# *Transcorporal artificial urinary sphincter cuff placement is associated with a higher risk of postoperative urinary retention*

Paul J. Smith, MD, Steven J. Hudak, MD, J. Francis Scott, BA, Lee C. Zhao, MD, Allen F. Morey, MD

Department of Urology, University of Texas Southwestern Medical Center, Dallas, Texas, USA

SMITH PJ, HUDAK SJ, SCOTT JF, ZHAO LC, MOREY AF. Transcorporal artificial urinary sphincter cuff placement is associated with a higher risk of postoperative urinary retention. *Can J Urol* 2013;20(3): 6773-6777.

***Introduction:*** *To explore the association of artificial urinary sphincter (AUS) cuff sizes and placement techniques with the development of postoperative urinary retention.*

***Materials and methods:*** *We analyzed the outcomes of AUS cases performed by a single surgeon at a tertiary referral center from 2007-2010. Outcomes relating to urinary retention and suprapubic tube placement were analyzed in three groups: those with 3.5 cm cuff placement, ≥ 4 cm cuff placement, and transcorporal cuff (TC) placement of any size.*

***Results:*** *Among 139 patients who underwent AUS placement from 2007-2010, 117 cases met inclusion criteria – 42 men received a 3.5 cm cuff, 53 received a ≥ 4 cm cuff, and 22 received a TC cuff (all ≥ 4 cm). TC patients had a significantly higher rate of urinary retention compared to the ≥ 4 cm group [7/22 (32%) versus 4/53 (8%), p = 0.02] as well as a higher rate of SPT placement [6/22 (27%) versus 1/53 (2%), p = 0.007].*

***Conclusions:*** *Transcorporal cuff placement is associated with a significantly higher rate of urinary retention and suprapubic tube placement compared to traditional 4 cm cuff placement.*

**Key Words:** artificial urinary sphincter, transcorporal cuff, urinary retention

## Introduction

Although the artificial urinary sphincter (AUS) has been the gold standard treatment for male stress urinary incontinence (SUI) for over 40 years,[1,2] many cases require revision surgery for refractory incontinence.[3] Among the various techniques advocated for reoperative cases, including tandem cuff insertion,[4] wrapping maneuvers,[5] and cuff downsizing,[6] transcorporal AUS placement has been one of the most prevalent at our tertiary institution. While we have favored transcorporal AUS cuff placement as a salvage technique, we have noticed a high rate of urinary retention after these procedures. In this study, we sought to determine the relationship of different cuff sizes and insertion techniques with urinary retention after AUS implantation.

Accepted for publication March 2013

Address correspondence to Dr. Allen F. Morey, UT Southwestern Department of Urology, Moss Bldg, 8th Fl, Ste 112, 5323 Harry Hines Blvd., Dallas, TX 75390-9110 USA

## Materials and methods

An institutional review board approved database of all cases of AUS insertion performed by a single surgeon was reviewed. Patients from 2007 to 2010 who had documented clinic follow up were included in this study. All AUS insertions were placed in the proximal bulb via a perineal incision and urethral circumference was measured with a standardized technique.[6] Decisions regarding cuff size and transcorporal cuff placement were made intraoperatively according to the surgeon's discretion. Factors involved in choice of technique included the measured urethral circumference, the tissue quality, and prior urethral surgery history such as prior cuff erosion. Urodynamics were typically not performed prior to surgery unless the patients had

evidence of poor storage or neurological comorbidity. Patients were admitted overnight with urethral catheter in place, and underwent voiding trial the following morning. For patients unable to void after AUS insertion, a 12 Fr urethral catheter was initially inserted; suprapubic tubes (SPT) were reserved for those with repeated failed voiding trials after the first postoperative visit. Patients returned for cuff activation at 6 weeks postoperatively and subsequently at 3 months and 9 months postoperatively. Cases were categorized into three groups according to cuff size/type: 3.5 cm, ≥ 4 cm, or transcorporal cuff (TC). All TC cuffs were either 4 cm or 4.5 cm. In addition, newer techniques developed for men with periurethral atrophy (3.5 cm cuff and TC cuff) were compared against the traditional cuff size group (≥ 4 cm). Student's t-test was used to analyze continuous variables and a two-tailed Fisher's exact test was used to compare proportions of categorical variables.

### *Surgical technique*

Standard AUS cuff placement is performed through a perineal incision, with a second high scrotal incision for pump and balloon placement, as previously described.[6] For transcorporal cuff placement, dissection is performed over the tunica albuginea of the proximal corporal bodies, just prior to their decussation in the mid-bulb area. Two holding sutures of 2-0 PDS are placed, and 1.5 cm longitudinal corporotomies are made. A large right-angle clamp is passed through the intercorporal septum, and the AUS cuff is placed in this tunnel. The medial pair of the holding sutures are removed, while the lateral pair are tied together to approximate the lateral edges of the corporotomies behind the AUS cuff. Pump and balloon placement were performed through a separate high scrotal incision.

## Results

### *Patient characteristics*

Among 139 cases of AUS placement from 2007-2010, 117 met inclusion criteria (42 men received a 3.5 cm cuff, 53 received a ≥ 4 cm cuff, and 22 received a TC cuff). Of those who underwent TC placement, 11 received a 4 cm cuff, nine a 4.5 cm cuff, and two a 5 cm cuff. Patient demographics are shown in Table 1. No significant differences were found between these groups in their rates of diabetes, erectile dysfunction, or previous urethral sling/AUS placement. The ≥ 4 cm group was significantly younger and exhibited lower rates of prior XRT in comparison to both the 3.5 cm and TC groups. IPP placement was significantly less common in the TC group than either the 3.5 cm or the ≥ 4 cm group.

### *Urinary retention and cuff erosion*

Urinary retention occurred in 18/117 AUS cases overall (15%, Table 2). A significantly higher rate of urinary retention was observed in the TC cuff patients compared to the ≥ 4.0 cm cuff patients [7/22 (32%) versus 4/53 (8%), p = 0.02]. Furthermore, more TC cuff patients required SPT placement postoperatively compared to the ≥ 4.0 cm group [6/22 (27%) versus 1/53 (2%), p = 0.007]. Retention patients had similar rates of prior XRT, prior urethral sling/AUS

TABLE 1. **Patient characteristics and outcomes by cuff type**

| | **3.5 cm** | **> 4 cm** | **Transcorporal cuff** |
|---|---|---|---|
| Cases | 42 | 53 | 22 |
| Mean age (years) | 72.3 | 67.1* | 73.8 |
| Erectile dysfunction | 36/42 (86%) | 44/53 (83%) | 19/22 (86%) |
| Diabetes mellitus | 8/42 (19%) | 7/53 (13%) | 4/22 (18%) |
| Prior sling/AUS | 24/42 (57%) | 25/53 (47%) | 16/22 (73%) |
| XRT | 21/42 (50%)* | 14/53 (26%) | 10/22 (45%) |
| IPP | 15/42 (36%) | 18/52 (34%) | 2/22 (9%)* |
| Urinary retention | 7/42 (17%) | 4/53 (8%) | 7/22 (32%)* |
| Suprapubic tube required | 5/42 (12%) | 1/53 (2%) | 6/22 (27%)* |
| Cuff erosions | 8/42 (19%) | 3/53 (6%) | 1/22 (5%) |

*p < 0.05 compared with > 4 cm group
AUS = artificial urinary sphincter; XRT = external beam radiation; IPP = inflatable penile prosthesis

TABLE 2. **Characteristics of urinary retention patients**

| | Retention | Non-retention | p value |
|---|---|---|---|
| Patients | 18 | 99 | |
| Prior XRT | 10/18 (56%) | 35/99 (35%) | 0.06 |
| Prior BNC/Stx | 7/18 (39%) | 25/99 (25%) | 0.25 |
| Prior AUS/Sling procedure | 12/18 (67%) | 53/99 (54%) | 0.6 |
| Cuff erosion | 5/18 (28%) | 7/99 (7%) | 0.001 |
| Suprapubic tube | 11/18 (61%) | 0 | |

XRT = external beam radiation; BNC = bladder neck contracture; AUS = artificial urinary sphincter

procedures, and previous bladder neck contracture or urethral strictures compared to others.

SPT placement was required in 11/18 men (61%) with urinary retention. The other seven men (39%) with retention were managed with urethral catheterization alone with a mean duration of 6.5 days (range: 1-16 days). Cuff erosions were noted more frequently in those having urinary retention (5/18, 28%) compared to those without (7/96, 7%) and in those requiring SP tubes (4/11 patients, 36%) versus those having urethral catheter alone (1/7, 14%). Although no single cuff size or technique was associated with a statistically higher rate of cuff erosion, the TC group had the lowest erosion rate (1/22, 5%).

## Discussion

### *Urinary retention after transcorporal AUS placement*

Retention occurred at a significantly higher rate in TC patients compared to cuffs placed in the traditional method. TC cuff patients also had a higher rate of SPT insertion for refractory urinary retention, lasting up to 6 weeks in some patients. We hypothesize that retention resulted from the additional bulk and reduced compliance of fibrous corporal tissues included within the TC cuff. Retention was also common when urethral wrapping with small intestinal submucosa was performed to enhance bulk.[5] In this series of eight patients, 100% had postoperative urinary retention, and after fifth patient, a SPT was placed routinely in the same operative setting. Similarly, the inclusion of dense intracorporal tissues within the cuff, combined with postoperative edema, places TC patients at considerably higher risk for urinary retention.

The transcorporal approach to AUS placement was initially advocated for patients with urethral atrophy or prior cuff erosion having revision of previously placed AUS.[7] Thus, the population of patients requiring TC cuff placement has always been a higher risk group, having unsuccessful first-line interventions and adverse tissue characteristics, a demographic found to be similar to men requiring 3.5 cm cuffs in this series. Because of their similar characteristics and medical history, the higher rate of urinary retention noted among TC cuffs compared to 3.5 cm cuffs suggests that this difference is rooted more in surgical technique than other risk factors. Men with prior bladder neck contracture did not have a higher risk of retention, thus supporting our strategy of first stabilizing bladder neck contractures by deep transurethral incision at least two months prior to performing AUS placement.[8,9]

### *Demographics*

Several important baseline differences between groups in our tertiary patient population deserve comment. First, the ≥ 4 cm cuff patients were roughly 5 years younger than the two other groups on average. The quality of the spongiosum was generally more robust and supple in these patients, and thus it is not surprising that erosion rates and urinary retention rates in these patients were superior to those receiving 3.5 cm or TC cuffs. Second, TC patients were our oldest patient group and had a lower rate of IPP placement, likely reflecting both a lack of TC patient interest in sexual activity and a surgeon preference for avoidance of combining IPP and TC cuff placement. Finally, 3.5 cm cuff patients had the highest rate of prior XRT. The higher age and rate of XRT in 3.5 cm cuff patients suggests that these men had more atrophic periurethral tissues, which likely accounts for the non-significant trend for higher cuff erosion rates in the 3.5 cm cuff group.[10]

### *Role of suprapubic tube placement in AUS patients*

Urinary retention after AUS placement is a vexing problem because of the concern for iatrogenic urethral injury precipitating cuff erosion. In general, we begin by placing a 12 Fr Foley catheter for several days, ensuring that the AUS is deactivated in the open

position. A voiding trial is attempted within 1 week. If unsuccessful, SPT placement is then offered as an alternative measure to protect the delicate periurethral tissues from the ischemic effects of prolonged compression on a rigid catheter, Figure 1.

SPT placement in this 3 year series was offered according to clinical judgment for men who repeatedly failed voiding trials over a period of several weeks. While SPT placement was not associated with a lower cuff erosion rate, this finding is likely because the deleterious effects of prolonged transurethral catheterization at the cuff site may already have occurred. Some experts recommend placing an SPT if a voiding trial is failed at 48 hours postop.[11] Although we view SP catheter placement after AUS as protective in the setting of urinary retention, the procedure is not without risks, since most of these patients have had lower abdominal surgery, and the pressure regulating balloon is in the vicinity of the trocar path. We now discuss the option of placing an SPT at the time of TC cuff placement in those with a history of prior erosions to prevent transurethral manipulation in the event of postoperative urinary retention. We also manage some end-stage patients with refractory BNC and prior AUS erosion with chronic SP tube and TC cuff placement.

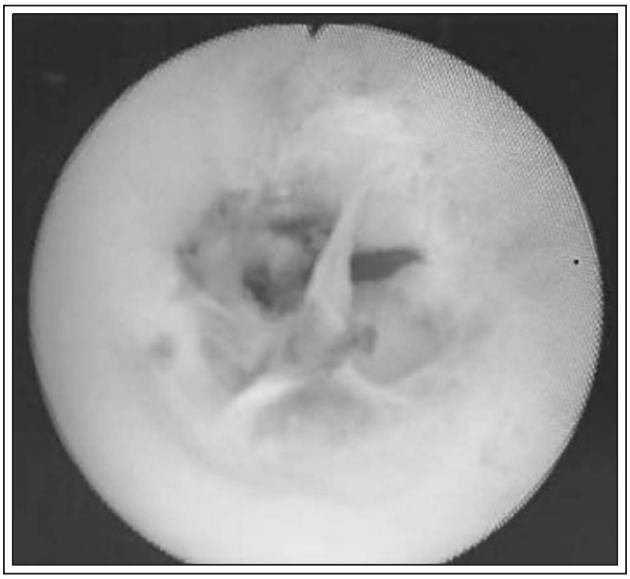

**Figure 1.** Endoscopic appearance of attenuated urethral mucosa following 2 weeks of indwelling urethral catheterization across a deactivated transcorporal cuff in a patient with persistent urinary retention. A suprapubic catheter was placed until the patient regained the ability to void 4 weeks later, thus eliminating the source of ongoing urethral injury and likely preventing subsequent AUS cuff erosion.

### *Study limitations*

The development of urinary retention may be based on multiple variables, including urodynamic parameters such as detrusor hypocontractility or perioperative anesthetic factors not assessed in this series. Bladder dysfunction has been described in up to 30% of men with post-prostatectomy incontinence, with valsalva voiding as high as 29.5%.[12,13] Although urodynamic parameters are poor for predicting adverse outcomes after AUS placement,[3,13,15] urinary retention after AUS has not been studied previously. It is therefore plausible that unidentified urodynamic factors may be related to the development of postoperative urinary retention. Post-void residual volumes were not evaluable in this retrospective series.

These data indicate that men having TC cuff procedures are at a higher risk for protracted urinary retention postoperatively. We reserve TC cuff placement as a tertiary maneuver, primarily for older, "end stage" patients having prior AUS cuff erosions and/or urethral reconstructions. For simple revisions due to urethral atrophy alone, cuff downsizing to a 3.5 cm system is our preference whenever possible—if erosion should occur after a 3.5 cm cuff, we can still offer a TC cuff placement in the future. All TC cuffs in our experience were ≥ 4cm and we size them loosely; we do not recommend TC placement of 3.5 cm cuffs. The TC cuff does appear safe, however. The low erosion rate among TC cuff patients (5%) was similar to that of conventional cuffs 4 cm (6%) and less than that noted among 3.5 cm cuff patients (19%).

The role and optimal timing of suprapubic catheter placement in the setting of retention after AUS is unclear since these patients also tended to have longer duration of indwelling catheterization. Still, we view SPT as protective in this setting and early SPT placement does seem reasonable in high risk patients to limit urethral catheterization.

## Conclusions

Transcorporal cuff placement is associated with significantly higher rates of urinary retention and SPT placement when compared to traditional 3.5 cm and ≥ 4 cm cuff placement. □

References

1. Flynn BJ, Webster GD. Evaluation and surgical management of intrinsic sphincter deficiency after radical prostatectomy. *Rev Urol* 2004;6(4):180-186.

2. Aaronson DS, Elliott SP, McAninch JW. Transcorporal artificial urinary sphincter placement for incontinence in high-risk patients after treatment of prostate cancer. *Urology* 2008;72(4):825-827.
3. Lai HH, Hsu EI, Boone TB. Urodynamic testing in evaluation of postradical prostatectomy incontinence before artificial urinary sphincter implantation. *Urology* 2009;73(6):1264-1269.
4. O'Connor RC, Gerber GS, Avila D, Chen AA, Bales GT. Comparison of outcomes after single or DOUBLE-CUFF artificial urinary sphincter insertion. *Urology* 2003;62(4):723-726.
5. Trost L, Elliott D. Small intestinal submucosa urethral wrap at the time of artificial urinary sphincter placement as a salvage treatment option for patients with persistent/recurrent incontinence following multiple prior sphincter failures and erosions. *Urology* 2012;79(4):933-938.
6. Hudak SJ, Morey AF. Impact of 3.5 cm artificial urinary sphincter cuff on primary and revision surgery for male stress urinary incontinence. *J Urol* 2011;186(5):1962-1966.
7. Guralnick ML, Miller E, Toh KL, Webster GD. Transcorporal artificial urinary sphincter cuff placement in cases requiring revision for erosion and urethral atrophy. *J Urol* 2002;167(5):2075-2078; discussion2079.
8. Anger JT, Raj GV, Delvecchio FC, Webster GD. Anastomotic contracture and incontinence after radical prostatectomy: a graded approach to management. *J Urol* 2005;173(4):1143-1146.
9. Gousse AE, Tunuguntla HSGR, Leboeuf L. Two-stage management of severe postprostatectomy bladder neck contracture associated with stress incontinence. *Urology* 2005;65(2):316-319.
10. Raj GV, Peterson AC, Webster GD. Outcomes following erosions of the artificial urinary sphincter. *J Urol* 2006;175(6):2186-2190.
11. Wessells HB, Peterson AC. Surgical procedures for sphincteric incontinence in the male. Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh Urology. 10 (Philadelphia) ed. Saunders-Elsevier; 2011. pages 2290-2305.
12. Ficazzola MA, Nitti VW. The etiology of post-radical prostatectomy incontinence and correlation of symptoms with urodynamic findings. *J Urol* 1998;160(4):1317-1320.
13. Gomha MA, Boone TB. Voiding patterns in patients with post-prostatectomy incontinence: urodynamic and demographic analysis. *J Urol* 2003;169(5):1766-1769.
14. Thiel DD, Young PR, Broderick GA et al. Do clinical or urodynamic parameters predict artificial urinary sphincter outcome in post-radical prostatectomy incontinence? *Urology* 2007;69(2):315-319.
15. Lai HH, Boone TB. Implantation of artificial urinary sphincter in patients with post-prostatectomy incontinence, and preoperative overactive bladder and mixed symptoms. *J Urol* 2011;185(6):2254-2259.