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Are There Prognostic Factors for Failure of Surgical Treatment of Post-Traumatic Posterior Ureteral Stenosis? About 30 Cases and Review of the Literature

Dimitri Mbethe[1], Mohammed Said Moudouni[2], Adrien Mougougou[1], Steevy Ndang Ngou Milama[1], Izoudine Bissiriou[1], Bilal Smith Olagui[3], Jean Massandé Mouyendi[1]

[1]Urology Department, the University Hospital of Libreville, Libreville, Gabon
[2]Urology Department, the Mohamed 6 University Hospital of Marrakech, Marrakech, Marocco
[3]Urological and Visceral Surgery Department, Hospital of Instruction of the Armies Omar Bongo Ondimba, Libreville, Gabon
Email: *dimitri.mbethe@yahoo.fr

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Abstract

Introduction: The management of post-traumatic stenosis of the posterior urethra is divided between early endoscopic realignment and delayed surgery. In the latter case, several techniques are used taking into account several factors. Our objective was therefore to investigate the possible prognostic factors of failure of this surgical management. **Material and Methods:** We conducted a retrospective study from January 2006 to December 2017 on patients admitted to the Urology Department of the Mohammed 6 University Hospital of Marrakech for management of post-traumatic posterior urethral stenosis. The parameters studied were age, medical and surgical history, causes, characteristics of the stenosis (location, number, length), associated lesions, surgical technique used, and evolution. The descriptive analysis consisted of calculation of absolute and relative frequencies for the qualitative variables, and of position and dispersion parameters for the quantitative variables (mean, standard deviation). In bivariate analysis, the comparison of categorical variables used Pearson's Chi-square statistical test and Fisher's test if necessary. The significance threshold was set at $p < 0.05$. **Results:** A total of 30 cases were selected. The age of our patients varied between 18 and 68 years, with an average of 38.33 years (16 - 80 years); the most affected age group was between 20 and 39 years. The mode of revelation of urethral damage was dominated by acute retention of urine present in 76% of patients, followed by dysuria (33%). The stenosis extended over 21.91 mm on average (14 - 40 mm). It was accompanied by bone involvement in 15 patients (53.3%). Erec-

tile dysfunction was present in 23 patients (23%). Terminal urethrogram was the main surgical technique used, followed by internal urethrotomy (60% and 30% respectively). 15 patients had a recurrence, with an average of 1-second operation. Statistical analysis of the different factors studied showed no correlation with the occurrence of recurrence after surgical treatment. **Conclusion:** The medium and long term results of anastomotic repair of the posterior urethra do not seem to depend on the lesion parameters of the stenosis (site, number, extent, presence of associated bony lesions or erectile disorders).

Keywords

Posterior Urethra, Stenosis, Urethrogram, Endoscopic Realignment

1. Introduction

Urethral stricture is defined as abnormal scarring that restricts the urethral lumen. It will manifest itself clinically by obstructive urinary symptoms such as dysuria, a decrease in micturition flow, or in the extreme by acute retention of urine. It is a frequent cause of hospitalization in urology [1]. If left untreated, the obstruction constituted by the stenosis will have an impact on the bladder (pressure bladder), and then on the upper tract (ureterohydronephrosis), ultimately leading to renal failure. The causes may be infectious (recurrent urethritis, urogenital tuberculosis, urinary bilharzia), iatrogenic (endoscopic instrumental maneuvers) and traumatic causes represent between 9% and 25% of the etiologies [1]. The management of post-traumatic stenosis of the posterior urethra in particular is divided between early endoscopic realignment within 10 to 15 days after the trauma, and delayed surgery after 3 months [2] [3]. In the latter case, several surgical techniques are proposed (internal urethrotomy, terminal urethrorrhaphy, urethroplasty) taking into account factors such as the location, number, size of the stenosis, and the patient's history. In spite of the numerous existing operative techniques, the number of recurrences of this condition remains important [4]. Our objective was therefore to search for possible prognostic factors of failure of their surgical management.

2. Material and Methods

We conducted a retrospective study from January 2006 to December 2017 on patients admitted to the urology department of the Mohammed 6 University Hospital of Marrakech for management of post-traumatic posterior urethral stenosis. We excluded all patients with stenosis of inflammatory or iatrogenic origin, and stenosis of the anterior urethra. A total of 30 patients were included in our study. Data entry was done on Microsoft Office 2016 software. For the elaboration of this work, we based on the patients' records. With the help of an exploitation form, we explored the following parameters: age, medical-surgical history, causes, characteristics of the stenosis (site, number, length), associated

lesions, surgical technique used, evolution. The surgical techniques used were internal urethrotomy by endoscopic approach, terminal urethrorrhaphy by perineal approach, urethroplasty with graft of the buccal mucosa. Pre and post-operative analyses of the quality of micturition are evaluated by debimetry, and the post-micturition residue. The success of the operation was defined by: the absence of recourse to another urethral surgery or to dilatation maneuvers, the obtaining of a normal micturition, with a follow-up of at least 6 months. A micturition was considered normal if it obtained the following criteria: no dysuria, debimetry ≥ 15 ml/sec without post-void residual, no appearance of stenosis on urethrography or cystoscopy. A failure was defined by, an intervention that could not result in satisfactory micturition, recourse to another urethral surgery or dilatation maneuvers. The descriptive analysis consisted of the calculation of absolute and relative frequencies for the qualitative variables, and of the position and dispersion parameters for the quantitative variables (mean, standard deviation). The normal distribution of the variables was studied by the Kolmogorov-Smirnov test. In bivariate analysis, the comparison of qualitative variables used Pearson's Chi-square test and Fisher's test if necessary. The Student t test and the Mann Whitny test were used to compare continuous variables. The significance level was set at $p < 0.05$. Statistical analysis was performed using SPSS version 19.0 software.

3. Results

A total of 30 patients were included in our study. The age of our patients ranged from 18 to 68 years, with an average of 38.33 years (16 - 80 years); the most affected age group was between 20 and 39 years [Figure 1]. The main causes were public road accidents (PVA) 56.7%, followed by work-related accidents (WIA) 20% [Figure 2].

The mode of revelation of urethral damage was dominated by acute retention of urine present in 76.6% of patients, followed by dysuria (50%) [Table 1]. The

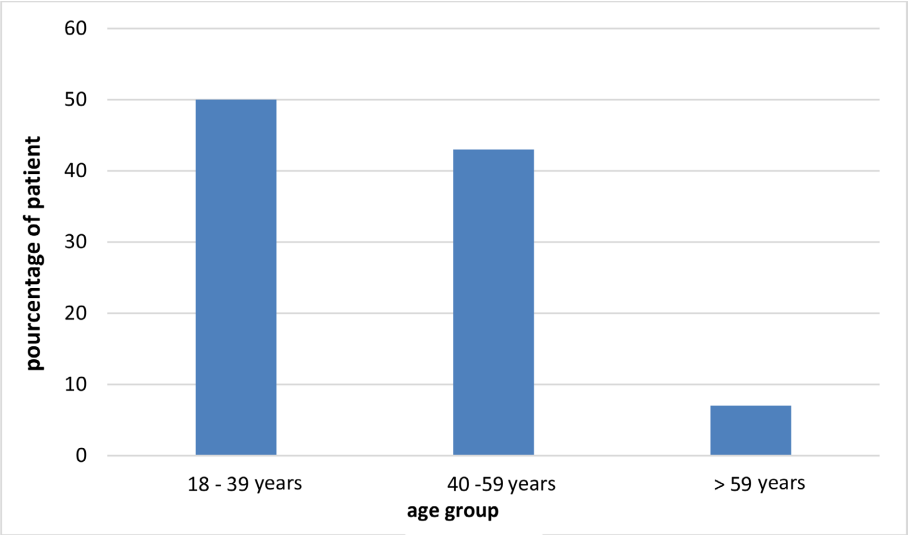

Figure 1. Distribution of posterior urethral stenosis by age group.

stenosis extended over an average of 21.91 mm (14 - 40 mm). It was accompanied by bone involvement in 15 patients (50%). Erectile dysfunction was present in 8 patients (26.6%). All patients underwent surgery at least 3 months after the trauma.

Terminal urethrogram was the main surgical technique used, followed by internal urethrotomy (60% and 30% respectively) [Figure 3]. 19 patients (63.3%) had an immediate failure at the first operation, requiring a second surgery in 5 of them, 2 repeats in 8 cases, 3 repeats in 3 cases, 4 repeats in 2 cases and 5 repeats in 1 patient. The statistical analysis of the different factors studied, which were the characteristics of the stenosis (site, number, length), the associated lesions (bone fracture), the presence of erectile dysfunction, the surgical technique used; The analysis made by Pearson's Chi-square test and Fisher's exact test showed that the dependence was not significant ($Ch^2 = 0.665$; ddl = 5; 1-p = 94%) [Tables 2-4], therefore, that no correlation exists between the above-mentioned factors and the occurrence of recurrences after surgical treatment.

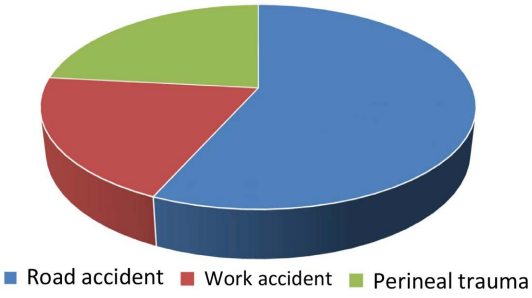

Figure 2. Stenosis etiology.

Table 1. The most common functional signs found in patients.

Functional signs	Number	Pourcentage %
Dysuria	15	50
Acute urine retention	23	76,6
Fistula	1	3,3
Uretrorrhagia	7	23,3

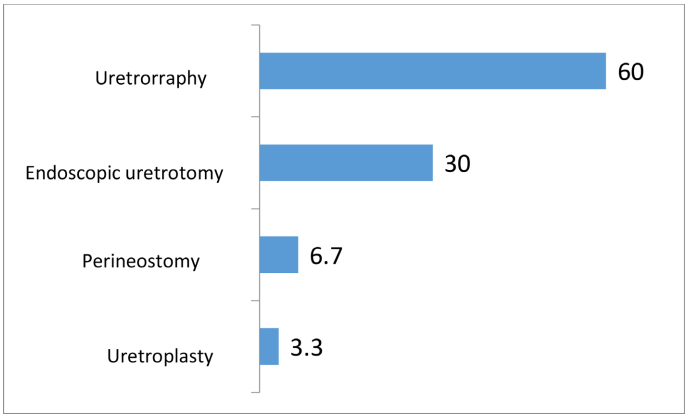

Figure 3. Surgical procedure.

Table 2. Study of age factor.

cross-tabulation age * recurrence					
			Recurrence		Total
			non	oui	
Age	15 - 49 years	Number	10	14	24
		% of Age	41.7%	58.3%	100.0%
	50 years and more	Number	1	5	6
		% of Age	16.7%	83.3%	100.0%
	Total	Number	11	19	30
		% of age	36.7%	63.3%	100.0%

Khi-deux test					
	Value	ddl	Signification asymptotic (bilatérale)	Signification exact (bilatérale)	Signification exact (unilatérale)
Khi-deux of Pearson	1.292[a]	1	0.256	0.372	0.261
correction for continuity[b]	0.440	1	0.507		
Likelihood ratio	1.421	1	0.233	0.372	0.261
Fisher exact test				0.372	0.261
Number of valid observations	30				

a. 2 cell (50.0%) have a theoretical staff of less than 5. Theoretical minimum staffing is 2.20. b. Calculated only for a 2 × 2 table.

Table 3. Study of erectile dysfunction factor.

cross-tabulation erectile dysfunction * recurrence					
			Recurrence		Total
			non	oui	
Erectile dysfunction	no	Number	10	12	22
		% of erectile dysfonction	45.5%	54.5%	100.0%
	yes	Number	1	7	8
		% of erectile dysfonction	12.5%	87.5%	100.0%
Total		Number	11	19	30
		% of erectile dysfonction	36,7%	63.3%	100.0%

Khi-deux test					
	Value	ddl	Signification asymptotic (bilatérale)	Signification exact (bilatérale)	Signification exact (unilatérale)
Khi-deux of Pearson	2.744[a]	1	0.098	0.199	0.108
Correction for continuity[b]	1.508	1	0.219		

Continued

Likelihood ratio	3.085	1	0.079	0.122	0.108
Fisher exact test				0.199	0.108
number of valid observations	30				

a. 1 cell (25.0%) have a theoretical staff of less than 5. Theoretical minimum staffing is 2.93.

Table 4. Study of surgical procedure factor.

Cross-tabulation of uretroplasty * Récidive					
			Récidive		Total
			no	yes	
uretroplasty	non	Effectif	9	18	27
		%	33.3%	66.7%	100,0%
	oui	Effectif	2	1	3
		%	66.7%	33.3%	100,0%
Total		Effectif	11	19	30
		%	36,7%	63.3%	100.0%

Khi-deux test					
	Value	ddl	Signification asymptotique (bilatérale)	Signification exacte (bilatérale)	Signification exacte (unilatérale)
Khi-deux of Pearson	1.292[a]	1	0.256	0.537	0.298
Correction for continuity[b]	0.255	1	0.613		
Rapport de vraisemblance	1.239	1	0.266	0.537	0.298
Fisher exact test				0.537	0.298
Number of valid observations	30				

a. 2 cell (50.0%) have a theoretical staff of less than 5. Theoretical minimum staffing is 2.20. b. Calculated only for a 2 × 2 table. Khi-deux of Pearson and Fisher exact test show that the dependence is not significant. $Ch^2 = 0.665$; ddl = 5; 1-p = 94%.

4. Discussion

Stenosis of the posterior urethra is the classic remote evolution of rupture or contusion of the urethra following trauma to it. The most affected age group in our study was between 20 and 39 years, with an average age of 38.33 years (**Figure 1**). These results are similar to those found by Eddahioui M.A in Morocco [5]. Ndour NS *et al.* [4] in Senegal found an average age of 58.7 years, with the most affected age group being 40 to 49 years. However, it should be noted that his study included all etiologies (inflammatory and traumatic) and all sites of stenosis (anterior and posterior). This age range found in our study can be

explained by the fact that young people are the population most affected by road accidents, which are the main cause of trauma to the posterior urethra (**Figure 2**).

The mode of revelation of urethral injury was dominated by acute retention of urine (ARU) present in 76.6% of patients, followed by dysuria (50%). Vladimir B *et al.* in the USA [6] found UAR in 91% of patients associated with urethral bleeding in 87%.

In our study, the stenosis was extended over 21.91 millimeters (mm) on average (14 - 40 mm), while Ndour *et al.* [3] found an average length of 17.3 mm. It was accompanied by bone involvement in 15 patients (50%). Diallo A.B *et al.* [7] found 56 patients (64.4%) with associated bone damage in 87 cases of trauma to the posterior urethra. These data confirm those of the literature which describe ruptures of the posterior urethra as a frequent complication of pelvic fractures.

Erectile dysfunction was present in 23 patients (23%). Aboutaieb *et al.* [8] in their study of 35 cases of trauma to the posterior urethra, divided into 2 groups according to the mode of management (delayed emergency repair group 1 or delayed repair group 2), found respectively 18.75% (3 cases out of 16) and 5.3% (1 case out of 19). Diallo *et al.* [7], who also divided their patients into two groups, found respectively 19.2% (5 cases) and 38.9% (14 cases) for groups 1 and 2. This disparity of results could be explained by the fact that in our study, all patients had a late repair, and the evaluation of erectile function was only done preoperatively (but at a distance, within 3 months after the trauma).

Terminal urethrogram was the main surgical technique used, followed by internal urethrotomy (60 and 30% respectively) [**Figure 3**].

Numerous studies have compared the two main surgical techniques (early endoscopic realignment and deferred terminal urethrogram) with results that remain controversial [9] [10] [11]. Boulma R *et al.* in Tunisia [5] found in a cohort of 30 patients, 85% of success in case of endoscopic realignment against 70% for deferred urethrorraphy. Jonathan N *et al.* in the USA [12] on a review of the literature on 29 articles evaluating erectile disorders, incontinence and the occurrence of recurrence according to the surgical technique adopted, found a significant statistical difference only for the occurrence of recurrence ($p < 0.1$), this being in favour of early endoscopic realignment. On the other hand, Qingsong Zou *et al.* [13] in China on a cohort of 522 patients, showed that early endoscopic realignment was associated with a greater number of secondary recurrences even if these stenoses were shorter and therefore reparable by endoscopic internal urethrotomy.

Barbara Cereda [8] in a multicenter study of 36 patients, shows that on clinically relevant criteria of rate of return to normal and definitive micturition, and time to achieve this, the results of deferred urethroplasty are better. It therefore recommends that deferred urethroplasty should be preferred; the place of early endoscopic realignment remains to be defined. In our study, no patient benefited from early endoscopic realignment because of their late management (on average three months after trauma). The recurrence rate in our study was 50%,

whereas Liberman D *et al.* in the USA [4] reported in a review of the literature on the follow-up of patients who had undergone posterior urethroplasty, recurrence rates of around 34%. The difference could be explained by the existence of reference centers for the management of pelvi-perineal pathology in the USA, which therefore have greater expertise. Koraitim [14] looked at the factors that can affect the long-term results of anastomotic repair of the posterior urethra. He concluded that the delay in management (minimum 4 months after the trauma), the surgical approach depending on the extent and location of the stenosis (perineal or abdominoperineal approach), the type of suture used for the anastomosis (3/0 in adults and 4/0 in children), in the case of a trans-pubic urethroplasty, the omental envelopment of the intra-abdominal segment of the bulbar urethra and of the anastomosis site, are the determining factors for the long-term success of the posterior urethroplasty. Bensouda A *et al.* in Morocco [15] and Anis J *et al.* in Tunisia [16], who studied terminal urethrorrhaphy by the trans-symphysis route, did not record any notable complications in the immediate postoperative period or in the long term. This leads them to conclude that this route can be an excellent approach for the treatment of complex lesions of the posterior urethra seen late.

All our patients operated on by terminal urethrogram had a perineal approach. Podesta *et al.* in Argentina [17] who studied the management of posterior urethral stenosis in children and adolescents, concluded from a review of the literature that deferred terminal urethrogramming (by perineal or trans-pubic approach according to the surgeons' preferences) remains the gold standard, the abdominoperineal approach will be reserved for complex lesions. Our cohort did not include any children. The review of the literature did not find any study correlating factors such as the location, number and extent of the stenosis and the occurrence of recurrence. Blaschko S.D *et al.* [18] examined the incidence of erectile dysfunction in pelvic fractures with urethral injury. In a review of the literature including 24 articles, he showed that 34% of the patients had initial erectile dysfunction and that depending on the surgical method used, early endoscopic realignment or delayed surgery, this percentage decreased to 16 and 3% respectively, thus favouring delayed surgery. The statistical analysis of the different factors studied, which were the characteristics of the stenosis (site, number, length), the associated lesions (bone fracture), the presence of erectile dysfunction, the surgical technique used; Analysis by Pearson's Chi-square test and Fisher's exact test showed that the dependence was not significant (Ch2 = 0.665; ddl = 5; 1-p = 94%) [**Tables 1-3**], so that there was no correlation between the above-mentioned factors and the occurrence of recurrences after surgical treatment. The number of patients in the cohort is the main limitation of this study.

5. Conclusion

The medium and long term results of anastomotic repair of the posterior urethra

do not seem to depend on the lesion parameters of the stenosis (site, number, extent, presence of associated bony lesions or erectile disorders).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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