



A comparative study of ascending urethrogram and sono-urethrogram in the evaluation of stricture urethra

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ABSTRACT

To compare the efficacy of sono-urethrogram and ascending urethrogram in the evaluation of stricture urethra.

Materials and Methods: In this prospective study 40 patients with obstructive lower urinary tract symptoms and suspected to be having stricture urethra were subjected to ascending urethrogram and sonourethrogram. The radiologist was blinded to the findings of ascending urethrogram. All the sonourethrograms were done by the same radiologist. The findings of sonourethrogram & ascending urethrogram were compared with the findings of cystoscopy and intra-operative findings. The specificity, sensitivity, positive predictive value and negative predictive value of each modality in the diagnosis of various urethral anomalies were estimated.

Results: The sonourethrogram identified stricture disease in all the patients who had abnormal ascending urethrogram. In addition, other abnormalities like spongiofibrosis, diverticula and stones which were not picked up in ascending urethrogram were diagnosed by sonourethrogram. The cystoscopic and intra-operative findings with respect to stricture length, diameter and spongiofibrosis correlated well with sono-urethrogram findings. 5 patients who had stricture in the ascending urethrogram were found to be having the normal urethra in sonourethrogram and confirmed by cystoscopy.

Conclusion: sonourethrogram is an effective alternative to ascending urethrogram in the evaluation of stricture urethra. It is more sensitive in the diagnosis of anterior urethral strictures than posterior urethral strictures. It is superior to ascending urethrogram in the identification of spongiofibrosis, diameter and length of the stricture. The complications were lower in sonourethrogram group compared to ascending urethrogram.

INTRODUCTION

Stricture urethra in Males is a common problem encountered by the urologists.

Besides history and physical examination, ascending urethrogram remained the Gold Standard for evaluating Male Urethral Stricture (Cunningham et al. 1910) (1-3). It has a Sensitivity of 91% and specificity of 72% for diagnosing anterior urethral strictures (4).

However some authors have reported that this imaging study is not ideal for posterior urethral strictures. For posterior urethra, combining ascending urethrogram with MCUG is more rewarding (2). Moreover it under estimates the length of proximal Bulbar urethral stricture and has the disadvantage of underestimating peri-urethral fibrosis. This has been elaborated as this segment of urethra is fixed in the same axis as pelvis. This leads to an 'End-on View' of bulbar strictures radiographically, which reduces their apparent length.

Ascending urethrogram leads to radiation exposure of 1-2 msv, equivalent to 6 months of background radiation and 20 chest X-rays (5, 6). Procedure related infection- Contributes to 0.6% to 1.6% of all hospital acquired infections (7, 8).

The initial experiences with ultrasound evaluation of the urethra were described separately in the late 1980s by McAninch et al. (2) and Merkle and Wagner (5). Early studies identified not only the ability of ultrasound to demonstrate the exact length of strictures but also the added ability to define the periurethral tissues, as opposed to contrast urethrography, which only demonstrates the lumen. In particular, the presence and degree of periurethral fibrosis can be shown with a view to guiding surgery (9, 10).

The aim of the study was to compare the efficacy of Sono-urethrogram with Ascending urethrogram in the evaluation of Male urethral strictures.

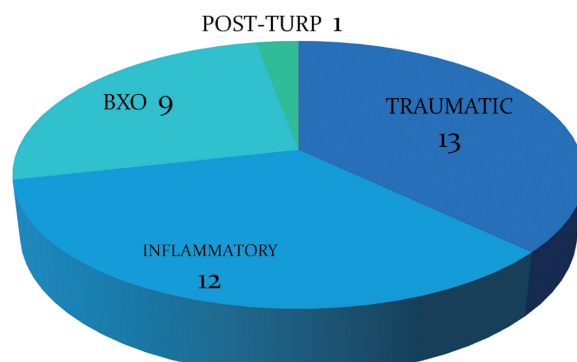
MATERIALS AND METHODS

This study was conducted in the department of urology, JSS hospital, Mysore, done between march 2011 to March 2012. Male Patients with age group between 25-75 years (mean 43 years) presenting with obstructing voiding symptoms suggestive of stricture urethra were subjected to ascending urethrogram (AUG) under aseptic precautions and antibiotic coverage. A written consent was taken from all the patients before subjecting to the study.

40 patients with evidence of stricture in AUG further underwent sono-urethrogram. Among 40 patients with evidence of stricture in AUG; 13 were secondary to traumatic, 12 inflammatory, 9 BXO and 1 post TURP respectively (Figure-1). Patients with recurrent stricture were excluded from the study.

The Radiologist was blinded to the findings of ascending urethrogram. All the sono-urethrograms were done by the same Radiologist. The findings of sono urethrogram & ascending urethrogram were compared with the findings of cystoscopy and intra-operative findings.

Figure 1 - Etiology of stricture.



TECHNIQUE

AUG: 20 mL of contrast medium (urograffin 76%) was injected into the urethra using 20 ml syringe and spot films were taken. The procedure time was 15-20 min.

The following data were recorded

- Stricture location, length and diameter were measured using a scale. 20% deduction was made to correct for magnification.
- Complications.

Sono-Urethrogram: Was done using 10 MHz frequency linear array transducer. Xylocaine jelly or sterile water (20-30 ml) injected using 20 ml syringe taking care not to inject air bubble. The urethra was screened up to BMJ-using trans-scrotal and trans-perineal approach. Longitudinal and transverse images were obtained. Procedure time was 10 to 15 min.

The following data were recorded

- The stricture location, diameter, length, spongiofibrosis.
- Other peri-urethral pathology and Complications.

The specificity, sensitivity, positive predictive value and negative predictive value in the diagnosis of urethral strictures and associated abnormalities were estimated.

All the statistical calculations were done through SPSS 16.0 (2007) for windows.

RESULTS

Among 40 patients who were diagnosed as having stricture urethra by Ascending urethrogram, 5 were found to be normal in Sono-urethrogram. The findings were confirmed later by cystoscopy. One patient who had evidence of posterior urethral stricture in SUG had normal urethra in cystoscopy. The assessment of stricture was incomplete in 2 patients due to posterior location. These pts subsequently required MCUG for complete stricture evaluation (Table-1).

Table 1 – Results of Sono-urethrogram.

	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Anterior	100%	100%	100%	100%
Posterior	75%	50%	75%	50%

Average stricture length in AUG group was 9.3 mm (Figure-2). Stricture length could not be assessed correctly in 5 patients in AUG group due to complete cut-off. Average stricture length in SUG group was 14.1 mm (Figure-3). Mean difference between 2 groups was 4.8 mm (P value- <0.01). The cystoscopic and intra-operative findings correlated well with the findings of SUG.

Average diameter of stricture in AUG group was 0.9 mm. Average diameter of stricture in SUG group was 1.1 mm. Mean difference between 2 modalities was 0.2 mm (P-value- <0.01).

Figure 2 - Stricture as seen in Ascending urethrogram.

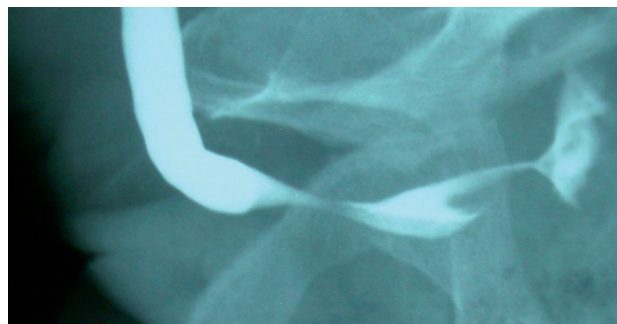
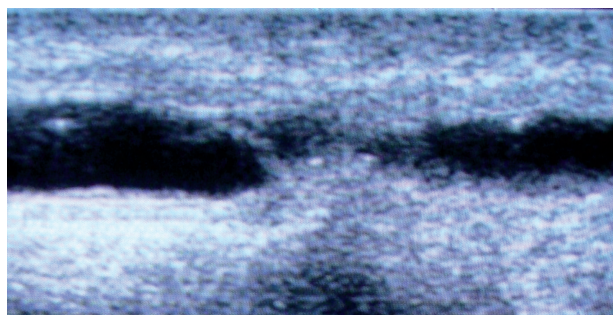


Figure 3 - Same stricture as seen in sono-urethrogram.



Spongiofibrosis was demonstrated in 12 patients with traumatic strictures, 4 patients with inflammatory strictures, 7 patients with BXO and in 1 patient with Post-operative (TURP) stricture. The findings of SUG correlated well with intra-op findings who underwent open surgery. Ascending urethrogram did not identify spongiofibrosis in any patient.

In Ascending urethrogram group, 3 patients had False tracts, 2 patients had urethral calculi and 4 patients had urethral diverticulum. In Sono-urethrogram group, 3 patients had False tracts, 3 patients had urethral calculi, 5 patients had urethral diverticulum and 2 patients had Periurethral abscess (Figures 4 and 5).

Minor bleeding was seen in 5 patients, In-travasation of contrast in 6 patients and Dysuria in 6 patients in ascending urethrogram group. In SUG group, Minor bleeding was seen in 2 patients and Dysuria in 4 patients. None of the patients developed procedure related infection.

Figure 4 - Diverticulum as seen in Sono-urethrogram.

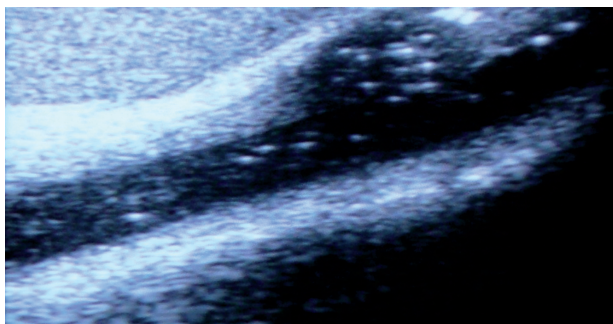
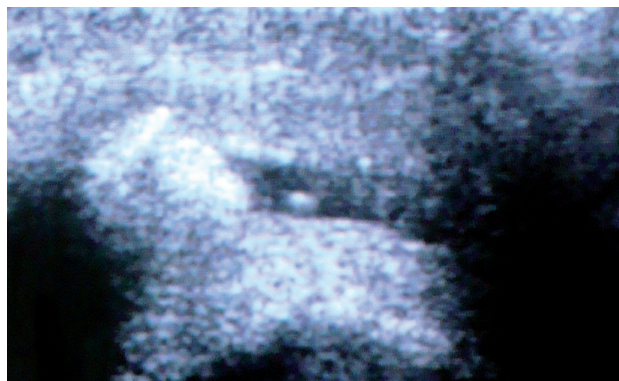


Figure 5 - Urethral calculus in sono-urethrogram.

DISCUSSION

Ascending urethrogram has been the gold standard investigation in the evaluation of stricture urethra. But it is associated with radiation exposure and underestimates the length of the stricture. Hence to overcome these shortcomings of ascending urethrogram, ultrasound evaluation of stricture urethra called sono-urethrogram has been tried.

Sono-urethrogram was more sensitive and specific in diagnosing urethral stricture disease in our study as compared to Ascending urethrogram. The false positive rate was less with sono-urethrogram as compared to ascending urethrogram. Sono-urethrogram was 100% specific, 100% sensitive in identifying anterior urethral strictures, with positive and negative predictive values being 100% (Table-1). But the accuracy of sono-urethrogram decreased dramatically in evaluating posterior urethral strictures. It was only 75% sensitive and 50% specific in diagnosing posterior urethral strictures. Voiding cysto-urethrogram is the gold standard investigation in the evaluation of posterior urethral strictures, such as PFUDD. It gives adequate information regarding the location and length of the stricture in most of the cases. AUG alone cannot give adequate information in these cases. But in some cases with inadequate opening of the bladder neck during VCUG, it needs to be complimented by either pre-operative or intra-operative antegrade cystoscopy. Hence it is not 100% sensitive in identifying all the details of posterior urethra. Sono-urethrogram is also

limited in its ability to define the posterior urethral strictures at present. The accuracy of sono-urethrogram may be improved by the addition of antegrade dynamic study using perineal USG or TRUS. In our study we have not directly compared VCUG and sono-urethrogram in the evaluation of posterior urethral strictures. Till the time advances in sono-urethrogram happens, VCUG along with antegrade cystoscopy is considered as standard for the evaluation of posterior urethral strictures.

Ascending urethrogram underestimates the length of anterior urethral stricture due to end on view. It results in wrong decision making regarding the type of intervention. This is may be overcome by the addition of sono-urethrogram which accurately estimates the length of the urethral stricture in real time. In our study the average length of the stricture in Ascending urethrogram group was 9.3 mm, whereas the length in sono-urthrogram group was 14.1 mm. the difference between 2 groups was 4.8 mm, which was statistically significant (P value-0.01). The findings of sono-urethrogram correlated well with the cystoscopic and intra-operative findings. But the sono-urethrogram is not the ideal study for estimating the length of posterior urethral strictures. Combining voiding cysto-urethrogram with the retrograde study still remains the gold standard in evaluating posterior urethral stricture. Sono-urethrogram is better than Ascending urethrogram in estimating the length of anterior urethral stricture.

Sono-urethrogram is also better in assessing the diameter of the stricture. The average diameter of the stricture in ascending urethrogram group was 0.9 mm, whereas in sono-urethrogram group it was 1.1mm with the difference being statistically significant (P value- 0.01). Cystoscopic and intra-operative findings correlated well with sono-urethrogram. Hence sono-urethrogram is more accurate in assessing the diameter of the stricture as compared to sono-urethrogram.

Spongiofibrosis is the important determinant of outcome of surgical procedure. It is a poor prognostic factor, which results in recurrence of stricture if not excised completely during surgery. Hence presence of dense spongiofibrosis predicts failure of endoscopic procedures. Spongiofibrosis cannot be identified with ascending urethrogram.

Sono-urethrogram accurately estimates the thickness and length of spongiofibrosis in all the patients which helps in better planning of surgery. Hence sono-urethrogram scores over Ascending urethrogram in estimating the spongiofibrosis.

Stricture urethra is complicated in some cases. It may be associated with diverticulum, stones, false tracts and abscesses which may complicate the surgery (False tracts in our study are because of attempted catheterization or urethral dilatation before AUG or Sono-urethrogram). Hence identifying these complicating factors before surgery is very important.

Sono-urethrogram identifies all these factors more accurately than Ascending urethrogram. Periurethral abscess cannot be identified by Ascending urethrogram, whereas sono-urethrogram identifies the abscess more precisely. Hence sono-urethrogram helps in identifying the complicating factors and better planning of surgery.

Ascending urethrogram is associated with complications like urinary tract infection, Bleeding and intravasation. Eventhough sono-urethrogram is also associated with similar complications, the incidence is less compared to Ascending urethrogram. Hence sono-urethrogram is more accurate in assessing the diameter of the stricture as compared to sono-urethrogram.

CONCLUSIONS

Sono-urethrogram is a highly sensitive and specific investigation in the diagnosis of anterior urethral strictures.

Sono-urethrogram is not ideal for the evaluation of posterior strictures.

Stricture length can be estimated more precisely with Sono-urethrogram compared to Ascending urethrogram.

Spongiofibrosis-The thickness and length can be appreciated by Sono-urethrogram, which is not possible with Ascending urethrogram.

Associated findings such as diverticulum and peri-urethral abscess can be detected with higher sensitivity by Sono-urethrogram.

In future Sono-urethrogram might replace Ascending urethrogram as the investigation of choice in the diagnosis of stricture urethra.

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