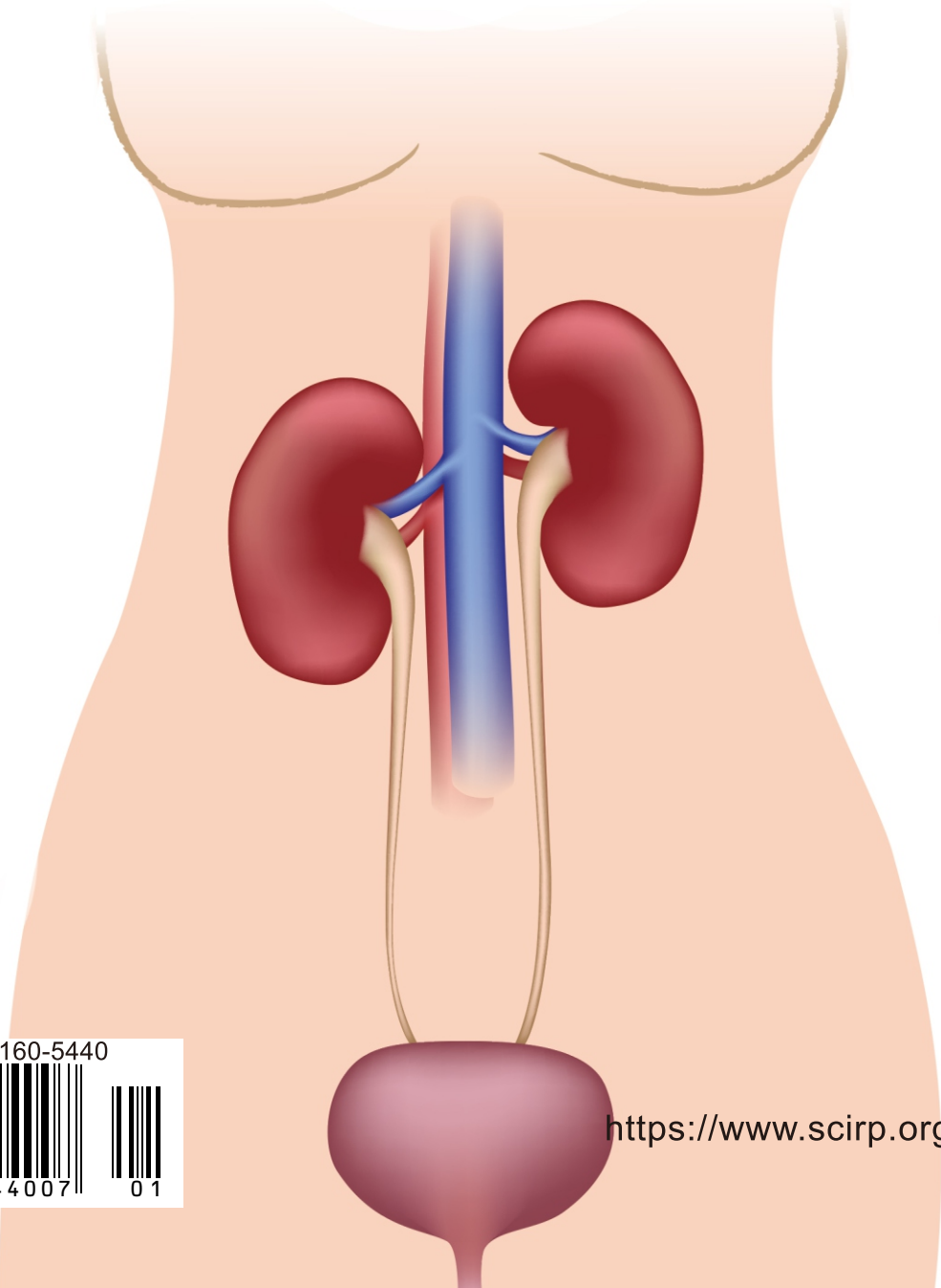


Open Journal of Urology



ISSN: 2160-5440



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ISSN 2160-5440 (Print) ISSN 2160-5629 (Online)

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Urological Emergencies at Kara Teaching Hospital (Togo): Epidemiological, Clinical and Therapeutic Profile

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How to cite this paper: Sikpa, K.H., Kpatcha, T.M., Tengue, K., Botcho, G., Sewa, E.V., Sade, S.R., Agbedey, M.S., Plante, P.R. and Gueouguede, K.E. (2023) Urological Emergencies at Kara Teaching Hospital (Togo): Epidemiological, Clinical and Therapeutic Profile. *Open Journal of Urology*, 13, 1-8.

<https://doi.org/10.4236/oju.2023.131001>

Received: November 29, 2022

Accepted: January 10, 2023

Published: January 13, 2023

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Abstract

Background: The urology department of the teaching hospital of Kara is the second urology department in Togo, after that of the teaching hospital Sylvanus Olympio, in Lomé the capital. It is a very young service, created less than 5 years ago. Urological emergencies were previously managed by general surgeons, for lack of urologists. The influx of patients with urological pathologies has increased with the arrival of urologists. The update on urological emergencies having been made in Lomé, we therefore wanted to take stock of urological emergencies at the teaching hospital of Kara. **Objective:** To describe the epidemiological, clinical, and therapeutic aspects of urological emergencies received at the teaching hospital of Kara. **Patients and Methods:** This was a descriptive study with retrospective data collection. The study took place in the urology department, and in the surgical emergency department of the teaching hospital of Kara, over a period of 18 months, from January 2021 to June 2022. The on-call medical team consisted of the intern in on-call medicine, and an on-call urologist, whom the intern called upon when he received a urological emergency. Pediatric urological emergencies were managed by the pediatric surgeon and were not considered in our study. The operating room register, the surgical emergency consultation register, the urology department consultation register, and the records of patients hospitalized in the urology department were used for data collection. The following parameters were studied: age, sex, type of urological emergency, and therapeutic management; epi info 7 software was used for data processing. **Results:** The average age of the patients was 52.5 ± 19.6 years with extremes ranging from 16 years to 102 years. Note that 57.7% of the patients were over 50 years

old. The sex ratio was 8.9. Urinary retention was the most common urological emergency in 47.7% (52) of cases; follow-up of infectious pathologies in 30.2% (33) of cases. Among the patients who had been seen for urinary retention, 84.6% (44) of the cases had presented with acute urinary retention. Urethral catheterization was the type of care most received by patients, in 30.2% (33) of cases; follow-up of medical treatment in 27.5% (30) of cases. The most common etiology of urinary retention was prostate tumours, in 71.1% (37) of cases, followed by urethral stricture in 15.3% (8) of cases. We also found in our series, traumatic emergencies in 10% of cases; these were traumatic urethral injuries, traumatic injuries of external genitalia, traumatic injury of bladder, and traumatic injury of kidney in respectively: 4.5% (5); 2.7% (3); 1.8% (2); and 0.9% (1) of cases. Torsion of the spermatic cord was found in 2.7% (3) of cases. **Conclusion:** Urine retention is the most common urological emergency at Kara University Hospital. They are most often found in elderly males. Urethral catheterization was the most common type of care.

Keywords

Urological Emergencies, Profile, Kara, Togo

1. Introduction

Urological emergencies occupy an important part of the activity of a urology department [1] [2]. They are diverse and varied and can be grouped into five main categories: infectious, traumatic, obstructive, genito-scrotal, and hematic [3]. The profile of urological emergencies can be different, depending on whether you are in one country or another [4]. In Togo, we have data on urological emergencies from the urology department of the teaching hospital Sylvanus Olympio in Lomé, the capital [1]. On the other hand, in Kara, a city located 400 km from Lomé, the urology department of the teaching hospital of KARA, the second in the country, created recently, does not yet have one. The aim of our study was to describe the profile of urological emergencies received at the teaching hospital of Kara.

2. Patients and Methods

This was a descriptive study with retrospective data collection. The study took place in the urology department, and in the surgical emergency department of the teaching hospital of Kara, over a period of 18 months, from January 2021 to June 2022. The on-call medical team consisted of the intern in on-call medicine, and an on-call urologist, whom the intern called upon when he received a urological emergency. Pediatric urological emergencies were managed by the pediatric surgeon and were not considered in our study. The operating room register, the surgical emergency consultation register, the urology department consultation register, and the records of patients hospitalized in the urology department

were used for data collection. The following parameters were studied: age, sex, type of urological emergency, and therapeutic management; epi info 7 software was used for data processing.

3. Results

The average age of the patients was 52.5 ± 19.6 years with extremes ranging from 16 years to 102 years. Note that 57.7% of the patients were over 50 years old. **Figure 1** shows the distribution of patients by age. The sex ratio was 8.9. **Figure 2** shows the distribution of patients according to sex. Urinary retention was the most common urological emergency in 47.7% (52) of cases; follow-up of infectious pathologies in 30.2% (33) of cases. Among the patients who had been seen for urinary retention, 84.6% (44) of the cases had presented with acute urinary retention. **Table 1** shows the distribution of patients according to the type of urological emergency. Urethral catheterization was the type of care most received by patients, in 30.2% (33) of cases; follow-up of medical treatment in 27.5% (30) of cases. **Table 2** shows the distribution of patients according to the type of care received in emergencies. The most common etiology of urinary retention was prostate tumours, in 71.1% (37) of cases; followed by urethral stricture in 15.3% (8) of cases. **Table 3** shows the distribution of patients seen for urinary retention according to etiology. As infectious diseases, we found in our patients: acute orchiepididymitis in 13.7% (15) of cases, acute prostatitis in 8.2% (9) of cases, gangrene of the external genitalia in 5.5% (6) of cases, and acute pyelonephritis in 2.7% (3) of cases. We also found in our series, traumatic emergencies in 10% of cases; these were traumatic urethral injuries, traumatic injuries of external genitalia, traumatic injuries of bladder, and traumatic injuries of kidney in respectively: 4.5% (5); 2.7% (3); 1.8% (2); and 0.9% (1) of cases. Spermatic cord torsion was found in 2.7% (3) of cases, with an average consultation time of 37 hours. All the patients received for torsion of the spermatic cord, had undergone an orchietomy, then a contralateral orchidopexy later.

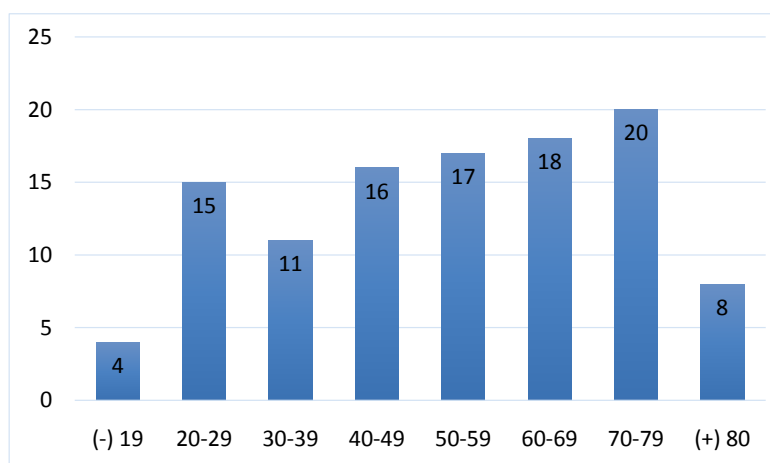


Figure 1. Distribution of patients by age.

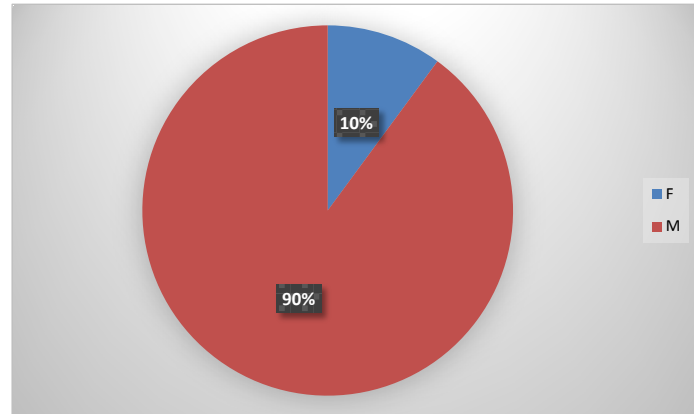


Figure 2. Distribution of patients according to sex.

Table 1. The distribution of patients according to the type of urological emergency.

Type of emergency	Frequency	Percent (%)
Nephritic colic	3	2.7
Hematuria	4	3.6
Bilateral ureteral obstruction	4	3.6
Infectious diseases	33	30.2
Priapism	4	3.6
Acute retention of urine	44	40.3
Chronic retention of urine	08	7.3
Torsion of the spermatic cord	3	2.7
Trauma	6	5.5
Total	109	100

Table 2. Distribution of patients according to the care given.

Treatment	Frequency	Percent (%)
Cavernospongious shunts	3	2.7
Circumcision	1	0.9
Cystorraphy	1	0.9
Suprapubic cystostomy	22	20.1
Necrosectomy	7	6.4
Néphrostomy	3	2.7
Orchiectomy	5	4.5
Vesico-ureteral reimplantation	1	0.9
Urethral catheter	33	30.2
JJ stent	3	2.7
Médical treatment	30	27.5
Total	109	100

Table 3. Distribution of patients seen for urinary retention according to causes.

Causes of urine retention	Frequency	Percent (%)
Phimosis	1	1.9
Urethral stricture	8	15.3
Traumatic urethral injury	4	7.6
Gynecological tumor	2	3.8
Prostate diseases	37	71.1
Total	52	100

4. Discussion

In our study, we recorded an average of 06 patients per month. This average is very low compared to Tengue [1] in Lomé, Tfeil [5] in Mauritania, Diallo [4] in Guinea, Fall [6] in Senegal, which found respectively 147 patients/year, 240 patients/year, 252 patients /year and 742 patients/year. This difference could be explained by the fact that the urology department of the teaching hospital of Kara is a very young department, which does not yet attract many patients; Kara being a semi-urban town, many patients do not always come to consult at the teaching hospital, given the difficulties that this entails transport from home to the teaching hospital sometimes difficult and very expensive, high cost of therapeutic care. Some patients therefore prefer to consult a health center or a traditional healer. It should also be noted that some, among the wealthiest of the inhabitants of Kara, sometimes prefer to go to Lomé, the capital, in the hope of having better therapeutic care.

In our study, the most represented age groups were that of 70 - 79 years, and that of 60 - 69 years, in respectively 18.3% and 16.5% of the cases. The average age was 52.5 years. These results are comparable to those of Diabaté [3] in Louga (Senegal), Tfeil [5], Diallo [4], Ouattara [6] in Burkina Faso, and Owon Abessolo [2] in Yaoundé who respectively found an average of age 59, 58, 56, 54, and 51. We thus agree with Tengue [1], that urological emergencies are often the prerogative of elderly subjects. These elderly subjects are often male, as evidenced by the results of the studies by Fall [6] and Diallo [4], which found a sex ratio of 20.3 and 16.3 respectively; the sex ratio in our study was 8.9.

Urinary retention was the most common urological emergency in our study with 47.7% (52) of cases. Acute urinary retention is the most common urological emergency in sub-Saharan Africa [1] [6] [7]. The absence of consultation at the dysuria stage, probably due to the lack of financial means, and to consultations with traditional healers, could explain this high rate of acute urinary retention [1]. In our study, among the patients with urinary retention, 84.6% had acute urinary retention. However, in the West, particularly in France, acute urinary retention ranked second among urological emergencies after lower back pain [8]. The causes of acute urinary retention are most often prostate tumors in first position, then urethral stricture. Diabate [3] found in his study that prostate tu-

mors and urethral strictures accounted for 77% and 15% of the causes of urinary retention; ikuerowo [9], in Nigeria found 64% for prostate tumors, and 28.4% for urethral stricture. Our results confirm these data from the literature, with prostate tumors as the main cause of urinary retention in 71.1% (37) of cases, followed by urethral stricture in 15.3% (8) of cases. Regardless of the cause of the urinary retention, management required urethral catheterization, or suprapubic cystostomy. In our study, urethral catheterization was the type of care most received by patients, in 30.2% (33) of cases; suprapubic cystostomy was performed in 20.1% of cases. The context of the realization of these gestures, was often marked by the absence of kit, especially about suprapubic cystostomy.

Infectious pathologies occupied 20.7%, 19.8%, and 16.4% in Diabaté [3], Fall [6], and Ouattara [7]. In our series, they accounted for 30.2% of urological emergencies. Acute orchiepididymitis in 13.7% (15) of cases, acute prostatitis in 8.2% (9) of cases, gangrene of external genitalia in 5.5% (6) of cases, and acute pyelonephritis in 2.7% (3) of cases. Gangrene of external genitalia in our series was not very common. This could be explained by the fact that there are specialists in general surgery in the region who know very well how to take care of this type of condition; we therefore share with our colleagues in general surgery the cases of gangrene of external genitalia. Gangrene of external genitalia is a very rapidly progressive necrotizing fasciitis. It is even rarer in France with an overall incidence estimated at 1.6/100,000, with a peak incidence (3.3/100,000) between 50 and 79 years [10]. The causative factor is most often a local cutaneous entry point. The terrain plays an important role in the spread of infection; Thus, an unbalanced diabetes will not only lead to immunosuppression which will promote infection, but also microangiopathy, which will promote tissue necrosis. Management in our context essentially consisted of emergency necrosectomy, combined with triple antibiotic therapy based on 3rd generation cephalosporins, metronidazole, and aminoglycosides. Necrosectomy was also performed by other authors [1] [6].

Traumatic emergencies were not very frequent in our series: traumatic urethral injuries were found in 4.5% of cases, the clinical manifestation of which was acute retention of urine; followed by traumatic injuries of external genitalia, of bladder, and of kidney in respectively: 2.7%; 1.8%; and 0.9% of cases. Traumatic urethral injuries, often occurred in the context of a road accident, with pelvic fractures. Sambo [11] in Benin had also found that urethral trauma was the most common urogenital trauma. The patient noted acute retention of urine due to urethral rupture, requiring the placement of a suprapubic cystostomy. The management of the urethral lesion was done later after performing a retrograde urethrocytography. The traumatic injuries of testis constituted the traumatism of the external genitalia encountered in our series. The scrotal ultrasound made it possible to make the lesion assessment by finding a rupture of the tunica albuginea. Other authors, in their series, had found that traumatic injuries of penis were more frequent [1] [6].

5. Conclusion

Urine retention is the most common urological emergency at the teaching hospital of Kara. They are most often found in elderly males. Urethral catheterization was the most common type of care.

Conflicts of Interest

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

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Surgical Video Review of Warm Ischemia Time during Laparoscopic Partial Nephrectomy and Impact on Positive Surgical Margins and Postoperative Complications

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How to cite this paper: Barnoiu, O.S., Tysland, A.O. and Andersen, A.W. (2023) Surgical Video Review of Warm Ischemia Time during Laparoscopic Partial Nephrectomy and Impact on Positive Surgical Margins and Postoperative Complications. *Open Journal of Urology*, 13, 9-17.
<https://doi.org/10.4236/oju.2023.131002>

Received: December 2, 2022

Accepted: January 13, 2023

Published: January 16, 2023

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Abstract

Introduction: A surgical video review is an emerging tool for quality improvement, especially in complex surgeries such as laparoscopic partial nephrectomy (LPN). Assessing and measuring the warm ischemia time (WIT) during LPN by dividing it into the time used for resection (ResT), time used for reconstruction (RecT) and intermediate time (IntT) has not been performed before. This study aimed to analyze the factors that can influence all these surgical times and assess their impact on positive surgical margins (PSM) and complication rates. **Methods:** We evaluated 36 surgical video recordings from patients who underwent LPN and measured WIT, ResT, RecT and IntT with a stopwatch. Factors such as tumor characteristics and surgeon experience were also recorded. SPSS software was used to identify the predictor factors for all these surgical times and to correlate the ResT with PSM and RecT with the complication rate. **Results:** We recorded a mean WIT of 887 seconds. The mean ResT, RecT and IntT were 240 (27.2% of WIT), 473 (52.6% of WIT) and 173 s (20.2% of WIT), respectively. We found a moderate correlation between the WIT ($p = 0.030$), IntT and the R.E.N.A.L. score ($p = 0.019$). The surgeon with less than 100 LPN had significantly longer WIT, ResT, and RecT values, with means of 977 ($p = 0.015$), 268 ($p = 0.019$) and 530 seconds ($p = 0.015$), respectively. No correlation was found between ResT and PSM ($p = 0.418$); however, a strong correlation was found between RecT and the probability of developing complications ($p = 0.012$). **Conclusion:** The surgeon's experience influences WIT, ResT, and RecT, but not IntT, which depends on tumor complexity. RecT affects the probability of developing complications. IntT represents a fifth of the WIT and efforts to reduce the WIT should focus on reducing the IntT for complex tumors, by improving surgical planning.

Keywords

Surgical Video, Laparoscopic Partial Nephrectomy, Warm Ischemia Time

1. Introduction

Partial nephrectomy represents the standard of care for patients diagnosed with T1a kidney cancer and should be favored over radical nephrectomy in patients with T1b, whenever feasible [1]. Minimally invasive nephron-sparing surgery should be performed if this approach does not compromise oncological, functional and perioperative outcomes. However, these approaches are technically challenging and are associated with a high rate of complications reported in up to 30% of cases [2]. Another concern is the positive surgical margins (PSM) reported in up to 4% of cases [3].

Vascular clamping during partial nephrectomy (PN) is associated with kidney function impairment and attempts should be made to limit the warm ischemia time (WIT) to 20 minutes [4], as every minute counts when the renal hilum is clamped [5]. Efforts to reduce the WIT should not compromise the surgical margins and the potential rate of complications resulting from excessive reduction of the necessary resection and suturing time.

Surgical video review (SVR) is an emerging tool for quality improvement, especially in complex surgeries, such as PN, and laparoscopy enables high-quality video recordings by providing greater magnification and a closer view of anatomical details. In our study, we focused on assessing and measuring the WIT during laparoscopic partial nephrectomy (LPN) by dividing it into the time used for resection (ResT), time used for reconstruction (RecT) and intermediate time (IntT). This study aimed to measure all these surgical times as parts of the WIT, reviewing surgical video recordings and analyzing the factors that can influence them. A secondary aim was to assess the impact of the ResT on PSM and the impact of the RecT on the complications' rate.

2. Material and Methods

Recording and archival for a period of the surgical video is mandatory in Norway to provide evidence for lawsuits. This allowed us to review surgical video recordings of all 36 consecutive patients who underwent LPN at our institution between September 2021 and May 2022. As part of the kidney cancer surgical team, one surgeon (O.B.), oversaw the video review and measured the WIT, ResT, RecT and IntT in seconds using a digital stopwatch.

The WIT is the time taken from clamping of the artery until its unclamping. It is measured intraoperatively by the anesthesiologist on the surgeon's command using a stopwatch. This time was recorded on the operation form. In the case of bleeding and the need for re-clamping, additional time was added to the initial measured time. If several arteries were involved, the time was measured from clamping until declamping of the main artery. At our institution, it is common

practice to clamp only the artery during hilar compression and the vein only for tumors situated centrally in the kidney especially on the right side and always after the artery is clamped. We performed an enucleoresection technique in all cases and used one V-loc 2/0 barbed suture for inner-layer renorrhaphy or two sutures, for a wide resection surface. This suture included all bleeding vessels and collecting system. Early declamping was attempted, and if hemostasis was achieved the surgeon proceeded to complete the outer-layer renorrhaphy using the sliding-clip technique. To minimize the WIT, we routinely simulated the resection angles using scissors and the reconstruction angles with a needle driver before resection. We also took a short time-out before clamping, involving all team members (assistant, nurse, anesthesiologist), specifying the role of each member during the WIT.

In this study, ResT was the time measured from the first cut in the kidney until the end of the resection. RecT was the time from the first needle passage into the kidney parenchyma until the hemolock clip was applied to the loose end of the inner-layer suture. In case of bleeding and the need for re-clamping and re-suturing, additional time was added to the initial measured time. IntT was defined as the time elapsed from clamping to unclamping of the artery that was not used to resect the tumor or for renorrhaphy.

Tumor anatomical aspects may influence WIT [6] and nephrometry scoring systems are widely used in surgical practice. In our unit, we used the RENAL score (Radius, Exophytic/endophytic, Nearness, Anterior/posterior, Location) to assess tumor complexity and plan the LPN, as described by Kutikov [7]. Procedural volume has served as a surrogate measure of the surgeon's expertise; for this study, we divided the surgical team into surgeons with more than and fewer than 100 LPN procedures. PSM that could be caused by an inappropriate excision technique was registered by a pathologist using microscopic examination, and perioperative complications, such as bleeding or urinary fistula, which could be caused by an inappropriate suturing technique, were recorded in the patient's journal according to the Clavien-Dindo classification [8].

The demographic (including age, sex, tumor type and side, tumor size at CT scan, RENAL score and grade, surgeon's expertise, bleeding amount, surgical margins and postoperative complications) and clinical outcomes (WIT, ResT, RecT and IntT), collected from patients' health records, were analyzed using descriptive statistics. Student's t-test and Pearson's χ^2 test were used to compare the means and proportions, respectively. Stepwise multivariable regression models were used to assess predictors for all surgical times. Statistical significance was set at $p < 0.05$. All data were analyzed using the SPSS statistical software (version 26.0; IBM Corp., Armonk, NY, USA).

3. Results

3.1. Demographics

The population and tumor characteristics are summarized in **Table 1**. The cohort comprised 75% males with a mean age of 65. Most of the tumors were solid

(83.3%) with a mean tumor diameter of 2.8 cm and a mean RENAL score of 7 points, with 44.4% of the tumors being low complexity, 52.8% medium complexity and 2.8% high complexity. Of the surgeries, 58.3% (21) were performed by a surgeon with a learning curve of fewer than 100 procedures and the remainder by the other two surgeons, both with learning curves of over 100 procedures. All three surgeons operated on similar low and medium-complexity tumors, and only two more experienced surgeons operated on high-complexity tumors. Three (8.3%) positive margins were recorded and Clavien-Dindo ≥ 2 complications occurred in four patients (11.1%) with bleeding and A-V fistulae. No patient registered an urinary fistulae.

Table 1. Population demographics.

Variable	Overall (n = 36)	Variable	Overall (n = 36)
Age (years)		Surgery time (minutes)	
Mean (SD)	65.8 (10.5)	Mean (SD)	155.61 (31.56)
Sex		WIT registered (seconds)	
Man	27 (75%)	Mean (SD)	870 (255.9)
Woman	9 (25%)		
Tumor type		WIT measured by SVR (seconds)	
Solid	30 (83.3%)	Mean (SD)	887.2 (267.9)
Cystic	6 (16.7%)		
Side		Resection Time (seconds)	
Right	15 (41.7%)	Mean (SD)	240.2 (87.6)
Left	21 (58.3%)	Percent of WIT	27.2%
CT diameter (cm)		Reconstruction Time (seconds)	
Mean (SD)	2.86 (1.16)	Mean (SD)	473.6 (175.9)
		Percent of WIT	52.6%
RENAL score		Intermediate Time (seconds)	
Mean (SD)	7.00 (1.79)	Mean (SD)	173.1 (55.8)
		Percent of WIT	20.2%
RENAL score grade			
Low (4 - 6)	16 (44.4%)		
Medium (7 - 9)	19 (52.8%)		
High (10 - 12)	1 (2.8%)		
Surgeon's expertise			
<100 procedures	21 (58.3%)		
>100 procedures	15 (41.7%)		
Bleeding (ml)			
Mean (SD)	143 (114)		
Surgical margins			
Negative	33 (91.7%)		
Positive	3 (8.3%)		
Postoperative complications			
<Clavien Dindo grade 2	32 (88.9%)		
\geq Clavien Dindo grade 2	4 (11.1%)		

The surgical features included a mean WIT of 887 seconds. The ResT used to resect the tumor was measured with a mean of 240 seconds (122 - 475) being 27.2% (17.6% - 38.9%) of all the WIT. The mean RecT was 473 seconds (154 - 870), representing 52.6% (30.9% - 65.4%) of the WIT. The mean IntT was 173 s (66 - 310), representing 20.2% (10.6% - 37.4%) of the WIT.

3.2. Predictor Factors for WIT, ResT, RecT and IntT (Table 2)

We found a moderate ($r = 0.362$) correlation between the WIT and RENAL score ($p = 0.030$), with a longer WIT for a higher RENAL score. Nevertheless, no significant difference was found between the WIT values for low and medium-complexity tumors ($p = 0.078$), although the mean ischemia time was higher in medium-complexity cases. The surgeon with fewer than 100 LPN had a significantly longer WIT with a mean of 977 s ($p = 0.015$).

No correlation was found between the ResT and RENAL score ($p = 0.120$) or other factors except the surgeon's experience, with a significantly longer ResT (mean 268 s, $p = 0.019$) for the surgeon with fewer than 100 LPN. Similarly, no correlation was found between the RecT and RENAL score ($p = 0.078$) or other factors except the surgeon's experience, with a significantly longer RecT (mean 530 s, $p = 0.015$) for the surgeon with fewer than 100 procedures.

Table 2. Factors correlated with total ischemia time, resection time, reconstruction time and intermediate.

Variable	N	Total ischemia time		Resection time		Reconstruction time		Intermediate time		
		Mean*/ Pearson corr. **	<i>p</i>	Mean*/ Pearson corr. **	<i>p</i>	Mean*/ Pearson corr. **	<i>p</i>	Mean*/ Pearson corr. **	<i>p</i>	
Sex* Man	27	891.07	<i>0.883</i>	237.19	<i>0.724</i>	472.41	<i>0.945</i>	181.19	<i>0.137</i>	
	Woman	9		875.56		249.33		477.22		149.00
Tumor* Solid	30	897.33	<i>0.619</i>	243.90	<i>0.581</i>	473.70	<i>0.995</i>	179.47	<i>0.130</i>	
	Cyst	6		836.50		221.83		473.17		141.50
Side* Right	15	901.40	<i>0.792</i>	260.27	<i>0.252</i>	483.27	<i>0.785</i>	157.19	<i>0.169</i>	
	Left	21		877.05		225.90		466.71		190.32
RENAL Grade* Low	16	789.50	<i>0.078</i>	217.19	<i>0.147</i>	419.50	<i>0.152</i>	152.19	<i>0.152</i>	
	Medium	19		950.37		252.53		507.63		190.32
	High	1		1250.00		375.00		693.00		182.00
>100 surgeries	15	761.13	<i>0.015</i>	200.40	<i>0.019</i>	394.47	<i>0.015</i>	166.40	<i>0.548</i>	
	Operator * < <100 surgeries	21		977.24		268.67		530.14		177.95
Age**	36	0.004	<i>0.979</i>	-0.073	<i>0.674</i>	0.054	<i>0.756</i>	-0.025	<i>0.886</i>	
Tumor size**	36	0.221	<i>0.195</i>	0.043	<i>0.803</i>	0.302	<i>0.074</i>	0.045	<i>0.793</i>	
RENAL score**	36	0.362	<i>0.030</i>	0.264	<i>0.120</i>	0.298	<i>0.078</i>	0.388	<i>0.019</i>	

* Student t-tests ** Pearson χ^2 tests.

We found a moderate ($r = 0.388$) correlation between IntT and RENAL score ($p = 0.019$), with a longer IntT for a higher RENAL score. However, no significant difference was found between the IntT values for low and medium-complexity tumors ($p = 0.152$), although the mean IntT was higher in medium-complexity cases.

After stepwise regression, two models were found to predict the WIT, as presented in **Table 3**, the model including operator and the RENAL score with better accuracy ($R = 0.523$). Only one model could predict the ResT and RecT, depending on the operator variable (R square = 0.152 and 0.149 respectively) as 15% of the ResT and RecT were determined by which surgeon performed the LPN. The model that could predict the IntT depended only on the RENAL score variable (R square = 0.151) as 15% of the IntT was determined by tumor complexity.

3.3. Correlation between ResT with PSM and RecT with Complications' Rate

No correlation was found between ResT, either as a continuous variable ($p = 0.418$) or as a percentage of the WIT ($p = 0.670$), and the probability of PSM. We tested a cut-off of 180 s (3 min) to determine whether a low ResT below 3 min correlated with positive margins without statistical significance ($p = 0.156$). A strong correlation was found between RecT and the probability of developing complications with a p value of 0.012 and an odds ratio of 1.008.

4. Discussion

To the best of our knowledge, no data are available regarding intraoperative video documentation review for LPN. Radical prostatectomy surgeons have accepted SVR as a form of quality assurance to reduce complications and improve outcomes [9]. Touijer *et al.* conducted such a video review methodology to understand the mechanism of PSM for laparoscopic radical prostatectomy showing that it could help decrease PSM, particularly in organ-confined disease [10].

For LPN, efforts should be made to reduce the WIT without compromising precise excision of the tumor and optimal reconstruction of the resection surface. Thus, we aimed to determine how much time surgeons took to resect the tumor, and to reconstruct the kidney and how much of the WIT was used for other maneuvers, such as instrument transfer from nurse to surgeon or any other "dead" time.

Table 3. Stepwise regression analyze for warm ischemia time, resection time, reconstruction time and intermediate time.

Model	Total ischemia time			Resection time			Reconstruction time			Intermediate time		
	R	R Square	Sig. F Change	R	R Square	Sig. F Change	R	R Square	Sig. F Change	R	R Square	Sig. F Change
1	0.403 ^a	0.163	0.015	0.389 ^a	0.152	0.019	0.385 ^a	0.149	0.020	0.388 ^a	0.151	0.019
2	0.523^b	0.273	0.032									
Predictors	a. Operator b. Operator, RENAL score			a. Operator			a. Operator			a. RENAL score		

The time taken to resect the tumor, time to reconstruct the kidney and intermediate time represented 27%, 53% and 20%, respectively, of the total WIT. For our population with a mean WIT of almost 15 min, 4 min were used to resect the tumor, twice as long to reconstruct the kidney (8 min), and 3 min for other maneuvers. It is also noteworthy that more than half of the total WIT was used to reconstruct the kidney.

In most studies, procedural volume has served as a surrogate measure of the surgeon's expertise as an objective assessment of operative proficiency, technique and skills, especially in complex procedures, such as LPN. Porpiglia *et al.* [11] evaluated the impact of the learning curve and tumor anatomical characteristics on margins, ischemia and complication rate and found that WIT < 20 min increased with the surgeon's experience and decreased when complex lesions were treated with LPN. In our study, the surgeon's experience and tumor anatomical aspects evaluated using the RENAL score were the factors influencing the WIT, ResT, RecT and IntT, although both factors determined in a low percentage of 15% these surgical times.

Ficarra *et al.* [12] found that anatomical tumor characteristics were an independent predictor of WIT, adjusted for the effects of surgeon experience and clinical tumor size. We found that only ResT and RecT as part of the WIT depended on surgical experience, in contrast with IntT which depended on tumor morphology. We believe that our standardized routine of taking a time-out before clamping the artery and an experienced kidney surgeon-nurse team can explain why the surgeon's experience was not a predictor for IntT.

Ko *et al.* [13] found the surgeon's experience, tumor morphology as the PAUDA score, and tumor size to be predictors of WIT. Among these factors, accumulating surgical experience was the most important and only modifiable factor for reducing the WIT. Our study found no significantly longer IntT for the surgeon with fewer than 100 LPN in contrast with the WIT, ResT and RecT. IntT depended more on tumor morphology, which is not a modifiable factor, but reducing IntT by improving teamwork and surgical planning could reduce the WIT independently of the surgeon's experience.

To best of our knowledge, no data are available to evaluate the time used to resect the tumor or to reconstruct the kidney, as separate parts of the WIT, neither studies assessing their separate impact on PSM nor those evaluating that on postoperative complications. Our study found no correlation between ResT and PSM, even with a subgroup analysis of times less than 3 min, as we expected that an accelerated resection could lead to PSM. The small sample size and low PSM rate of this study could have biased our findings. Conversely, the RecT significantly correlated with the postoperative complication rate as the longer the time taken to reconstruct the resection surface, the higher the probability of developing a complication. A longer time to reconstruct the kidney in our study was needed mainly to achieve hemostasis, as we did not separately repair the urinary collecting system. We recorded no urinary leakage, postoperative bleeding or

development of an A-V fistula as the only Clavien-Dindo grade >2 postoperative complications. Interestingly, Ficarra *et al.* [12] also found that urinary collecting system repair was not associated with an increased risk of postoperative complications such as urine leakage.

The main limitation of this study is the small sample size, and the tumors were relatively small and of low to intermediate complexity, which we believe represents patients we typically treat in our daily practice in this era of incidentally finding early kidney cancer on CT scans. The study was not blinded because SVR requires a trained kidney surgeon to identify the specific steps of the procedure. Some patient characteristics and comorbidities were not recorded owing to the retrospective design of this study. We believe that this study offers several opportunities for future research using SVR analysis to assess WIT for robot-assisted PN.

5. Conclusions

We divided WIT into ResT, RecT and IntT using SVR. ResT represents more than a quarter of WIT without necessarily affecting PSM. Conversely, RecT represents more than half of the WIT and affects the probability of developing postoperative complications. The surgeon's experience influences the WIT, ResT and RecT but not the IntT, which depends more on the tumor morphology.

As time is not used to resect or reconstruct, IntT represents a fifth of the WIT. We believe that, in addition to improving the surgical experience, efforts to reduce the WIT should also focus on reducing IntT, especially for more complex tumors, by improving surgical planning and teamwork, without compromising surgical margins and complication rate.

Acknowledgements

This study was approved by the Institutional Review Board of our institution. The use of surgical video content for extracting quality improvement and educational material was subject to written approval by the patient and all the patients in our study signed an informed consent form.

Author Contributions

Ovidiu Barnoiu: conceived and designed the study, collected the data and wrote the paper. Ole Tysland: contributed data and analysis tools. Aage Andersen: contributed data and analysis tools.

Conflicts of Interest

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

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Prune Belly Syndrome: A Ten-Year Single Tertiary Centre Experience in South-South, Nigeria

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How to cite this paper: Victor, A. and Francis, G.I. (2023) Prune Belly Syndrome: A Ten-Year Single Tertiary Centre Experience in South-South, Nigeria. *Open Journal of Urology*, 13, 18-29.

<https://doi.org/10.4236/oju.2023.131003>

Received: November 28, 2022

Accepted: January 14, 2023

Published: January 17, 2023

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Abstract

Background: Prune belly syndrome (PBS) is a congenital anomaly that consists of a triad of abdominal wall defect, bilateral cryptorchidism, and urinary tract dilation. The disease is of varying severity. This study aims to highlight the challenges and peculiarities in the management of PBS in a resource-poor setting. **Materials and Methods:** This is a ten-year retrospective study conducted at the University of Port Harcourt Teaching Hospital. Ethical approval for the study was sought and gotten from the hospital's ethical committee. The information gotten included history, duration of symptoms, examination findings, age of the patient, category of disease, and intraoperative findings. The data from the folders were collected and evaluated. Frequencies, percentages, the mean and standard deviation were used to summarize the data as appropriate. **Results:** Fifteen patients were included in the study. The hospital incidence of PBS was 112/100,000, twelve males and three females. The age range was from 1 day to 15 years, mean age was 14 months \pm 2.3 months. Most patients presented between 3 months and 2 years and 11 months. Twelve patients had category three PBS and five patients had associated anomalies. Eleven male patients died after 5 years of follow-up from progressive renal deterioration. The female patient fared better than the males. **Conclusion:** PBS is rare, most patients with the condition present late. The most common cause of mortality was progressive renal deterioration.

Keywords

Prune Belly Syndrome, Renal Deterioration, Late Presentation

1. Introduction

Prune belly syndrome (PBS) is a congenital anomaly that consists of a triad of

abdominal wall defect, bilateral cryptorchidism, and urinary tract dilation [1]. The disease is of varying severity [2]. PBS is also called Eagle-Barrett syndrome, Orbinsky syndrome, abdominal musculation syndrome and triad syndrome. The disease was named PBS because of the wrinkled appearance of the anterior abdominal wall muscle due to the deficiency of muscle cells. The most severely affected die during the neonatal period while the least severely affected grow up with minor defects [3]. Males are more affected than females.

Prune belly syndrome is a rare congenital disease of unknown aetiology that is present in one in every 40 thousand live births worldwide [4]. Several theories have been postulated to explain the aetiology of PBS. These theories propounded include mesenchymal developmental defects and an obstruction to urine outflow in utero [1]. The aetiology of PBS is largely unknown. However, the high male-to-female ratio and occurrence of the disease amongst siblings, relatives and twins suggests a genetic basis to PBS. PBS has been associated with trisomy 13, trisomy 18, turner syndrome and monosomy 16 [5].

The urinary tract anomaly appears to be the most important determinant of survival in these patients [5]. Individuals with PBS presented with varied symptoms with the urogenital syndrome mostly affected. Patients presented with renal dysplasia, hydronephrosis, ureteropelvic junction obstruction, hydroureters, vesicoureteric reflux, patent urachus and distended bladder [6]. The prostate may be hypoplastic, and the vas deferens and seminal vesicles are either dilated or atretic [7]. The tests lie intraabdominal [7]. Extra genitourinary anomalies include abdominal wall anomalies, pulmonary [1], gastrointestinal [8], orthopaedic [1] and dental anomalies [9].

In Africa, there are not too many publications on the subject [10] [11] with most of the available publications being case reports. In Nigeria, few studies on PBS have been carried out [12]-[17]. We are currently unaware of any study on PBS conducted in Port Harcourt, Nigeria. Treatment of PBS is also a challenge [12] because of poor access to health care and cultural beliefs [10]. This study will evaluate the presentation, and management of patients with PBS in Port Harcourt, Nigeria.

2. Materials and Methods

This was a ten-year retrospective study. All patients who presented with features suggestive of PBS between January 2011 and December 2020 at the Paediatric surgery unit of the University of Port Harcourt Teaching Hospital UPTH were included in the study. Ethical approval for the study was sought and gotten from the hospital's ethical committee.

Data from all patients listed in the medical records department as having been treated for PBS during the study period were retrieved. Also, data were obtained from ward admission registers, theatre, and discharge records. The data included history, examination findings, patient age at presentation, intraoperative findings, and post-operative complications. Patients were also categorized into three

categories based on the severity of the symptoms. Category 1 had severe renal dysplasia, oligohydramnios, pulmonary hypoplasia and Potters facies. Category 2 patients presented with Full triad features, moderate or unilateral renal dysplasia, no pulmonary hypoplasia, and slightly abnormal renal function. Category three patients presented with incomplete or mild triad features, mild uropathy, no renal dysplasia, stable renal function and no pulmonary hypoplasia. patients with incomplete records were also excluded from the study.

Each patient had an intravenous urography, urinalysis/ microscopy culture and sensitivity, full blood count, electrolyte urea, and creatinine before surgery.

The data from the folders were collected and entered using Microsoft Excel 2016 version and transferred into the statistical package for social sciences (SPSS) for windows (version 25) (IBM SPSS Inc. Chicago, IL) for analysis. Ninety-five per cent confidence interval and a p-value less than 0.05 was considered significant. Frequencies, percentages, the mean and standard deviation was used to summarize the data as appropriate. Categorical data were presented in the form of frequencies and percentages using tables. Continuous variables were presented in means and standard deviation. Results were presented in tables and charts.

3. Results

Of the 13,343 patients seen during the study period, 15 with PBS were seen at the paediatric surgery clinic and Paediatric surgery ward, giving a hospital incidence 112/100,000 (**Table 1**).

4. Discussion

Since the first description of the disease between 1839 and 1895 PBS data have been composed primarily of case reports and small case series [13]. Prune Belly Syndrome is quite rare as shown in this study, and only 15 patients were diagnosed with this condition in 10 years of study with a hospital incidence of 112/100,000. Many other studies attest to the rarity of this syndrome [1] [14] [17]. The sex most affected in this study was male sex with 12 males and only 3 females as shown in **Table 2**. The literature on this subject is also in agreement with this finding [2] [14] [17] [18]. The mean age of presentation was 14 months \pm 2.3 months.

Table 1. The age at presentation of patients to the hospital.

Age at presentation	Frequency	Percentage
Below 3 months	2	13.33
Three months to 2 years 11 months	11	73.34
Three years and above	2	13.33
Total	15	100

Table 2. The sex distribution of patients with PBS.

Sex distribution	Frequency (n)	Percentage (%)
Male	12	
Female	3	
Total	15	100

Sex distribution of patients with PBS, three females and 12 males. Age range = 1day to 15 years. Mean age = 14 months \pm 2.3 months.

In utero, the amniotic fluid is composed mainly of urine, in situations of poor production of urine, there are oligohydramnios and poor development of the thoracic and musculoskeletal system. Also, the development of the kidneys in the presence of urinary tract obstruction can lead to dysplasia and renal compromise [5]. Severe oligohydramnios and renal dysplasia is associated with poor outcome. No patient in this study presented with respiratory difficulties, even the day-old neonate in **Figure 1** had no respiratory difficulties.

In Nigeria, there is poor antenatal care [19] [20], while some of these cases of PBS are diagnosed before birth in developed countries as early as 14 weeks gestational age with the use of an obstetric scan [1] [18]. The findings on ultrasound include abnormal dilatation of the bladder, reduced amniotic fluid, and bilateral hydronephrosis [18]. In Nigeria, the finding is different; late presentation and diagnosis are common. In this index study, only 2 presented before 3 months of age as shown in **Table 2**. These two patients were delivered at the University of Port Harcourt Teaching Hospital and the syndrome was promptly diagnosed by the paediatricians. In Africa and other developing economies, health care is largely unavailable [21] [22]. If these children were delivered by a traditional birth attendant or at home the syndrome may not have been diagnosed that early. Case reports of patients with PBS treated prenatally abound [18].

No patient presented with category 1 PBS in this study as shown in **Table 3**. The reason may be that even if patients with the severe form of PBS were delivered, they will most likely die within the first few hours because of poor health care in developing economies. Even in developed healthcare systems, early mortality for patients with severe PBS is not uncommon [18]. Most of the patients (12.80%) presented with category 3. Female patients tend to have a milder form of the disease as seen in **Figure 2** and **Figure 3** with these female patients having lax abdominal wall musculature on the left and right side respectively. We don't know if this one-sided laxity of the anterior abdominal wall leads to a better prognosis in these females. Men tend to have a more generalized laxity of the anterior abdominal wall as seen in **Figures 4-7**. The older patients tend to develop a pot belly as seen in **Figure 7**, which revealed a 15-year-old male with PBS.

PBS is associated with urogenital and extra-urogenital anomalies. The extra urogenital anomalies include cardiopulmonary, gastrointestinal and musculoskeletal and orthopaedic anomalies [1] [18] [23] [24] [25]. In this study, 2 patients had patent urachus as shown in **Figure 8** and **Figure 9**. A patent urachus tends to reduce the pressure on the developing kidneys, reducing urinary tract

obstruction’s effect on the developing renal system. Each patient had an intravenous urography which revealed hydroureteronephrosis of various degrees as shown in **Figure 10**.



Figure 1. A day-old male with PBS, note the wrinkles on the whole anterior abdominal wall.



Figure 2. A 45 days-old female infant with PBS, note the defect more on the left Side of the abdomen.



Figure 3. A 4 month old female infant with PBS and the abdominal wall defect is more on the right.

Table 3. The different categories of presentation. None presented with the most severe form of PBS.

Category	Frequency	Percentage %
1	0	0
2	3	20
3	12	80
Total	15	100

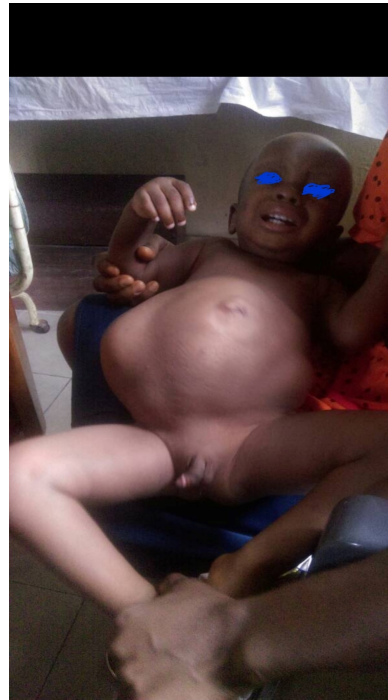


Figure 4. A two-year-old male with PBS, note the undescended testes and wrinkled abdominal wall.



Figure 5. A 2-year-old male with PBS with generalized wrinkling on the abdominal wall.



Figure 6. A 7-year-old male child with PBS, testes in the scrotum, note the scar above the inguinal region where he had orchidopexy.



Figure 7. A 15-year-old male child with PBS who appears to have a pot belly. With ageing, the wrinkled abdominal wall may appear as a pot belly.



Figure 8. A patient with PBS with a patent urachus.

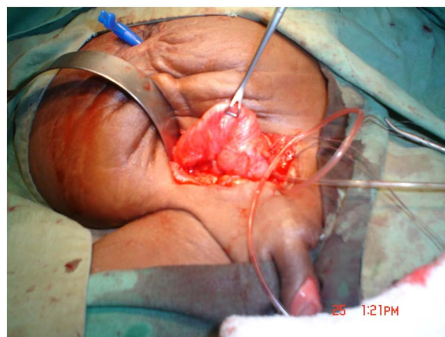


Figure 9. A feeding tube passed into the bladder from an opening in the umbilicus.



Figure 10. An intravenous urogram of a patient with PBS left hydroureteronephrosis and an elongated, dilated and tortuous left ureter.

Extra urogenital presentations of PBS are possible as shown in **Figure 11**. Two patients had malrotation of the gut. This was noted during the plication of the anterior abdominal wall. One patient had polydactyl. Ten patients with PBS had no other identified anomaly aside from the PBS.

Management of patients with PBS is quite tasking and should be multidisciplinary. In our centre, paediatricians, paediatric surgeons, urologists and radiologists are all involved. Preservation of renal function is a must. Nine patients had ureteric reimplantation, two had abdominal wall plication and one had a vesicostomy. One patient had orchidopexy in the study. The aim of these procedures was to attempt to make these patients lead a normal life. Despite the efforts of the managing team, eleven patients with PBS died during the study period as shown in **Table 4**. The female patients also seemed to fare better than their male counterparts. Other studies have reported good prognosis for patients in category 3 [3] [26]. Zugor *et al.* [27] feel that the level of renal dysplasia is the most significant factor affecting prognosis. The higher the degree of dysplasia, the worse the prognosis. We feel that despite the degree of dysplasia the poor health facilities in Africa and the late presentation contributed to the poor prognosis of the patients in this series. The most common cause of mortality in this study was progressive renal deterioration. Renal transplantation is an option for these patients if the resources are available and facilities are present [28] [29]. Renal transplantation is currently not carried out in Port Harcourt, Nigeria, so none of the patients in this study had renal transplantation.

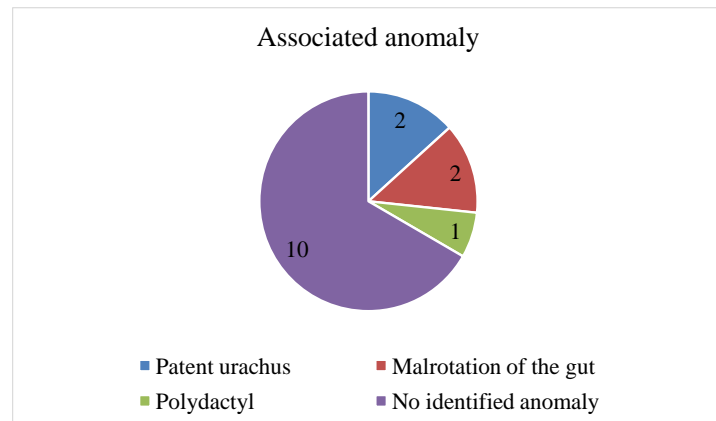


Figure 11. The anomalies associated with PBS in this study.

Table 4. The mortality of patients with PBS after a follow-up period of 5 years. More males (91.67%) tend to succumb to the disease than females.

Mortality	Frequency	Percentage
Male	11	91.67
Female	0	0
Total	11	

Follow-up is also important for these patients; the patients should have serial renal function tests. There are reports of developing renal failure and bladder malignancy later in life [25].

5. Conclusion

PBS is rare, most patients with the condition present late in Port Harcourt. Early antenatal visits can ensure prenatal diagnosis of the syndrome and hence proper and timely treatment. The most common cause of mortality was progressive renal deterioration. Adequate renal replacement therapy is also important in management.

Recommendations

Earlier registration for the antenatal clinic can lead to earlier diagnosis and better management.

Limitation of Study

This was a retrospective study. Records were poorly kept and this affected the sample size.

Acknowledgements

We acknowledge the wonderful paediatric nurses and theatre staff who aided us in carrying out our work. We also acknowledge our wonderful spouses for their immeasurable support in seeing this work through.

Source of Funding

This research was self-funded by the authors.

Conflicts of Interest

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

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ArtiSential™ Revolutionizes Traditional Laparoscopy in Urology by Introducing the Dexterity of a Robotic System to a Laparoscopic Instrument

—First Experiences in Urology in Europe by the Ukrb in Neuruppin

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How to cite this paper: A Cordes, J., Bethge, L., Amria, M., Ghazi, M., Arevalo, E.S., Alhanini, H., Rauter, S. and Awad, M. (2023) ArtiSential™ Revolutionizes Traditional Laparoscopy in Urology by Introducing the Dexterity of a Robotic System to a Laparoscopic Instrument. *Open Journal of Urology*, 13, 30-35.

<https://doi.org/10.4236/oju.2023.131004>

Received: December 21, 2022

Accepted: January 17, 2023

Published: January 20, 2023

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Abstract

We describe the first two conventional, laparoscopic renal operations with a new multi-degree of freedom articulated single-use laparoscopic instrument (ArtiSential™). The two patients underwent different laparoscopic interventions at Ukrb University (Neuruppin, Germany): nephrectomy and Anderson-Hynes-pyeloplasty. All procedures were completed, with no need for conversion or placement of additional ports. No intraoperative complications or technical failure of the instrument was recorded. The mean operative time was 180 min median length of stay was 11.5 d. The instrument could be opened out of the sterile packaging and used at once when it was needed, because it is a single-use instrument. There was real haptical feedback and the costs are minimal compared to robot surgery. The use was straightforward and rapid processes after an intensive training of 4 h in a dry lap. Awaiting future investigations in larger series, this study proves the safety and feasibility of renal surgery with ArtiSential™ and provides relevant data that may help early adopters of this surgical instrument.

Keywords

Renal Cancer, Renal Surgery, Laparoscopic Surgery, New Multi-Degree Instrument, Single-Use

1. Introduction

In the late 1970s, Kurt Semm founded the laparoscopic surgery in Kiel/Germany

[1] [2]. A normal laparoscopic device consists of a straight shaft and sometimes with a jaw-like tip which can open and close. The laparoscopic surgeon uses the “fulcrum effect”. This means that the tip of the device moves opposite from the handle reducing the degrees of freedom compared with the movement of the human hand [3]. The advantages of the robot surgery (e.g., da Vinci® surgical system) were increased dexterity, degrees of freedom and elimination of the fulcrum effect [4]. However, the very high cost of the surgical robot, hygienically problems of a non-disposable instrument and the loss of the real haptical feedback triggered an interest in development of a “wristed” instrument for conventional laparoscopy which can be sterile opened in the theatre just in time when it is needed.

Many mechanical or partly motorized instruments have been developed. Yet none of these instruments have so far managed to play a major role in laparoscopic operations [5]. In 2019, ArtiSential™ (Figure 1) was introduced by LIVSMED, Seongnam/Republic of Korea and registered as a Class I medical device with the Food and Drug Administration [6]. The instrument uses two joints to enable full 360° wristed capability similar to the da Vinci® surgical system [7]. It is the first articulating laparoscopic device with the widest-angle motion of 360 degrees.

We describe the first two conventional, laparoscopic renal operations with a new multi-degree of freedom articulated single-use laparoscopic instrument (ArtiSential™) in Europe. These two patients underwent different laparoscopic interventions at Uker University (Neuruppin, Germany): nephrectomy and Anderson-Hynes-pyeloplasty. This paper is designed to share our preliminary experience and first impressions to make urologic surgeons aware of this novel technology.

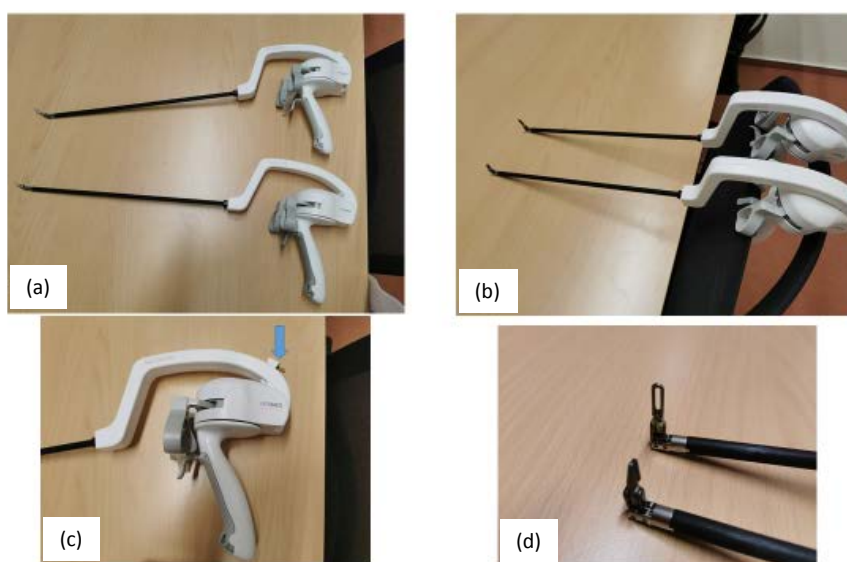


Figure 1. (a) View from the side of two wristed instruments: above the Forceps and below the Needle holder. (b) View from above (c) The Arrow shows the connection for the bipolar coagulation (only for the Forceps available). (d) Forceps and Needle holder.

2. Patients and Methods

Before using the ArtiSential™-Instruments the operating surgeon has to go through an advanced training in dry lap in which LIVSMED provided a training kit. Ibahim Darwich *et al.* explain this peg-transfer task of 4 hours with a Fenestrated Forceps [8]. After this initial training on the training kit, we start suturing in the Dry Lap with the Needle Holder of ArtiSential™.

Medical data of patients who underwent laparoscopic surgery on the kidney with ArtiSential™ (nephrectomy and pyeloplasty) from September 2022 to November 2022 at a single tertiary centre were retrospectively analysed.

All patients were placed on the kontralateral Side of the Kidney of interest.

We used multiport technique, with one 12 mm port near the umbilicus for the camera, one 5 mm port near the thorax in the medioclavicular line and one 12 mm port 20 cm distal in the medioclavicular line (Figure 2). Sometimes we had to use another 5 mm port near Xyphoid for the right kidney to retract the liver.

Because of this port technique, the ArtiSential™ instrument was used with the right Hand for the left kidney and with the left hand for the right kidney. The surgeons were trained on his dominant and non-dominant hand.

3. Results

During the renal surgery, articulated instrument with forceps was useful for dissection, traction and counter traction around adhesions, Colon, Duodenum, ureter and hilum of the kidney. It was very helpful in preparing tumours in the kidney and resecting them (Figure 3).

Bleedings in the ground of the tumor could easily be coagulated, with the bipolar option of the fenestrated forceps (Figure 1(c)).

When it comes to reconstruction by a suture, we used the articulated instrument with a needle holder (Figure 4). The suturing was fast, precise, ergonomic and with a real haptical feedback.

All procedures were completed, with no need for conversion or placement of additional ports. No intraoperative complications or technical failure of the instrument was recorded. The mean operative time was 180 min Median length of stay was 11.5 d. The instrument could be opened out of the sterile packaging and used at once when it was needed, because it is a single-use instrument.

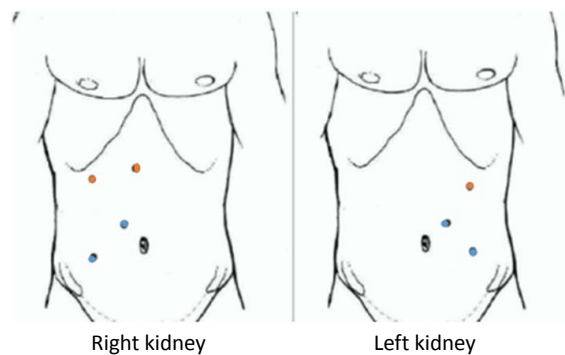


Figure 2. Blue dot: 12 mm port, orange dot 5 mm port.

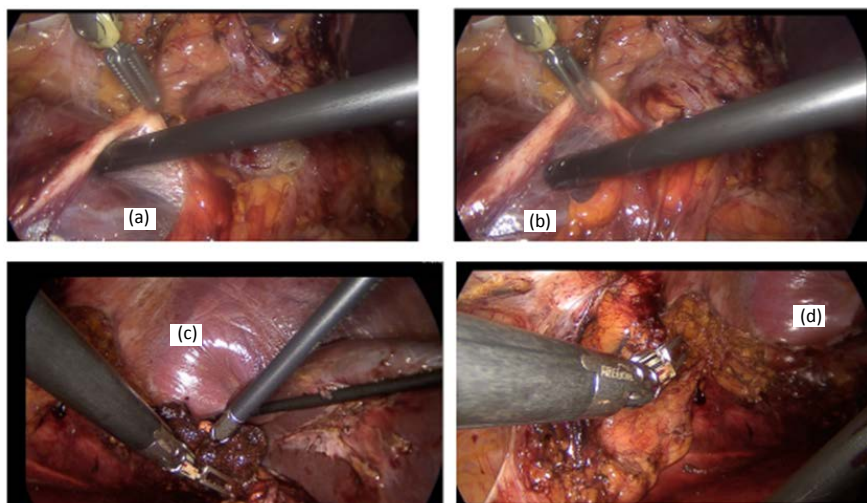


Figure 3. Usage during Nephrectomy. (a) + (b) traction and grabbing of the ureter. (c) Positioning of tabotamp under the liver on the hilum. (d) Repositioning of the colon ascendence.

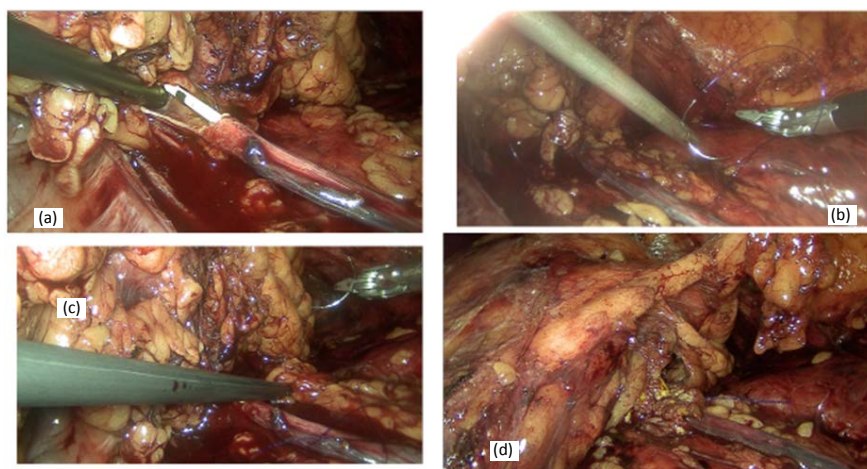


Figure 4. Usage during Pyeloplasty. (a) Spatulated ureter with DJ. (b) + (c) Usage of the needle holder with the right hand, a straight needle holder on the left hand and a barbed suture. (d) Completed suture.

4. Discussion

Robotic systems have several advantages like increased dexterity, degrees of freedom and elimination of the fulcrum effect [4]. Unfortunately, the very high cost of the surgical robot [9], hygienically problems of a non-disposable instrument and the loss of the real haptical feedback limit its use in urology. The usage of surgical energy devices is also limited in robot surgery.

The new ArtiSential™ could fill this gap between conventional laparoscopy and robot surgery. It's intuitive usage just ergonomic like a robot system and it's affordability and computer or motor absence making this instrument valuable for all countries. The learning curve is quick on a steady plateau. After 4 hours of training, one can start with the first cases, when there is laparoscopic expertise

[8].

There is no long docking manoeuvre like in robot surgery. The instrument is pulled out the sterile package in seconds, just when it's needed.

Hygienically standards are steadily rising and wristed instruments have complicated cleaning and sterilisation procedures, because of the complexity of the instruments. This problem is absent in a single-use, sterile Instrument like ArtiSential™.

Haptical feedback is very important when it comes to intraoperative traction and counter traction. In reconstructive surgery with suturing e.g., the ureter to the renal pelvis it is essential. Min *et al.* evaluated the performance of suturing tasks between ArtiSential™ and a robotic system. They reported that experienced laparoscopic surgeons could achieve the same result with ArtiSential™ [7].

We encourage multicentre randomized case-control studies to endorse the adoption of this robot-inspired device with stronger scientific evidence.

5. Limitations

An important limitation of this study is its retrospective design. Other limitations of the study include its single centre nature and the performance of the procedures by a single surgeon; further studies involving more surgeons are needed.

In addition, future studies with larger number of patients may be necessary. Lastly, this study just focused on early postoperative complications.

6. Conclusion

Awaiting future investigations in larger series, this study proves the safety and feasibility of renal surgery with ArtiSential™ and provides relevant data that may help early adopters of this surgical instrument. It is a safe and feasible option that does not increase operation time, length of hospital stay and intraoperative bleeding.

Ethical Statements

This study was in accordance with the Helsinki declaration. Informed consent was obtained from all patients after a thorough verbal explanation.

Conflicts of Interest

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

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<https://doi.org/10.1007/s00268-012-1728-4>

Iatrogenic Urethral Stenoses: Epidemiological Aspects Clinics and Therapeutic in the Urology Department of the National Hospital of Conakry

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How to cite this paper: Cisse, D., Keita, Y., Keita, F.O., II Barry, M., Diallo, A., Diallo, T.M.O., Bah, M.D., Bah, M.B., Barry, A.O., Kante, D., Bah, I. and Bah, O.R. (2023) Iatrogenic Urethral Stenoses: Epidemiological Aspects Clinics and Therapeutic in the Urology Department of the National Hospital of Conakry. *Open Journal of Urology*, 13, 36-47.

<https://doi.org/10.4236/oju.2023.131005>

Received: November 24, 2022

Accepted: January 28, 2023

Published: January 31, 2023

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Abstract

The aim is to highlight the epidemiological, clinical and therapeutic aspects of iatrogenic urethral strictures. **Methodology:** This was a retrospective study, descriptive type, 6 years from January 1st 2012, to December 31st 2017 carried out in the Urology-Andrology department of the National Hospital Ignace Deen of Conakry. All records of patients carrying the Diagnosis of iatrogenic urethral stricture were included in this study. **Results:** We collected 30 cases of iatrogenic urethral stricture, with a frequency of 2.5%. The average age of the patients was 62.33 years. The most affected age group is from 71 to 80 years (33.33%). Dysuria was the main reason for consultation. Retrograde urethrocytography plus voiding cystourethrography (RUC-VCU) allowed us to make the diagnosis. The treatment was essentially surgical and several techniques were used. Endoscopic internal urethrotomy alone was the most performed surgical technique, followed by segmental uretrectomy associated with end-to-end urethrography. **Conclusion:** Iatrogenic urethral stricture is easy to diagnose but difficult to manage due to the frequency of recurrences. Improving the quality of care, in particular urethral catheterizations and transurethral endoscopic maneuvers, makes it possible to prevent it.

Keywords

Stenosis, Urethra, Iatrogenic, Conakry

1. Introduction

Urethral stricture or stricture is a permanent reduction in the caliber of the

urethra, constituting an obstacle to the normal flow of urine [1]. It is said to be iatrogenic when it follows an act of care [2]. The healing of the initial lesion will lead to a more or less complete obstruction of the lower urinary tract with, in the long run, chronic retention of urine and risk of chronic renal failure.

The incidence of this condition is increasing due to the proliferation of endourethral maneuvers on the one hand and on the other hand, due to the insufficiency in the training of the personnel involved in the realization of these gestures [3]. The management of iatrogenic urethral strictures still remains a problem in many situations because poor initial management frequently leads to disability throughout life.

In France, at the urology department of the University Hospital of Poitiers in 2011, A. Rouanet and Coll. [4] found in 9 years, 24 cases of iatrogenic urethral stricture (IUS) representing all urethral strictures (US).

In Cameroon, in 2017 Ngaroua et Coll. [1] found 12 cases of IUS or 21.05% of the US.

In West Africa, the IUS represented in 2015: in Benin 21.7% of the US [5] [6]; in Burkina Faso 29.1% of the U.S. and 9% of the U.S. in Senegal [3].

In Guinea, in 2001, S. Guirassy *et al.* [7] had recorded in 9 years, 22 cases of IUS which represented 4.20% of the US.

The multiplicity of risk factors, namely the conditions for the placement of urethral catheters, the development of endourology and the absence of previous studies on this clinical entity in Guinea justify the realization of this study.

The aim of this work is to highlight the epidemiological, clinical and therapeutic aspects of iatrogenic urethral strictures in the urology department of the University Hospital of Conakry.

2. Material and Methods

This is a descriptive retrospective study over a period of six (6) years from January 1st 2015 to December 31th 2020, involving 30 patients, and was carried out in the Urology-Andrology department of the National Hospital Ignace Deen of Conakry.

Inclusion criteria:

Were included in this study, patients hospitalized and operated for iatrogenic urethral stricture during the study period with a medical file including, a clinical observation, retrograde urethrocytography and voiding cystourethrography (RUC/VCU)

Exclusion criteria: All patients with diagnosis other than iatrogenic urethral stricture were excluded from this study; incomplete records and patients hospitalized outside the study period.

The variables of the study: They were divided into: Sociodemographic variables:

Frequency: number of cases of iatrogenic urethral stricture compared to other urethral pathologies treated in the department during the study period.

Age: This is the number of completed years lived between the day of birth and the day of admission to our service, we have divided into age groups with a range of 10 years. The average was calculated and the extremes specified.

Clinical variables: We clinically assessed the reasons for consultation, the circumstances of occurrence of iatrogenic urethral stricture; associated lesions and initial management. Reasons for consultation:

Dysuria: This is a difficulty in urinating which results in a decrease in normal urinary flow. Pollakiuria: These are too frequent urinations and low volume without modification of the diuresis.

Urgency: The patient is forced to urinate as soon as he perceives the need.

Urinary burning: it is a burning pain felt during urination.

AUBR: It is a total and sudden inability to perform urination when the needs arise.

CIUBR: It is the impossibility of completely emptying the bladder after urination, it can be with or without distention. If the post-voiding residual <300 ml (without distension); ≥300 ml (with distension).

CCUBR: It is a total impossibility to perform urination in a patient with a long history of dysuria. The circumstances of occurrence: circumstance having contributed to the genesis of the iatrogenic stricture of the urethra (history of endourethral manipulation, prolonged wearing of a urethral catheter, prostate surgery, and endoscopic surgery).

Biology:

CBEU + Culture: cytobacteriological examination of urine in search of germs by direct examination and by culturing identified germs and sensitivity to antibiotics.

Creatininaemia: Blood concentration of creatinine, it allows the study of global renal function expressed in micromole/ml.

Imaging:

RUC + VCU: Allows the characteristics of the stenosis to be established (site, extent, degree of stricture, number).

- **The seat of the stenosis:** That is to say the urethral segment affected by the stenosis; the patients were distributed according to the site; either membranate, bulbar, penile or associated.

- **Length:** Corresponds to the length of the stenosis, measured in centimeters or millimeters, the patients were divided into short stenosis and long stenosis.

- **Short stenosis:** Any stenosis <2 cm

- **Long stenosis:** Any stenosis ≥2 cm

- **The number:** The patients were divided according to the uniqueness or the multiplicity of the iatrogenic urethral stricture.

- **The degree of stricture:** Allows the stenosis to be divided into 2: loose stenosis (allowing the contrast product to pass); tight stenosis (not allowing the contrast product to pass).

- **The opening or not of the bladder neck** with formation of the funnel.

- **Evaluation** of post-voiding residue
- Complications of obstruction (fistula, bladder stones, diverticulum, uretero-hydronephrosis, reflux, etc.).

Therapeutic variables: Corresponds to the therapeutic methods used to treat patients.

Medical treatment: All treatments received by patients via the enteral and/or parenteral route during the pre, per and post-operative period. It consisted of administering: Antibiotics; Analgesics; Antispasmodics.

Surgical treatment: Set of surgical gestures that allowed to treat patients; it was: Endoscopic internal urethrotomy; Segmental urethrectomy followed by end-to-end urethrorrhaphy; Urethroplasties with or without pedicled or free flaps.

The duration of hospitalization: This is the time expressed in days that our patients spent in the service. We have broken down these lengths of stay: 0 - 7 days; 7 - 15 days and 15 - 21 days. Ethical consideration: All the sheets were numbered, while respecting anonymity to maintain the confidentiality of the data.

Difficulties:

- Poor maintenance of medical records.
- The no computerization of medical records
- The absence of a urodynamic assessment, in particular the flowmeter.

3. Results

TEXT 1: Distribution of patients according to emergency drainage mode.

In this study, 60% of patients had received emergency cystostomy drainage and 40% had not benefited from any gesture.

4. Discussion

Iatrogenic urethral stricture (IUS) currently occupies a growing place among the other types of urethral stricture (US), due to the too often systematic and immoderate use of the urethral catheter and the development of transurethral endoscopy. From January 1, 2012 to December 31, 2017, we collected 1200 cases of urethral strictures. Among them, 30 cases of IUS were the subject of our study with a proportion of 2.5% of iatrogenic urethral stricture (**Figure 1**) out of all urethral strictures.

Our results are lower than those found by S. Guirassy *et al.* [7] in 2001 who reported 22 cases of IUS over 9 years, (4.20%) of IUS out of all US. This difference can be explained by the duration and the small size of our sample.

The age of our patients ranged from 5 to 86 years with an average age of 62.33 years, IUS can occur at any age, in children, adults and the elderly after a urogenital gesture. However, in our study, the most affected age groups were 71 to 80 years old with a frequency of 33.33% followed by that of 61 to 70 years old with a frequency of 26.67% (**Table 1**).

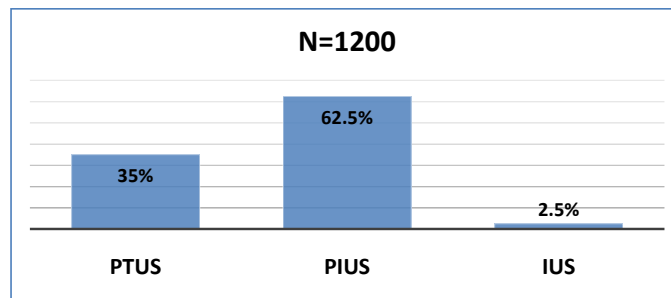


Figure 1. The frequency of iatrogenic urethral stenosis compared to other urethral strictures.

Table 1. Distribution of patients by age.

Age (year)	Number	Percentage
≤40	3	10
41 - 50	3	10
51 - 60	3	10
61 - 70	8	26.67
71 - 80	10	33.33
>80	3	10
Total	30	100

Average Age = 62.33 ans **Extreme Age** = 5 and 86.

Our results are different from those found in Côte d'Ivoire in a urology department whose average age was 55 years, but with a maximum peak between 60 - 80 years [8] [9]; In a similar study in Togo [10], 95 patients were registered and the mean age was 44.71 ± 18 years with extremes of 16 and 87 years. And in Kenya [11], the average age was 42.7 years. The predominance of these age groups could be explained by the fact that iatrogenic urethral stricture can strike at all ages.

The main symptom of iatrogenic stenosis was the dysuria present in all our patients (Figure 2). Data on urethral stricture in developing countries differ from literature data from developed countries [12]. Thus, in these countries almost all of the patients are admitted to a specialized structure at the stage of pure dysuria, according to a study published in 2011 in AUA-SI (American Urological Association–Symptom Index) which notes that the clinical picture was dominated by dysuria [13].

In our studies, this form was associated with other symptoms such as Pollakiuria (50%), Urgenturia (33.33%), burning while urinating (16.67%).

Chronic bladder urinary with 50% or 15 cases followed by acute bladder urinary retention with 10% or 3 cases, requiring emergency urinary drainage by suprapubic catheterization (Figure 2).

In our series, urethral catheterization was the most frequent source of IUS 60% (Table 2). Our results are superior to those of H. BOUJNAH [12], who noted that urethral catheterization was the cause of IUS in 15.78% of cases (n = 100).

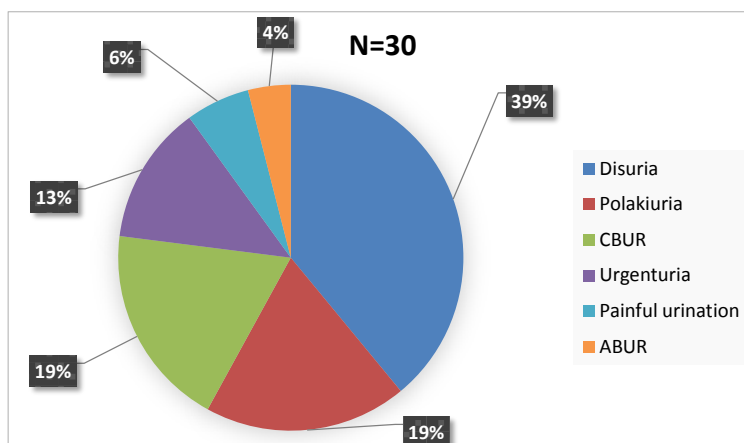


Figure 2. Distribution of patients according to the reasons for consultation.

Table 2. Distribution of patients according to the circumstances of occurrence.

Circumstances of occurrence	number	Percentage
□TURB	2	6.67
Uréthral catheterisazion	18	60
Prostatic Adénomectomy	10	33.33
Total	30	100

Transurethral resection of the bladder.

Some authors have concluded that the most important etiologies of urethral strictures were of iatrogenic origin (45%) and they were dominated by urethral manipulations (trauma by catheterization, trans-urethral interventions, correction of hypospadias, prostatectomy, brachytherapy) [14] [15]. This finding was the same in many series [14] [16] [17]. Iatrogenic causes are most often due to endoscopic maneuvers [18].

The latex Foley catheter was the most used in our patients 50%. Raibaut [19] in his study recommends the use of hydrophilic catheters because they limit friction on the urethra during catheterization, which would result in a reduced risk of IUS. This type of material was not commonly used in our patients because of its high price.

Apart from the nature of the material used, the technique of placing an indwelling catheter can also be the cause of the stenosis (Table 2). Numerous studies have demonstrated the value of proper training of medical and paramedical personnel in reducing complications related to endourethral maneuvers, in particular the occurrence of IUS [20] [21] [22]. A correct application of all these preventive measures would certainly allow a better standardization of endourethral maneuvers so as not to transform them into harmless acts.

All our patients had benefited from a cytobacteriological study of urine (CBSU). Culture was sterile in 80% of cases and positive in 20% of cases.

In this study, E. Coli was the most found germ 50% (3 cases), followed by Klebsiella 33.33% (2 cases) and staphylococci 16.67% (Table 3).

Table 3. Distribution of patients according to Cytobacteriological examination of Urine (CBEU).

CBEU	Numbers	Percentage
<i>E. coli</i>	3	50
Staphylocoques	1	16.67
Klebsiella	2	33.33
Culture stérile	24	80
Total	30	100

In the series of Ouattara Z. and Coll. [23], 39 patients, (57.4%), had urine colonized by germs, of which *Escherichia coli* was the most found with 12 cases, (17.6%).

Many of our patients were seen after multiple treatment attempts (mainly untimely antibiotic therapy).

It would be beneficial for these patients to benefit from early diagnosis and effective management to avoid associated infectious complications.

In our series we found an increase in serum creatinine in 15 of our patients (50%), and 15 other patients had normal serum creatinine (Table 4), whereas P. Barnaud and Coll. [24] estimated the frequency of chronic renal failure at 11.53%. On the other hand, other authors [25] report its extreme rarity. H. BOUJNAH [12] described one case out of a series of 100 files.

Above all, in this case, we should emphasize the importance of early diagnosis and treatment, as it is true that this complication poses difficult therapeutic problems due to the very fact of its impact on the general condition of the patient.

In our study, all our patients had benefited from the RUC/VCU. The confirmation of the diagnosis of urethral stenosis using radiological examination (RUC/VCU), allowed us to specify the seat of the stenosis in relation to the different anatomical segments of the urethra, its length, the number, the degree of stricture, the importance of upstream dilation and its repercussions especially on the bladder.

It appears from our study that the attack of the bulbar portion of the urethra was the most frequent with 22 cases or 73.34% followed respectively by the penile + membranous urethra, Penile + bulbar and membranous urethra (Table 5). Our data were superior to those of K.H. Sikpa *et al.* [26], who reported in their series that the bulbar urethra was the most affected with 67.6% of cases, and those of A.

C. Ze Ondo [3] who reported respectively 42.6% and 54% of cases of bulbar stenosis

In this study, the degree of stricture was less tight 73.33% (22 cases) allowing the contrast product to pass in the majority, and 26.67% of tight strictures not allowing the contrast product to pass (Table 6).

Table 4. Distribution of patients according to renal function.

Créatinin in $\mu\text{mol/l}$	Numbers	Percentage
62 à 124	15	50
124 à 200	14	46.67
>200	1	3.33
Total	30	100

Table 5. Distribution of patients according to the site of iatrogenic urethral stricture.

Site of de la IUS	Number	Percentage
Bulbar	22	73.34
Pénile + Membranous	4	13.33
Pénile + Bulbar	3	10
Membranous	1	3.33
Total	30	100

Table 6. Distribution of patients according to the degree of stricture of the iatrogenic urethral stricture.

Degree of stricture of the IUS	Number	Percentage
Not tight allowing the product to pass through Contrast	22	73.33
Very tight not allowing the product to pass Contrast	8	26.67
Total	30	100

The urethral stenosis with single lesion type was largely majority with 23 cases (76.67%) and multiple in 23.33% of cases (**Table 7**). As for the uniqueness of the narrowing, the same observation had been made in the series of Benjelloun [16], of N'démanga Kamoune [27], and also in those of Mhiri and Coll. [28], who had carried out their research on 158 cases, of which 135 cases presented single strictures, against 23 cases of multiple strictures. Giannakopoulos from Kammenos [29] in Greece found 53 cases of single stricture out of 70 cases. These results are comparable to our result.

The length of the short stenosis was the most represented with 24 cases or 80% against the long stenosis 6 cases out of a total of 30 patients (**Table 8**). SANTUCI and Coll [30] found a comparable result with an average length of 1.5 cm. It should be noted that the length of the stenosis plays an important role in the therapeutic choice.

On the therapeutic level of iatrogenic urethral strictures, the treatment was essentially surgical and several techniques were performed. Endoscopic internal urethrotomy alone was the most performed surgical technique in 23 cases (76.67%), followed by segmental urethrectomy associated with end-to-end urethrorrhaphy in 4 cases, 13.33% (**Table 9**). This frequency has been found by many authors (**Table 10**).

Table 7. Distribution of patients according to the number of iatrogenic urethral stricture.

Number of stricture	Number	Percentage
one	23	76.67
Multiple	7	23.33
Total	30	100

Table 8. Distribution of patients according to the extent of iatrogenic urethral stenosis.

Length of the Stenosis	Number	Percentage
Short stenosis < 2 cm	24	80
Long stenosis \geq 2 cm	6	20
Total	30	100

Table 9. Distribution of patients according to surgical treatment.

Surgical treatment	Number	Percentage
Endoscopic internal urethrotomy	23	76.67
Segmental urethrectomy + Terminal-terminal urethroraphy	4	13.33
Ur�throplasty in 1 time	1	3.33
Ur�throplasty in 2 times	2	6.67
Total	30	100

Table 10. Distribution of patients by length of hospital stay.

Hospitalisation stay	Number	Percentage
0 - 7 days	9	30
7 - 14 days	17	56.67
14 - 21 days	4	13.33
TOTAL	30	100

Average duration = 9.6 days **Extreme** = 3 - 16 jrs.

Leremboire H. *et al.* [31] in France reported 115 out of 142 patients treated by this method. H. BOUJNAH *et al.* [12] in Tunisia recorded out of 162 procedures performed, 105 cases of EUI.

The high frequency of patients treated with EUI in this study would be linked to the preponderance of short, loose, single strictures without periurethral fibrosis.

However, its ease, its speed, its application at any age, its low cost compared to urethroplasties, its effectiveness for few serious complications are factors that have contributed to its dissemination and its use as first-line treatment in the management of urethral stricture iatrogenic [9].

5. Conclusions

Iatrogenic urethral stricture currently occupies an increasing place among the

other types of urethral strictures, due to the too often systematic use of the urethral catheter and the development of transurethral endoscopy.

The circumstances of occurrence of iatrogenic urethral strictures were dominated mainly by urethral catheterization and the latex Foley catheter was the most used.

Retrograde urethrocytography coupled with voiding cystourethrography was the reference examination for diagnosis. Endoscopic internal urethrotomy was the most performed surgical technique, followed by segmental urethrectomy associated with end-to-end urethrorrhaphy.

Iatrogenic urethral stricture could be avoided by improving the quality of care including urethral catheterizations, and transurethral endoscopic maneuvers.

Conflicts of Interest

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

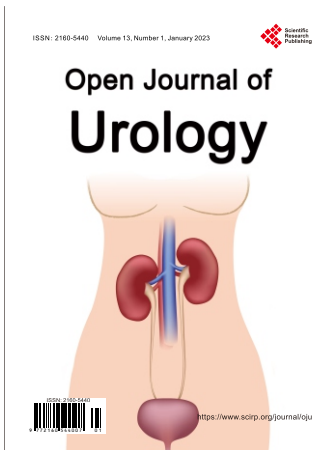
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ISSN 2160-5440 (Print) ISSN 2160-5629 (Online)

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