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ORIGINAL ARTICLE

COMPARATIVE EVALUATION OF SONOURETHROGRAPHY (SUG) AND RETROGRADE URETHROGRAPHY (RGU) IN DETECTION OF URETHRAL STRICTURES

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ABSTRACT: AIMS AND OBJECTIVE: To compare the role of sonourethrography (SUG) and retrograde urethrography (RGU) in detection of urethral strictures. **MATERIALS AND METHODS:** This study was done in the Department of Radiodiagnosis and Surgery, G R Medical College, Gwalior between September 2012 & September 2013. 80 male patients between age group 10 to 70 years with symptoms of lower urinary tract obstruction underwent RGU followed by SUG. Patients having urethral pathologies other than stricture were excluded from the study. The findings of SUG and RGU were compared with each other and per operatively and results analyzed. **RESULTS:** Out of the 80 patients taken into study, 60 were diagnosed as having urethral stricture. The most common site of stricture was bulbar urethra (53.3%) followed by penile (33.3%) & diffuse (13.3%) on SUG. 29,25 and 6 cases had short segment (< 2 cm), intermediate (2-4 cm) and long stricture (> 4 cm) on SUG as compared to 33, 21 and 4 cases on RGU. SUG had sensitivity and specificity of 96.5% and 96.7% respectively while RGU had sensitivity and specificity of 90% and 78%. For stricture thickness of <4mm, SUG had sensitivity and specificity of 97% and 86%. **CONCLUSION:** Thus we conclude that SUG is more sensitive and specific in diagnosing the length, site and thickness of urethral stricture as compared to RGU. Hence, we recommend the use of sonourethrography with greater frequency for pre-surgical assessment of urethral strictures in men.

KEYWORDS: Stricture, urethra, ultrasonography.

INTRODUCTION: Abnormality of male anterior urethra is a common pathology. Various abnormalities of anterior urethra include stricture, trauma, foreign body, calculus, tumor and diverticula. Among these, strictures are very common and may be congenital or acquired in origin. Acquired strictures are mostly due to iatrogenic causes and occur secondary to catheterization, trauma and dilatation of urethra.

Urethral stricture is a common problem in Indian patients. Mostly it is diagnosed by retrograde urethrography. Recently sonourethrography has been used to diagnose urethral stricture after saline instillation in urethra. Sonourethrography has been shown to be more accurate, sensitive and specific for the diagnosis and assessment of penile and bulbar urethral strictures in male urethra compared to conventional retrograde urethrography.[1] Sonourethrograms involve no ionizing radiation and have potential to detect spongiofibrosis and other periurethral abnormalities invisible on radiographic urethrograms. In conventional retrograde urethrography, site, diameter and stricture length are underestimated due to technical factors like magnification factor and patient position.[2]

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MATERIALS AND METHODS: This prospective study was carried out in Department of Radiodiagnosis and Surgery, Gajra Raja Medical College & Jaya Arogya Hospital, Gwalior from September 2012 to September2013. A total of 80 patients attending surgery OPD in age group 10 to 70 years with complaints suggestive of lower urinary symptoms were studied and 20 patients out of them having urethral pathologies other than stricture were excluded from the study.

In all the patients, retrograde urethrography using 300 mA Allengers conventional X-ray machine in a standard way was done initially. The RGU films were evaluated for stricture site, number, and presence of false tract, filling defects or diverticula. Stricture length was determined by direct measurement.

Subsequently they underwent sonourethrography on ALOKA SSD 4000 with linear array 7.5 MHz after saline instillation into the urethra. Upon scanning, urethra was distended and appeared as homogenous echofree band with posterior acoustic enhancement and reflection from tunica albugenia. Strictures were located as segment of reduced distensibility on injection of saline. The stricture length was assessed with electronic callipers method. The thickness of the stricture, indicated by spongiofibrosis, was also assessed by degree of echogenicity and thickness of corpus spongiosum.

The parameters studied by RGU and SUG were compared with intraoperative findings as gold standard. The degree of spongiofibrosis was also assessed intraoperatively.

RESULTS: In our study, a total of 80 patients with symptoms of lower urinary tract obstruction underwent retrograde urethrography (RGU) followed by sonourethrography (SUG). 20 patients having urethral pathologies other than stricture were excluded from the study. Findings of sonourethrography were at first compared with retrograde urethrography and then correlated with operative findings. As compared to RGU, the findings of SUG were more closely correlated with operative findings. The outcome variables in the study were compared with intraoperative findings of stricture urethra. Sensitivity, specificity and overall accuracy for two procedures were calculated. The findings of the study obtained from data analyses are given in different tables and graphs.

The various sites of stricture in our series were penile, bulbar and diffuse (Peno-bulbar) (Table 1). Evaluation of strictures on sonourethrography revealed that 53.3% of the strictures were located in bulbous part (32 cases) followed by 33.3% in penile part (20 cases) and 13.3% in peno-bulbar (8 cases) region. In comparison with RGU evaluation, 46.7% of strictures were located in bulbous part (28 cases) followed by 36.7% in penile part (22 cases) and 16.7% at peno-bulbar part (10 cases).

SITE	SUG	RGU	INTRAOPERATIVE
Bulbar	32(53.3%)	28(46.7%)	32(53.3%)
Penile	20(33.3%)	22(36.7%)	20(33.3%)
Diffuse(both)	8(13.3%)	10(16.7%)	8(13.3%)
Total	**60**	**60**	**60**

Table 1: Distribution of site of urethral stricture

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On sonourethrography, 29(48.4%) cases had short segment (<2 cm) stricture as compared to 35(58.3%) on RGU. Of the 25(41.6%) cases having intermediate segment (2- 4 cm) stricture at surgery, all 25(41.6%) were detected by sonourethrography as compared to 21(35%) patients by retrograde urethrography. 6 cases were having long segment stricture intraoperatively. All 6 were detected by sonourethrography as compared to 4 cases by retrograde urethrography (Table 2).

Length of stricture(cm)	SUG	RGU	Intraoperative
< 2 cm	29(48.4 %)	35(58.3%)	29(48.4 %)
2- 4 cm	25(41.6%)	21(35%)	25(41.6%)
> 4 cm	6(10%)	4(6.7%)	6(10%)
Total	**60**	**60**	**60**

Table 2: Distribution of length of urethral stricture

Of the 15(25%) cases having stricture thickness >4 mm at surgery, 14(23%) were detected by sonourethrography. 46(77%) cases on SUG had stricture thickness < 4 mm. Out of these, 45(75%) were found to have stricture thickness < 4 mm on intraoperative procedures (Table 3).

Thickness	SUG	Intraoperative
< 4 mm	46(77%)	45(75%)
> 4 mm	14(23%)	15(25%)
Total	**60**	**60**

Table 3: Distribution of thickness of urethral stricture

DISCUSSION: Disease of male urethra is common and by virtue of its anatomical location and use, it is prone to develop strictures. The strictures are most commonly seen due to iatrogenic injuries produced during catheterization, urethral dilatation or other endoscopic procedures. Till date, retrograde urethrography is the most commonly used investigation for evaluation urethral stricture and is considered the gold standard, but it has its limitations which are variation in the appearance of strictures with positions of the patients and the degree of stretch of the penis during the study, errors of magnification, limited information about periurethral fibrosis, extravasation of contrast material into other areas of the penis.[3] These limitations are not seen with sonourethrography.

In our study, the most common site for stricture was found to be bulbar urethra, 53.3% cases on SUG and intraoperatively and 46.7% cases on RGU. Thus SUG detected all 32 cases of bulbar stricture correctly while RGU detected only 28 with a sensitivity of 87.50%. All 20 cases of penile urethral stricture were also accurately detected by SUG while RGU recorded 2 false positive cases. All 7 cases of peno-bulbar (Diffuse) stricture were accurately detected by SUG with one false positive as compared to RGU in which 3 false positive cases were seen.

Nash et al.[4] found significant difference between stricture length($p<0.003$) as measured by RUG as compare to SUG. Bircan MKet al.[5] observed that routine use of RUG is misleading when it is not used with urethroscopy. Babnik Peskar Det al.[6] described stricture length and diameter

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measured by RUG were significantly greater than those measured by sonourethrography because of radiographic magnifications. Heidenreich A et al.[7] reported a 98% sensitivity and 96% specificity of using SUG in the detection of urethral stricture. Gupta S et al.[8] showed that the ultrasound diagnosed 91.3% anterior urethra strictures and x-ray urethrography diagnosed 88.5% strictures of anterior urethra. Posterior urethral strictures were inconclusive in sonourethrography.

In our study, on sonourethrography, 29(48.4 %) cases had short segment (< 2 cm) stricture as compared to 35(58.3%) on RGU. Of the 25(41.6%) cases having intermediate segment (2-4 cm) stricture at surgery, all 25(41.6%) were detected by sonourethrography as compared to 21(35%) patients by retrograde urethrography and of the 6 cases having long segment stricture, all 6 were detected by sonourethrography as compared to 4 cases by retrograde urethrography. So the findings in this study were consistent with results of previous studies. (Table 4)

Index	SUG	RGU
Sensitivity	100%	100%
Specificity	100%	80.65%
PPV	100%	82.86%
NPV	100%	100%

Table 4: Comparison of different modalities in detection of short urethral stricture length < 2 cm

Of the 15(25%) cases having stricture thickness > 4 mm at surgery, 14(23%) were detected by sonourethrography. 46(77%) cases on SUG had stricture thickness < 4 mm. Out of these, 45(75%) were found to have stricture thickness <4 mm on intraoperative procedures, while it is not possible to assess stricture thickness at RGU. So SUG has added advantage of evaluation of thickness of stricture over RGU.

Index	SUG
Sensitivity	92%
Specificity	95%
PPV	86%
NPV	97%

Table 5: Accuracy of SUG in detection of urethral stricture thickness > 4 mm

Index	SUG
Sensitivity	97%
Specificity	86%
PPV	95%
NPV	92%

Table 6: Accuracy of SUG in detection of urethral stricture thickness ≤ 4 mm

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Sonourethrography offers a 3-D approach in evaluation of urethral strictures. The method is simple, noninvasive, inexpensive and repeatable with no exposure of radiation to gonads. It provides accurate data with reference to site and severity of stenosis as well as helps to plan surgical management.

The only limitation of sonourethrography is that it cannot assess strictures of membranous and prostatic urethra.

CONCLUSION: From this study, we conclude that sonourethrography is a useful investigation for evaluation of urethral strictures in men. SUG is more effective in detecting urethral stricture than retrograde urethrography. Further, characters of the stricture such as stricture site, length and depth can be assessed with greater confidence and accuracy by SUG, therefore it is more useful when determining the type of operative procedure suitable for patients with urethral strictures. Also, this investigation can be repeated safely due to non-exposure to ionizing radiation. Therefore it can be recommended to use sonourethrography with greater frequency for pre-surgical assessment of urethral strictures.

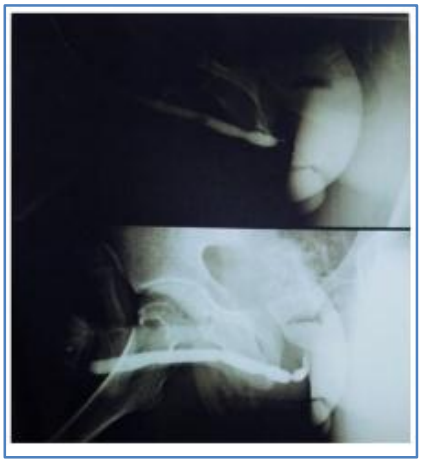

Fig. 1: RGU showing short segment stricture involving bulbar and penile urethra

Fig. 2: SUG showing long segment stricture involving bulbar urethra with increased periurethral echogenicity (spongiofibrosis)

BIBLIOGRAPHY:

1. Samaiyar SS, Shukla RC, Dwivedi US, Singh PB. Role of sonourethrography in anterior urethral stricture. Ind J Urol. 1999; 15(2): 146- 151.
2. Breyer BN, Cooperberg MR, McAninch JW and MasterVA. Improper retrograde urethrogram technique leads to incorrect diagnosis. J Urol. 2009; 182: 716-717.
3. Geise RA, Morin RL: Radiation management in uroradiology. In: Pollack HM, McClennan BL, eds. Clinical urography, 2nd ed. Philadelphia: WB Saunders; 2000:p.13-14.
4. Nash PA, McAninch JW, Bruce JE, Hanks DK. Sonourethrography in the evaluation of anterior urethral strictures. Radiology J Urol. 1995; 154(1): 72-76.

5. Bircan MK, Sahin H, Korkmaz K. Diagnosis of urethral strictures: is retrograde urethrography still necessary? Int Urol Nephro.l 1996; 28: 801-804.
6. Babnik Peskar D, Visnar Perovic A. Comparison of radiographic and sonographicurethrography for assessing urethral strictures. Eur Radiol. 2004; 1 4(1): 137-44.
7. Heidenreich A, Zumbé J, Vorreuther R, Klotz T, Braun M, Engelmann UH. Value of urethral ultrasound in evaluation of pathologic urethral changes. Ultraschall Med. 1995; 16(6): 254-8.
8. Gupta S, Majumdar B, Tiwari A, Gupta RK, Kumar A, Gujral RB. Sonourethrography in the evaluation of anterior urethral strictures: correlation with radiographic urethrography. J Clin Ultrasound. 1993; 21(4): 231-9.

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