Comparative Evaluation of Sonourethrography and Retrograde Urethrography In Urethral Strictures''

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ABSTRACT
AIMS AND OBJECTIVES:
The aims and objectives of the study are:
1. To evaluate the anterior urethra stricture in males using sonourethrography.
2. To determine the efficacy of sonourethrography in measuring the location, length, and luminal diameter of anterior urethral stricture compared to retrogradeurethrography using intra-operative findings as gold standard.
3. To assess the ability of sonourethrography to detect spongiofibrosis and other periurethral abnormalities.
MATERIALS AND METHODS:
The study conducted was a prospective and observational study for a period of 24 months. All patients who presented to urology department with complaints of lower urinary tract with clinical suspicion of urethral stricture are referred to the Department of Radiology are included in the study. Sample size of 35 cases is enrolled for the study and RGU done with SAMSUNG x ray machine and scanned with LOGIQ GE Ultrasound machine in the department of Radiology .
RESULTS:
no significant difference observed between RGU and SUG in case of length of stricture but assessment of luminal diameter of stricture and spongiofibrosis,periurethral pathologies is done better with SUG with less complications
- *When compared with RGU ,SUG is more sensitive and specific in identifying strictures especially at penobulbar junction. For penile strictures and panurethral strictures there is no advantage of sonourethrography in the evaluation of stricture length.*
- *Sonourethrography is a accurate in accessing strictures with < 2 mm luminal diameter compared to retrograde urethrography.*
- *In addition, it is accurate in identification of spongiofibrosispreoperatively .*

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I.   Introduction:

Urethral pathologies, especially strictures are common problem affecting young adult males and are a major cause of morbidity and discomfort.Its management remains a challenge to both the urologist and the patients. Thorough preoperative evaluation remains important in achieving reasonable postoperative outcome.

The gold standard imaging technique is the retrograde urethrography (RGU) and voidingcystourethrography (VCUG). Diagnostic imaging of the male urethra by these techniques, involve the use of radiation and intra-urethral injection of contrast medium to visualise luminal anatomy.[1] Limitations of RGU in accurate evaluation of anterior urethral stricture diseases include variation in the appearance of strictures with position of the patient and the degree of stretch of the penis during the study. It also provides limited information about periurethral structures.

In 1988 McAninch et al. reported a new technique for imaging the male anterior urethra with high-resolution ultrasound (sonourethrography). [2]The initial technique involved the use of a 5 MHz linear array transducer applied to the dorsal surface of the penis. Images were obtained during retrograde instillation of normal saline.[3]In the last decade, the evaluation of anterior urethral stricture with sonourethrography (SUG) has made tremendous advances. Ultrasound of the anterior urethra offers a three-dimensional study without exposure to radiation. It also accurately defines the length of stricture and detects spongiofibrosis. There are several reports available in literature on sonourethrography1-12 but there are no clear cut information regarding the exact role of sonourethrography and radiographicurethrography (RGU/ VCUG) in evaluation of urethral and periurethral abnormalities and further the accuracy of this newer technique over conventional urethrography is not known. The availability of superficial high frequency (7.5-10 MHz) and high resolution ultrasound probe has revolutionized the imaging of urethra. The radiographic urethrography is a invasive, time consuming procedure and due to the risk of radiation exposure can't be repeated when required, further it has failed to demonstrate periurethral abnormality as a cause of urethral lesion. Whereas sonourethrography is a noninvasive, painless, quick, easy to perform and without radiation exposure and provides detailed visualization of mucosal and periurethral soft tissue. Further it does not use any radiographic contrast material. Hence with this advantage of sonourethrography, this study was conducted to establish the role of sonourethrography and its accuracy in evaluation of urethral lesions.

This study was therefore carried out to evaluate the anterior urethra stricture in males using sonourethrography specifically to establish the sensitivity and specificity of sonourethrography in the identification of the anterior urethral stricture, to determine the accuracy of sonourethrography in measuring the length of anterior urethral stricture, to assess its ability to detect spongiofibrosis and to compare the efficacy with that of retrograde urethra

II.   Aims And Objectives

The aims and objectives of the study are:
1. To evaluate the anterior urethra stricture in males using sonourethrography.
2. To determine the efficacy of sonourethrography in measuring the location, length, and luminal diameter of anterior urethral stricture compared to retrogradeurethrography using intra-operative findings as gold standard.
3. To assess the ability of sonourethrography to detect spongiofibrosis and other periurethral abnormalities.

III.   Material And Methods

The study conducted was a prospective and observational study for a period of 24 months. All patients who presented to urology department with complaints of lower urinary tract with clinical suspicion of urethral stricture are referred to the Department of Radiology are included in the study. Sample size of 35 cases is enrolled for the study and RGU done with SAMSUNG x ray machine and scanned with LOGIC GE machine in the department of Radiology .
Sample size :35.
STUDY DESIGN: Prospective and observational study.
Inclusion Criteria:
1. Age group 18 - 70 years.
2. Male patients attending urology outpatient with symptoms of poor urine
stream, straining to void.
3. Preliminary Retrograde Grade Urethrogram of the patients showing anterior
urethral stricture.
Exclusion Criteria:
1. Patients who have not given consent for the procedure.
2. Patients with symptoms suggestive of acute urethritis.
3. Patients with Pelvic fracture urethral injuries.
4. Patients with poor urine stream secondary to Benign prostate hypertrophy.
Statistical analysis: done by using SSPS software

IV.   Result

AGE WISE DISTRIBUTION

TABLE 1 : AGE WISE DISTRIBUTION OF PATIENTS

Age group	No of patients	Percentage
21-30	3	8.6
31-40	9	25.7
41-50	8	22.9
51-60	8	22.9
61-70	7	20
Total	35	100
Mean+/-SD	47.28+/-13.54	

Out of the 35 patients studied,the mean age of the patients is 47.28 ± 13.54 yrs,youngest of all aged 21 yrs and oldest aged 70 yrs .Of the 35 patients,3patients were under 20 to 30 yrs age group ,9 were under 31-40 yrs age,8 patients were under 41 to 50 yrs age,8 patients were under 51 to 60 yrs and 7 patients were under 61

DURATION OF SYMPTOMS
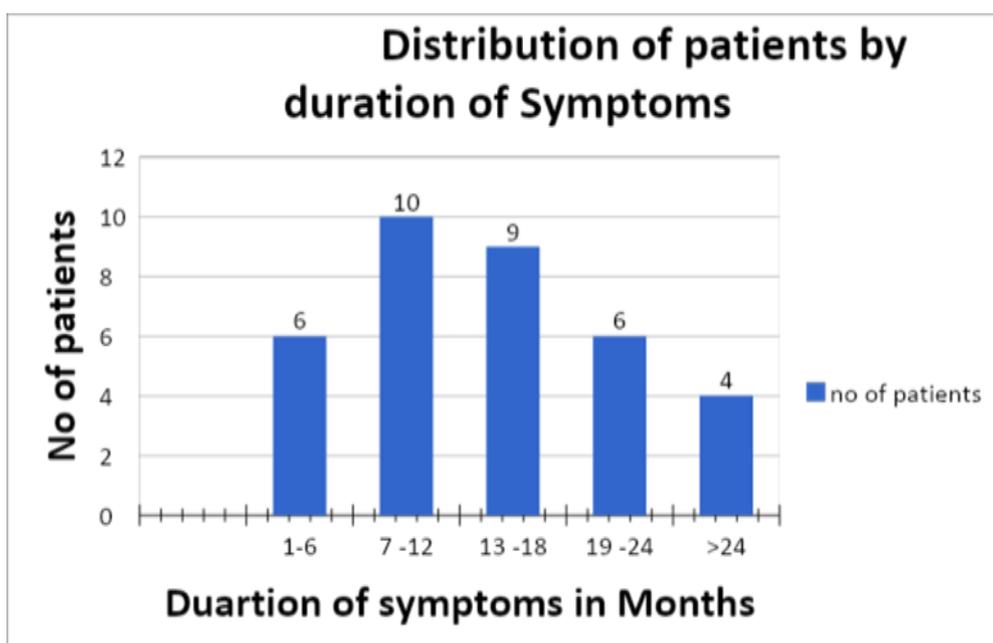
Of the 35 patients studied,30(85.71%) patients presented with thin stream of urine as the presenting symptoms. Straining to void is reported by 28(80%) patients. Burning sensation during micturition was reported by 15(42.8%)patients. The mean duration of symptoms was 14.97 ± 8.50 months(table 6 :graph 2).Past history of urethral instrumentation for stricture disease was reported by 5(14.2%) patients.

DISTRIBUTION BY ETIOLOGY:
Of the 35 patients in the study,inflammatory cause is the most common etiology found in 21 (60%)patients,followed by iatrogenic cause in 8(22.86%) patients,idiopathic in 4(11.43%)patients and traumatic in 2(5.71%) patients
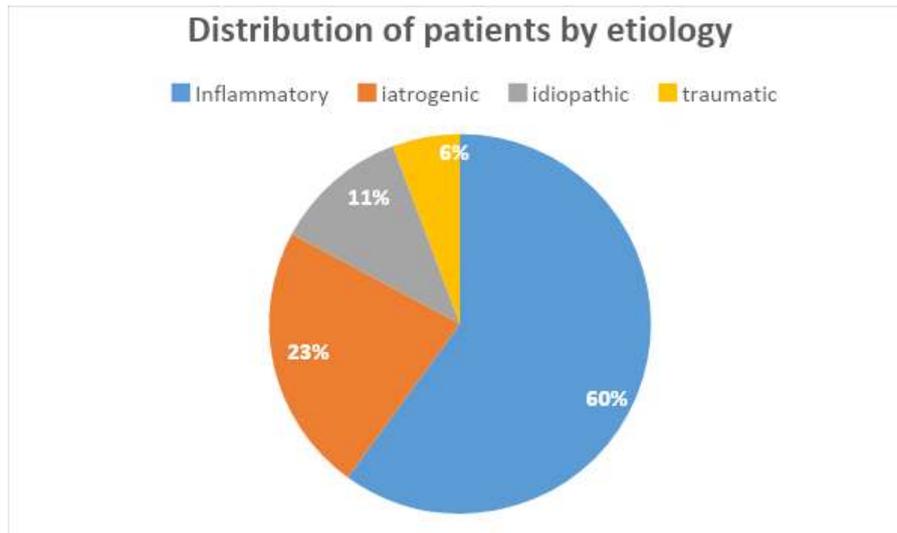
Distribution of patients by etiology

■ Inflammatory　■ iatrogenic　■ idiopathic　■ traumatic

6%

11%

23%

60%

Correlation of findings of Location of stricture of RGU and SUG in relation to intraoperative findings as gold standard

TABLE 2: Correlation of findings of Location of stricture of RGU and SUG in relation to intraoperative findings as gold standard.

	Observations					Correlation				
RGU	TP	FP	FN	TN	TOTAL	Sensitivity	Specificity	PPV	NPV	Accuracy
Bulbar	15	0	0	20	35	100.0	100	100.0	100.0	100
Penobulbar	7	0	2	26	35	77.78	100	100.0	92.86	94.29
Panurethral	7	0	0	28	35	100.0	100	100.0	100.0	100
Penile	4	2	0	29	35	100.0	93.54	66.67	100.0	94.29
SUG										
Bulbar	15	0	0	20	35	100.0	100.0	100.0	100.0	100
Penobulbar	9	0	0	26	35	100.0	100.0	100.0	100.0	100
Panurethral	7	0	0	28	35	100.0	100.0	100.0	100.0	100
Penile	4	0	0	31	35	100.0	100.0	100.0	100.0	100

TP-True Positve, FP-False Postive, FN-False Negative, TN-True Negative, PPV-Postive Predictive Value, NPV-Negative Predictive value

COMPARATIVE ANALYSIS OF LENGTH OF STRICURE WITH INTRAOPERATIVE FINDINGS

Table 3 : Distribution of Patients by length of stricture

Length (mm)	RGU	SUG	intra operative
<10mm	5(14.28%)	4(11.42%)	4(11.42%)
11 -20	5(14.28%)	2(5.71%)	2(5.71%)
21 -30	3(8.57%)	6(17.14%)	7(20%)
31 -40	2(5.71%)	2(5.71%)	1(2.85%)
41 -50	4(11.42%)	4(11.42%)	4(11.42%)

51- 60	4(11.42%)	4(11.42%)	3(8.57%)
61- 70	3(8.57%)	3(8.57%)	5(14.28%)
>70	9(25.71%)	10(28.57%)	9(25.71%)
Mean+/-SD	51.34 +/-39.07	53.94 +/-38.8	54.31 +/-38.71

Distribution of patients by Luminal diameter of the stricture
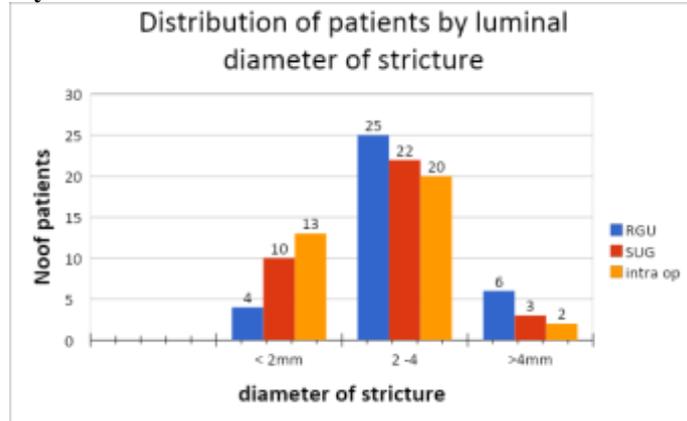
The difference between the luminal diameter of strictures measured on RGU with intraoperative findings were significant for strictures <2mm diameter.For strictures >2 mm there is no significant difference in the diameter measured.There is no significant difference in the diameter measured by the SUG with intraoperative findings

Distribution of patients based on degree of spongiofibros
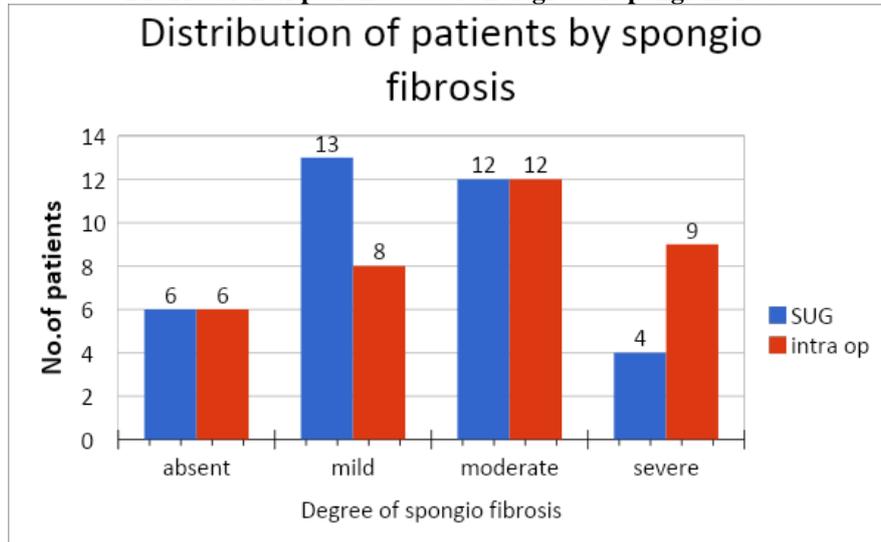
Table 4 :Correlation of degree of spongio fibrosis on SUG with intra operative findings

SUG vs intra operative	Observation					Correlation				
	TP	FP	FN	TN	TOTAL	Sensitivity	Specificity	ppv	npv	Accuracy
nil vs present	29	0	0	6	35	100	100	100	100	100
Mild	7	5	1	22	35	87.5	81.48	58.3	95.6	82.86
Moderate	7	5	6	23	35	58.33	79.31	53.85	82.14	73.17
Severe	4	0	5	26	35	100	83.87	44.44	100	85.71

TP-True Positve, FP-False Postive,FN-False Negative,TN-True Negative,PPV-Postive Predictive Value, NPV-Negative Predictive Value

Distribution of patients by the periurethral pathology
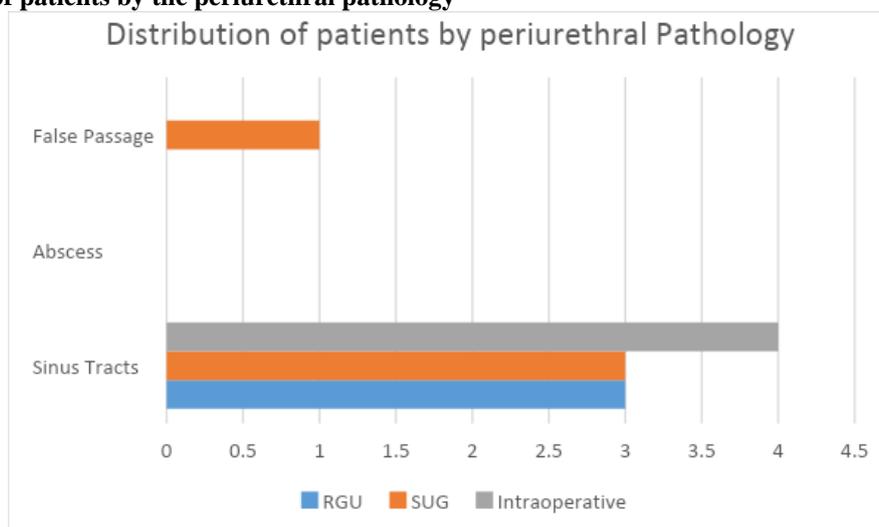
TABLE 5

Other periurethral findings	RGU	SUG	Intraoperative
Sinus Tracts	3(8.57%)	3(8.57%)	4(11.42%)

Abscess	NIL	NIL	NIL
False Passage	NIL	1(2.85%)	NIL

Table 6 :Comparision of other periutheral pathologies between RGU and SGU with intraoperative findings

Other Peripheral findings	Interoperative		In Comparision to intraoperative findings			
	NIL	YES	Sensitivity	Specificity	PPV	NPV
RGU						
*yes	0	5				
*NIL	27	3	62.5	100	100	90
SUG						
*yes	0	7				
*NIL	27	1	87.5	100	100	96.42

Complications observed during RGU and SUG
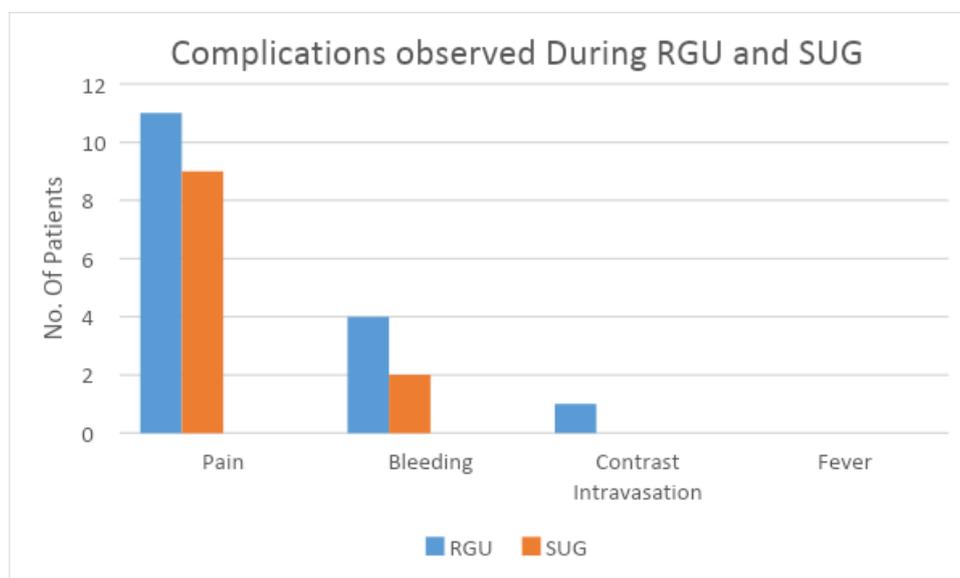
V.   DISCUSSION

Various imaging modalities are available for the evaluation of the stricture urethra. Retrograde urethrography is the most common and preferred modality despite its well known limitations and disadvantages. Inadequate positioning of the patient leading to alteration in stricture length and overlapping resulting in underestimation of length of anterior especially bulbar urethral stricture[3-5].Further inability to evaluate spongiofibrosis ,is one of the limitation of RGU as it is useful in planning for type of surgery. Complications of RGU include extravasation and intravasation of dye in case of forceful injection of contrast material, radiation exposure to gonads and contrast allergy in some susceptible patients.[6,7]

TO overcome these limitations ,an adjuvant technique of sonourethrography was introduced by McAninch et al. In 1988 which provided better estimation of stricture length[1], delineation of spongiofibrosis and periurethral pathology with an added advantage of no radiation exposure and hypersensitivity reaction .Various studies have been conducted for the comparision of both techniques.[6,7]

In the present study the mean age of the patients presented with anterior urethral stricture is 47.28 +/- 13.54yrs. Recently ,Palminteri et al.[8] evaluated urethral stricture characteristics in Italy using data from 1,439 male patients that were referred to specialized genitourinary reconstructive centres. The mean age of urethral

stricture presentation was 45.1 Yrs. Patients with bulbar strictures tend to be younger than patients with strictures in any other part of the urethra.

Etiology of the disease is important in the management of stricture disease as etiology is one of the prognostic factor in defining the outcome of surgery and recurrence as described by Albers et al[9].In the present study, the most common etiology is inflammatory which includes Lichen sclerosis in 21(60%) patients followed by iatrogenic in 8(22.86%) Patients ,idiopathic in 4(11.43%) And traumatic in 2(5.71%)patients. Results of the present study result were in contradiction with a recent metaanalysis by Fenton et al[10] where majority of strictures were due to idiopathic (33%) and iatrogenic(33%) etiology, traumatic in 19% cases and only 15% were due to inflammatory cause. The reason for the difference might be due to study being conducted in the developed countries. As a developing nation with majority of population of low socioeconomic background, lack of facilities for proper hygiene and probable associated higher incidence of lichen sclerosus in the population might be the cause for higher incidence of inflammatory strictures in the present study.

The most common presenting symptom is thin urine stream in 30(85.71%) Patients. Straining to void is reported by 28(80%) patients. Burning sensation during micturition was reported by 15(42.8%) patients. The mean duration of symptoms was 14.97 +/-8.50 Months .Past history of urethral discharge was reported by 5(14.28%) patients.

In the present study the most common location of stricture intraoperatively was bulbar urethra in 15(42.8%) Cases, followed by penobulbar junction strictures in 7(20%) Cases, penile urethra in 4(11.42%) cases and panurethral in 7(20%)cases. Based on the location of stricture ,all the strictures identified by sonourethrography has correlated with intraoperative findings. Where as 2 penile strictures diagnosed on Retrogradeurethrography(RGU) were actually found to be penobulbar strictures. The sensitivity of RGU for identification of strictures at bulbar, penobulbar, penile and panurethral was 100%,100%,66.67%,100% respectively and specificity of RGU for identification of strictures at bulbar ,penobulbar ,penile and panurethral was 100%,92.86%,100%,100% respectively.In the present study sonourethrography has shown 100% sensitivity and 100% specificity in identification of strictures by location. In a similar study by Anand Hatgaonkar[11]showed that sensitivity and specificity of SUG for identification of location of stricture were 97.73% and 93.75% respectively.

VI.   Conclusion

- Sonourethrography is a useful imaging modality to evaluate anterior urethral strictures in males[1].
- When compared with RGU ,SUG is more sensitive and specific in identifying strictures especially at penobulbar junction. For penile strictures and panurethral strictures there is no advantage of sonourethrography in the evaluation of stricture length.
- Sonourethrography is a accurate in accessing strictures with < 2 mm luminal diameter compared to retrograde urethrography.
- In addition, it is accurate in identification of spongiofibrosispreoperatively .
- Selective use of sonourethrography in stirctures, especially at penobulbar junction can help in more accurate assessment of stricture before surgery.

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