
Transabdominal Sonocystography: A Novel Technique to Assess Vesicourethral Extravasation Following Radical Prostatectomy

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Purpose: We describe our new technique of transabdominal sonocystography in men following radical prostatectomy.

Materials and Methods: From May 2007 to January 2008, 75 men underwent gravity transabdominal sonocystography and fluorocystography 8 days following open radical retropubic prostatectomy. Bladder volume after the instillation of 150 cc saline was determined by measuring bladder height, width and length in the longitudinal and transverse planes. Extravasation volume was calculated by subtracting the calculated bladder volume after filling from a volume of 165 ml, which represents the instilled saline volume of 150 ml plus 15 ml in the urinary catheter balloon. Extravasation was then qualitatively graded as none, slight, moderate or severe after instilling 150 cc contrast medium into the bladder.

Results: The correlation between fluorocystography and transabdominal sonocystography was ascertained by determining the mean extravasation volume corresponding to the qualitatively graded categories of extravasation determined fluoroscopically. Mean extravasation volume in cases with no, slight and moderate extravasation on fluoroscopic cystography was -3.72, 6.51 and 46.0 ml, respectively. At an extravasation volume of 20 ml the sensitivity and specificity of transabdominal sonography to differentiate no or slight vs moderate or severe fluoroscopic extravasation was 100%.

Conclusions: The advantages of transabdominal sonocystography over fluorocystography are lower cost, lack of radiation exposure and the ability to perform the procedure at most urological outpatient facilities. Therefore, transabdominal sonocystography represents a good alternative to fluorocystography for assessing the integrity of the vesicourethral anastomosis following open radical retropubic prostatectomy.

Key Words: bladder; urethra; prostatectomy; anastomosis, surgical; urinary catheterization

The optimal timing for removal of the urinary catheter following radical prostatectomy is controversial. In the late 1980s Dalton et al performed sequential gravity cystography in men following radical prostatectomy and reported that 20% showed more than minimal extravasation 2 weeks after surgery.¹ Leibovitch et al subsequently reported that 94.3% of anastomoses showed no vesicourethral extravasation on cystograms performed between 14 and 21 days after radical prostatectomy.² These studies supported removing the urinary catheter 3 weeks after radical prostatectomy without performing cystography.

Approximately half of the men surveyed following radical prostatectomy indicated that the urinary catheter was a source of moderate to severe bother and an impediment to returning to physical activity after surgery.³ In a prospective study of 537 men undergoing radical prostatectomy the timing of urinary catheter removal was an independent predictor of time to return to work.⁴ Therefore, it is prudent to remove the urinary catheter as early as possible without jeopardizing outcomes.

While it is unproven, we believe that it would be problematic to remove the urinary catheter in the presence of significant urinary extravasation at the vesicourethral anastomosis. Removing the urinary catheter in men with no demonstrable extravasation at the vesicourethral anastomosis before 5 days after radical prostatectomy is associated with an unacceptably high incidence of acute urinary retention.^{5,6} Therefore, our protocol has been to perform gravity fluorocystography on postoperative day 8 in the outpatient office setting to exclude significant extravasation at the anastomosis before removing the urinary catheter.⁷

Fluorocystography is a procedure that cannot be readily performed at many outpatient office based facilities. We describe our new technique of transabdominal sonocystography as an alternative to fluorocystography in men following radical prostatectomy.

METHODS

From May 2007 to January 2008, 75 men underwent gravity transabdominal sonocystography and fluorocystography 8 days after ORRP. All ORRPs were performed by a single surgeon using a previously described surgical technique.⁸ Transabdominal sonocystography was performed at our outpatient office facility using a 4.5 MHz sector probe transducer and a Sequoia™ 512 ultrasound machine.

The pelvis was scanned to ensure that the bladder was empty. The bladder was identified by localizing the liquid

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Fluorocystography Extravasation Degree	No. Pts (%)	Mean ± SEM Sonocystography Extravasation Vol (range) (ml)
None	58 (77.3)	-3.72 ± 0.55 (-14-5.6)
Slight	9 (12)	6.51 ± 2.58 (-5-18)
Moderate	8 (10.7)	46.0 ± 5.34 (21-70)

There was no severe extravasation.

filled inflated balloon of the urinary catheter. A total of 150 ml saline were instilled into the bladder under gravity with the saline bag 125 cm above the patient bladder. Saline was typically instilled during approximately 3 minutes. Bladder volume was measured immediately after instilling 150 ml saline into the bladder. Bladder volume after saline instillation was determined by measuring the height (h), width (w) and length (l) of the bladder in the longitudinal and transverse planes. Bladder volume was calculated using the equation, $l \times w \times h \times 0.52$. EV was then calculated by subtracting the calculated bladder volume after filling from a volume of 165 ml, representing 150 ml instilled saline volume plus 15 ml, corresponding to the fluid volume in the urinary catheter balloon.

The bladder was drained and a total of 150 ml contrast material were gravity instilled into the bladder under fluoroscopic guidance. The degree of contrast extravasation was qualitatively graded as none, slight, moderate or severe, as previously described.⁵

The ability of transabdominal sonocystography and fluorocystography to characterize the integrity of the vesicourethral anastomosis was compared by determining the calculated EV associated with the degree of extravasation ascertained by fluorocystography. ANOVA was performed to

determine whether the mean EVs were significantly different among the fluoroscopic extravasation categories.

RESULTS

Gravity transabdominal sonocystography and fluorocystography were performed in 75 men following ORRP. EV was quantified ultrasonographically by calculating the amount of saline escaping from the bladder after gravity instillation of 150 ml saline into the bladder. The degree of extravasation was qualitatively evaluated using fluorocystography. The table shows the percent of fluoroscopic cystograms showing no, mild, moderate and severe extravasation. Mean EV was significantly different for the 3 categories of extravasation defined by fluorocystography.

The correlation between fluorocystography and transabdominal sonocystography was ascertained by determining the mean and range of EVs corresponding to the qualitatively ascertained categories of extravasation determined fluoroscopically (see table). There were no cases of severe extravasation. Figure 1 shows the distribution of EVs for the 3 categories of extravasation determined fluoroscopically. At an EV of 20 ml the sensitivity and specificity of transabdominal sonography to differentiate no or slight vs moderate or severe fluoroscopic extravasation was 100%.

Figure 2 shows fluorocystogram and sonocystogram in 1 case of moderate extravasation. Measured bladder volume after instilling 150 ml saline was 120.2 ml. Calculated EV in this case was 44.8 ml, that is 165 ml - 120.2 ml = 44.8 ml.

DISCUSSION

The current study demonstrates that gravity fluorocystography performed 8 days after ORRP revealed no, slight, moderate and severe extravasation in 77.3%, 12%, 10.7%

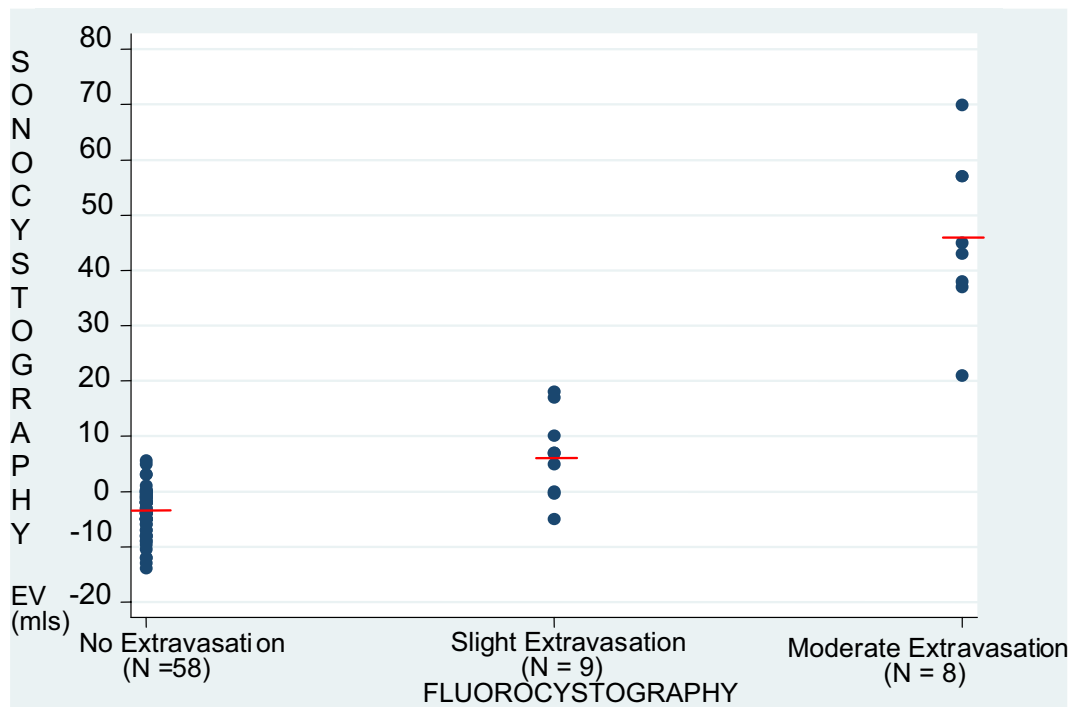


FIG. 1. Extravasation degree was qualitatively assessed using fluorocystography. Note EV measured by transabdominal sonocystography in cases with no, slight and moderate extravasation on fluorocystography.

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