of an artificial urinary sphincter (AUS) AMS 800 in a male paraplegic patient. Scott described the treatment of incontinence secondary to myelodysplasia by an implantable prosthetic urinary sphincter in 1973.<sup>1</sup> This patient received an AUS with a bladder neck cuff simultaneously with an ileum bladder augmentation at the age of 18 years. Although the patient did not achieve total continence, he was happy to carry on with his apprenticeship and start a successful career. After 29 years of uninterrupted AUS function, the patient presented with sudden new onset of complete urinary incontinence with an empty balloon and air in the tubing (Fig. 1).

## Case presentation

The male patient was born in 1969 with sacrospinal myelodysplasia and hydrocephalus. After birth, myelomeningocele closure and ventriculo-peritoneal shunt drainage for the hydrocephalus, followed. Bladder emptying ensued by clean intermittent catheterization by the parents. In 1983, bladder stones developed in the severely trabeculated and christmas-tree-shaped high-pressure bladder as shown on videourodynamics (VUD). A suprapubic cystotomy enabled the removal of multiple bladder stones. In 1987 after puberty, Helmut Madersbacher

and Arno Ebner did an ileum bladder augmentation simultaneously with the implantation of an AUS. Cuff placement (9 cm) was at the bladder neck, and the system filled with isotonic radio contrast solution into the 61–70 mmHg pressure regulating balloon reservoir.<sup>2</sup> Post-operatively clean intermittent self-catheterization (CISC) became impossible, because of multiple bulbous urethral false routes. The patient then emptied his bladder using abdominal pressure voiding, even though not recommended in neurogenic patients. Spontaneous micturition was without residual, and the patient did not develop vesicoureteral reflux (VUR) or urinary tract infections. As the cuff at the bladder neck, was rather loose, the patient was “socially” continent but not dry. He still needed 3–4 pads per day, and adapted well to live with it. Otherwise, he would be completely incontinent. Over time the bladder capacity increased into a >1 L low-pressure oval shaped reservoir, and his acid-base balance remained satisfactory. He had yearly neurourology check-ups including blood and urine investigations including urine cytology, videourodynamics and abdominal and brain sonography. The annual VUD showed a low-pressure and high compliance (>30ml/cmH<sub>2</sub>O) large capacity oval shaped reservoir (>1 L) with no signs of VUR. After 29 years, suddenly, he was completely incontinent needing 60 large pads every four days. He was miserable and an abdominal X-ray and CT scan confirmed an empty balloon reservoir and air in the tubing (Fig. 1). The old AMS 800 system was explanted and successfully exchanged beginning 2017. The cuff was downsized from 9

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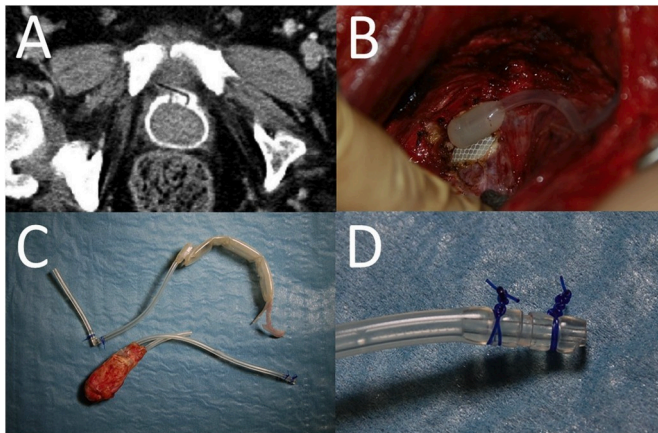
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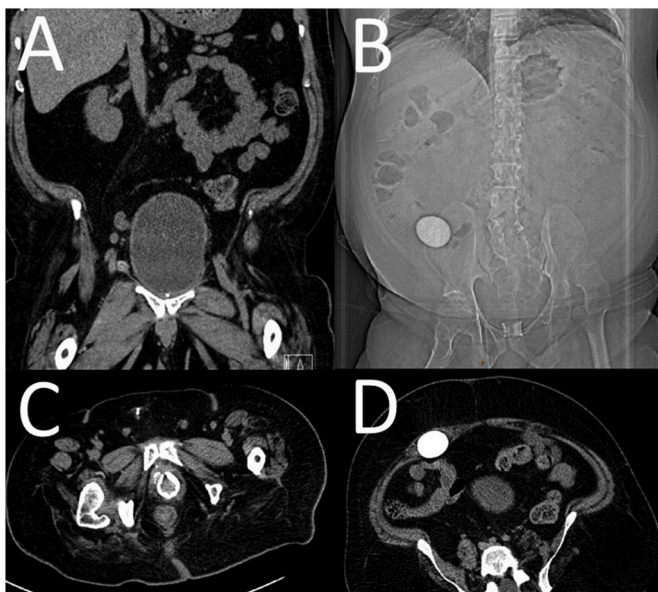
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**Fig. 1.** A) The 9 cm cuff (white round structure) seen in the middle of the CT image with air in the tube (black) indicating that the AUS system is defect. B) Bladder neck cuff and connector in-situ without signs of infection. C) Cuff still intact after 30 years in-situ. D) Broken tubing site at polypropylene suture connector.



**Fig. 2.** A) Oval shaped bladder after ileum augmentation 30 years ago. B) Pressure regulating balloon in right abdomen and cuff above symphysis. C) New 8 cm cuff filled with contrast solution (white ring-like structure in middle of image). D) Extraperitoneal position of pressure regulating balloon underneath atrophic rectus muscle.

to 8 cm. The cause for the contrast solution leak was tube breakage at the polypropylene suture connector site (Fig. 1). Cystoscopy showed healthy epithelium of both bladder and bowel segments without signs of tumour. After three-year follow-up post AMS 800 exchange the patient is completely dry and is able to void with abdominal pressure with no residual urine (Fig. 2).

**Discussion**

Table 1 summarizes the postulated reasons for long-term success and AUS function in this particular patient. The fact that the patient could empty his bladder spontaneously without residual obviated the need for

**Table 1**

Possible reasons for AUS long term success (29 years) in this particular paraplegic patient.

Simultaneous BIA and AUS	One major operation
BIA	Low pressure oval shaped reservoir
Loosely fitting bladder neck cuff	Low risk of cuff erosion
Satisfaction with “social continence”	Realistic expectations
No CISC (not generally recommended!)	Less risk of urethral injury
Abdominal pressure voiding	Safe for urethra
No continuous antibiotic therapy/prophylaxis	Healthy bowel flora
Polypropylene suture tie connections	Quick connect connectors tend to get brittle
Good bowel management	No obstipation
Yearly neurourology follow-up	Timely problem management
Motivated patient	Interested in optimizing bodily functions

AUS = artificial urinary sphincter; BIA = bladder ileum augmentation; CISC = clean intermittent self-catheterization.

intermittent catheterization with the risk of infections and antibiotic therapy. Bowel movements remained regular and without obstipation by a strictly regulated diet. The AUS gave the patient a level of continence and incontinence he could deal with.<sup>3</sup> As soon as he became severely incontinent again, after feeling “something go”, he immediately consulted us for an AUS exchange. The downsizing of the bladder neck cuff resulted in him becoming completely continent, which was not the case before. He still empties his bladder completely, by seating himself onto the toilet seat, bending forward and opening the cuff.

**Conclusion**

The introduction of the AUS 47 years ago has revolutionized the treatment of urinary incontinence. Very few medical devices have “survived” this long in urology. Especially in neurogenic patients with urinary incontinence, the AUS is still the reported treatment of choice whilst maintaining urethral voiding. The placement of the cuff at the bladder neck is very safe in the long term. According to our extensive online literature search, 29 years uninterrupted AUS function without any revision seems to be a world record.<sup>4,5</sup>

**Declarations of competing interest**

MP, LAJ, AG, WH: no conflicts of interest.  
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