Original Research Article

Sonographic evaluation of male anterior urethral abnormalities in tertiary hospital in Bangalore: Cross sectional study

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Abstract

Background: The present study titled is intended to evaluate the role of sonourethrography in the investigations of male anterior urethral abnormalities. The present study was conducted with two objectives, To find out the role of sonourethrography in the evaluation of male anterior urethral lesions. Comparison of sensitivities of ascending urethrography and sonourethrography, in detection of anterior urethral lesions **Materials and Methods:** Source of data: Source of data collection is from patients referred to department of radiology, Sapthagiri institute of medical sciences and research Centre College, Bengaluru, Karnataka with voiding difficulties. Method of collection of data: Patients presenting with voiding difficulties were examined by conventional radiographic retrograde urethrogram followed by sonourethrogram. **Results :-** 40 subjects were selected for the study. All the 40 patients underwent RGU and SUG Pathology detection rates of RGU was 58% and Pathology detection rates of SUG 63%Stricture detection rates of RGU was 83% whereas in SUG it was 100% Urethritis detection rates of RGU was 83% whereas in SUG it was 100% Diverticulae detection rates of RGU and SUG was 100% Periurethral cysts detection rates of RGU was 50% and whereas in SUG it was 100%.

Key Words: sono urethrogram., retrograde urethrogram

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INTRODUCTION

Various diseases affect the urethra, the final pathway of the lower urinary tract. It is subjected to various sexually and non-sexually transmitted infections resulting in urethritis. It is the common site of strictures either due to infections, trauma or iatrogenic. Congenital anomalies, though rare can still be encountered. The pathologies of external structures like bulbo-urethral glands of Littre and Cowper's glands can also result in urethral disorders.

Until recently conventional retrograde urethrography and antegrade urethrography along with voiding cysto-urethrography were the standard studies for the anterior urethra.[1] However their limitations in accurate evaluation of urethral diseases are well recognized. They may only poorly define the length of the stricture, and cannot define the depth of scar formation.[2] They provide only the luminal anatomy and no information about the periurethral structures or extent of periurethral fibrosis.[2] Ultrasonography has made tremendous advances in last decade and is now routinely used for imaging of kidneys, urinary bladder, scrotum and prostate.[2] Recently few reports appeared from western countries as well as from India about the utility of ultrasonography in the evaluation of urethral stricture disease. They have confirmed its advantages. However not many reports have been seen about its utility in other urethral abnormalities, and it is not being used routinely. Ultrasonography of anterior urethra known as sonourethrography, offers a dynamic, three-dimensional study that can repeated easily without ionizing radiation

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to gonads. It also holds the promise of defining not only the stricture but also status of peri-urethral structures.[2] with this improved technique the optimal surgical approach can be selected more easily. The present study titled is intended to evaluate the role of sonourethrography in the investigations of male anterior urethral abnormalities. The present study was conducted with two objectives,To find out the role of sonourethrography in the evaluation of male anterior urethral lesions. Comparison of sensitivities of ascending urethrography and sonourethrography, in detection of anterior urethral lesions

MATERIALS AND METHODS

Source of data: Source of data collection is from patients referred to department of radiology, Sapthagiri institute of medical sciences and research Centre College, Bengaluru, Karnataka with voiding difficulties.

Method of collection of data: Patients presenting with voiding difficulties were examined by conventional radiographic retrograde urethrogram followed by sonourethrogram.

Inclusion criteria: All male patients presented with voiding difficulties pertaining to anterior urethra like strangury and poor stream of urine.

Exclusion criteria: All female patients.

Male patients presenting with voiding difficulties pertaining to posterior urethra like frequency and urgency.

Method of examination: Selected patients for the study were explained about the procedure of retrograde urethrography and sonourethrography along with the purpose of conducting both examinations. Written consent was obtained from patients. The privacy of patients was maintained throughout the examinations.

Patients selected for study were initially examined by conventional radiographic retrograde urethrography. After conventional retrograde urethrography the patients were taken for sonourethrography. Patients were made to lie down on the ultrasonography examination table in supine position with extended hip and knee. A thin polythene catheter attached to a 20 ml syringe loaded with normal saline was placed in the distal most part of urethra. The catheter was secured in place by applying pressure over glans of penis, by holding it between left index and middle fingers of the examiner. Saline was gradually injected while examining penis sonographically by linear transducer of frequency 7.5-10 MHz. The sonography unit used for our study was Esoate Biomedica AU5 with linear transducer of 7.5-10 MHz. The images were obtained in both sagittal and transverse sections by placing the transducer over both dorsal and ventral aspects of penis. Trans perineal approach was used as and when necessary. The findings of retrograde urethrography were recorded on routine conventional radiograms. The findings of sonourethrogram were recorded in the memory disc of the sonography unit. The findings of both examinations were tabulated in the format prepared for the study. The findings of the study were then subjected to statistical tests of significance. The sensitivities were statistically calculated. The findings of both examinations were analyzed in terms of Percentage sensitivities of pathology detection rates.

RESULTS

Table 1: Various details of subjects

	Number
Subjects selected For study	40
Subjects underwent RGU	40
Subjects underwent SUG	40
Pathologies detected	25
Normal studies	15

40 subjects were selected for the study. All the 40 patients underwent RGU and SUG

Table 2: Pathology detection rates of RGU and SUG in 40 patients presented with voiding difficulties

Character	Pathology	Normal	Percentage
R G U	23	17	58
S U G	25	15	63

Pathology detection rates of RGU was 58% and Pathology detection rates of SUG 63%.

Table 3: Stricture detection rates of RGU and SUG

Character	Number	Percentage
Total strictures detected	18	100
Detected on RGU	15	83
Detected on SUG	18	100

Stricture detection rates of RGU was 83% whereas in SUG it was 100%

Table 4: Urethritis detection rates of RGU and SUG

Character	Number	Percentage
Total urethritis detected	10	100
Detected on RGU	9	90
Detected on SUG	10	100

Urethritis detection rates of RGU was 83% whereas in SUG it was 100%

Table 5: Diverticulae detection rates of RGU and SUG

Character	Number	Percentage
Total diverticulae detected	1	100
Detected on RGU	1	100
Detected on SUG	1	100

Diverticulae detection rates of RGU and SUG was 100%

Table 6: Periurethral cysts detection rates of RGU and SUG

Character	Number	Percentage
Total periurethral cysts detected	2	100
Detected on RGU	1	50
Detected on SUG	2	100

Periurethral cysts detection rates of RGU was 50% and whereas in SUG it was 100%.

Table 7: Percentage sensitivities of SUG and RGU in detecting different pathologies

Character	SUG	RGU
Strictures	100	83
Urethritis	100	90
Diverticulae	100	100
Periurethral cysts	100	50

DISCUSSION

Diseases affecting the urethra, the final pathway of lower urinary tract, are varied.[17] It is subjected to various sexually and non-sexually transmitted infections resulting in urethritis. It is the common site of strictures either due to infections, trauma or iatrogenic.[17] Congenital anomalies though rare can still be encountered. The pathologies of external structures like bulbo-urethral glands of Littre and Cowper's glands can also result in urethral disorders.[18] Until recently conventional retrograde urethrography and antegrade urethrography along with voiding cysto urethrography were the standard studies for the anterior urethra.[1] However their limitations in accurate evaluation of urethral diseases are well recognized. They may only poorly define the length of the stricture, and cannot define the depth of scar formation. They provide only the luminal anatomy and no information about the periurethral structures or extent of periurethral fibrosis. They use radiation and hence are associated with radiation hazards.[19] Ultrasonography has made tremendous advances in last decade.[2] Recently few reports appeared about the utility of ultrasonography in evaluation of urethral stricture disease. They have confirmed its advantages. However not many reports are seen about its utility in other urethral abnormalities. The present study is conducted to evaluate the role of sonourethrography in investigations of male anterior urethral abnormalities. Urethral abnormalities have been known since the period of Aristotle.[5] Upto the year 1984 conventional radiographic retrograde urethrography was the gold standard for evaluation of urethral abnormalities.[8] In the year 1984 Mathew F Rifkin published trans- rectal endosonography as a useful tool for evaluation of prostatic urethra. The article was published in Radiology in December 1984. Since then the utility of ultrasonography has been evaluated in the study of urethral abnormalities. Jack W. Mc Aninch. Faye C Laing and R Brooke Jaffrey, Jr. had studied[17] patients with suspected stricture disease both by conventional retrograde urethrography and sonourethrography. They compared the length of stricture assessed by each imaging modality and open urethroplasty in seven patients. They found out that sonourethrography was consistently more accurate as compared with conventional retrograde urethrography.9 In our study we found that the length of strictures detected by sonourethrography was usually more than the length detected on conventional urethrography. Clifford d. Gluck, Albert L Bundy, Calliope fine *et al* had studied [22] patients suspected of having stricture disease. They found out that sonourethrographic findings were as diagnostic as roentgen findings in 19 patients.[1] In one patient sonourethrography identified a bulbar urethral stricture, which was not seen on retrograde urethrography. In our

study we noticed all strictures identified on retrograde urethrography were seen on sonourethrography. In addition three strictures not demonstrated on retrograde urethrography were identified on sonourethrography. In two patients retrograde urethrography could not be performed, as stricture was total, quite long and beginning from meatus itself. Here we performed sonourethrography by pushing saline by keeping catheter tip at meatus, while holding glans closed for delineation of distal extent of stricture. We then instructed patients to strain, for demonstration of proximal extent of stricture by delineating proximal urethra by urine itself. In 1993, Gupta S, Majumdar B, Tiwari A *et al* examined 30 patients of age group 19-77 years having urethral strictures with both roentgenographic and sonographic techniques. They found out 29 urethral strictures in 28 patients. They also found out that in most cases the stricture appeared shorter on radiographic study than on sonourethrography.10 This was particularly true for proximal penile, bulbopenile and bulbar urethral strictures. In our study we also noticed the discrepancy in length measurement by roentgenographic and sonographic techniques. Majority of times stricture length was more in sonourethrographic measurements. In 1995, Peter A Nash, Jack W Mc Aninch, Jeremy E Bruce And Douglas K Hanks studied 123 cases with sonourethrographic and conventional retrourethrographic studies during a 7-year period. They found that sonourethrography readily identified urethral calculi, diverticulae and false passages. It correctly identified stricture and its site in every case. There was a significant difference between stricture lengths measured by urethrography compared to that measured by sonourethrography.[12] The findings of our study support their views in all respects. In 2000,Ravi Pushkarna, Satish K Bhargava, Mukta Jain studied patients with clinical diagnosis of urethral strictures. They performed conventional retrograde urethrography in all patients followed by sonourethrography, independently by different observers. Of the 20 patients they evaluated with diagnosis of urethral strictures, 10 patients revealed abnormalities of anterior urethra. Six of these revealed strictures in anterior urethra, three-revealed urethritis, and one revealed urethral diverticula. Of these six strictures 5 were revealed on retrograde urethrogram as well as on sonourethrography. One patient who appeared normal on retrograde urethrography revealed a small 2 mm stricture on sonourethrography. Length of strictures was better demonstrated on sonourethrography in all patients and varied between 2mm and 1cm. Three patients revealed urethritis on retrograde urethrography, which was appreciated very well on sonourethrography. One patient revealed a diverticulum on retrograde urethrography that was also well correlated with sonourethrography.14 In our study with sonourethrography, 18 strictures, 10 cases of urethritis, 2 periurethral cysts, 1 fistula and 1 diverticula were demonstrated. While as with retrograde urethrography only 15 strictures, 9 cases of urethritis, 1 periurethral cysts, 1 fistula and 1 diverticula were demonstrated. Thus better pathology detection rates were demonstrated with sonourethrography

CONCLUSIONS

Various diseases affect anterior urethra, which is enclosed in corpus spongiosum of penis,3,4 and is quite superficial and easily approachable by high-resolution sonography. We conducted a study to know the role of ultrasonography in evaluation of anterior urethral abnormalities. We studied 40 patients presented to us with voiding difficulties pertaining to anterior urethra. All patients were studied by both conventional radiographic retrograde urethrography and sonourethrography. The findings of both studies were analysed and compared. With this study we found out that sonourethrography is quite competent and sensitive in picking up of the lesions. In fact it is better than conventional radiographic retrograde urethrography. Sonourethrography take less time than radiographic retrograde urethrography, is easy to perform, does not require iodinated contrast media and does not have radiation hazards. It is a three dimensional, real time study that can be repeated without any hazards. It also demonstrates periurethral pathologies like periurethral cysts and spongiofibrosis well. The only drawback of the study is it will not demonstrate the entire urethra in single panoramic view. Considering all the advantages of sonourethrography, we conclude by recommending the routine use of the technique for evaluation of anterior urethral abnormalities

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REFERENCE

1. Clifford d Gluck, Albert l Bundy, calliope fine, Kevin r. Loughlin and Jerome p Richie. Sonographic urethrogram: comparison to roentogenographic techniques in 22 patients. Journal of Urology 1988; 140: 1404-1408.
2. Paul W Klosterman, Faye C Laing, Jack W Mc Aninch. Sonourethrography in evaluation of urethral stricture disease. Urologic Clinics of North America 1989; 16; 4: 791-797.
3. Mary Dyson. Male urethra. In. Grays Anatomy, the anatomical basis of medicine and surgery. Editor Peter L Willamas.2000.Churchill Livingstone. edition, 38: 1842-1843.
4. S D Chang and H Hricak. Radiological evaluation of the urinary bladder, prostate and urethra. Diagnostic

radiology a textbook of medical imaging edited by Ronald G Grainger, David Allison, Andreas Adam and Adrian K Dixon. Edition 4 Churchill living stone 2001; volume 2:1615-1652.
5. Mitchell K Rauch, Rafael Gosalbez and Christopher G Zaleski. Congenital anomalies of urethra. Lower urinary radiology imaging and intervention. Springer –verlag New York 1998:333-357
6. Stuart M Gayness, Jay B Hollander and S Zafer H Jafri. Trauma of lower genitourinary tract. Abdominal and general ultrasound edited by David Cosgroove, Hylton Meire, Keith Dewbury. Edition 1; Churchill living stone 1993;volume 2:115-127
7. Gerald W Friedland, Matilde Nino-Murcia, Harcharan S Gill and Inder Perkash. Acquired non-traumatic lesions of urethra. Lower urinary radiology imaging and intervention. Springer – verlag New York 1998:352-389
8. Mathew D Rifkin. Sonourethrography: technique for evaluation for prostatic urethra. December 1984; Radiology: 791-92.
9. Jack W Mc Aninch, Faye C Laing and Brooke Jeffrey, Jr. Sonourethrography in the evaluation of urethral strictures: a preliminary report. Journal of urology. 1988, 139: 294-297.
10. Gupta S, Majumdar B, Tiwari A, Gupta R K, Kumar A, Gujral RB. Sonourethrography in evaluation of anterior urethral stricture: correlation with radiographic urethrography. Journal Of Clinical Ultrasound 1993; 21:231-239.
11. A Heidenreich .W, Derschum .R, R. Bonfig and D.M. Wilbert. Ultrasound in the evaluation of urethral stricture disease: a prospective study in 175 patients. British journal of urology 1994; 74:93-98
12. Peter A Nash, Jack W McAninch, Jeremy E Bruce and Douglas K Hanks. Sonourethrography in the evaluation of anterior urethral strictures. The Journal of urology July 1995; 154:72- 76.
13. Allen F Morey and Jack W McAninch. Sonographic staging of anterior urethral strictures .the journal of urology April 2000; 163:1070-1075.
14. Ravi Pushkarna, Satish K Bhargava, Mukta Jain. Ultrasonographic evaluation of abnormalities of the male anterior urethra. Indian journal of Radiology and Imaging 2000; 10; 2:89-91.
15. Merkle W Wagner w. Sonography of the distal male urethra a new diagnostic procedure for urethral strictures; results of a retrospective study. Journal of Urology 1988; 140:1409-1411.
16. Julian E Kabala. The male genitalia and urethra. Textbook of radiology and imaging edited by David Sutton; Edition 7; Churchill living stone 2003; volume 2: 1017-1038.
17. Rosen M A and McAninch J W. Preoperative staging of anterior urethral strictures in traumatic and reconstructive urology. Edited by J W McAninch. Philadelphia; W.B.Saunders, chapter 46 pp 551-564, 1996.
18. David Richards and Steven Garber .the lower urinary tract. Abdominal and general ultrasound edited by David Cosgroove, Hylton Meire, Keith Dewbury. Edition 1; Churchill living stone 1993;volume 2:543-570.
19. Edward M, Mullin Lloyd J, and Paterson And David, Paulson F. Retrograde urethrogram: diagnostic aid and hazard. Journal of Urology 1973; 110:464-466.
20. Jordan G H Schlossberg, S M and Devine C.J: Surgery of the penis and urethra. Campbell's urology, 7th edited by P.C.Walsh, A.B.Retik, E.D.Vaughan, Jr. et.al. Philadelphia: W.B.Saunders, vol3, chapter 107,pp3318-3394.
21. Dennis L Cochlin, Paul A Dubbine, Barry B Goldberg, Archie A Alexander. Urogenital ultrasound a text atlas edition 1; Martin Dunitz Ltd U.K; 1994:316-321.
22. Carol B Benson, Peter M Doubilet. Penis.general ultrasound. Edited by Carol A Mittlestaedt, Churchill Living stone Inc 1992:1119-1137.
23. Leslie M Scout, Peter Burns, Janis L Brown, Lynwood Hammers, Arthur T Rosen Field. Ultrasound evaluation of urinary tract. Clinical Urography edited by Howard M Pollack, Bruce L Mc Clennan edition 2; W B Saunders Company 2000. Volume 1:388-472.
24. Gerald W Friedland, Matilde Nino-Murcia, Peter A Devries. Congenital anomalies of urethra. Clinical urography edited by Howard M Pollack, Bruce L Mc Clennan Edition 2; W B Saunders Company 2000;volume 1:852-867.
25. David J Disantis. Inflammatory conditions of urethra. Clinical urography edited by Howard M Pollack, Bruce L McLennan edition 2; W B Saunders Company 2000,volume 1:1041-1057.
26. Dornberger v, Dornberger g, Fluchter SH, micturition urethrosonography, an alternative to x-ray urethrography. Ultraschall 1988; 9:279-285.
27. Jordan G H., Devine C J., Jr, and Devine p c. an anatomic approach to urethral stricture disease. Journal of Urology; 1986. Part 2,135:210A,abstract 426,
28. Devine C J, Jr. Surgery of the urethra. In Campbell's urology.5th edition edited by P C Walsh R F Gittis, A D Perlmettur and t a Stamey Philadelphia. W B Saunders company, 1986.vol 3 sect XV chapter.80: 2853-2887.
29. Albright R J, Harris JH, Zinner N R. Transcutaeneous measurement of the urethral lumen. Invest urology. 1970.8: 340-42.
30. Brown Mc Sutherst JR, Murray A, *et al*. Potential use of ultrasound in place of x-ray fluoroscopy in Urodynamics. British journal of urology. 1985.57: 88-93.

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