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Original Article

A Comparison of Sonourethrography and Retrograde Urethrography in Evaluation of Anterior Urethral Strictures

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ABSTRACT

The urinary tract has restrictions in its lower parts. This problem can be detected by two different methods. Obstruction in the anterior portion of this tract can be diagnosed by some available standard methods. **Objective:** To assess the general problems in the male urethra specifically in the anterior portion. **Methods:** It is a prospective and comparative study with a statistical approach, conducted at Bakhtawar Amin Memorial and Trust Hospital, Multan and MTI Mardan Medical Complex, Mardan for the duration of one year from December 2020 to December 2021. The study was done by using ultrasound of high resolution. Then the comparison of the operative conclusions has to be done with retrograde urethrography (RGU) to find out the efficiency of RGU. For this study work, seventy-seven patients were selected. All these patients had some restrictions in the urinary pathway confirmed by retrograde urethrography. Different characteristics of the patients were studied and matched with the available standard methods. By both tests specificity, sensitivity, and overall accuracy of the protocol were also assessed. Different statistical analyses were performed to find out the results. **Results:** All the seventy-seven patients were having some restriction of urinary pathway, which were detected by sonourethrography and further confirmation was done by other previously verified methods. The retrograde urethrography shows almost very low sensitivity of this particular problem detection. This test was about 60 to 80% sensitive for this diagnosis. This sensitivity is specific for the length of about 1 to 5 cm. These results were compared with the results of sonourethrography. The problem termed as spongiofibrosis was also diagnosed with sensitivity about 76 to 82 %. A number of other problems were also detected by this method like calculi and further confirmation was done at the time of surgery. The probability was greater than 0.001 and difference in frequency was also not so significant. It was less than 0.5. **Conclusions:** Both of the methods have equal efficiency for the detection of different restrictions in urinary tract. When other parameters were assessed; it was inferred that sonourethrography is more efficient method.

INTRODUCTION

The urinary tract has restrictions in its lower parts, this problem can be detected by two different methods. Obstruction in the anterior portion of this tract can be diagnosed by some available standard methods. The two most commonly used methods are retrograde and antegrade methods for urethrography [1,2]. Retrograde methods are commonly used by the assistance of penile clamps. Catheter can also be used in case of women to detect obstructions. But for the diagnosis of male urethra, different other techniques are used for detection of obstruction due to larger length of tract, such as different radiations and other anatomy related methods [3, 4]. Every diagnostic method has number of advantages as well as some limitations in sensitivity and specificity for the detection of a particular disease. In case of retrograde methods, strictures appeared within tract, there is difficulty in the measurement of exact position of stricture within penis [5]. In the case of other method, like sono-

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urethrography, which is considered as a standard method for the detection of different restrictions within urinary pathway, it can scan the urethra from posterior side as well as from the urinary bladder from the Trans side of the rectum [6, 7]. When sensitivity of both retro and antegrade method was compared, both have same level of efficiency for the diagnosis of restriction in the urethra but other parameters like length of urinary pathway which is different in case of male and female were considered, then it seems a difference in measuring capacity of both tests [8-10]. A new method of detection of restriction in urinary pathway was introduced in 1988. This method was quite useful for the detection in case of longer urinary pathway as in case of males. The new method has high resolving power ultrasound waves for the detection. The name of this method was sono-urethrography [11]. Firstly, ultrasound waves of 6 MHz were used and inducted on penis from dorsal side and images were obtained from all sides. In case of normal person, the walls of the urethra were elastic, spongy and blood filled veins were present but in case of any obstruction or stricture, the elasticity of urethral wall is lost. Collagen content gets reduced from the wall. To measure the efficiency, specificity and sensitivity of the both retrograde and sono-urethrography, all patients undergo detection by both methods [12]. The main objective of this study is to find the better method for the detection of different problems in urinary pathway.

METHODS

It is a prospective and comparative study with a statistical approach, conducted at Bakhtawar Amin Memorial and Trust Hospital, Multan and MTI Mardan Medical Complex, Mardan for the duration of one year from December 2020 to December 2021.To proceed with this study, about 77 patients were selected, all these patients were having obstructions in urinary pathway. Patients hd acute symptoms were not included in this study. Some patients had history of urinary tract infection or some kind of trauma related to urinary pathway were also included. The patients were analyzed completely by noticing and analyzing all the attributes like length of urinary tract, symptoms, dilatation of urethra, and discharge from urinary pathway, diversification and all the related parameters. All this information was taken from the patients by their own consent. Disease level of the patient was detected by using prescribed protocols of retrograde method. Patients were not allowed to drink water 5 to 6 hours before test. A radiogram of the penis was taken by using catheter as well. The radiogram was analyzed by experts by considering all the parameters described above. The quality level of stricture with urinary pathway was determined. Then the same patient was further analyzed by using sonourethrography test by using ultrasound waves of 9 MHz and images were taken. All the related parameters were analyzed by experts. Sensitivity and specificity were measured. Comparison of the results was done by using some statistical tools, such as Chi-square. The significant difference was observed in the detection level of both of the tests. Kappa values and probability was measured to find out the significant differences between both of the methods. The studies were carefully analyzed by expert team for the prediction of final results.

RESULTS

The study was carried out in 77 male patients. The most frequent symptom that they showed was thin streamed urine flow in case of 73 (94%) patients. Almost 68 (88%) of the patients complained about micturition straining problems, 14 (18%) patients had past history that they were suffering from urethritis. Most of the patients were showing symptoms within less than 13 months. 19 (24%) patients had already carried out surgery previously, 16 (20%) patients were already suffering from urethritis. Some of the patients also reported previous signs and symptoms like trauma for example assault, electric burns etc. Extent and characteristics of spongiofibrosis are showed in table 1. All the cases of the disease that include detection by RGU also got scanned by sonourethrography (SUG) and it was confirmed at the time of surgery. In the determination of site of strictures at the position of urethra, SUG showed better results than RGU. The sensitivity and working of RGU was almost 61-67% in detecting the overall length of the available stricture (Table 2). For the similar reasons the SUG showed very promising results of 67% with an average accuracy of 98%. The estimation of the diameter of detected stricture was analyzed by RGU and it showed a sensitivity of 49-78% (Table 3). There was a case of bulbar urethral stricture that had a filling problem observed near to it by RGU. Peri-urethral fibrosis was also detected by using SUG with prominent accuracy and precision. The SUG eliminated the idea of spongiofibrosis significantly as the negative prediction value can be observed from the data. Using kappa statistical analysis, the level of agreement was determined between SUG and RGU, and it was revealed that a very strong agreement was observed (table 3). Intravasation of contrast occurred in 5% of the patients during RGU, which created problems.

Extent of spongiofibrosis	Less Intense	medium	Intense
Color of the detected urethral mucosa	Pink colored	grey	White colored
Resistance in causing incision	mild	medium	severe

Table 1: Characteristics for the complete assessment of spongiofibrosis

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Disease	Length (mm)	Sensitivity %	Specificity %	PPV%	NPV%	Accuracy %
RGU	<111	84	95	78	97	93
	1-21	61	99	91	91	91
	22-33	62	97	62	97	95
	34-44	67	94	54	96	92
	45-55	99	98	52.2	99	98
	diffuse	94	96	94	95	98
SUG	<11	85	98.2	96	96	93
	11-21	63	99	76	92	91.7
	22-33	62.4	98.9	66.4	96.5	95.1
	34-44	65	99	100	93.6	92
	45-55	100	100	95	99	98.4
	diffuse	92	92	93	97	96

Table 2: RUG and SUG comparison to estimate strictures length

Disease	Diameter (mm)	Sensitivity %	Specificity %	PPV%	NPV%	Accuracy %
RGU	0-3	75	89	78.1	81	93.1
	4-7	68	85	75	82	81
	7-10	62.9	79	62.4	84.1	85
	10-13	67.3	86	25.5	97.2	83
SUG	0-3	82	95	95	81	93.1
	4-7	86.2	96.5	86	82.6	88.5
	7-10	69	98	65	94.1	95.2
	10-13	82	97.5	33.9	97.2	83.4

Table 3: RUG and SUG comparison to estimate strictures diameter

DISCUSSION

In order to detect and view anterior urethra, RGU in addition with cystourethrography was used as it was considered as a standard procedure for this purpose. According to recent studies, the use of urethrography was not only to decrease the primary stricture so that the source of the patient's stricture can be located [13]. Studies were required to show what sort of procedure will be suitable for the patient to know the location, length and the correct diameter of the stricture of the patient. The overall complete idea of the severity of the disease like the presence of false tract, polyps, fistula will surely help the radiologist to find the cure of the disease. By making use of a negative contrast, this technique is used to achieve all the features [14]. The complications that were showed in this study included trauma (18%), infection (21%) and surgery (26%). Nash et al., detected a blunt trauma in almost 45% of the patients that had history of this sort of infection [9]. Most of the patients of Wagner et al., studies had these strictures because of infection that occurs after using catheter for too long [15]. Albers et al., found that after repeatedly using the procedure of urethrotomy, the urethral strictures become a critical factor causing complications. In the present study, the SUG presented a higher sensitivity while determining the length of stricture so that overall better findings can be done. When the grouping was done on the basis of anatomical areas, both these procedures showed almost equal sensitivity and length was also similar in both cases. However, it was found that RGU had poorer ability to determine the length of the stricture [16]. According to the previous studies the correlation between SUG and RGU showed poor results in determining the length of the bulbar urethral stricture. Gupta et al., did a study on 30 patients and showed that the both techniques had low correlation in determining the length of the stricture. It is very important to precisely determine the exact length of the stricture as this is something that will determine what sort of treatment and scanning procedure should be used for the patient. Urethral ultrasound is the right way that can help to determine accurate length and diagnosis can be made easier [17]. Gluck et al., showed that the reconstructive treatment provided by sonourethrography was very much different from that of RGU [12]. The detection of length and diameter of stricture plays a very important role in assessing the degree of narrowing as compared to RGU. However, in our study we showed that the sensitivity was less and the sonourethrography showed similarities with operative results. As per studies, there was poor correlation between the diameter of the lumen detected by RGU and that of operative data, but they didn't mention statistical evidence. If we have information about diameter of the lumen, then it can help to decide the possible dimensions for the reconstruction of penile flap. Peri-urethral fibrosis is also one of the critical factors that play important role in determining the possible therapy and the final result. As it was observed that critical case of fibrosis is the main cause of recurrence. Urethral ultrasound is also important as you can also detect spongiofibrosis while using it. If the spongiofibrotic tissue has a lot of scars that appear in form of reflective zones, then there are chances that it appeared because of elevated collagen content. When showed in form of a shadow the spongiofibrosis is very critical which will appear in form of highly dense images and shadowed view. It is mostly seen near the traumatic event [18, 19]. No doubt SUG does not tell about the depth of spongiofibrosis but it provides enough information that can help to classify the form of disease. The risk factors that are associated included urethral bleeding and pain during RGU. It was also found that after SUG some patients complained about bleeding. There was no discomfort that was reported by any patient during RGU and SUG. Other than that, in SUG the complications like haematuria and urinary infection were observed. As compared to RGU, SUG was more comfortable for patients so it can be used if discomfort is reported in case of SUG [20-22].

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CONCLUSION

Concluding it, the study showed that the sonourethrography is a very effective and easy way to evaluate and detect male urethra as it is a combination of normal saline and high resolution B-mode sonograghy. It can provide information about the depth and length of strictures that can help to decide what sort of treatment can be used for treatment of this medical condition.

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