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Correlation of Sonourethrography Findings of Male Anterior Urethral Stricture with Retrograde Urethrography

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ABSTRACT

Introduction

Imaging plays significant role in diagnosing the male urethral stricture and helps the urologist in determining the treatment protocols. Retrograde urethrography (RGU) had been the standard imaging technique for anterior urethral stricture. Sonourethrography (SUG) as compared to the retrograde urethrography has the advantage of being radiation free. Aim of this study was to compare the sonourethrography findings in anterior urethral stricture with that of retrograde urethrography.

Methods

This was an observational study done in 46 patients with clinical symptoms related to lower urinary tract during the period of September 2019 to August 2020 after obtaining informed consent. Ethical clearance was received from Institutional Review Committee, Institute of Medicine. Patients were first evaluated by sonourethrography. Then, retrograde urethrography was done as per the standard protocol of the department. Data were collected in the predesignated proforma including the study variables on sonourethrography and retrograde urethrography and entered in IBM SPSS version 20. The lengths of strictures on sonourethrography and retrograde urethrography were compared.

Results

Among 46 patients 21 patients showed anterior urethral strictures on both SUG and RGU with bulbar region as the commonest location. SUG showed all the urethral strictures seen on RGU with significant positive correlation. SUG also showed spongiofibrosis in nine patients.

Conclusion

Sonourethrography, an radiation free imaging technique, showed all the strictures seen in retrograde urethrography with added benefit of detection of spongiofibrosis as well.

Keywords
Anterior urethra, imaging evaluation, spongiofibrosis, ultrasonography

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INTRODUCTION

Many diseases affect lower urinary tract in males and result in stricture of urethra. Common causes of urethral strictures include infections, trauma or iatrogenic insults.[1]

Retrograde urethrography (RGU) and micturating cystourethrography (MCU) have been the standard imaging techniques for the evaluation and diagnosis of the urethral strictures. However, they may only poorly define the length of the stricture, and cannot define the depth of scar formation. They add no information about the periurethral structures or extent of periurethral fibrosis. The sonourethrography, offers a dynamic, three-dimensional study that can repeated easily without ionizing radiation to gonads. It also holds the promise of defining not only the stricture but also status of periurethral structures.[2]

Sonourethrography (SUG) can detect anterior urethral stricture, its length, and complications related to strictures and extent of spongiofibrosis.[3] The only major disadvantage of sonourethrography is inadequate evaluation of the posterior urethra, even when the transscrotal approach is used.[4] Though, usefulness of ultrasonography in the evaluation of the anterior male urethra has been widely studied, there is limited literature available regarding detection of anterior urethral stricture by sonourethrography in Nepal.[5,6] Hence, this study was intended to identify the role of sonourethrography in the investigation of anterior urethral stricture in males.

METHODS

This was an observational study done in 46 patients who were referred for retrograde urethrography during the period of September 2019 to August 2020 after obtaining written informed consent. Ethical clearance was received from Institutional Review committee, Institute of Medicine, Tribhuvan University (Ref.:- 59/(6-11)E^2/076/077). All the male patients with urinary symptoms sent for the RGU to our department were included in the study. Patients with voiding difficulties pertaining to posterior urethra and those with symptoms of acute UTI were excluded from the study.

Sonourethrography was performed with 4-12 MHz linear transducer (Acuson NX3 Elite of Siemens). Patient was examined in supine position with hips flexed and abducted as well as knees flexed. Under aseptic precautions, anterior urethra was distended with normal saline using 20 cc syringe till the patient was comfortable. The tip of the penis was pinched using thumb and index finger to avoid the backflow of saline. Both dorsal and ventral approaches were used and additional transperineal approach was used when necessary. All the necessary images of urethra were obtained in longitudinal plane. All the necessary measurements and findings of sonourethrography including evaluation of periurethral spongiofibrosis were obtained (Figure 1A).

Then the patients underwent retrograde urethrography under aseptic precautions and fluoroscopic guidance. Urograffin 60% was used as the contrast agent which was diluted with normal saline in ratio of 1:3. Patient was positioned in supine position. The tip of the 8F Foley's catheter was inserted into the urethra and the balloon was placed in the fossa navicularis and secured by inflating with 2 to 3 ml of water. Patient was then turned in oblique (30 to 45 degrees) position. With gentle traction, contrast agent was injected under fluoroscopic guidance and the necessary images were recorded (Figure 1B). The required measurements were obtained later.

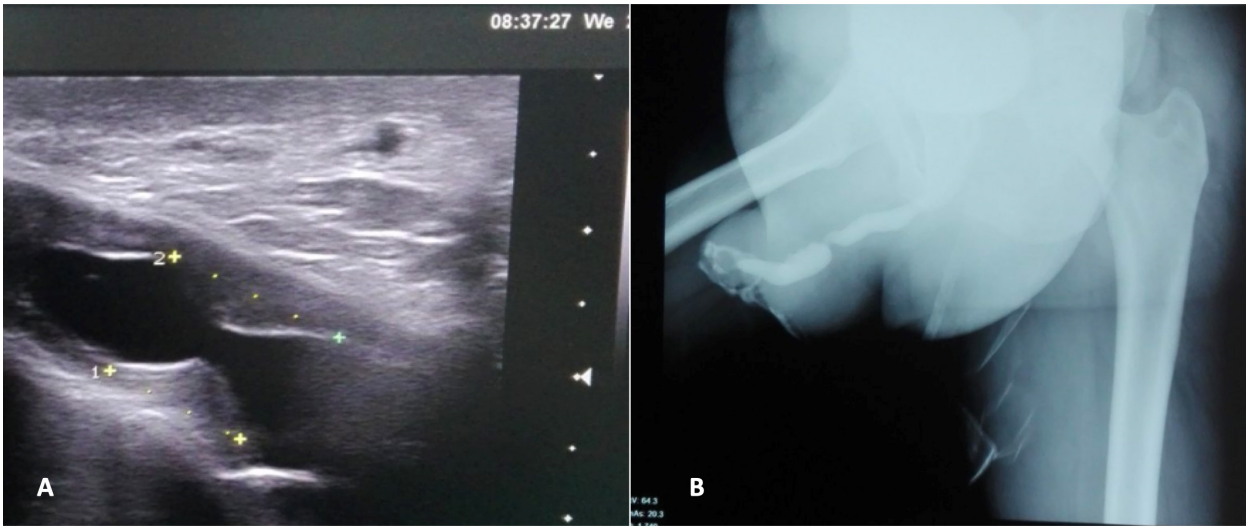

Figure 1. A. Sonourethrography showing urethral stricture. B. Retrograde urethrography.

Both investigations were done by separate observers who were blind to each other's findings.

Data were collected in the predesignated proforma and entered in IBM SPSS Statistics version 20. Mean and standard deviation (SD) were calculated for continuous variables. Paired t-test was used for the association between quantitative values. The p-value of <0.05 shows the statistical significance difference. Pearson's correlation coefficient was used to see the correlation between lengths of strictures on SUG and RGU.

RESULTS

Age of the patient ranged from 20 to 76 years with majority patients in age group 30 to 39 (n=11, 23.9%).

Among 46 patients examined, both SUG and RUG showed strictures in 21 patients (45.7 %), one stricture in each patient. Most of the strictures were in bulbar urethra (42.9%) with similar frequency of strictures in penile and penobulbar urethra. (Table 1)

Table 1. Location of the anterior urethral stricture (n=21)

Location	SUG	RGU
Penile	6	6
Bulbar	9	9
Penobulbar	6	6
Total	21	21

Out of total 21 strictures, SUG showed spongiofibrosis in nine patients (42.9%).

Mean length of the stricture was 14.93±8.45 mm in SUG and 12.86±7.56 mm in RGU. There was strong and positive correlation between length of stricture in SUG and RGU with r value of 0.978 and p value of <0.01. The mean difference was 2.1 mm (Confidence interval, CI = 1.208-2.945, p<0.01). (Table 2 and Figure 2)

DISCUSSION

Urethral stricture, due to obstruction in lower urinary tract, can affect quality of life and can cause damage to entire urinary tract as well. Stricture in posterior urethra is rare and within the anterior urethra, bulbar urethra is the most common site.[7] We found anterior urethral stricture in 21 patients

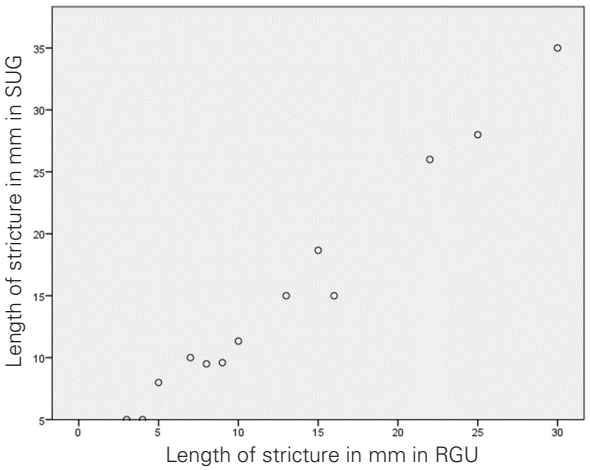

Figure 2. Scatter graph showing correlation between lengths of strictures on SUG and RGU

in both SUG and RGU with bulbar urethra being the commonest location of stricture (42.9 %). Bulbar urethra was the most common site of anterior urethral stricture (52%) in the study done by Fenton et al as well.[1]

Ultrasonography has made great advances in last few decades. Though considered as gold standard imaging technique for anterior urethral stricture, RGU has certain limitations, the greatest disadvantage being radiation to the gonads. In addition, it doesn't outline periurethral tissues. The length of stricture on RGU can be underestimated as the imaging is done in oblique position resulting in apparent shortening of bulbar stricture. The appearance, diameter and length of the stricture might get altered with the traction applied during the procedure.[8] Thus, studies have been done regarding the evaluation of anterior urethral strictures using sonourethrography.[2] Gluck et al found SUG as diagnostically comparable as RGU. They even found a case of bulbar urethral stricture with sonourethrography which was not seen on RGU.[5] We also found a stricture in bulbar urethra on SUG but not seen on RGU. But as we considered the RGU as gold standard modality, the bulbar urethral narrowing was considered false positive. All strictures seen on SUG were also seen on RGU. Thus, the sensitivity of SUG was 100% whereas specificity was 96% in our study. Heidenreich et al also found similar sensitivity and specificity of the ultrasound in detecting the anterior urethral stricture (98% and 96% respectively).[9]

Table 2. Correlation between lengths of strictures on SUG and RGU

Length	Mean (mm)	SD (mm)	Standard Error of Mean (mm)	p-value
Length of stricture on SUG	14.93	8.447	1.843	<0.01
Length of stricture on RGU	12.86	7.558	1.649	

SUG have the added advantage of evaluation of periurethral tissue and our study showed spongiofibrosis in nine patients (42.9%) with strictures. Ani et al also found spongiofibrosis with SUG in 51.7% of the anterior urethral strictures.[3]

There was strong positive correlation between lengths of strictures by SUG and RGU with r value of 0.978 and p value of <0.01 in our study. The length of strictures detected by SUG was more than on RGU with the mean difference of 2.1 mm (Confidence interval, CI = 1.208– 2.945, p<0.01). Ani et al[3] also found similar results in their study with the mean difference of 2.0 mm (Confidence interval, CI = 0.872 – 2.911, p<0.05). This difference might be due to inherited limitation of underestimation of the stricture length in bulbar region due to imaging position in RGU. Nash et al[10] also found poor correlation of the length of bulbar stricture than the penile urethral stricture. Different studies done by Gallentine et al;[11] Peskar et al;[12] Khan et al;[13] Rauniyar et al;[14] Gupta et al[15] also showed the similar findings of underestimation of the stricture length by RGU.

Some limitations of this study must be acknowledged. The imaging findings on SUG were correlated with RGU only. Accuracy of stricture length by open urethroplasty/urethroscopy was not evaluated because immediate surgery was not feasible. Similarly, due to same reason grading of spongiofibrosis was not possible. Only the presence or absence of periurethral fibrosis on SUG was taken in consideration.

CONCLUSION

Our study showed strong positive correlation between the sonourethrography and retrograde urethrography in evaluation of length of anterior urethral stricture. Real time sonourethrography has additional advantage of assessing periurethral spongiofibrosis. Sonourethrography with its high sensitivity and specificity is a convenient, cost effective and radiation free imaging modality comparable to retrograde urethrography for detection of anterior urethral structure, with additional benefit of evaluation of the periurethral tissue.

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CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

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