Original Research Article

Role of MR urethrography in detection and characterization of various urethral lesions in male patients and its comparison with conventional urethrography and Sonourethrography

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Abstract

Background: Role of MR Urethrography in Detection and Characterization of Various Urethral Lesions in Male Patients and its Comparison with Conventional Urethrography and Sonourethrography **Aim and Objective:** To assess the role of Magnetic Resonance (MR) Urethrography in the detection and characterization of various urethral lesions in male patients in comparison with conventional urethrography and sonourethrography **Material and Methods:** In present study we have enrolled total of 60 Male Patients in 12 to 80 years age group who fulfilled selection criteria of the study and referred to Department of Radio Diagnosis and Imaging for conventional urethrography. The patients were investigated by conventional urethrography (RGU/MCU) and sonourethrography followed by MR urethrography. These patients were subjected to definitive endoscopic or open surgical intervention under anesthesia. The radiological data were compared by endoscopic (or) operative findings in all these patients. **Results:** While comparing RGU/MCU, SUG and MRU to surgery, the mean difference in stricture length was found to be significantly higher with RGU/MCU, it reduced with SUG and there was no significant difference with MRU. **Conclusion:** In conclusion, our study has demonstrated that MR urethrography is a very useful and promising noninvasive technique for the evaluation of male anterior urethral stricture and posterior urethral distraction defect for planning the surgical approach.

Key Words: Magnetic Resonance, Micturating Cystourethrogrphy, Retrograde Urethrography, Sonourethrography

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INTRODUCTION

The approximate length of male urethra is 18 to 20 cm and it runs from the bladder to the outer urethral meatus [1]. In 19th century, imaging techniques of retrograde urethrography (RGU) and micturition cystourethrography (MCU) were invented, and also regarded as standard imaging modality for the morphologic and functional study of the urethra for nearly about centuary[2]. The radiographic urethrography is an invasive, expensive, tedious technique. Though it has been considered as standard technique for the evaluation of pre operative male urethra, there were several limitations associated with it, as it poses the risk of radiation it is not recommended to repeat whenever required, it has failed to

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demonstrate periurethral abnormality as a cause of urethral lesion. Not useful in defining accurate length of the stricture and also results vary between the endoscopic and radiographic appearances of the stricture. Moreover, no information is available about the extent of periurethral fibrosis[1].There are several reports available in literature on sonourethrography but there are no published comparative studies available which provide the information regarding the exact role of sonourethrography and radiographic urethrography (RGU/MCU) in evaluation of urethral and periurethral abnormalities and further the accuracy of this newer technique over conventional urethrography is not known. Magnetic Resonance Urethrography (MRU) is a new and less widely used technique in the evaluation of morphologic and functional study of male urethra. Magnetic Resonance (MR) can depict clear anatomic insights about the urethra and periurethral tissue with three dimensional orientation of the lesion . MRU may result in change of surgical plan for individual patients based on the stricture length and severity of spongiofibrosis. The present study will be carried out with the aim to assess the clinical relevance of Magnetic Resonance (MR) urethrogram in the diagnosis and characterization of various urethral lesions in comparison with conventional urethrography and sonourethrography.

MATERIALS AND METHODOLOGY

It was an Observational and cross-sectional study which was conducted in National Institute of Medical Sciences and Research, Jaipur, Rajasthan. In present study we have enrolled total of 60 Male Patients in 12 to 80 years age group who fulfilled selection criteria of the study and referred to Department of Radio Diagnosis and Imaging for conventional urethrography from the period of January 2018 to June 2019 (18 months). Those patients having any implants that were not compatible with MRI and claustrophobic patients were excluded from the study

Inclusion Criteria: All male Patients clinically suspected to have urethral lesion. Patients in age group 12 to 80 years

Exclusion Criteria: All female patients. Patients below 12 years and above 80 years. Patients having any implants that are not compatible with MRI and claustrophobic patients.

Equipment: Retrograde and Micturating cystourethrography was performed under IITV and CR images obtained. Sonouretherography was performed on GE Voluson 730 ultrasound machine.

MR uretherography was performed on Phillips Ingenia CX 1.5 tesla MRI, manufactured by Phillips with software version Window 7 OS, version 5.2. The patients were investigated by conventional urethrography (RGU/MCU) and sonourethrography followed by MR urethrography. These patients were subjected to definitive endoscopic or open surgical intervention under anesthesia. The radiological data were compared by endoscopic (or) operative findings in all these patients.

Technique: Conventional urethrography, Sonouretherography and Mr- urethrography:

RESULTS

Table 1: Age Distribution

Age Group	N	%
20-30 Years	15	21.13%
30-40 Years	27	38.03%
> 40 Years	29	40.85%
Total	**71**	**100.00%**

In present study it was found that majority of the patients had age > 40 years (40.85%) whereas 38.03% had age between 30-40 years and 21.13% had age between 20-30 years.

Table 2: Comparison of Methods

Method	N	%
Site of stricture on RGU/MCU		
Membranous (Posterior)	15	25.00%
Prostatic (Posterior)	5	8.33%
Penile (Anterior)	5	8.33%
Bulbar (Anterior)	20	33.33%
Complex Urethral Stricture	15	25.00%
Total	**60**	**100.00%**
Other findings on RGU/MCU (without stricture)		
Urethral Calculus	5	71.43%
Urethrocutaneous Fistula	2	28.57%
Total	**7**	**100.00%**
SUG Evaluation for anterior urethral stricture+spongiofibrosis		
Penile + spongiofibrosis (Anterior)	3	7.50%
Bulbar + spongiofibrosis (Anterior)	14	35.00%
Complex urethral Stricture + spongiofibrosis	10	25.00%
Total	**27**	**67.50%**
SUG Evaluation for anterior urethral stricture alone		
Penile (Anterior)	2	5.00%
Bulbar (Anterior)	6	15.00%
Complex Urethral Stricture	5	12.50%
Total	**13**	**32.50%**
Other Findings on SUG (without stricture)		
Urethral Calculus	5	45.45%
Urethrocutaneous fistula	2	18.18%
Hematoma	3	27.27%
Periurethral abscess	1	9.09%
Total	**11**	**100.00%**
MR Evaluation for stricture site + spongiofibrosis		
Membranous + spongiofibrosis (Posterior)	12	20.00%
Prostatic + spongiofibrosis (Posterior)	2	3.33%
Penile + spongiofibrosis (Anterior)	4	6.67%
Bulbar + spongiofibrosis (Anterior)	16	26.67%
Complex Urethral Stricture + spongiofibrosis	10	16.67%

Total	**44**	**73.33%**
MR Evaluation for stricture site alone		
Membranous (Posterior)	3	5.00%
Prostatic (Posterior)	3	5.00%
Penile (Anterior)	1	1.67%
Bulbar (Anterior)	4	6.67%
Complex Urethral Stricture	5	8.33%
Total	**16**	**26.67%**
Other findings on MRI (Without Stricture)		
Urethral Calculus	5	45.45%
Urethrocutaneous Fistula	2	18.18%
Hematoma	3	27.27%
Periurethral Abscess	1	9.09%
Total	**11**	**100.00%**

All enrolled patients were underwent Site of stricture on RGU/MCU and it was found that 33.33% had Bulbar (anterior) stricture, 25.00% had Membranous (Posterior), 25.00% had Complex urethral Stricture, 8.33% had Prostatic (Posterior) and 8.33% had Penile (Anterior) stricture. 5 patients found to have Urethral Calculus and 2 patients found to have Urethrocutaneous Fistula on RGU/MCU evaluation. In present study it was found that out of 40 patients, 10 patients had Complex urethral stricture along with spongiofibrosis followed by 14 patients had Bulbar along with spongiofibrosis and 3 patients had Penile along with spongiofibrosis. All enrolled patients were underwent SUG evaluation and it was found that 15.00% had Bulbar (anterior) stricture, 12.50% had Complex urethral Stricture and 5.00% had Penile (Anterior) stricture. 5 patients found to have Urethral Calculus, 3 Patients had hematoma, 2 patients had Urethrocutaneous Fistula and 1 patient had Periurethral Abscess. In present study on examination of MR Urethrography, 12 patients had Membranous + spongiofibrosis, 2 patients had Prostatic + spongiofibrosis, 4 Patients had Penile + spongiofibrosis, 16 patients had Bulbar + spongiofibrosis and 10 patients had Complex Urethral Stricture + Spongiofibrosis. 6.67% had Bulbar (anterior) stricture, 5.00% had Membranous (Posterior) and Prostatic (Posterior), 8.33% had Complex Urethral Stricture respectively and 1.67% had Penile (Anterior) stricture respectively. 5 patients found to have Urethral Calculus, 3 Patients had hematoma, 2 patients had Urethrocutaneous Fistula and 1 patient had Periurethral Abscess.

Table 3: Mean Length of Stricture

Type	Mean Length of Stricture	SD	p value
RUG	1.781	1.17	0.402
SUG	1.654	1.05	
MR	1.538	0.74	
Surgery	1.523	0.70	

While comparing RGU/MCU, SUG and MRU to surgery, the mean difference in stricture length was found to be significantly higher with RGU/MCU, it reduced with SUG and there was no significant difference with MRU.

DISCUSSION

The present study was done to assess the role of MR urethrography in detection and characterization of various urethral lesions in male patients and its comparison with conventional urethrography and sonourethrography. The mean length of strictures in this study was: 1.781(SD 1.17) on RGU/MCU, 1.654 (SD 1.05) on SUG, 1.538 (SD 0.74) on MR urethrography, while according to surgical findings the mean length of strictures was 1.523 (SD 0.70) which is closest to the mean length of strictures demonstrated on MR urethrography. Therefore it is derived that MRU is most sensitive in assessing the accurate site and length of urethral strictures which correlated most closely with surgical findings. The method of surgical approach namely, endoscopic repair, trans-pubic approach and peri urethral approach could be better decided according to MR urethrography findings, as it has a higher accuracy in determining the length of strictures and presence of spongiofibrosis as compared to conventional and sonourethrography. The retrograde urethrogram was set as gold standard imaging modality for the diagnosis of stricture urethra in 1910, by Cunningham[3] because it is easily available and a simple technique. But it has certain disadvantages like over or under estimation of stricture length, radiation hazards and lack of information about spongiofibrosis. To overcome this limitation, MRI was suggested. According to Garcia-Valtuille, the treatment choice and route of approach depends upon the site, length, spongiofibrosis and associated pathology. Endoscopic repair can be effective for stricture < 1.5 cm without spongiofibrosis. The long stricture > 1.5cm with spongiofibrosis can be treated by open repair- either anastomotic or augmentation urethroplasty, through perineal route. However, complex strictures need transpubic approach. Our study showed that the sensitivity andspecificity for diagnosing anterior as well as posterior urethral strictures by RGU/MCU and MRU was 97.3% and 100% respectively. Whereas in the study by Syed Mamun Mahmud *et al* [4], the sensitivity and specificity of RGU for the diagnosis of urethral stricture was 91% and72% respectively and by MRU both sensitivity and specificity were 100%. In our study, the accuracy showed by RGU for planning surgery was 83% and by MR urethrogram was 90.1%. But the study by Yasser osman5 for both RGU and MR urethrogram the accuracy of 85%. In our study MR urethrogram diagnosed all the cases of anterior and posterior stricture with exact delineation of its length with 100% sensitivity, 93.4% specificity and 90.1% overall accuracy, which was well correlated with the study by MA El-Ghar *et al*.[6] In

our study in 6 cases of posterior distraction defect, RGU showed over estimation of defect because of failure of bladder neck to relax. But MR urethrogram showed accurate length and associated findings which helped to plan the surgical approach. This finding of our study correlate well with the study by Sung DJ *et al*,[7] who in his small series of patients proved MR urethrography to be a promising technique for evaluating male urethral stricture. Therefore, overall, while comparing the previous studies on results showed even better sensitivity, specificity and accuracy in diagnosing various urethral abnormalities and presence of spongiofibrosis. On basis of our study we concluded that MR urethrography is more accurate modality of choice is detecting the anatomy and morphology of strictures as well as presence of spongiofibrosis.

CONCLUSION

In conclusion, our study has demonstrated that MR urethrography is a very useful and promising noninvasive technique for the evaluation of male anterior urethral stricture and posterior urethral distraction defect for planning the surgical approach.

LIMITATIONS

Follow up imaging was not available for any of these patients. Patients having any implants that are not compatible with MRI and claustrophobic patients.

REFERENCES

1. Yoshifumi Narumi, Hedvig Hricak, Armenakas NA *et al*. MR imaging of traumatic posterior urethral injury. Radiology 188 : 439-443, 1993.
2. Christopher M, Dixon, Hedvig Hricak, Jack W. McAninch, MR imaging of traumatic posterior urethral distraction defects and pelvic crush injuries. J Urol 148: 1162-1165, 1992.
3. Semelka R, Hricak H, Kim B, *et al*. Pelvic fistulas: appearance on MR images. Abdom Imaging. 1997;22:91–95.
4. Syed Mamun, Salman El Khalid, *et al*. Is ascending urethrogram mandatory for all Urethral Strictures. JPMA 58:429;2008.
5. Yasser Osman, Mohamed Abou El-Ghar, Osama Mansour, Huda Refaie, Tarek El-Diasty; Magnetic Resonance Urethrography in Comparison to Retrograde Urethrography in Diagnosis of Male Urethral Strictures: Is It Clinically Relevant; european urology 50 (2006) 587–594588.
6. El-Ghar MA, Osman Y, Elbaz E, Refiae H, El-Diasty T. MR urethrogram versus combined retrograde urethrogram and sonourethrography in diagnosis of urethral stricture. Eur J Radiol. 2010 Jun;74(3):e1938.
7. Deuk Jae Sung, MD, Yun Hwan Kim, MD *et al*, Obliterative Urethral Stricture: MR Urethrography versus Conventional Retrograde Urethrography with Voiding Cystourethrography. Radiology 2006; 240:842-848.) RSNA, 2006.

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