

**EVALUATION OF ANTERIOR URETHRAL PATHOLOGY ON SONOURETHROGRAPHY AND EVALUATION OF DEGREE OF SPONGIOFIBROSIS**J. S. Sikarwar<sup>1</sup>, Harish Bhujade<sup>2</sup>, Shilpi Muchhoria<sup>3</sup>, Vrashabhan Ahirwar<sup>4</sup>, Rashmi Singh<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

J. S. Sikarwar, Harish Bhujade, Shilpi Muchhoria, Vrashabhan Ahirwar, Rashmi Singh. "Evaluation of Anterior Urethral Pathology on Sonourethrography and Evaluation of Degree of Spongiofibrosis". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 05, February 03; Page: 1206-1214, DOI: 10.14260/jemds/2014/1969

**ABSTRACT: AIMS AND OBJECTIVE:** To evaluate abnormalities of male anterior urethra using high resolution ultrasound (sonourethrography) and to detect degree of spongiofibrosis. **MATERIALS AND METHOD:** A total of 80 male patients between age group 10 to 70 years with symptoms of lower urinary tract obstruction underwent sonourethrography (SUG) between September 2012 to September 2013 in department of Radiodiagnosis G.R. Medical College & Jayarogya Hospital, Gwalior. The findings of sonourethrography are compared with intraoperative findings. **RESULT:** In this study, most of the patients presented with thin stream of urine (90%), followed by straining on micturition (60%). Etiologically, the commonest cause for stricture was found to be traumatic which was seen in 35 (43%) cases followed by previous surgery in 20 (25%) and infective in 15 (18%) cases. No cause could be detected in 10 (14%) cases. Anterior urethral strictures were found in majority of cases 60 followed by calculi 4 cases and diverticuli 4 cases on sonourethrography with sensitivity and specificity of 98.5% and 90.9% respectively (p value < 0.0001). The most common site involved was bulbar urethra 53.3% followed by penile in 33.3% & diffuse in 13.3% on sonourethrography. Of 54 cases detected to have spongiofibrosis at surgery, 44 were detected by sonourethrography with sensitivity and specificity of 81.4% and 92.3% respectively (p value < 0.0001) which is considered statistically significant. **CONCLUSION:** We conclude that sonourethrography is a reliable investigation for evaluation of male anterior urethral pathology and degree of spongiofibrosis. It is simple, noninvasive, inexpensive and repeatable with no exposure of radiation to gonads. We believe that sonourethrography should be included in the presurgical investigation protocol for urethral stricture and for post-operative follow-up of patients.

**KEYWORDS:** Ultrasound of male anterior urethra, sonourethrography, spongiofibrosis, anterior urethral pathologies.

**INTRODUCTION:** Sonourethrography is the visualization of urethra on ultrasound after instillation of normal saline into the urethra. Sonourethrography has been shown to be accurate, sensitive and specific for the diagnosis and assessment of penile and bulbar urethral strictures in male anterior urethra. 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 is not well assessed as well as stricture length is also underestimated because of certain technical factors like magnification factor and patient position. MRI provides excellent soft tissue contrast, depicts the urethra and periurethral tissue to best advantage, but it is expensive and universal availability is a problem.

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Abnormality of male anterior urethra is a common pathology. Various abnormality of anterior urethra includes 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 and occur secondary to post catheterization, trauma, and post dilatation of urethra. This study was conducted to establish the role of sonourethrography and its accuracy in evaluation of urethral pathologies.

**MATERIALS AND METHODS:** A Prospective study was carried in Department of Radiodiagnosis, G.R. Medical College & Jayarogya Hospital, Gwalior from September 2012 to september 2013. A total of 80 patients from surgery OPD in age group 10 to 70 years with complaints suggestive of urethral strictures, calculi, tumor, diverticuli, anterior urethral fistula, urethritis, palpable anterior urethral irregularities and ventral penile curvature.

**Exclusion Criteria:** Patients with previously diagnosed posterior urethral pathology are excluded as sonography cannot be accurately performed to visualized posterior urethra. However the clinical presentation of anterior and posterior urethral pathologies is often overlapping.

**Sonourethrography-** It was done on ALOKA SSD 4000 with linear array 7.5 MHz in the Department of Radiodiagnosis, G.R. Medical College and J.A Group of Hospitals, Gwalior. For the study, patient was lying supine. The glans was disinfected and a 12F Foley catheter was introduced such that the bulb lay in fossa navicularis. The bulb was distended with 2 ml of normal saline. The penis was then cranially extended over the lower abdomen and ultrasound gel was liberally applied over the ventral surface of penis. 20-50 ml of sterile normal saline was injected excluding air bubble.

The penile urethra was visualized upto peno-scrotal junction with scanning done in both longitudinal and transverse plane. More proximal penile and bulbar urethra were scanned by transperineal and transscrotal approach. On scanning urethra was distended and appeared as homogenous echo free band with posterior acoustic enhancement and reflection from tunica albugenia. Strictures were located as segment of reduced distensibility on injection of saline. In general, the term urethral stricture refers to a fibrous scarring of the anterior urethra caused by collagen and fibroblast proliferation<sup>1,2</sup>.

Associated scar in the surrounding corpus spongiosum is known as spongiofibrosis. Periurethral fibrosis (spongiofibrosis) was also assessed by degree of echogenicity and thickness of spongiosum. The parameters studied by sonourethrography were compared with intraoperative findings. The degree of Spongiofibrosis also assessed intraoperatively by the colour of the urethral mucosa and degree of resistance felt during incision. The degree of spongiofibrosis was graded as mild (pink coloured mucosa and mild resistance during incision), moderate (grey coloured mucosa and moderate resistance) and severe (white coloured and severe resistance).

This study was evaluated by the Ethics Committee of the JA Hospital, and has received its approval.

**RESULT:** In our study, a total of 80 patients with symptoms of lower urinary tract obstruction underwent sonourethrography. Findings of sonourethrography were correlated with operative findings. It was found to have closer observations of sonourethrography with operative findings. The outcome variables studied were compared with intraoperative findings of stricture urethra and

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sensitivity, specificity and overall accuracy for the procedures were calculated. The findings of the study obtained from data analyses are given in different tables and graphs.

Clinical Complaints	Cases	Percentage
Thin Stream of Urine	72	90 %
Straining on Micturition	48	60 %
Pain during Micturition	32	40 %
Penile swelling	2	2.5 %

**Table 1: Presenting Complaints**

Clinical history	Cases	percentage
History of trauma	35	43 %
Previous Surgery	20	25 %
Previous H/o urethritis	15	18 %
Idiopathic	10	14 %

**Table 2: Etiology Based Distribution**

Pathology	Cases	Percentage
Stricture	60	75 %
Calculi	4	5 %
Diverticuli	4	5 %
Other	2	2.5 %
None	10	12.5 %
Total	80	100 %

**Table 3: Anterior Urethral Pathology**

Spongiofibrosis	SUG*	Percentage (%)	Intraoperative	Percentage (%)
Mild	23	50 %	28	51.8 %
Moderate	17	37 %	20	37 %
Severe	6	13 %	6	11.2 %
Total	46	100 %	54	100 %

**Table 4: Degree of Spongiofibrosis(\*SUG- Sonourethrography)**

**DISCUSSION:** Male anterior urethra is the part of the urethra spanning from the bulbo-membranous junction to the external urethral meatus coursing through the corpus spongiosum. By virtue of its anatomical location and use, it is exposed to different types of pathologies. Till date, retrograde urethrography is the most commonly used investigation for evaluation of anterior urethral stricture and is considered the gold standard.

Although radiographic retrograde urethrography (RGU) has long been the gold standard for imaging the anterior urethra, inherent limitation persist<sup>3</sup>. Limitations of RGU include 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 and it has

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hazards of radiation exposure <sup>4</sup>. Contrast material may extravasate into other areas of the penis. In addition venous and lymphatic intravasation may occur.

Among them, 72 (90%) patients presented with thin stream of urine (90%), 48(60%) with straining on micturition, 32(40%) with increased frequency of micturition.(Table 2) Etiologically, the commonest cause for stricture was found to be traumatic which was seen in 35 (43%) cases followed by previous surgery in 20(25%) and infective in 15 (18%)cases. No cause could be detected in 10 (14%) cases (Table 3).

Samaiyer SS et al <sup>5</sup> described the diagnostic accuracy by RUG was 85.75% compared to SUG in 96.44% in their study. Akano AO et al <sup>6</sup> observed similar observation Out of total 80 patients, strictures were found in majority of cases i.e. 60 (75%) followed by calculi 4 (5%) cases and diverticuli (5%) cases on sonourethrography. The penile tumors were found in only 2 (2.5%) cases. In 10 (12.5%) cases no abnormality was detected (Table 4 & 5) Sonourethrography had sensitivity and specificity of 98.5% and 90.9% (p value < 0.0001) for detection of pathology of male anterior urethra.. Heidenreich A et al <sup>7</sup>, reported 98% sensitivity and 96% specificity of using sonourethrography in the detection of urethral stricture. Gupta S et al<sup>8</sup> 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.

Index	SUG
Sensitivity	<b>98.5%</b>
Specificity	<b>90.9%</b>
PPV	<b>98.5%</b>
NPV	<b>90.9%</b>

**Table 5: Anterior Urethral Pathology**

Periurethral fibrosis (spongiofibrosis) is a critical determinant of appropriate therapy and ultimate prognosis. Excessive fibrosis is said to be responsible for high recurrence rates. Peroperative evaluation of strictures shows 51 % were pink colored, 37% gray coloured and 11% white colored. In 51.8% of the cases mild resistance was felt during incision, in 37% cases moderate and in 11.2% cases severe resistance was felt. In our series SUG evaluation of fibrosis was correlated well with intraoperative findings of fibrosis (p <0.0001).Out of 54 cases found to have spongiofibrosis intraoperatively, 45 cases were accurately detected by SUG with one false positive case(Table 11). AKM K Alam et al <sup>9</sup> found that SUG evaluation of fibrosis was correlated well with per operative findings of fibrosis (r=0.569; p <0.001). 67.1% agreement was also observed between SUG and per operative findings in the evaluation of fibrosis.

Index	SUG
Sensitivity	<b>81.4%</b>
Specificity	<b>92.3%</b>
PPV	<b>95%</b>
NPV	<b>70.5%</b>

**Table 6: degree of spongiofibrosis**

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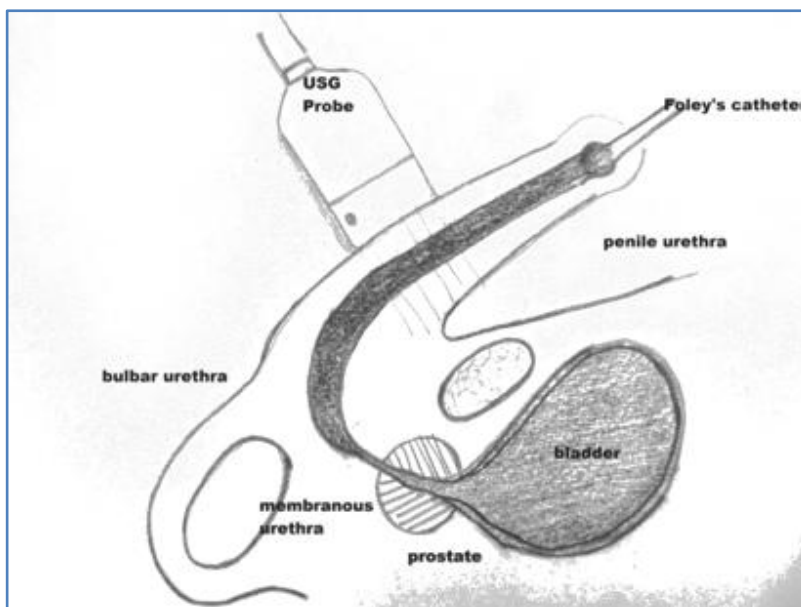
Out of total 80 cases, diverticuli were seen in 4 cases on SUG. Calculi were detected in 4 cases. 2 cases presented with penile swelling had hypoechoic masses on sonourethrography one of which found to have benign teratoma.

**CONCLUSION:** From our study we conclude that sonourethrography is a reliable investigation for evaluation of anterior urethral pathology in men. It is an effective combination of high-resolution B mode sonography and normal saline. With accurate information about periurethral pathologies like spongiofibrosis, sonourethrography is more useful when determining the type of operative procedure suitable for patients with strictures localized to the anterior urethra. Moreover, repeatability of the test due to non-exposure to radiation is an added benefit. Hence, we recommend the use of sonourethrography with greater frequency for pre-surgical assessment of anterior urethral strictures in men.

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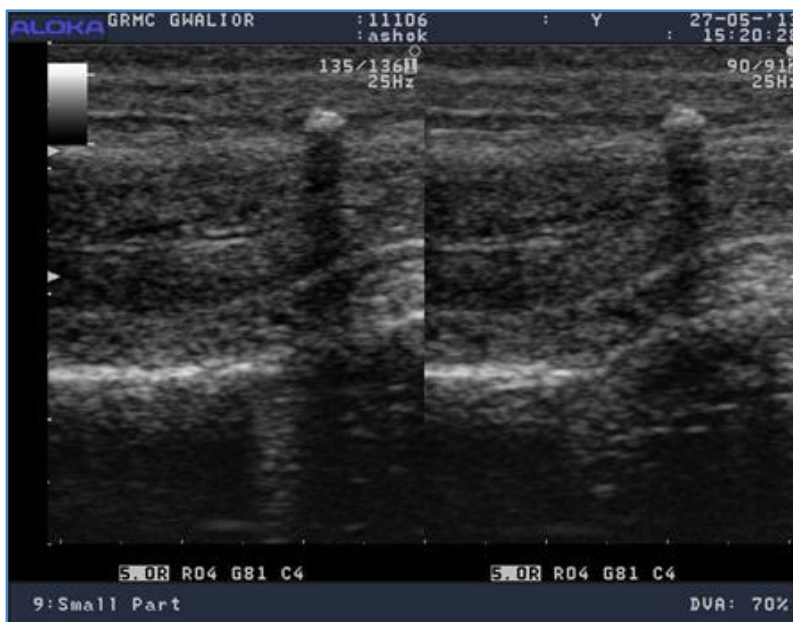


**FIG. 1: Diagrammatic representation of SUG technique**



**FIG. 2: Short segment stricture involving bulbar urethra**



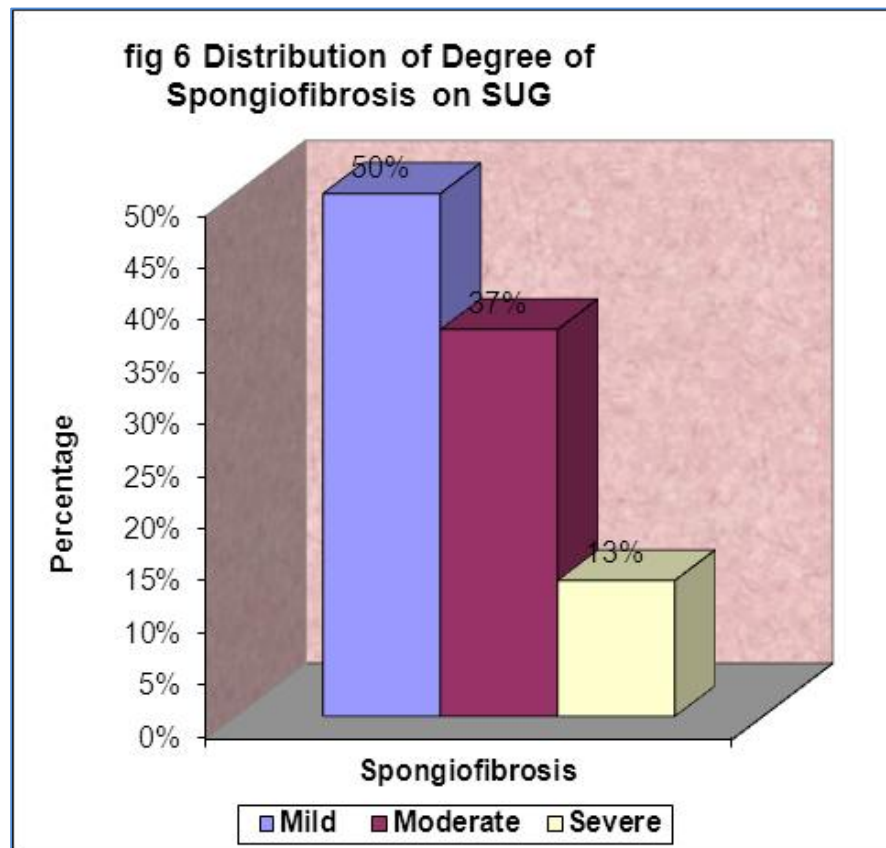
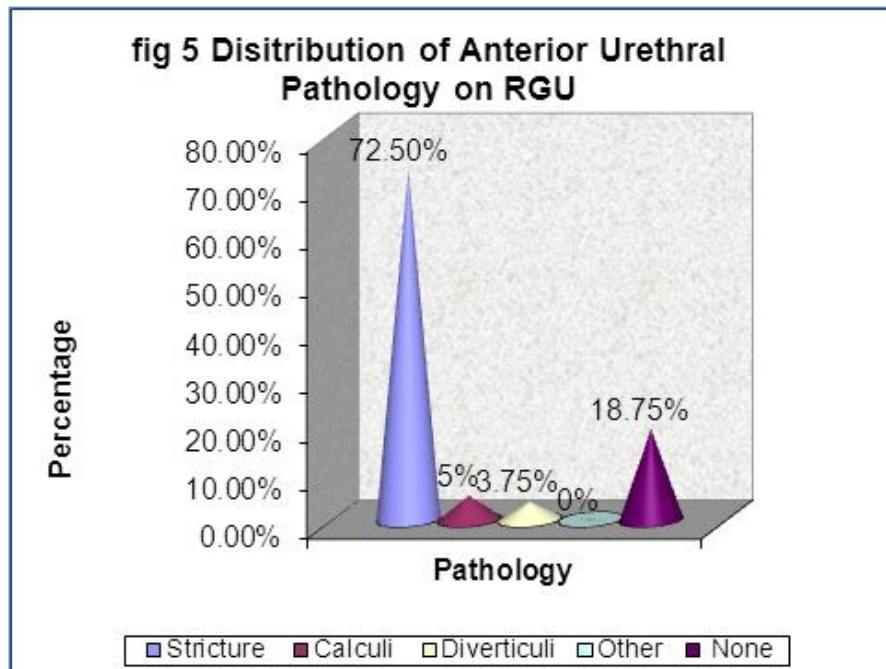


**FIG 3: Echogenic focus with posterior shadowing (calculus)**



**FIG 4- CYSTIC FLUID FILLED DIVERTICULI ARISING FROM ANTERIOR URETHRA**

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Date of Submission: 03/01/2014.

Date of Peer Review: 11/01/2014.

Date of Acceptance: 21/01/2014.

Date of Publishing: 29/01/2014.