ORIGINAL ARTICLE

Diagnostic Accuracy of Sonourethrography for Anterior Urethral Stricture Taking Retrograde Urethrogram as Gold Standard

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ABSTRACT

Background: Diagnostic accuracy can be improved by using sonourethrography (high-resolution ultrasound) for male anterior urethra.

Aim: To find the diagnostic accuracy of sonourethrography for diagnosis of anterior urethral stricture taking retrograde urethrogram as gold standard.

Study design: Cross-sectional study.

Methodology: Patients (n=102) presented with lower urinary tract symptoms. All enrolled patients had first retrograde urethrogram followed by sonourethrography in the Department of Radiology, Family Care Diagnostic Center Multan-Pakistan for 6 months by keeping confidence interval 95%. Informed consent was taken from all of them. Data analyzed by SPSS 24.0v. Mean \pm SD for age whereas frequency and percentages were given for stricture and site of stricture. Significant p-value was of ≤0.05.

Results: The mean age of patients was 37.41 ± 10.96 years with range (20-66 years). Stricture was observed in 23.5% (24 patients) by SUG whereas it was in 24.5% (25 patients) by RUG. Sensitivity of sonourethrography as a diagnostic tool of anterior urethral stricture among males in our study was 96% whereas specificity was 100%. **Conclusion:** It gives more accurate information about periurethral fibrosis associated with strictures and other abnormalities thus it can be a useful as well as effective modality for diagnosis of anterior urethral pathologies. **Keywords:** Urethra, Stricture, Sonourehrography and Retrograde Urethrography

INTRODUCTION

Diagnostic accuracy can be improved by using sonourethrography (high-resolution ultrasound) for male anterior urethra. This disease is a challenging urologic condition mainly affecting men. Its real incidence remains unknown as it varies with geography and population. Its incidence rises with aging especially after 55 years of age in the Western population. The risk factors for its development include increasing age, previous radiation exposure, infections, traumatic scarring and inflammatory diseases¹.

The normal male urethra is of 20 cm which is surrounded by corpus spongiosum². Urethra contains anterior and posterior division. The division between the anterior and posterior urethra is done by membranous urethra. Urethritis incidence as a cause is less than three percent for all types of strictures³. Regardless of the cause for stricture, patient's age and site of its origin are important in order to understand it's etiology⁴. It's initial diagnosis begins with a thorough history by focusing on risk factors like genital injury, urethral discharge and dysuria with careful physical examination. An AUA system index assesses lower urinary tarct symptoms^{5,6}.

Literature review revealed that retrograde urethrography (RUG) was standard imaging technique for urethral strictures diagnosis as well as the evaluation of other related pathologies for centuries⁷. Acquisition of meaningful x-ray images, requires experience and accuracy. A new imaging modality (sonourethrography) for evaluating pathology by using high-resolution⁸. It visualizes spongiofibrosis which is next to urethral lumen. It not only diagnose the anterior urethral stricture but helpful for surgical planning as well⁸. Currently, high frequency modulators are applied to the ventral surface of penis in order to evaluate the entire anterior urethra⁹. Thus, the development of new techniques pave a path for correct diagnostic of urethral strictures. Due to the high incidence of urethral strictures among Pakistani males with limited data available regarding its diagnosis due to limited resources, we planned the current study to access the diagnostic accuracy of sonourethrography for anterior urethral stricture taking retrograde urethrogram as gold standard.

The objective of the study was to find the diagnostic accuracy of sonourethrography for diagnosis of anterior urethral stricture taking retrograde urethrogram as gold standard.

METHODOLOGY

Male patients (n=102) presented with lower urinary tract symptoms were enrolled with age ranging from 20-66 years. All of them underwent retrograde urethrogram first followed by sonourethrography in the Department of Radiology, Family Care Diagnostic Center Multan-Pakistan by keeping confidence interval 95% following Hospital's Ethical Committee approval for 6 months.. RUG was performed by introducing Foley's catheter prefilled with contrast into the glans penis. Contrast media (Urografin 76%) was then introduced and a single spot film was taken. For sonourethrography, patient was kept in supine position and ultrasound scanning was done by using high frequency (10--14 MHz) linear array transducer to access whole anterior urethra. Hence, site of stricture, number of strictures length and grade of stricture and periurethral pathology was recorded by imaging anterior urethra. Patients with active urinary tract infection and not willing for sonourethrography were excluded from the present study. **Statistical analysis**: Data analyzed by SPSS 24.0v. Mean±SD was used for age and length of strictures. Independent sample t-test was used to measure length of stricture between SUG and RUG. Chi square was used to determine the difference in grading of the stricture between SUG and RUG. Sensitivity and specificity was used to evaluate the diagnostic accuracy of SUG against RUG.

RESULTS

Among 102 enrolled patients, general characteristics with ultra-sonographic findings were summarized in Table-1. Types with different grades of strictures were presented as frequency and percentage in Table-2. According to the results of SUG, 14 patients (13.7%) were suffering from mild stricture, 9 patients (8.8%) were suffering from moderate stricture and 1(1%) were diagnosed with severe grade stricture. Sensitivity, specificity with diagnostic accuracy of sonourethrography was summarized as %age in Table-3. Sensitivity of sonourethrography as a diagnostic tool of anterior urethral stricture among males in our study was 96% whereas specificity was 100%.

| Table 1. | Conoral | characteristics | of all | oprollad | notionte |
|----------|---------|-----------------|--------|----------|----------|
| | General | characteristics | orai | enrollea | patients |

| Variables | Categories | Frequency | %age |
|---------------------|-------------|-----------|------|
| Gender | Males | 102 | 100 |
| SLIC Findings | Strictures | 24 | 23.5 |
| 300 Findings | Normal | 78 | 76.5 |
| PLIC Findings | Strictures | 25 | 24.5 |
| ROG Findings | Normal | 77 | 75.5 |
| Mean±SD | 37.41±10.96 | | |
| Age (years) | 0 | | |
| Mean±SD | 1.83 ± 0.34 | p-value | |
| Stricture length by | | | |
| RUG (mm) | | | |
| Mean ± SD | 4.60 ± 4.26 | < 0.001* | |
| Stricture length by | | | |
| SUG (mm) | | | |

*Statistically Significant

Table 2: Types with grades of strictures among enrolled patients

| Variables | Categories | Frequency | %age |
|---------------------------------------|----------------|---------------|--------|
| SLIC findings | Bulbar urethra | 16 | 15.7 |
| 300 minuings | Penile urethra | 08 | 7.8 |
| PLIC findings | Bulbar urethra | 17 | 16.7 |
| ROG Infulligs | Penile urethra | 08 | 7.8 |
| | No | 78 | 76.4 |
| Grades of strictures | Mild | 14 | 13.7 |
| by SUG | Moderate | 09 | 8.8 |
| | Severe | 01 | 1 |
| | No | 77 | 75.4 |
| Grades of strictures | Mild | 14 | 13.7 |
| by SUG | Moderate | 11 | 10.8 |
| | Severe | NIL | NIL |
| Difference in grading of stricture | p-value | Insignificant | >0.999 |

| Variables | Estimate | 95% Confidence Interval | |
|---------------------|----------|-------------------------|----------|
| | | Lower (%) | Upper(%) |
| Sensitivity | 96% | 80.5 | 99.3 |
| Specificity | 100% | 95.3 | 100.0 |
| PP Value | 100% | 86.2 | 100.0 |
| NP Value | 98.72% | 93.1 | 99.8 |
| Diagnostic accuracy | 99.02% | 94.6 | 99.8 |

Fig. 1: SUG anterior urthral stricture among enrolled patients



Fig. 2: SUG showing bulbar stricture among enrolled patients



DISCUSSION

The present study aimed to find the diagnostic accuracy of sonourethrography for diagnosis of anterior urethral stricture taking retrograde urethrogram as gold standard. Stricture was observed in 23.5% of patients by SUG while in 24.5% of patients by RUG. Our results were in line with one previous study carried by Shahsavari et.al,. who compared SUG vs RUG in anterior urethral strictures¹⁰.

In present study SUG found 66.66% strictures at bulbar urethra with 33.33% in penile urethra whereas RUG found 68% strictures at bulbar level with 32% at penile urethra. Similarly in one study conducted by Alam et.al, documented that maximum number of strictures were found in bulbomembranous urethra (34%) in his study⁵. Bulbar urethral strictures represented the most common category at 66% stand alone or combined with stricture in another portion of the urethra¹¹.

Findings of current project by SUG showed 14, 09 and 01 patient was suffering from mild, moderate and severe urethral strictures respectively whereas RUG showed 14 and 11 patient were suffering from mild and moderate urethral strictures respectively. No patient was diagnosed with severe grade stricture by RUG. There was no significantly difference in grading of the stricture measured through RUG and SUG methods (p > 0.999). Similarly, our findings were in line with one Indian study that showed mild and moderate grades of urethral strictures¹².

In-order to make good management and treatment plan, vital parameters to know include the knowledge about location, length and nature of the stricture. For centuries, dilation/urethrotomy was commonly employed procedure for determination of urethral stricture length¹³. Results showed average length of the stricture measured by RUG and SUG methods were 1.83±0.34 mm and 4.60±4.26 mm respectively in present study. The length of the stricture measured through SUG method was significantly longer than the stricture measured through RUG (p<0.001). While in the study of Akpayak , the mean length of anterior urethral stricture on RUG/MCUG and SUG were 14.1±1.9mm and 16.0±2.1mm respectively¹⁴. Many previous researchers proved that SUG is better in the measurement of the anterior urethral stricture length than other imaging techniques¹⁵.

Our study gives the sensitivity and specificity of sonourethrography in diagnosing strictures as 96% and 100% respectively. Sensitivity and specificity varies between 75-100% and 72-97% respectively as reported in some studies¹⁶. According to Ravikumar et.al,. Sonourethrography is 100% sensitive and 100% specific, in identifying anterior urethral strictures, with both negative and positive predictive values being 100% each¹³. SUG aimed to diagnose the anterior urethral strictures effectively. It allowed better accuracy in the evaluation of the stricture length than RUG as documented previously¹⁷.

CONCLUSION

It gives more accurate information about periurethral fibrosis associated with strictures and other abnormalities thus it can be a useful as well as effective modality for diagnosis of anterior urethral pathologies.

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Limitations: Our study had several limitations including that it cannot be readily used to evaluate the posterior urethra. It was single centre study.

Conflict of interest: None

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