ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES

ASSESSMENT OF DIAGNOSTIC PERFORMANCE OF SALINE SONOURETHROGRAPHY IN THE EVALUATION OF MALE ANTERIOR URETHRAL STRICTURE IN BLACK LION SPECIALIZED HOSPITAL, ADDIS ABABA UNIVERSITY, ADDIS ABABA, ETHIOPIA

A NON-INVASIVE TECHNIQUE WITHOUT RADIATION RISK
A PROSPECTIVE COMPARATIVE STUDY

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A RESEARCH PAPER FOR PREPARATION OF SENIOR PAPER TO BE SUBMITTED TO THE RADIOLOGY DEPARTMENT, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY IN PREPARATION FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE POST GRADUATE STUDY IN RADIOLOGY.

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Assessment of Diagnostic Performance of Saline Sonourethrography in the Evaluation of Male Anterior Urethral stricture in Black Lion Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia

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Abstract

Introduction

Purpose of this study was to evaluate the efficacy of saline Sonourethrography (SUG) in detection and evaluation of male anterior urethral strictures compared with retrograde urethrography (RUG). Anterior male urethral stricture disease is a major health problem representing a significant part of the workload of the radiologist and urologist. Its management remains a challenge to both the urologist and the patients. The appropriate choice of management of anterior urethral stricture depends largely on a reasonable, safe and high diagnostic yield of preoperative imaging methods.

Methods

Hospital based prospective cross-sectional study was used at Tikur Anbessa specialized hospital from October 2020 – September 2021. The study participants were all patients on work up for clinically suspected anterior urethral stricture that came to urology department & radiology department at TASH. There were a total of 44 patients involved in this study. Data was collected directly by interviewing the patients and as well as by reviewing Salinesonourethrography and retrograde urethrography imaging's done for the patients using a structured questionnaire. The data was analyzed using SPSS software and results were presented using text, tables and graphs. The results of both methods (Salinesonourethrography and Retrograde urethrography) were compared. Retrograde Urethrography was considered as the gold standard for this comparison.

Result

In 68.18% of the patients (30 patients) anterior urethral stricture was identified by retrograde urethrography. Most of the patients with anterior urethral stricture were in the age group of 41-60 years (41.9%). The two most common presenting symptoms were weak stream and dysuria each comprising 38.7% and 32.3% respectively. The most common site of stricture was bulbar urethra and the most frequent length of stricture was short segment stricture. Moderate degree of Spongiofibrosis was the mostly identified degree of Spongiofibrosis. The sensitivity and specificity of SSU were 86.66% and 92.85% respectively and the PPV and NPV were 96.29% and 76.47% respectively.

KEY WORDS: Saline Sonourethrography, Retrograde Urethrography, Urethral Stricture

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List of Acronyms and Abbreviations

TASH; Tikur Anbessa Specialized Hospital

SSU; Saline Sonourethrography

RUG; Retrograde Urethrography

MCUG; Micturating Cystourethrography

1. Introduction

1.1 Background

Anterior male urethral stricture disease is a major health problem representing a significant part of the workload of the radiologist and urologist. (1) Male urethral strictures account for about 5,000 inpatient visits and 1.5 million office visits per year in the USA. Stricture disease can have a profound impact on quality of life, resulting in infection, bladder calculi, fistulas, sepsis, and ultimately renal failure. The incidence of urethral stricture has been estimated at 200–1,200 cases per 100,000 individuals, with the incidence sharply increasing in people aged ≥55 years. Management of urethral strictures is complex and depends on the characteristics of the stricture. (2) Therefore, its management remains a challenge to both the urologist and the patients. (3) The appropriate choice of management of anterior urethral stricture depends largely on a reasonable, safe and high diagnostic yield of preoperative imaging methods. (1, 2, 3) Hence, accurate imaging of urethral strictures is critical for preoperative staging and planning of reconstruction. (4)

So far the recommended and gold standard imaging technique applied both in our set up or in most developed urology practice is the use of retrograde urethrography (RUG) and micturating cystourethrography (MCUG). (1, 2, 3, 4, 5) Both techniques give two dimensional images and could not assess the mural and extramural component of the urethra like assessment of Spongiofibrosis. Moreover, they have exposure to ionizing radiation and iodinated contrast media (1, 2). Limitations of RUG recognized in the accurate evaluation of anterior urethral stricture disease 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. (5)

In the last few decades, the evaluation of anterior urethral stricture with Saline Sonourethrography (SSU) has made tremendous advances. SSU is a simple, repeatable, dynamic, and reliable procedure in the evaluation of male anterior urethral strictures without radiation hazard, risk of reactions or extravasations of contrast media, or any significant complications.(6, 7). It also accurately defines the length of stricture and detects Spongiofibrosis which are important parameters in deciding the surgical management approach. (7, 8).

As urethral stricture causes progressive narrowing of the urethral lumen, symptoms and signs of urinary obstruction arise. Patients experience weak stream, straining to urinate, incomplete emptying, post-void dribbling, urinary retention, and recurrent urinary tract infections. Understanding the epidemiology of urethral strictures helps to identify risk factors for disease occurrence or progression, which may be amenable to preventive measures resulting in reduced disease severity and health care expenditure. Urethral stricture disease is common in the elderly population with a marked increase after 55 years of age. (2, 9) The mean age of urethral stricture presentation was 45.1 years (range, 2-84 years). The mean length of stricture was 4.2 cm with the vast majority of strictures occurring in the anterior urethra (92.2%), in particular the bulbar urethra (46.9%). The majority of patients, 73.6%, received some form of surgical intervention for their stricture disease prior to presentation to the referral center (9).

Geographic setting, socioeconomic factors and access to healthcare can affect stricture etiology. In developed countries, the most common etiology of urethral stricture is idiopathic (41%) followed by iatrogenic (35%). (10) In comparison, trauma (36%) is the most common cause in developing countries, reflecting higher rates of road traffic injuries, less developed trauma systems, inadequate roadway systems and conceivably socioeconomic factors leading to a higher prevalence of trauma-related strictures.(10)

In a study done *by* C Akpayak et al, The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of SSU were 94%, 78%, 96% and 70% respectively (3).

Spongiofibrosis refers to the presence of fibrous tissue beyond the urethral epithelium that affects the spongy body, and in severe cases, the corpora cavernosa. The best treatment can be chosen if the amount of Spongiofibrosis surrounding the stricture is known. RUG and MCUG does not have the ability to show this per urethral tissue. Spongiofibrosis is manifested in SSU by the absence of dispensability during retrograde instillation of saline to the urethra. (1, 3, 8, 13)

In another review by Conrad_Maciejewski et al , the sensitivity and specificity of SSU were 66-100% and 97-98% respectively with corresponding PPV and NPV of 50-80% and 96-98% respectively (4).

In a study done by S. Choudhary et al RUG and SSU found to have equally efficacious in the detection of anterior urethral stricture. But SSU has showed added advantage for further

characterization of length and diameter of a stricture , and periurethral pathologies like Spongiofibrosis and false tracts with greater sensitivity (5, 8,13, 17).

In our country where there is a wide and easily availability of ultrasound than fluoroscopy throughout the country, introducing SUU as an investigating method of choice in the management of urethral stricture is highly required.

Therefore the main aim of this study is to assess the diagnostic performance and feasibility of SSU in the management of male anterior urethra.

1.2 Significance of the study

It is well known that proper and timely diagnosis of urethral strictures is a corner stone in the management of such patients. Currently, as a well known fact there is a great shortage of fluoroscopy machines even in tertiary level and teaching hospitals in our country to do RUG and MCUG which are considered the gold standard for imaging evaluation of urethral strictures. Even though it is available in some private centers it is expensive and not universally available for the patients. So it is so hard for urology clinics to give appropriate treatment for their patients with clinical suspicion of urethral strictures.

However, relatively speaking ultrasound is more widely available, relatively cheaper and has multiple advantages including no radiation risk and can be done or repeated whenever it is needed; including intra-operatively.

So our aim is to assess the diagnostic accuracy of high resolution ultrasound in correctly identifying anterior urethral strictures in our setup to fill in the gap as there is no research done of this nature in our country, Ethiopia.

Additionally this study will serve as a baseline for further future researches of similar nature.

2. Objectives of the Study

2.1 General Objective

- To assess the diagnostic performance of Saline Sonourethrography in the evaluation of male anterior urethral stricture

2.2 Specific Objectives

- To determine the presence of Urethral stricture and compare it with RUG
- To determine the length and number of urethral stricture and compare it with RUG
- To determine the magnitude of peri urethral fibrosis and grade of peri urethral fibrosis
- To assess for the possible Risk factors for Urethral stricture
- To determine the sensitivity ,specificity, Positive predictive value and Negative predictive value of Saline Sonourethrography

3. Methods and Materials

3.1Study Area and Period

The study was conducted at Tikur Anbessa specialized hospital (TASH), college of health science, Addis Ababa University, Addis Ababa Ethiopia. TASH is the largest referral hospital in the country where there is an adequately trained radiologist to supervise the radiology resident while undertaking SSU and RUG. The institution has also an established urology service and training program with adequate load of cases with urethral stricture. The study was done from October 2020 – September 2021

3.2 Study design: A cross-sectional institutional based prospective comparative study

3.3 Source Population & Study Population

Source populations are all patients with clinical features of anterior urethral strictures

Study populations are all patients with clinical features of anterior urethral strictures who visited urology clinic of the Tikur-Anbessa Specialized Hospital and sent to radiology department and for whom SSU and RUG imagings were done.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

- All patients sent for imaging work up for suspected urethral stricture and are imaged at TASH radiology department during October 2020 to September 2021

3.4.2 Exclusion Criteria

- All Patients with symptoms suggestive of acute urethritis were not included

3.5 Sample size:

All patients with clinical features of anterior urethral strictures seen at TASH at urology unit and imaged at radiology department during the study period

3.6 Sampling Technique

Non-probability sampling technique was used to include all patients with clinical suspicion for urethral strictures and is seen at Urology department and imaged at radiology department during the study period.

3.7. Procedure and Operational Definitions

Procedure: SSU was performed in male patients with clinical diagnosis of urethral stricture and sent for RUG. After informed consent, those who were willing to undertake SSU, the SSU was performed immediately before RUG. The RGU was assessed for the following parameters: site, number, length, diameter of strictures, presence of false tracts, filling defects or diverticula. Stricture length and diameter were determined by direct measurement on the film and correction will be applied for magnification. So, both studies were analyzed by the radiology resident and verified by the consultant body imaging subspecialist.

Technique of SSU: SSU technique was performed by placing a catheter inside the urethra similar to RUG. After disinfecting the glans penis and applying a sterile gel over the catheter and a 12 F Foley catheter introduced with balloon inflated in the fossa of navicularis. The balloon was distended with 2ml saline and after securing in for appropriate position and stability. The ultrasound examination was performed using a high resolution linear transducer (7-12MHZ), in long and short axis along the ventral surface of the penis. Sub scrotal and perineal views were obtained. The following parameters were recorded: site, number, length, and diameter of the stricture, and Spongiofibrosis. Digital images were saved and re-analyzed later.

For RUG, the patient was placed in supine; 45-degree oblique position and using a 12 Fr Foley catheter 10–15mL of water soluble contrast medium was injected into the urethra and spot radiographic images were taken

Urethral Stricture … refers to term any abnormal narrowing of the anterior urethra, which runs from the bulbar urethra to the meatus and is surrounded by the corpus spongiosum

Stricture length is classified as short when length of stricture is ≤15 mm, intermediate segment stricture when length is between 16–25 mm and long segment stricture when length is >25 mm(8,13)

Spongiofibrosis …refers to scar tissue of the corpus spongiosum, which surrounds the anterior urethra

Severity of Spongiofibrosis was graded on SSU as mild when the encroachment on is less than 1/3 of the lumen, moderate when the encroachment on is between 1/3 to 1/2 of the lumen, and severe when the encroachment on is more than half of the lumen [1, 8, 13].

3.8 **Study Instrument**

A well structured questionnaire for data collection was developed from similar studies and utilized for data collection

3.9 **Study Variables**

The independent variables included in this study were the socio demographic and economic characteristics including age, sex, residence area, religion, educational level, occupation, income status, history of trauma and STDs, patient presenting symptoms, medical help seeking status and the dependent variables were SSU and RUG imaging findings and surgical intervention status variables.

3.10**. Data Collection**

Data was collected directly from interviewing patients sent for the imaging study to radiology department at TASH and as well as by reviewing medical records of patients to include all the study variables of patients with clinical features of anterior urethral stricture from October 2020 to September 2021.

3.11**Data Analysis**

Data was analyzed using the statistical package for the social sciences for windows (SPSS) and descriptive statistics such as frequency distribution, mean, standard deviation and percentages. Finally the result was described using text, tables and figures.

3.12. **Ethical Considerations**

Informed consent regarding the procedures performed was taken from all patients and the information obtained from patients medical records as well as imaging reports of the patients were kept confidential & Permission was obtained from research & ethics committee of the department of radiology.

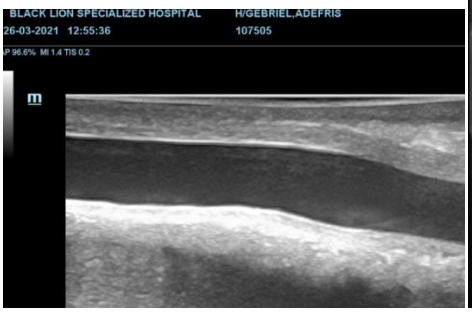
4. Results

The total number of study participants included in this study was 44 patients. The average age of the study participants was 48.41± 17.58 with the smallest age being 16 years and the highest age 83 years. Most of the patients included in this study were in the age range of 41 to 60 years comprising of 38.6% (17 participants). Most of the patients live in urban areas (75%) and most were orthodox in religion (88.6%) and most were doing private business for their livelihood; Most of the participants did not have a regular monthly income (72.7%)

Table 1, Sociodemographic characteristics of study population

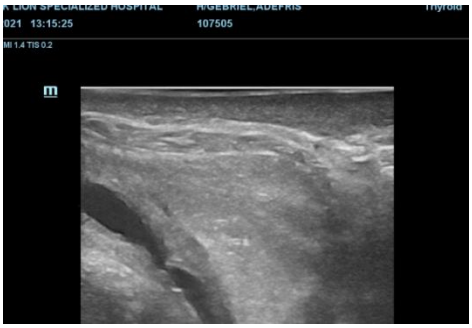
Variables		Frequency	Percent
Age	<=20	3	6.8
	21-40	13	29.5
	41-60	17	38.6
	>=61	11	25.0
	Total	44	100.0
Residence	urban	33	75.0
	rural	11	25.0
	Total	44	100.0
Religion	Orthodox	39	88.6
	Protestant	2	4.5
	Muslim	3	6.8
	Total	44	100.0
Educational level	Not able to read & write	10	22.7
	Able to read & write	6	13.6
	Grade 1-8	8	18.2
	Grade 9-12	14	31.8
	Diploma, Degree and above	6	13.7
	Total	44	100.0
Occupation	Government employee	5	11.4
	Non-government employee	3	6.8
	Private business	16	36.4
	Daily laborer	6	13.6
	Farmer	8	18.2
	other	6	13.6
	Total	44	100.0
Do you earn regular monthly Income?	yes	12	27.3
	no	32	72.7
	Total	44	100.0

Figure 1, Few SSU and RUG images from the study participants

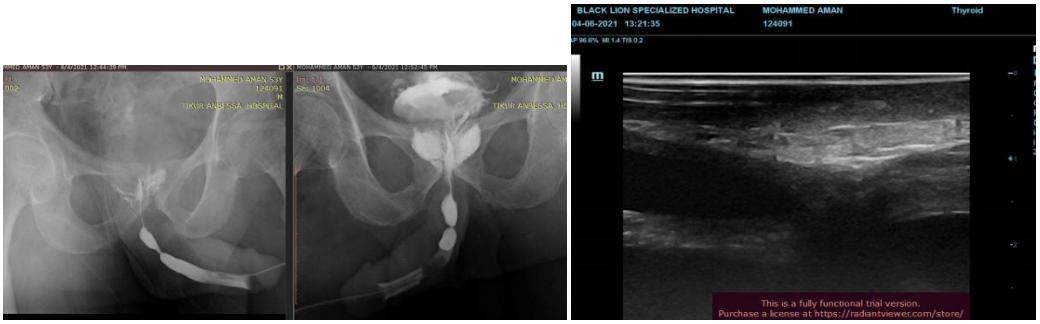


Normal penile urethra in 58 yrs old

Bulbar urethral stricture on RUG in a 58 yrs old



Bulbar stricture on SSU in 58 yrs old



Bulbar urethral stricture in a 53 years old man in RUG and SSU respectively

About one third 14 participants (31.8%) of the patients had history of pelvic or perineal trauma. Most of the study participants (72.72%) denied any history of suggestive of STDs. The two most common presenting symptoms (chief complaints) of the participants were weak stream (45.5%) and dysuria (25%) followed by difficulty of micturation and dribbling as indicated in Table 2 below.

Table 2. Major Presenting Symptoms and History of Previous Interventions

Presentation		Frequency	Percent
History of trauma to the pelvis or perineal area	Yes	14	31.8
	No	30	68.2
	Total	44	100.0
History of STDs	Yes	12	27.27
	No	32	72.72
	Total	44	100.0
What are the presenting symptoms	Dysuria	11	25.0
	Weak stream	20	45.5
	Dribbling	5	11.4
	Difficulty of micturation	6	13.6
	Others	2	4.6
	Total	44	100
Previous intervention history	Antibiotics	23	52.3
	surgical	15	34.1
	both antibiotic & surgery	6	13.6
	Total	44	100.0

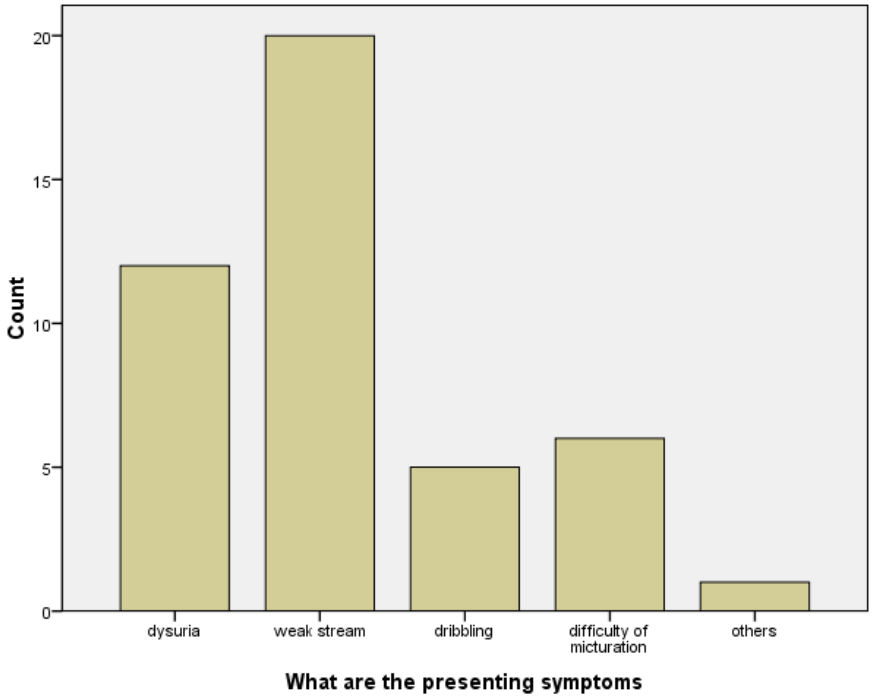


Figure 2, Chief Presenting Symptoms of the Study Participants

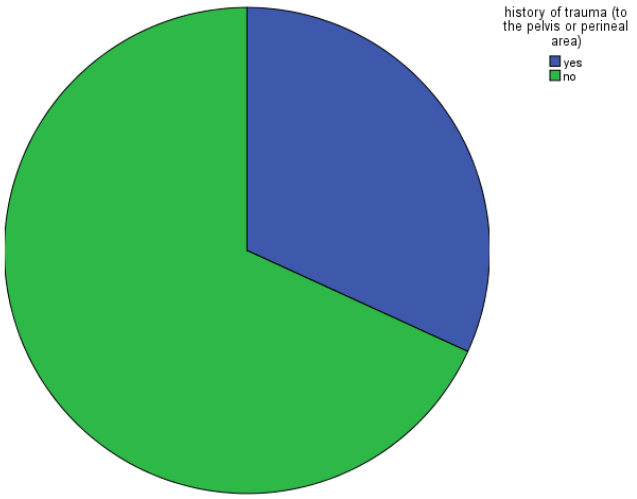


Figure 3. History of Trauma to the perineum or pelvis of the Study Participants

On SSU in 27 patients (61.4%) anterior urethral stricture was found of which about three fourth (74.2%) were involving only the bulbar urethra. And most of the strictures were short segment strictures (61.3%) followed by intermediate (22.6%) and the rest were long segment strictures.

All the strictures detected were single strictures and all had different degrees of associated Spongiofibrosis. Most common degree of Spongiofibrosis was moderate one (45.2%) followed by the mild degree which makes up about 25.8% as detailed in Table 3 and Table 4 below.

Table 3, Saline Sonourethrography (SSU) Findings

SSU Finding		Frequency	Percent
Is there is stricture	Yes	27	61.4
	No	17	38.6
	Total	44	100.0
Location of stricture	Only penile	2	4.5
	Only bulbar	23	52.3
	Both penile and bulbar	2	4.5
	Normal finding	17	38.6
	Total	44	100.0
Length of stricture	≤15mm	19	43.2
	16mm - 25mm	7	15.9
	more than 25mm	1	2.3
	normal finding	17	38.6
	Total	44	100.0
Number of stricture	one	27	61.4
	normal finding	17	38.6
	Total	44	100.0
Diameter of stricture	<1.5mm	8	18.2
	1.5mm-3mm	15	34.1
	more than 3 mm	4	9.1
	normal finding	17	38.6
	Total	44	100.0
Is there periurethral fibrosis	yes	27	61.4
	No	17	38.6
	Total	44	100.0
Degree of Spongiofibrosis	mild	8	18.2
	moderate	14	31.8
	severe	5	11.4
	normal finding	17	38.6
	Total	44	100.0

Table 4, Retrograde Urethrography (RUG) Findings

RUG Finding		Frequency	Percent
location of stricture	only penile	2	4.5
	only bulbar	25	56.8
	both penile and bulbar	3	6.8
	Normal finding	14	31.8
	Total	44	100.0
length of stricture in cm	≤15mm	20	64.5
	16mm - 25mm	9	29.0
	more than 25mm	1	3.2
	normal finding	14	3.2
	Total	44	100.0
number of stricture	one	30	68.2
	normal finding	14	31.8
	Total	44	100.0

Among the study participants who had anterior urethral stricture only 8 patients had surgical intervention during the study period as summarized in the table and pie chart below

Table 5, Surgical Intervention

Surgical intervention		Frequency	Percent
Done	yes	8	18.2
	no	36	81.8
	Total	44	100.0
Type of surgical procedure done	Urethroplasty	3	6.8
	Optical uretherotomy	3	6.8
	Bougie dilatation	2	4.5
	No surgical intervention done	36	81.8
	Total	44	100.0

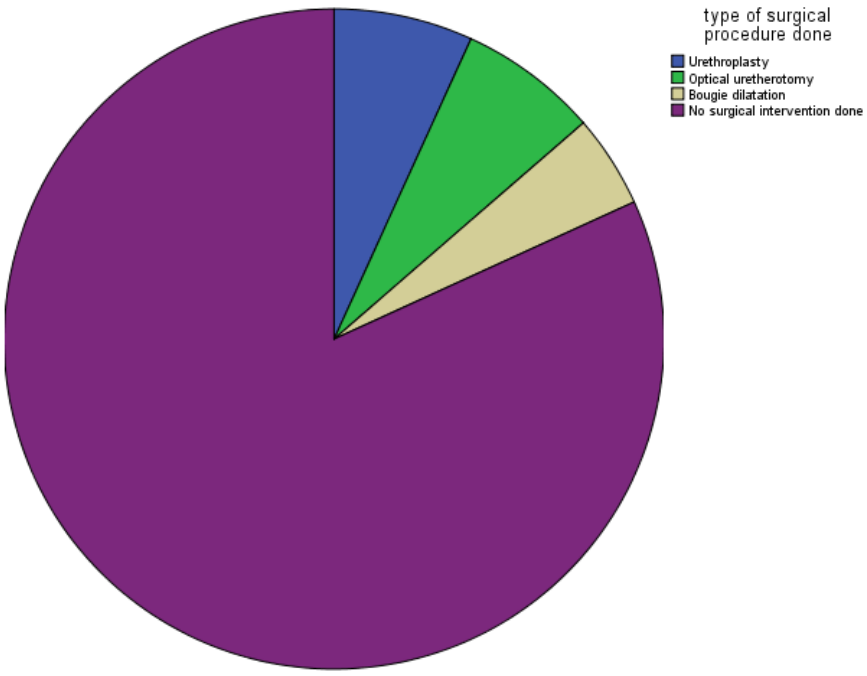


Figure 4. Types of Surgical Procedure Done

Considering RUG as the current gold standard method to investigate urethral stricture and assessing the saline Sonourethrography results with this view, there were 26 true positives, 13 true negatives, 1 false positive and 4 false negative cases as shown in Table 6 below.

Table 6: Sensitivity, Specificity, Positive Predictive and Negative Predictive Value of SSU

Sensitivity	86.66%
Specificity	92.85%
Positive predictive value	96.29%
Negative predictive value	76.47%

5. Discussion

High resolution ultrasound evaluation of male anterior urethral strictures was first reported in 1988 by McAninch et al. (2) as a new technique. High resolution linear ultrasound was applied in our research to sonographically evaluate the anterior urethra. There were 44 participants who fulfilled the inclusion criteria and were evaluated out of whom anterior urethral stricture was diagnosed in 30 by RUG and 27 by SSU, 14 and 17 patients did not have anterior urethral stricture by RUG and SSU respectively. RUG findings were considered as the gold standard in this study for further data analysis and correlations. From the 44 participants of this study 30 had anterior urethral stricture (by RUG) which is about 68.18%. And SSU correctly detected 26 of this cases which indicates that 86.6% of cases were correctly picked.

In this research it was found that the most commonly affected peoples with urethral strictures were in the age group of 41- 60 years which is lower than a study done in India which showed the commonest age group of 21 to 40 years (8) which may be due early presentation of patients to tertiary level hospitals in their case. And the average age of the participants were 48.41± 17.58 which is comparable to a similar research done in Iran of which the average age of the participants was 46.95 ± 11.7 (7, 14), and in another study done in Nigeria West Africa the mean age of patients recruited for the study was 46 ± 18 (3) years.

In this research 32.3% of patients having anterior urethral stricture had history of trauma to the pelvis or perineal region indicating that it is an important risk factor for developing strictures and this is comparable to research done in India which found history of trauma in 36.1% of the cases(9). But it is higher than a similar study done in USA San Francisco which showed history of trauma in only 20% of participants(2). This may be likely high incidence of road traffic accidents in developing countries like Ethiopia compared with developed countries like USA. About 27.27% of the patients admitted that they had a history of STDs in the past with the majority denying any history of similar sort.

The most common presenting symptoms in this research were weak stream (45.5 %) and dysuria (25%) which agrees with similar research done in Turkey which identified poor stream (59.4%) and dysuria (23%) as the two most common presenting symptoms.(13) and in a study done in

India the most common presenting symptoms were weak stream (51.6 %) and dysuria(38.7) in India(16) .

About 38.6% of the participants has a normal SSU scan which is comparable to a similar study done in Germany which reported 35% had normal SSU (17). Among those diagnosed with urethral stricture based on SSU and retrograde urethrography study the most common stricture length was the short stricture identified in 61.3% and 64.5% of cases respectively which agrees done in Turkey which reported short segment stricture as the commonest one which identified in 65.8% and 54% of cases respectively (13) and in another study done in Iran which identified short stricture in 56.6% and 50% of patients respectively (7).

Mean stricture length measured by RUG, and SUG was 10.90 ± 8.05, and 11.43 ± 9.28mm respectively which is comparable to a similar study done in India which reported mean stricture length of 9.3 mm in RUG and 14.1 mm in SSU (16) and lower than the mean stricture length of anterior urethral stricture were 14.1 ± 1.9mm and 16.0 ± 2.1mm for RUG and SUG respectively (3) and in a study done in Turkey the mean stricture length was 16.37±10.09 mm, 17.6±10.37 mm respectively (13). In this two cases it was a bit higher than our case for both RUG and SSU likely due to their high sample number and different sociodemographic status of the participants and small number of long stricture length in our case which was (3.2%). But similar to our findings the average stricture length is longer on SSU than RUG by about 1mm. Which is explained that in most studies done in different areas which were reviewed by compared to intraoperative findings RUG measurements of strictures are shorter which were attributed to multiple factors including angulations to the x ray beam during imaging, retractions secondary to contrast administrations, etc. However, since SSU is a real time three dimensional imaging and angulations' related problems can be avoided and measurements can be taken so it relatively more corresponds to intra-operative stricture length.(2,3,4,5,6,7,8, 9, 13)

There was Spongiofibrosis found in 61.4% of cases of which the commonest degree of Spongiofibrosis was the moderate degree which comprises of 51.8% and in a similar research done in Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India the commonest degree of Spongiofibrosis was mild degree (48%, 24 of 50 patients) (8). In our case moderate degree is more common which may be related to late presentation of patients to urosurgery clinics in our

setup and delay in getting the definitive treatment since some patients stay long on suprapubic catheter.

Regarding sensitivity and specificity of SSU, taking RUG as the gold standard was 86.66 and 92.85% respectively which agrees with a research done in Tehran University of Medical sciences this found the sensitivity and specificity of SSU against RUG of 86.63% and 94.66% respectively.(7) . Also comparable results were found in the research conducted by Heinrich et al., a sensitivity of 98% and a specificity of 96% was reported for Sonourethrography in diagnosing the urethra strictures (7, 13) and in another hospital based study the sensitivity and specificity of SSU were 94% and 78% respectively. Maciejewski and colleagues in 2015 in a literature review regarding the different techniques in the diagnosis of urethral stricture diseases reported that SU has 66 - 100% sensitivity, about 97 – 98% specificity. In their study, the PPV and NPV of SU are estimated 50 - 80% and 96 – 98% respectively (7) and also another study the PPV and NPV were found to be 82.6% and 95.5% (7). In another study the PPV and NPV of SSU were reported 96% and 78% respectively which is similar to ours where the PPV and NPV were 96.29% and 76.47%. And in a study done in Germany PPV and NPV of SSU was 98% and 96% (17).

6. Conclusion and Recommendation

In this research urethral stricture was identified in 61.4% and in 68.2% in SSU and RUG respectively. Most urethral strictures were short segment strictures. The commonest location for anterior urethral stricture identified was bulbar urethral part. The sensitivity and specificity of SSU, taking RUG as the gold standard was 86.66% and 92.85% respectively.

From this research results we conclude that SSU provides comparable efficiency to retrograde urethrography in detection of anterior urethral stricture disease. Therefore, Sonourethrography is a reliable investigation for evaluation of anterior urethral stricture in men and therefore it can be used as an alternative method in imaging work up of male anterior urethral strictures. Also it is very important in further characterization of the stricture such as stricture length and peri urethral soft tissue abnormalities with greater confidence and accuracy by Sonourethrography.

We recommend the routine use of SSU as an alternative imaging technique for imaging work up of clinically anterior urethral stricture suspected patients

Further study is recommended with comparison with intraoperative findings and in multiple institutions.

7. Strength and Limitations of the Study

Strength

- Being the first study of such kind in the country (Ethiopia) which can serve as building block for further studies in the future
- Being a prospective study

Limitation

- Small sample size due to reduced patient flow which was largely attributable to the current COVID- 19 pandemic.
- Inability to compare results with intraoperative findings since for majority of patients (74%) which were diagnosed to have anterior urethral stricture there was no surgical intervention during the study period.

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Annex I: Questionnaire

Section I -Socio demographic and Economic characteristics of the respondent

101. Age in complete years	
102 . sex	1- Male
103 .residence	1- Urban 2. Rural
104. Religion	1. Orthodox 2. Catholic 3. Protestant 4. Muslim 5.Others (Specify)
105. Educational level	1. Not able to read & write 2. Able to read & write 3. Grade 1-8 4.Grade 9-12 5. Diploma 8. Degree & above
106. Occupation	1. Government employee 2. Non-government employee 3. Private business 4. Daily laborer 5. Others (specify)
107. Do you earn regular monthly Income?	1. Yes 2. No
108. if yes how much in birr per month?	
109 : history of trauma (to the pelvis or perineal area)	1. Yes 2. No
110.history of STDs	1. Yes 2. No

Section II – Presenting symptoms

201. What is the major presenting symptoms/chief compliant?	1. Dysuria 2. Dribbling 3. Weak stream 4. Others
202. How long do the symptoms persist?	----------months
203. If the symptoms appear more than one month, did you seek help?	1. yes 2 .No …….skip to 205

204. If yes what was the response/intervention?	-1- antibiotic 2- surgical 3 - non
205. If No what was the reasons for not seeking help? Circle if there is more than one response Don't read option	1. didn't bother me much 2. didn't have money 3. health facility are far away 4. others
206. Any history of surgical intervention	Yes / NO If yes; mention procedure ----------

III—Imaging findings and management

301.SSU findings	1. Normal 2. Anterior urethral stricture 3. others
302. Is there is stricture ; Location of stricture Length of stricture Number of stricture Diameter of stricture Presence of periurethral fibrosis	Yes / No …….. …….. mm ------- -------mm ….. Yes / No
303. RUG Findings Is there stricture Location of stricture Number of stricture	 yes /No ……. ----------
304. surgical intervention	Yes / No If yes; mention procedure ----------