

# Archivio Italiano di Urologia e Andrologia

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**Medline/Index Medicus  
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## Urological and Andrological Sciences

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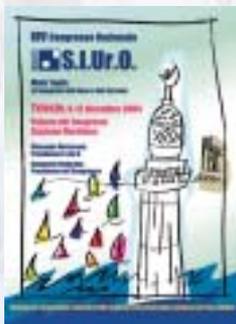
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# Role of nephron sparing surgery in the treatment of centrally located renal tumors.

Giuseppe Martorana, Santo Lupo, Eugenio Brunocilla, Sergio Concetti, Michele Malizia, Emmanuele Vece

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## Summary

**Objectives:** In recent years many long-term data have suggested that nephron sparing surgery can be considered as an effective method of treatment also in patients with small, solitary, unilateral renal cell carcinoma and a normal contralateral kidney. Generally, partial nephrectomy is performed for peripheral tumors and usually is limited to imperative indication for central tumors to avoid hemodialysis. We retrospectively evaluate the value of tumor location on technical and oncological results, particularly in patients with elective indication.

**Patients and Methods:** Between 1993 and 2002, 112 patients underwent nephron sparing surgery at our institution. The tumor was centrally and peripherally located in 22 and in 90 cases, respectively. The tumor was discovered in 13 (56%) central and in 57 (63%) peripheral tumors incidentally. The indication was imperative in 12 and elective in 10 patients for central group, while it was imperative in 34 and elective in 56 patients for peripheral group.

**Results:** The mean renal ischemia time was longer in central group compared to peripheral group (20.81 versus 18.8 minutes  $p < 0.05$ ) and the collecting system was violated more frequently in central group (53% versus 28%  $p < 0.05$ ). Postoperative complications were higher for central tumors compared to peripheral tumors (18% versus 4%  $p < 0.05$ ) but the ultimate mean serum creatinine level was similar for central and peripheral tumors (1.36 versus 1.22 mg/dl). The mean tumor size was 39.69 mm in central group and 32.77 mm in peripheral group ( $p < 0.05$ ). The mean diameter of central tumors in imperative indication was 42 mm while in elective indication was 32 mm ( $p < 0.05$ ). Pathological tumor stage was T1 to T3 in 18 (82%), 1 (4%) and 3 (14%) cases in central group and in 81 (88%), 6 (7%) and 5 (5%) cases in peripheral group. Grades was 1 to 3 in 4 (18%), 15 (68%) and 3 (14%) cases in central group and in 21 (23%), 61 (66%) and 10 (11%) cases in peripheral group. There was no difference in 5-year cancer specific survival (91% versus 98%) or postoperative local tumor recurrences (9% versus 6%) in central tumors compared to peripheral tumors and there was no local recurrence in elective partial nephrectomy performed in central tumors.

**Conclusions:** Nephron sparing surgery is technically more demanding in patients with central tumors. However there were no significant differences in cancer specific survival and local recurrence between centrally versus peripherally located tumors.

Elective partial nephrectomy can be performed also in patients with central tumors as long as really less than 4 cm.

**KEY WORDS:** Kidney; Carcinoma; Renal cell; Nephrectomy.

## INTRODUCTION

Previously nephron sparing surgery was established as the method of choice for treating renal masses only in patients with solitary kidney, bilateral tumor or impaired renal function.

At present, partial nephrectomy offers excellent long-term survival and low local tumor recurrence rate also in patients with small, solitary, unilateral renal tumor and a normal contralateral kidney.

In fact up to a third of patients with unilateral renal cell carcinoma and a normal contralateral kidney underwent partial nephrectomy (1).

Nephron sparing surgery under an elective indication is generally performed for peripheral tumors.

The role of nephron sparing surgery for central tumors is controversial and is usually performed limited to imperative indication.

We evaluate through a retrospective analysis the impact of tumor location on morbidity, recurrence rate and survival of patients treated with partial nephrectomy.

**PATIENTS AND METHODS**

From 1993 to 2002, 112 patients with renal tumor were treated with nephron sparing surgery at our Institution. Preoperative evaluation included physical examination, urinalysis, complete blood count, serum creatinine measurement, ultrasound, computerized tomography (CT) of abdomen and chest X-ray. Some patients also underwent magnetic resonance imaging (MRI).

Arteriography was performed only in 11.11% of cases, all with imperative indication.

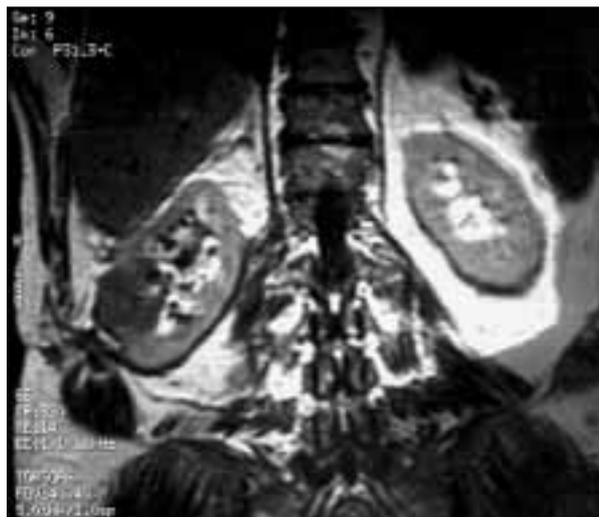
The characteristics of patients are detailed in Table 1. The mean age at surgery was 60.43 years (range 30 to 82 years). The tumor was detected incidentally in 62.5% of cases. In symptomatic tumors hematuria and flank pain was present in 29.62% and 37.03% of cases, respectively. The indication was imperative in 45 patients and elective in 67 patients. In imperative indication a bilateral tumor was present in 23 cases (51%), 16 metachronous and 7 synchronous. The 16 patients with metachronous lesions presented a mean of 8.1 years after contralateral radical nephrectomy.

Of 7 patients with synchronous tumor, 5 underwent radical and partial nephrectomy, 2 underwent bilateral partial nephrectomy.

Tumor location was determined retrospectively by review of computerized tomography (CT) or magnetic resonance imaging (MRI) and operative report.

A central tumor was defined as a lesion extending beyond the renal medulla into the renal sinus (Figure 1). Using this definition the tumor was central and peripheral in 22 and 92 cases, respectively.

The characteristics of patients with central or peripheral tumor are indicated in Table 2. The mean age at surgery



**Figure 1.**  
MRI shows central renal cell carcinoma.

was 62 years (range 31 to 80 years) in central group and 59 years (range 30 to 82) in peripheral group.

The tumor was discovered incidentally in 56% of cases in central group and in 63% of cases in peripheral group. The indication was imperative in 12 and elective in 10 patients for central group while it was imperative in 34 and elective in 56 patients for peripheral group.

Pathological tumor staging was determined according to the 1997 TNM (2) classification, while tumor grade to the method of Fuhrman (3).

Tumor size was reported as maximal diameter of surgical specimen. Our follow-up at 3-month intervals in the first year consisted of urinalysis, serum creatinine and abdominal ultrasound. Abdominal computerized tomography (CT) and chest X-ray were repeated yearly. Mean postoperative follow-up was 5 years (range 1 to 10.8 years).

The 2-sample t tests were used to compare all mean values, a Pearson chi-square test for all percentages and Kaplan-Meier survival curves were used for the end points of overall and disease specific survival.

**Surgical technique**

The principles of nephron sparing surgery included resection of tumor with at least a 0.5 cm margin of normal kidney parenchyma.

**Table 1.**

Data on 112 patients who underwent nephron sparing surgery.

No. pts.	112
Mean age (yrs)	60.43
No. men (%)	74 (66)
No. women (%)	38 (34)
No. incidental detection (%)	70 (62.5)
No. elective (%)	67 (60)
No. imperative (%)	45 (40)

**Table 2.**

Patient characteristics in central and peripheral groups.

	Central	Peripheral
No. pts.	22	90
Mean age (yrs)	62	59
No. men (%)	16 (73)	58 (64)
No. women (%)	6 (27)	32 (36)
No. incidental detection (%)	13 (59)	57 (63)
No. elective (%)	10 (45)	56 (62)
No. imperative (%)	12 (55)	34 (38)



**Figure 2.**  
*Teflon plug for parenchymal compression.*

In central tumors we used a transparenchymal incision. The kidney was completely liberated from fatty tissue and inspected for other possible lesions. At surgery biopsies from the bed of enucleation were not routinely obtained while frozen sections from the tumor base are always taken to verify pathologic negative margins. Ultrasound was done intraoperatively only for suspicious multifocal lesions.

Lymphadenectomy was performed in 1 case and surrenalectomy in 4 cases. The renal artery was occluded in 105 (92%) cases, while 9 (8%) of partial nephrectomy was performed without artery closing. Average ischemia time was 19.43 minutes range (7 to 32). Surface hypothermia with slush ice was necessary in 25 cases (24%). In central group 10 (47%) partial nephrectomy was performed in warm ischemia, while the remaining 12 (53%) cases with surface hypothermia.

In peripheral group partial nephrectomy was performed in 69 (75%) patients with warm ischemia, 14 (15%) with hypothermia and the remaining 9 (10%) with no vascular clamping.

Average ischemia time was 20.81 minutes (range 11 to 32) in central group and 18.8 minutes (range 7 to 30) in peripheral group. The collecting system was violated in 38 (33%) cases and only in one case a double J stent was inserted at surgery.

In central tumors the collecting system was entered in 12 (53%) cases while in peripheral tumors in 26 (28%) cases. Teflon plug was used for parenchymal compression (Figure 2).

**RESULTS**

There were no significant differences between central and peripheral groups in terms of patients age, sex, incidental diagnosis and indication.

The characteristics of central and peripheral tumors are indicated in Table 3.

The mean tumor size was 39.69 mm in central group and 32.77 mm in peripheral group ( $p < 0.05$ ).

The mean diameter of central tumors in imperative indication was 42 mm, whereas in elective indication it was 32 mm ( $p < 0.05$ ).

Pathological tumor stage was T1 to T3a in 18 (82%), 1 (4%) and 3 (14%) cases, in central group and in 81 (88%), 6 (7%) and 5 (5%) cases, in peripheral group.

Grade was 1 to 3 in 4 (18%), 15 (68%) and 3 (14%) cases in central group and in 21 (23%), 61 (66%) and 10 (11%) cases, in peripheral group.

Frozen sections showed negative surgical margins in all cases. There were no statistical differences between central and peripheral groups in terms of tumor stage and tumor grade.

Table 4 represents a comparison of central versus peripheral tumors in terms of renal artery occlusion, ischemia time and collecting system entry.

All partial nephrectomy in central group was performed with renal arterial occlusion while in peripheral tumors 9 cases (10%) was performed without vascular clamping.

The percentage of partial nephrectomy performed with surface hypothermia in central group was statistically significant compared with peripheral group (55% versus 17%  $p < 0.05$ ).

**Table 3.**

*Tumor characteristics in central and peripheral groups.*

	Central	Peripheral
Mean tumor size (mm)	39.69	32.77
<b>No. Tumor stage</b>		
T1	18	81
T2	1	6
T3a	3	5
<b>No. Tumor grade</b>		
G1	4	21
G2	15	61
G3	3	10

**Table 4.**

*Partial nephrectomy surgery results.*

	Central	Peripheral	p Value
No. Partial nephrectomy with surface hypothermia (%)	12 (55)	14 (17)	$P < 0.05$
Renal ischemia time (min)	20.81	18.8	$P < 0.05$
No. Collecting system entry (%)	12 (53)	26 (28)	$P < 0.05$

The mean renal ischemia time was longer in central group compared to peripheral group (20.81 versus 18.8 minutes  $p < 0.05$ ).

The collecting system was violated more frequently in central group compared to peripheral group (53% versus 28%  $p < 0.05$ ).

The postoperative mean serum creatinine value was higher in patients with central versus peripheral tumors (1.88 versus 1.34 mg/dl) but not statistically significant. Complications correlated to surgery occurred in 8 patients (7%). Of 4 (18%) patients with central tumor 1 had a urinary fistula, 1 an arterovenous fistula, 1 a delayed bleeding and 1 underwent transient hemodialysis. Of 4 (4%) patients with peripheral tumor 3 had a delayed bleeding and 1 underwent transient hemodialysis. The percentage of complications was greater in central group compared to peripheral group (18% versus 4%  $p < 0.05$ ).

At the last follow-up mean serum creatinine level in central group was 1.36 mg/dl (range 0.9 to 4 mg/dl) with 2 cases (9.09%) of chronic renal failure; in peripheral group mean serum creatinine level was 1.22 mg/dl (range 0.67 to 3.3 mg/dl) with 5 cases (5.55%) of chronic renal failure.

The differences in terms of chronic renal failure between the groups was not statistically significant.

Table 5 shows a comparison of central versus peripheral tumors for local recurrence and survival.

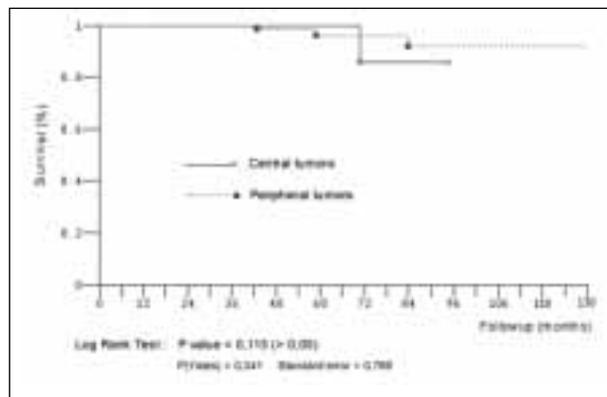
Local tumor recurred in 2 of 22 patients (9%) with central tumor, both with imperative indication, at postoperative intervals of 55 and 50 months; in both cases a radical nephrectomy was performed and patients died after 14 and 24 months for pulmonary and bone metastases. In peripheral tumor local recurrences developed in 5 of 90 patients (6%), 4 with elective indication and 1 with imperative indication at postoperative intervals of 19, 16, 16, 24 and 53 months; 4 patients underwent radical nephrectomy and 1 patient underwent immunotherapy with interferon; two patients died for pulmonary metastases after 66 and 26 months; 1 patient died for colon cancer after 11 months; the remaining two patients are alive without evidence of malignancy.

At the latest follow-up overall and cancer specific survival rate was 86% and 91% in central group and 97% and 98% in peripheral group.

The differences in terms of local recurrence and cancer specific survival between central and peripheral tumors were not statistically significant.

Figure 3 shows the Kaplan-Meier curves for cancer specific survival in patients with central and peripheral tumor.

**Figure 3.**  
Kaplan-Meier cancer-specific survival curves of patients with central and peripheral tumor.



**DISCUSSION**

For many years nephron sparing surgery has been used as the only alternative to radical nephrectomy in patients with bilateral renal cell carcinoma, tumor involving in a solitary kidney, chronic renal failure.

In this cases several large studies have reported 5-years cancer specific survival rates of 84 to 90% with a local tumor recurrence rates of 4 to 9% (4-7).

Novick recently reported under imperative indications a 10-years cancer specific survival of 73% with a local recurrence rate of 10% (8).

Furthermore, no significant difference was observed in terms of cancer specific survival in patients treated with either radical or partial nephrectomy, particularly for low stage renal cell carcinoma (9, 10).

Encouraged by these results the urological community have expanded the indications for nephron sparing surgery to include patients with a normal contralateral kidney. The results achieved in this setting show a 5 and 10-years cancer specific survival rate of 98% (11) and 97% (12) respectively with a local recurrence rate of 0% to 1.6% (11-13).

Furthermore a 5-years cancer specific survival of 100% with no local recurrence is reported in patients with elective indication and tumor less than 4 cm (13, 14).

This long-term data justifies partial nephrectomy even when the contralateral kidney is normal.

Generally nephron sparing surgery is performed for peripherally located tumors and previously was considered inaccessible for central tumors except under imperative indication. The aim of this study was to evaluate whether the location of the tumor was a significant factor for technical and oncological outcome.

**Table 5.**  
Nephron sparing surgery outcome.

5-year survival	Central	Peripheral	p Value
Overall survival (% patients)	86	97	P > 0.05
Cancer specific survival (% patients)	91	98	P > 0.05
No. local recurrence (%)	2(9)	5 (6)	P > 0.05

Hafez et al. reported the results of partial nephrectomy for centrally located tumors (15). They showed an increased ischemia time in central tumors compared to peripheral tumors (55 minutes versus 34 minutes,  $p < 0.05$ ) and an increased incidence of collecting system violation (74 versus 47%,  $p < 0.05$ ).

However there was no significant difference in the incidence of complications and the ultimate postoperative mean serum creatinine level was equal in both groups. Moreover the 5-years cancer specific survival was 100% for central and 97% for peripheral tumors. Hafez concluded that there are no significant biological differences between centrally versus peripherally located renal cell carcinomas.

Thuroff (16) recently reported that there are no differences between cases overall versus those with central tumor in terms of frequency of collecting system violation (30% versus 33%) and mean ischemia time (21 versus 23 minutes). The complication rate was lower in the overall group (7.4%) compared with the central tumor group (12.1%). However the 5-years cancer specific survival was 69% with a local tumor recurrence rate of 7% in central tumors. Thuroff concluded that partial nephrectomy for centrally located tumors is technically feasible with an acceptable complication rate. The local tumor control is comparable to that of peripheral tumors and the overall prognosis depends on contralateral disease and metastasis.

Our data show that nephron sparing surgery for central tumors is technically more demanding compared to peripheral tumors. In fact the percentage of partial nephrectomy performed with surface hypothermia was higher in central versus peripheral group (55% versus 17%  $p < 0.05$ ) so as the renal ischemia time (20.81 versus 18.8 minutes  $p < 0.05$ ).

The collecting system was entered more frequently during excision of central tumors versus peripheral tumors (53% versus 28%  $p < 0.05$ ) and the rate of complications was major in central versus peripheral group (18% versus 4%  $p < 0.05$ ).

However the ultimate mean serum creatinine level was similar for central and peripheral group (1.36 versus 1.22 mg/dl) and there are no significant differences in terms of chronic renal failure.

Following surgical treatment there was no difference in 5-year cancer specific survival (91% versus 98%) or postoperative local tumor recurrences (9% versus 6%) in central tumors compared to peripheral tumors.

Furthermore there was no local recurrence in elective partial nephrectomy performed in central tumors.

In conclusion, partial nephrectomy in central tumors is feasible even if technically more complicated and with a higher complication rate than in peripheral tumors.

The location of tumor within the kidney do not influence the cancer specific survival or the incidence of local recurrences. Elective nephron sparing surgery for central tumors should be reserved to selected patients with tumor size clearly less than 4 cm to avoid local recurrences.

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# The choice of urinary drainage in patients with ureteral calculi of solitary kidneys.

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## Summary

*Purpose: To evaluate the safety and efficacy of the treatment of patients with ureteral calculi of solitary kidneys (UCSK) in relation to the modality of urinary drainage. Materials and Methods: We have studied a total of 55 patients with UCSK during the period from 1999 to 2002, 15 of them (27.3%) with radio-opaque calculi (ROC). The group included 13 female and 42 male patients, aged 36 to 62 years. In 24 (43.6%) patients the stone treated represented the first stone episode. The stones were mainly located in distal ureter (in 39 patients, 70.9%). Stone size was heterogeneous, with the majority of the patients (26 patients, 47.3%) having calculi no more than 5 mm wide. In 41 patients (74.5%) reasons for early intervention occurred such as urosepsis, persistent ureteral obstruction and acute pyelonephritis with anuria. The patients were divided in 2 groups of patients in accordance with the modality of urinary drainage: 30 (54.5%) patients with double-J stent (group A) and 25 (45.5%) with percutaneous nephrostomy (group B). After carrying out conservative methods for stone passage in all patients, we performed extracorporeal lithotripsy (ESWL)(1-3 treatments) in 40 (72.7%) patients. After ineffective stone removal we used instrumental procedures, such as ureteroscopy (with electrohydraulic or ultrasonic lithotripsy). Results: The spontaneous passage rate of UCSK after conservative treatment and ESWL was obtained in 23 (76.7%) patients of the group A and in 21 (84.0%) patients of the group B. In 7 (23.3%) cases with ROC we observed acute back pain and anuria when the double-J stent was removed after ESWL. Ureteroscopy was performed in all such patients. Percutaneous nephrostomy was placed in 5 patients with ROC before endoscopic manipulation. In 2 cases with ROC we performed ureteroscopy without previous nephrostomy but urosepsis and intractable pain occurred. Electrohydraulic endoscopic lithotripsy was performed in 4 (16.0%) cases of group B after ineffective ESWL. Ineffective result of ESWL could be explained by the sacro-iliac location of the stone in such cases. Conclusions: Placement of percutaneous nephrostomy in patients with radio-opaque ureteral calculi in solitary kidney could give us a chance to make the lithotripsy easier. We showed the feasibility of endoscopic manipulation of the ureter in solitary kidneys preventing open surgical intervention.*

**KEY WORDS:** Solitary kidney; Ureteral stones; Ureteral stent; Percutaneous nephrostomy; Extra corporeal shock wave lithotripsy; Ureterolithotripsy.

## INTRODUCTION

In present days the basic modern methods of stone treatment are: ESWL and endoscopic treatment. Open surgery is now carried on rarely. The choice of the method of treatment depends on localization, size and number of calculi and, of course, on peculiarities of their mineral structure and on urinary tract anatomy, functional status of the affected kidney and activity of the inflammatory process (1-4). The most difficult stone patients are those with solitary kidney. As showed by

several Authors (5-7), obstructive anuria developed in 49.5% of patients with calculi in solitary kidneys and in 75.0% patients with ureteral stones in solitary kidneys. For this reason an active tactic of treatment is requested with the purpose of preventing obstructive anuria and inflammatory process.

It is necessary to begin the treatment of such patients with the drainage of the solitary kidney. This procedure often promotes the spontaneous passage of the stone

with resolution of anuria. In unsuccessful cases, after conservative approach we used to perform percutaneous nephrostomy (8).

Use of an ureteral catheter (stent) before ESWL in the patients with ureteral calculi of solitary kidneys is still controversial. Ureteral stenting prevents many complications such as ureteral obstruction by stone fragments after ESWL and related obstructive symptoms and pyelonephritis.

On the contrary, potential side effects of stenting are irritative symptoms and bladder discomfort, stent migration, vesicoureteral reflux and stent incrustation (9).

At present days, according to American literature, stent was used in 28% of patients with stone size of about 1.0 cm, in 57% with 1.5 cm size and in 87% with 2.0 cm size. As some Authors wrote (6, 10), preliminary placement of a stent or percutaneous nephrostomy before ESWL is not the only modality of treatment and does not show the best results.

In fact, there are controversial opinions about using stent or percutaneous nephrostomy in patients with ureteral stones of solitary kidney (6, 11).

According to the most recent achievements in the field of stone treatment (6, 7, 12), contact and remote lithotripsy (3, 12, 14) are extremely actual problems and we are still looking for the best treatment of patients with ureteral calculi in solitary kidneys. What stated above confirms the necessity to address the future research and the request of serious scientific developments.

The purpose of this research was to estimate the results of the treatment of patients with ureteral stones of solitary kidneys, based on the principle of preventive urinary drainage as the only correct method of treatment.

## MATERIALS AND METHODS

We considered 55 patients with ureteral stones of solitary kidneys observed in the period from 1999 till 2003. Twenty-nine (53%) patients out of this group lost one kidney after operation for nephrolithiasis, in other 20 (36%) patients nephrectomy was performed for different diseases (hydronephrosis, tuberculosis, RCC, renal trauma). Renal agenesis was present in 6 (11%) patients. Radio-opaque calculi (ROC) were observed in 15 (27%) patients. Patients were divided according to the size and location of stones. The stone size was less than 5 mm in 26 (47%) patients, from 5 mm up to 10 mm in 23 (41%) and more than 10 mm in 6 (10%). Stones of the upper ureter were 9 (17%), of mid ureter 6 (11%) and of lower ureter 39 (72%). Obstructive anuria was present in 41 (75%) patients, acute pyelonephritis in 19 (35%). According to the modality of urinary tract drainage, patients were divided in two groups. The first group included 30 (54%) patients treated with ureteral stenting (ureteral catheter stent, Brauns company, 6 F, stent length depending on the size of the patient). Stent was placed under intravenous anesthesia in men and without anesthesia in women). Ten (18%) patients had radio-opaque calculi. The second group included 25 (45%) patients treated with percutaneous nephrostomy (basically we

used nephrostomy drainage of Rüsck company, 6 F and 8 F). The treatment modalities offered to our patients were: conservative treatment as initial approach in all patients, and as monotherapy in 15 (20%) patients. In 40 patients (80%) we performed also ESWL (using the device of Siemens company, "Lithostar", Multiline 3B), from 1 up to 3 treatments. After unsuccessful conservative treatment and ESWL we preferred endoscopical urological procedures.

## RESULTS

In the first group of patients 23 (76%) stones were passed after the initial conservative therapy (CT) or after EWSL. In 7 (24%) patients with radio-opaque calculi after the removal of ureteral catheters renal colic and obstructive anuria occurred. Percutaneous nephrostomy or ureteroscopy were performed in this group.

In the second group unsuccessful results of CT or ESWL were observed in 4 (16%) patients. Ureteroscopy with contact lithotripsy was also performed in those patients.

Unsuccessful results of ESWL were observed in patients with sacro-iliac location of the stone (at level of sacroiliac joint) and in patients with radio-opaque calculi (ROC). We preliminary placed stents in patients with ROC in complicated location.

In 5 (71%) patients with ROC after preliminary stent placement and ESWL we performed percutaneous nephrostomy and ureteroscopy, in 2 patients (29%) we performed ureteroscopy without nephrostomy, but further we observed acute renal failure.

## CONCLUSIONS

We can conclude that the placement of percutaneous nephrostomy in patients with ureteral ROC in solitary kidneys can give us a better chance to locate stones facilitating ESWL.

Also, we carried on endoscopical urological manipulations in this group of patients for minimizing the risk of main serious complications. Common sense indicates us to evaluate such interesting and suggestive experience in the future.

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# Proposed urodynamic pressure-flow nomogram to diagnose female bladder outlet obstruction.

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## Summary

**Objective:** To investigate female bladder outlet obstruction by urodynamics and create a nomogram to propose in clinical applications. **Patients and Methods:** We investigated by urodynamic studies 200 women referred for lower urinary tract symptoms. A total of 179 patients were available for analysis: 136 served as control and 43 as obstructed. The following urodynamic variables were studied and compared in both groups: Free peak urinary flow (Free Qmax), intubated peak urinary flow (Qmax P/F), Free voiding time, pressure-flow voiding time, Detrusor pressure at peak flow rate (PdetQmax), Maximum detrusor pressure (PdetMax), Free postvoiding residual, Pressure-flow postvoiding residual. All data are presented according to descriptive statistics as mean and standard deviation (SD). Comparisons between the control and between the obstructed group were performed by means of Student's t test for equality of means.  $p < 0.01$  were considered significant. By creating ROC curves we calculated sensitivity, specificity, and positive and negative predictive values in all the patients data to derive the optimal combination of Maximum flow together with detrusor pressure at max flow, and Maximum flow together with Maximum detrusor pressure. **Results** Free peak urinary flow (Free Qmax) was  $26.6 \pm 11$  ml/seconds for the control and  $10.9 \pm 3.6$  ml/seconds for the obstructed group ( $p < 0.001$ ). Qmax P/F were  $22 \pm 8.7$  cm water in the control group and  $10 \pm 3.9$  cm water in the obstructed group ( $p < 0.001$ ). Free voiding time were in both  $28.2 \pm 15$  seconds and  $48 \pm 24$  seconds ( $p < 0.001$ ) respectively; P/F voiding time were  $41.4 \pm 21$  seconds and  $78.2 \pm 52$  seconds ( $p < 0.001$ ) respectively. PdetQmax in control and obstructed group were  $17.2 \pm 11.3$  and  $27.6 \pm 12.5$  cm water ( $p < 0.001$ ) respectively. PdetMax were  $25.2 \pm 14.0$  and  $39.4 \pm 18.9$  cm water ( $p < 0.001$ ) respectively. Free postvoiding residual  $25.1 \pm 37.4$  and  $74.6 \pm 79.3$  cc ( $P < 0.001$ ). P/F postvoiding residual were respectively  $24.9 \pm 44.7$  and  $96.0 \pm 102.6$  cc ( $p < 0.001$ ) All the differences among the variables investigated in both groups were statistically significant. We calculated sensitivity, specificity, and positive and negative predictive values. According to receiver operating characteristics (ROC) curve analysis, the overall combining values of free max flow rate of 13 ml/sec or less and detrusor pressure at max flow rate of 22 cm water or greater we obtained a sensitivity of 55.8%, a specificity of 96.3%, a positive predictive value of 82.8% and a negative predictive value of 87.3%. Moreover we combined Max flow rate of 13 ml/sec and Maximum detrusor pressure of 38 cm water to obtain a sensibility of 48.8%, a specificity of 99.3%, a positive predictive value of 95.5% and a negative predictive values of 86%. **Conclusions.** Diagnosing female BOO is a challenge condition and an accepted pressure-flow nomograms are still missing. We propose our nomogram as a valid and reliable tool to investigate female bladder outlet obstruction.

**KEY WORDS:** Urodynamics; Female bladder outlet obstruction; Uroflowmetry; Pressure-flow studies.

## INTRODUCTION

Female lower urinary tract obstruction is an uncommon condition, ranging between 2.7 and 8% (1). Nevertheless its real incidence remains unknown because reliable diagnostic criteria have not yet been established. Usually

lower urinary tract obstruction in female is a consequence of anti-incontinence surgery, pelvic prolapse, learned voiding dysfunction and, less commonly, due to primitive obstruction of bladder neck. A clinical suspicious of

female lower urinary tract obstruction is based on reported symptoms of poor flow, hesitancy, stranguria, abdominal straining, voiding in upright positions, intermittent stream and urinary retention other than irritative symptoms, i.e. urgency, frequency, nocturia and recurrent urinary infections. Unfortunately the aforementioned symptoms are not pathognomic in obstructed patients, because they are present in patients with hypoactive bladder as well. Diagnostic criteria of this condition are object of many controversies, and so far most of therapies applied to female lower urinary tract obstruction is based on empirical experience. Clinical, endoscopic and radiographic evaluations of female BOO are not always satisfying and sometimes may be misleading. Some authors have proposed urodynamic nomograms in order to detect a condition of BOO as in a standard fashion as in males. But controversies are aroused throughout, since voiding behaviour in women is warranted by different mechanisms, such as pelvic muscle relaxation, abdominal straining, active detrusor contraction, or a combination of these factors; so it is difficult to enclose female low urinary obstruction in precise urodynamic criterias (2). On the contrary, it has been demonstrated that bladder emptying in males is due to an active detrusor contraction and is prone to be analysed more reliably. Moreover it is well-known that male BOO is very common as consequence of prostate enlargement, so investigators can study bladder obstruction in huge male population samples. Nomograms such as the Abrams-Griffith or Schaffer, which are specific for investigation of BOO in male, cannot be used to detect the same conditions in females, because voiding detrusor pressures in females are much lower than in males (3-5). Therefore better criteria to define obstruction in women are needed to better treat the different causes of this disease. Chancellor et al. have stated that a conceptual criteria in order to suspect female BOO is a low urinary flow and a detrusor contraction of adequate magnitude, duration and speed at the same time (6). Though these criteria are empirical, we believe they are very useful as a basis to investigate suspicious female lower urinary tract obstruction. Our aim was to investigate women who came to our attention referring lower urinary tract symptoms, to detect bladder outlet obstruction and describe the urodynamic findings and differences between obstructed and unobstructed samples.

## MATERIALS AND METHODS

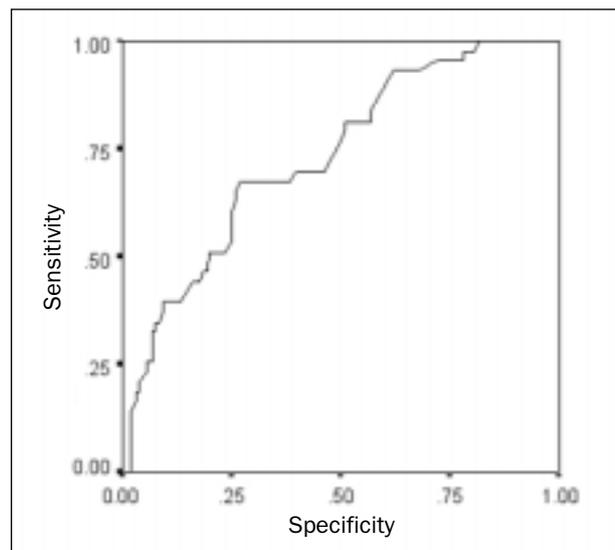
We investigated 200 patients, mean age of  $55 \pm 11$  who referred lower urinary tract symptoms and who underwent multichannel urodynamics. Of the 200 cases, 179 had evaluable pressure-flow studies. The remaining cases were excluded for bad quality of traces, inability of voiding and hypococontractive bladder. Criterias to define bladder hypocontractility were a detrusor contraction of not adequate magnitude, duration and speed and a low urine flow in pressure-flow tracings. Before urodynamics all patients were asked to provide a complete history of their lower urinary tract discomfort and underwent a detailed physical and vaginal examination, other than normal neurological examination, cystourethrography and

**Table 1.**  
*Clinical Characteristics of patients.*

<b>Pts. characteristics</b>	<b>n</b>
Control	136
Obstructed	43
Pelvic prolapse	20
Bladder neck obstruction	2
Learned voiding dysfunction	6
Urethral stenosis	1
Idiopathic	8
<b>Total</b>	<b>179</b>

cystoscopy. In all patients prolapse was defined according to the Half-way system and urethral pathology or inflammation were excluded. Of the 179 traces, we considered 136 women as a control group and 43 as obstructive group. The control group consisted of patients complaining of urinary incontinence who had not previous vaginal or retropubic surgery for incontinence, vaginal prolapse not superior to I grade according the Half-way system, and no urethral pathology based on physical, endoscopic and cystographic findings. Criteria to define the clinical obstructive group were complaining obstructive symptoms. Causes of obstruction according to the etiology were: large pelvic prolapse (n=20) defined as coming out of the introitus at rest (grade III or IV according to half-way system); previous bladder neck suspension (n=6), learned voiding dysfunction (n=6), bladder neck obstruction (n=2), urethral stenosis (n=1) and idiopathic obstruction (n=8) (Table 1). Multichannel urodynamics, free uroflometry, pressure-flow studies (P/F) and superficial perineal electromyography recor-

**Figure 1.**  
*Roc curve of detrusor pressure at peak flow (PdetQmax).*



**Table 2.**Means  $\pm$  standard deviation of urodynamic parameters.  $P < 0.05$  is considered significant.

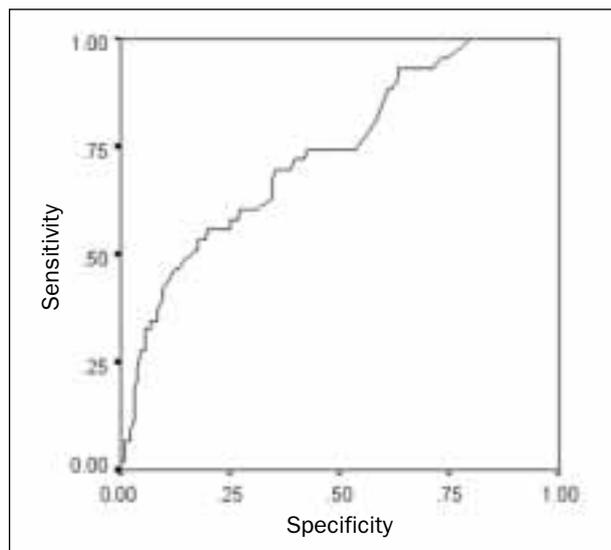
Groups	Obstructed	Control	p
Free Qmax	10.9 $\pm$ 3.6	26.6 $\pm$ 11	<0.001
Free voiding time	48 $\pm$ 24	28.2 $\pm$ 15	<0.001
Free postvoid residual	74.6 $\pm$ 79	25.1 $\pm$ 37	<0.001
Pdet Qmax	27.6 $\pm$ 12	17.2 $\pm$ 11	<0.001
Pdet Max	39.4 $\pm$ 18	25.2 $\pm$ 14	<0.001
Intubated Qmax	10 $\pm$ 3.9	22 $\pm$ 8.7	<0.001
Intubated postvoid residual	96 $\pm$ 102	24.9 $\pm$ 44	<0.001
Intubated voiding time	78.2 $\pm$ 52	41 $\pm$ 21	<0.001

ding (EMG) were obtained in all patients. Urodynamic testing was performed at room temperature (25°) with normal saline. The infusion rate was 50 ml/min. A 10 Fr rectal catheter was used to detect abdominal pressure. Another 10 Fr transurethral catheter was used to fill the bladder and a smooth mono J 4 Fr catheter was used to detect detrusor pressure. The urodynamic transducers were balanced to zero at atmospheric pressure and levelled to the superior border of the symphysis pubis as dictated by International Continence Society (7). After filling the bladder at normal capacity, the filling 10 Fr catheter was removed and the patient voided with the 4 Fr smooth single J catheter only, as not to affect the voiding process. Examinations were performed twice in order to select the best tracing and all the examination (filling and emptying) were performed in a sitting position and in privacy. The free Qmax, voiding time, postvoiding residual urine were recorded and compared with the same variables in both group. Then Pressure/ flow maximum flow rate (P/F Qmax), detrusor pressure at

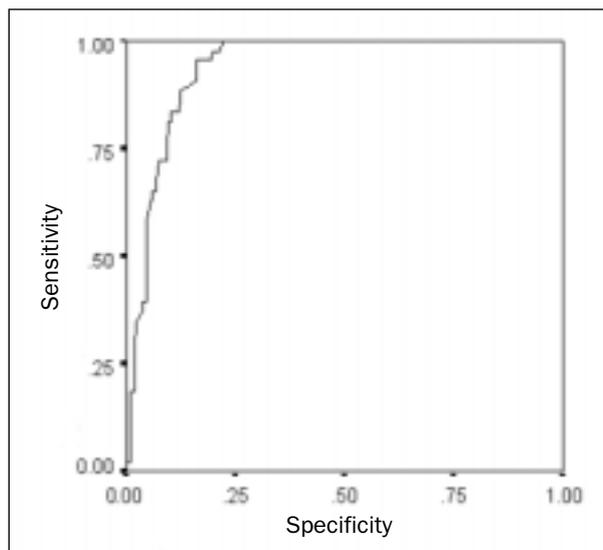
maximum flow (Pdet Qmax), and maximum detrusor pressure were recorded during voiding (Pdet Max), pressure/flow voiding time and pressure/flow postvoiding residual urine were analysed and compared in both groups. Patients who were not able to generate a detrusor contraction of adequate magnitude, speed and duration were excluded as hypocontractive. All traces were analysed manually. Only patients without lower urinary tract diseases, i.e. without bladder and urethral infections, bladder stones and tumors were recruited. All data are presented according to descriptive statistics as mean and standard deviation (SD). Comparisons between control and obstructed groups were performed with the Student's t test for equality of means.  $p < 0.01$  were considered significant. By creating ROC curves we calculated sensitivity, specificity, and positive and negative predictive values in all the patients data to derive the optimal combination of free maximum flow together with detrusor pressure at max flow, and free maximum flow together with Maximum detrusor pressure.

**Figure 2.**

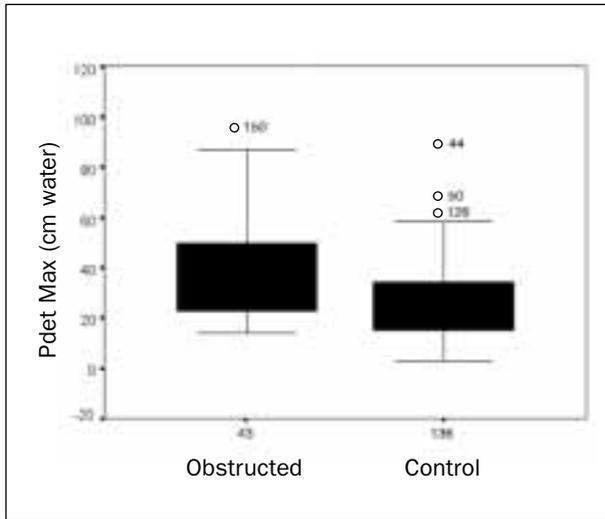
Roc curve of Max detrusor pressure (Pdet Max).

**Figure 3.**

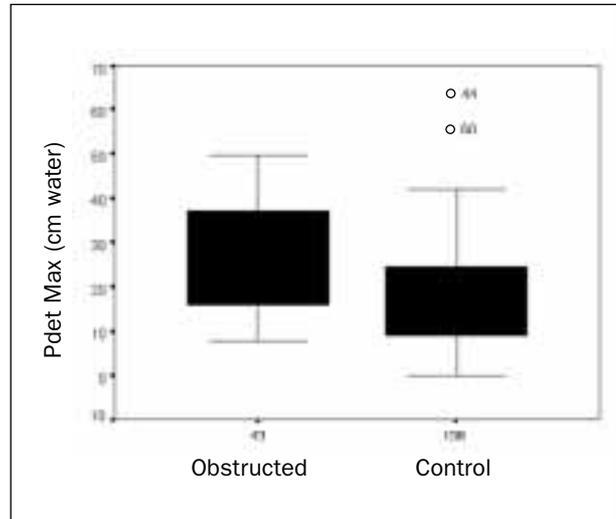
Roc curve of Peak flow rate (Free Qmax).



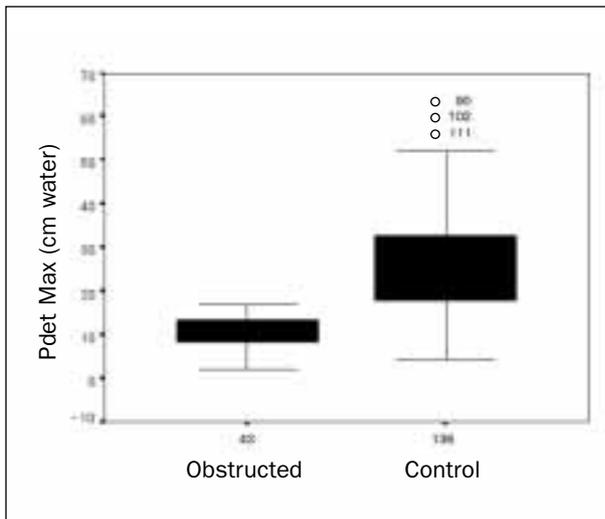
**Figure 4.**  
Boxplot of control and obstructed maximum detrusor pressure.



**Figure 5.**  
Boxplot of control and obstructed detrusor pressure at max flow.



**Figure 6.**  
Boxplot of control and obstructed free maximum flow rate.



**RESULTS**

A total of 179 patients were available for analysis: 136 served as controls and 43 as obstructed. Free peak urinary flow (Free Q<sub>max</sub>) was 26.6±11 ml/seconds for the control and 10.9±3.6 ml/seconds for the obstructed group (p<0.001) (Figure 1 and Table 2). Q<sub>max</sub> P/F were in both groups 22±8.7 cm water in the control group and 10±3.9 cm water in the obstructed group (p<0.001). Free voiding time were in both respectively 28.2±15 seconds and 48±24 seconds (p<0.001); P/F voiding time were 41.4±21 seconds and 78.2±52 seconds, respectively (p<0.001). PdetQ<sub>max</sub> in both control and obstructed groups were 17.2±11.3 and 27.6±12.5 cm water, respectively (p<0.001) (Figure 2). Pdet Max were 25.2±14.0 and 39.4±18.9 cm water respectively (p<0.001) (Figure 3). Free postvoiding residual 25.1±37.4 and 74.6±79.3 cc, respectively

(p<0.001). P/F postvoiding residual were 24.9±44.7 and 96.0±102.6 cc, respectively (p<0.001). All the differences among the variables investigated in both groups were statistically significant. We calculated sensitivity, specificity, and positive and negative predictive values. According to receiver operating characteristics (ROC) curve analysis the overall combining values of free max flow rate of 13 ml/sec and detrusor pressure at max flow rate of 22 cm water or greater we obtained a sensitivity of 55.8%, a specificity of 96.3%, a positive predictive value of 82.8% and a negative predictive value of 87.3% (Figures 4-6 and Table 3). Further we combined Max flow rate of 13 ml/sec and Maximum detrusor pressure of 38 cm water to obtain a sensibility of 48.8%, a specificity of 99.3%, a positive predictive value of 95.5% and a negative predictive values of 86% (Table 4).

**DISCUSSION**

Male bladder emptying is a well-known mechanism occurring after voluntary relaxation of pelvic floor, followed by a sustained detrusor contraction that opens bladder neck and generates urine flow. As this mechanism has been well established in male, evaluating criteria of obstruction have been assessed as well, and many referring reliable monograms to assess male BOO are available.

On the contrary it is known that female bladder voiding may be the consequence of various different patterns, i.e. simple pelvic floor relaxation, active and sustained detrusor contraction, abdominal straining or both combination, and a precise detection of the female voiding pattern, also in normal patients is not always easy to characterize. Further in many women the bladder emptying is warranted by a normal and sustained detrusor contraction but with very low pressure, i.e. 10-15 cm water or less, and bladder response to obstruction may not be as elevated as in males. Therefore assessing female voiding dysfunction, i.e. bladder obstruction and impaired detrusor function, has always been consi-

**Table 3.***Sensibility, specificity and predictive values of combined free max flow rate and Detrusor pressure at max flow rate.*

<b>Max Flow (ml/sec)</b>	<b>Detrusor pressure at Max flow (cm water)</b>	<b>% Sensitivity</b>	<b>% Specificity</b>	<b>% Positive Predictive Value</b>	<b>% Negative Predictive Value</b>
13 or less	20 or greater	55.8	95.6	80.0	87.2
13 or less	22 or greater	55.8	96.3	82.8	87.3
15 or less	20 or greater	62.8	91.9	71.1	76.0
15 or less	22 or greater	62.8	93.4	75.0	88.8

**Table 4.***Sensibility, specificity and predictive values of combined free max flow rate and Max Detrusor pressure.*

<b>Max Flow (ml/sec)</b>	<b>Detrusor pressure at Max flow (cm water)</b>	<b>% Sensitivity</b>	<b>% Specificity</b>	<b>% Positive Predictive Value</b>	<b>% Negative Predictive Value (ml/sec)</b>
13 or less	28 or greater	58.1	97.1	86.2	88.0
13 or less	38 or greater	48.8	99.3	95.5	86.0
15 or less	28 or greater	65.1	94.9	80.0	89.6
15 or less	38 or greater	51.2	98.5	91.7	86.5

dered a challenge by most investigators. Causes of non-neurogenic female bladder obstruction are several in women. They are distinguished in anatomical and functional. Anatomical causes are consequence of bladder neck obstruction, urethral stenosis, urethral kinking due to a prominent pelvic prolapse, or an excessive angulation of bladder neck due to an overcorrective suspension for urinary incontinence (8-10). Female bladder outlet functional obstruction, very uncommon in males, is due to a learned voiding dysfunction and is very common in adolescent who complain of lower tract obstructive symptoms. It is suspected that these patients with a past history of enuresis, urgency or frequency, learn not to relax pelvic floor when voiding, and develop obstructive voiding pattern. In our series we selected for our evaluation patients complaining of obstructive symptoms, i.e. hesitancy, low urinary stream, abdominal straining, voiding in upright position, post void retention. We also used the free uroflow parameter < 15 ml/seconds to select patients potentially supposed to be obstructed, because relying on a history of only obstructive symptoms for inclusion is restrictive, as it is well known that correlation between obstructive symptoms and objective urodynamics findings is poor. Furthermore, many patients sometimes do not complain of irritative symptoms, presenting at the same time bladder retention or other symptoms deemed to be obstructive (11). In all of these patients, cases of bladder hypoactivity, defined as a missing adequate and a sustained detrusor contraction were excluded. All parameters of free and intubated urodynamic investigations were different with statistical significance between the control and the obstructed groups, i.e. free Qmax and

Pressure flow Qmax, Pressure at maximum flow (PdetQmax), Maximum pressure (Pdet Max), voiding time in both free and P/F tracing and postvoid residual in free and P/F evaluation. Massey and Abrams proposed two or more of 4 parameters, including flow rate less than 12 ml/s, detrusor pressure at peak flow greater than 50 cm water, urethral resistance (detrusor pressure at maximum flow rate/maximum flow rate 2) greater than 0.2 or significant residual urine in presence of high pressure. In their series the incidence of obstruction was 2.74% (12). In our series the mean and standard deviation of detrusor pressure at maximum flow was 27.6 ± 12, whereas in the control group was 17.2 ± 11. For this reason a pressure at peak flow bigger than 50 cm water may exclude a big sample of patients who are probably obstructed and whose detrusor voiding contractions are not able to reach such magnitude and this is the reason why the incidence of female outlet obstruction is considered to be much lower than it probably is. Bass and Leach stated that a peak flow greater than 15 ml/sec, with a voided volume of greater than 100 ml, normal uroflow morphology and no significant postvoid residual can exclude bladder outlet obstruction in females. These results are surely reliable but they do not permit to better investigate a condition of outflow obstruction without considering the voiding pressure as well (13). Nitti et al. referred that patients who underwent urethrolysis for presumed outlet obstruction did equally well in achieving normal voiding and emptying regardless of urodynamic findings of voiding pressure or flow rate independently or together, so the diagnosis of obstruction in this series was based on a empirical combination of history, physical examination radiographic,

endoscopic and urodynamic findings (14). Webster described a series of 52 patients in whom BOO was detected at the level of external sphincter. Although there were differences in voiding pressure and flow between control and obstructed groups, concluded that one cannot draw a sharp division between them based on urodynamic parameters because overlap exists between each parameters regarding obstruction (15). Other authors suggested that urodynamic assessing of bladder outlet obstruction in women is not a reproducible test (16). Chassagne et al. reported cut-off values to define female bladder outlet obstruction. The best cut-off (sensitivity 74.3% and specificity 91.1%) was  $Q_{max} < 15$  and  $P_{det} Q_{max} > 20$  cm water, but, as highlighted by Nitti et al, who had the same results, there was a wide range of values for maximum flow rate (2 to 29 ml/s) and detrusor pressure at maximum flow rate (2.5 to 76.4) cm water in obstructed and unobstructed patients and, though there is a clear difference in means value between flow rate and pressure at maximum flow rate in both groups, there is an enormous range (large standard deviation) for each parameter that can reduce the statistical significance and make the use of cut-off potentially limiting because of low sensitivity (17). In our series we observed a more homogenous distribution of values for parameters considered to be more significant such as maximum flow rate, and our results are very similar to those registered by Chassagne and Nitti in their own studies. Axerol and Blaivas in a group of female patients with bladder neck obstruction enabled a cut off of  $P_{det} > 20$  cm water and a  $Q_{max} < 12$  ml/sec (18). Lemack analysed 87 women with clinical obstructive symptoms and detected a statistical significant difference with a control group of 124 patients, and established a cut-off values of 11 ml/s or less and 21 cm water or more optimized to detect female bladder outlet obstruction. The authors concluded that these criteria can aid to suspect female BOO, but a certain diagnosis is based on clinical and instrumental evaluation, other than urodynamics (19). As realized by other authors, we drew a series of Roc curve in order to extrapolate high sensitive and specific cut-offs to apply in clinics. In our analysis we selected free max flow rate, not to affect the voiding process even though in another study we demonstrated any statistical significant difference between free and intubated flow when using a 4 Fr smooth single J urethral catheter (8). Further we also selected the detrusor pressure at maximum flow and Maximum detrusor pressure not to exclude from analysis patients who are not able to void with urethral catheter as suggested By Groutz et al. (20, 21). Groutz et al. realized a nomogram according to  $P_{det} Max$  and free  $Q_{max}$  subdividing female obstructed patients in 3 major clusters comprising severe, moderate and mild obstruction, and in their study did not find any statistical difference between Detrusor pressure at max flow and Max detrusor pressure, but in our series we found a significant difference. That is the reason why we realized two nomograms combining free flow max/ $P_{det}$   $Q_{max}$ , and free flow max/  $P_{det} Max$ . With a peak urinary flow of 13 or less ml/sec and detrusor pressure at  $Q_{max}$  of 22 cm water or more, we obtained a sensibility of 55.8%, a

specificity of 96.3%, a positive predictive value of 82.8% and a negative predictive value of 87.3%. As observed above, in our opinion the best combination of values selected do not present a very high sensibility, even though the high specificity and predictive values promoted this cut-off as the best in our series. With a free  $Q_{max}$  of 13 ml/sec or less and a max detrusor pressure of 38 cm water or more to obtain a sensibility of 48.8%, but a very high specificity of 99.3%, a positive predictive value of 95.5% and a negative predictive value of 86%. In our series we could have selected other values to obtain a better sensibility, but we decide to privilege specificity. Chassagne and Leach prospectively excluded patients who had an increase of 10 cm water in abdominal pressure during voiding in order not to have an interference with pressure-flow analysis. But in our opinion excluding this population in female BOO urodynamic investigation means not to investigate women who react to BOO using a synergistic action of abdominal strength and detrusor contraction at the same time; and we know from practical experience that they are a big sample. For this reason we prospectively excluded from the evaluation only patients who did not reach a valid and sustained detrusor contraction during voiding, considering prone to analysis female patients who strained during voiding as well, as we think that patients obstructed who do not strain during voiding are very uncommon to encounter. Another limitation in investigation female voiding is usually caused by instrumentation. A large catheter may affect the voiding process significantly as determined by Groutz and Blaivas using a 7 Fr catheter. The obstructive effect caused by large catheter may lead to diagnose outlet obstruction even in patients who are not obstructed (23). In a previous report we investigate the difference between free and intubated flows in the same patient using a 4 FR mono J smooth catheter and we did not find any statistical difference in all the parameters of flow investigated. That is the reason why we preferred to use a smooth 4 Fr catheter in P/F investigation to obtain reliable values. Recently new parameters considered more statistically significant than traditional urodynamic parameters have been determined and defined as area under the curve of detrusor pressure and area under the curve of detrusor pressure/volume. We believe that more series analysing these new parameters are requested to confirm their utility in better diagnosing female bladder outlet obstruction (24). As far as our results are concerned we do not believe that a sharp division between obstructed and not obstructed female can always be drawn, but we strongly believe that urodynamic investigation is the best tool to obtain a quantitative and qualitative definition of Female bladder outlet obstruction.

## CONCLUSIONS

According to our findings, urodynamic testing is a valid tool to investigate female bladder outlet obstruction, though new efforts are needed to ameliorate the sensibility of nomograms potentially useful in clinics.

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## Our experience in the treatment of penile curvature.

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### Summary

*Objectives: evaluation of the authors' results achieved using corporoplasty in patients treated for penile curvature from 1/1/1993 to 31/12/2002. Materials and Methods: 26 patients underwent corporoplasty to correct penile curvature: congenital curvature without hypospadias or epispadias in 22 patients (aged 17 to 42) and curvature due to La Peyronie's disease in 4 patients (aged 48 to 65). In the latter 4 cases corporoplasty was chosen, instead of plaque excision or incision, since the plaque was quite small-sized and well stabilized, causing an overall limited curvature in a proportionately long penis with perfectly preserved erectile functions. The Ebbehøj-Metz technique (plication of the tunica albuginea of the corpora cavernosa using introflecting double cross-over stitch of 2/0 Prolene, grasping deep into the tunica in 4 positions) was used in 24 patients and the Yachia procedure (longitudinal incision of the tunica albuginea of the corpora cavernosa followed by transverse suture using 2/0 PDS) in 2 patients, both affected by congenital curvature. Results: penile straightening was completely satisfactory in 24 patients, while 2 with congenital curvature, who had undergone the Ebbehøj-Metz technique corporoplasty, had recurring penile curvature. One of these last 2 patients, aged 17, required further corporoplasty, using the same procedure again, obtaining penile straightening. The other patient, aged 42, refused further operation. Although the 2 patients treated using the Yachia technique had a satisfactory curvature correction, for some months they reported feeling a bothersome bump on the corpus cavernosum in the cut and sutured area of the tunica albuginea, with moderate pain during erections. For this reason this technique was not used in other patients. The only complication reported by 1 patient was the formation of a redundant balanopreputial scar due to suture dehiscence, later removed under local anaesthesia. Conclusions: considering their results, the authors consider corporoplasty a reliable and easy to perform procedure in the treatment of both congenital penile curvature and in well selected cases of penile curvature due to induratio penis plastica.*

**KEY WORDS:** Penile curvature; Corporoplasty; Corpora cavernosa.

### INTRODUCTION

Penile curvature consists of the deviation and/or torsion of the penis compared with its longitudinal axis, due to an extensive or localized alteration of the elasticity of the fascial structures coating the corpora cavernosa and the urethral corpus spongiosum.

Penile curvature can be congenital, acquired and iatrogenic.

Congenital penile curvature, rated about 37 cases every 100,000 male subjects (1), is caused by an alteration of the embryonic development of the fibroelastic sheaths supporting the corpora cavernosa, urethra and corpus spongiosum; these sheaths are of mesenchymal nature. The curvature can be associated with hypospadias and, more rarely, epispadias.

Acquired penile curvature generally occurs together

with induratio penis plastica (La Peyronie's disease); more rarely it is due to an alteration of the spongiosum tissue and sclerocicatrical retraction of the penile urethra following chronic urethritis.

Iatrogenic curvature is generally traceable to fibrosclerotic alterations of the urethra and corpus spongiosum caused by endoscopic proceedings, urethroplasty or similar alterations in the corpora cavernosa after corporoplasty.

If it is not associated with hypospadias or epispadias, congenital curvature is seldom evident at birth, usually tending to manifest during puberty with the first erections.

Acquired and iatrogenic curvatures generally occur in middle-aged and elderly men.

Penile curvature treatment is surgical and it is necessary when the curvature degree makes vaginal intromission difficult or impossible.

In such cases corporoplasty, introduced by Nesbit in 1965 (2, 3), with its variations developed over the years, is the main operation in congenital curvature without hypospadias or epispadias and can also be used in selected cases of curvature due to induratio penis plastica.

## MATERIALS AND METHODS

From 1/1/1993 to 31/12/2002 26 patients with penile curvature were treated in our department. All were assessed with clinical examination, dynamic penile duplex scanning or color flow mapping and self-photography. 22 patients had congenital penile curvature without hypospadias or epispadias, the 4 left had penile curvature due to induratio penis plastica. The congenital curvature patients were aged 17 to 42, while the La Peyronie's disease curvature ones were aged 48 to 65.

Of the 22 congenital penile curvature patients, 10 had a ventral-directed deviation, 3 left deviation, 2 right deviation, 1 a combination of right and ventral deviation and 6 had a combination of left and ventral deviation. The curvature degree in these patients ranged from 30° to 50°. In 4 cases with curvature due to induratio penis plastica we noticed that 2 patients had a left deviation and 2 had a dorsal deviation. The curvature was respectively 40° and 45° in the 2 patients with dorsal deviation and respectively 30° and 45° in the 2 patients with left deviation.

In 20 congenital curvature patients and in the 4 induratio penis plastica curvature patients corporoplasty technique as described by Ebbehøj-Metz (plication of the tunica albuginea of the corpora cavernosa using intro-flecting double cross-over stitch of 2/0 Prolene, grasping deep into the tunica in 4 positions) (1, 4, 5) was performed. In the other 2 patients with congenital curvature we used the Yachia procedure (longitudinal incisions of the tunica albuginea of the corpus cavernosum followed by transverse suture using 2/0 PDS)(6).

The plications or the incisions, one or more, where the Yachia technique was used, were performed on the tuni-

ca albuginea of the corpora cavernosa opposite surface of the curvature direction, in such a way, as every corporoplasty technique suggests, as to obtain straightening of the penis with its only slight overall shortening. The curvature degree and the extent of its correction were monitored during the operation by erection induced by injecting one of the corpora cavernosa of the penis with normal saline, using a 19 G "Butterfly" needle introduced through the glans after clamping the base of the penis (Figure 1).

Both techniques were performed through subcoronal incision and degloving of the penis; then opening Buck's fascia longitudinally level with the corpora cavernosa lateral surface, and its detachment from the lower layer, isolating and preserving the dorsal neurovascular bundle (Figure 2) in those cases when operating on the dorsal surface of the corpora cavernosa was necessary.

After the plications (Figure 3) or incisions on the tunica albuginea of the corpora cavernosa, a careful running suture of Buck's fascia was placed using 4/0 Vicryl, as an anatomico-compressive physiologic bandage; the operation finished with an absorbable balanopreputial suture (Figure 4) preceded by posthectomy.

A bladder catheter, together with fairly compressive bandage, was placed and left for 24-48 hours after operation; antiandrogens were administered immediately post-operatively in order to reduce nocturnal penile erections.

Corporoplasty operations were performed under general anaesthesia or loco-regional anaesthesia.

We must say we decided to perform corporoplasty in the 4 induratio penis plastica curvature patients instead of plaque surgery (excision or incision), as these patients had a quite small-sized and well stabilized plaque, causing an overall limited curvature in a proportionately long penis with perfectly preserved erectile functions.

## RESULTS

The results achieved with corporoplasty were completely satisfactory in 24 patients with excellent straightening of the penis and durable outcomes.

In a 42-year-old patient with congenital penile curvature

**Figure 1.**

*Important ventral curvature shown inducing erection by injection through the glans.*



**Figure 2.**

*Isolation of the dorsal neuro-vascular bundle.*



**Figure 3.**

*Plication of the tunica albuginea of the corpora cavernosa according to Ebbehøj-Metz.*



**Figure 4.**

*Balanopreputial suture at the end of the procedure and assessment of the correction obtained.*



re, treated using the Ebbehøj-Metz technique, the preoperative situation recurred due to dehiscence of the plication: he refused to undergo further operation. After an excellent initial straightening of the penis, another patient, aged 17, also treated because of congenital penile curvature, had a following progressive recurrence of the penile bend which, although it didn't reach its initial degree, required reoperation performed as formerly, using the Ebbehøj-Metz technique, in order to obtain penile straightening again.

Just postoperatively a 20-year-old patient, who had the correct straightening of the penis, reported dehiscence of the balanopreputial suture followed by the formation of a redundant and unaesthetic scar, which was removed under local anaesthesia about two months after corporoplasty, obtaining optimal healing.

In the 2 patients, both with congenital penile curvature treated with the Yachia technique, the straightening was completely satisfactory, but for a few months the patients reported feeling a bothersome bump on the corpus cavernosum in the area where the tunica albuginea had been cut and sutured, with moderate pain during erections. For this reason this technique was not used in other patients.

No erectile trouble was observed after corporoplasty, except for a 20-year-old patient, treated with the Ebbehøj-Metz technique, who reported postoperative erections which were less rigid than preoperatively, although they were valid: instrumental examinations (nocturnal penile tumescence recording by Rigiscan, dynamic penile color flow mapping) did not assess any erectile pathological outline, leading to erectile problems of likely psychological nature.

## CONCLUSIONS

In our experience corporoplasty turned out to be a completely effective procedure in the treatment of both congenital penile curvature and in well selected cases of penile curvature due to induratio penis plastica.

As a matter of fact in 24 patients out of 26 penile straightening was excellent, while only in 2 out of 26 there was a recurrence; only 1 patient had a complication of a slight extent. These results were obtained thanks to easy to perform procedures and with postoperative courses devoid of peculiar precautions by the patients except for cleansing the surgical wound and abstaining from intercourse for a few weeks.

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# Ileocecal with teniomyotomies and ileal detubularized neobladders: considerations about a videourodynamic study after a long-term follow-up.

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## Summary

**Objective.** To evaluate the functionality of ileal detubularized reservoir and ileocecal neobladder with multiple teniomyotomies after a long term follow-up.

**Material and Methods.** Eight patients with ileal detubularized reservoir (IR) and 10 with ileocecal neobladder with multiple teniomyotomies (ICUS) with an average follow-up of 95 months, were submitted to a videourodynamic digital fluororangiographic examination. The patients had the longest disease-free follow-up of our series.

**Results.** Urodynamic data collected were almost good and comparable between IR and ICUS. Anyway the exams showed that the smooth intestinal muscles remain active both in non-detubularized and detubularized bladders even after years. Continence is mostly assured by the striated sphincter, which can withstand transient high pressure peaks but is less effective when facing prolonged pressure increases. While in some cases a valid micturition was achieved simply relaxing the perineal floor, in other cases micturition was obtained by an abdominal straining against the resistance of a contracted urethral sphincter/pelvic floor even after a long follow-up.

**Conclusions.** Detubularization and teniomyotomies can equally help the striated sphincter function by increasing the neobladder compliance. Moreover we observed that a non-spherical neobladder was compatible with good clinical results as well, proving that neobladder shape was less important in achieving good functional performance. Furthermore, in some cases the optimal relaxation of the perineal floor made abdominal straining superfluous especially when neobladders had physiological capacity. Thus a perineal floor musculature training and its co-ordination with abdominal muscles may improve the quality of micturition.

**KEY WORDS:** Ileal neobladder; Ileocecal neobladder; Urodynamic evaluation; Detubularization; Teniomyotomy.

## INTRODUCTION

Most orthotopic bladder replacement techniques can be traced back to detubularization and (in some cases) reconstruction principles proposed by Kock (1), and theoretically emphasized by Hinman (2). Their clinical benefits were obvious compared with the first neobladder experiences using intact intestinal loops, especially when narrow diameter ileum was employed (3). Complete continence, however, was hard to achieve.

Most functional studies in literature rely on neobladder urodynamic evaluations with relatively short follow-ups. Given the availability of two different neobladders implemented by one surgeon within the same centre,

the aim of this study was the assessment of the long-term behaviour of bowel smooth muscles in both detubularized neobladders and neobladders where total detubularization was replaced with the simple incision of taeniae coli through a sophisticated method such as video urodynamic digital fluorangiography (VUDM).

## MATERIALS AND METHODS

Between 1983 and 2002, 39 patients in our department underwent orthotopic bladder replacement through ileal reservoir (IR) (4). This technique required 35-40

**Table 1.**

*Urodynamic data relating to 18 patients, mean follow-up 95 ( $\pm 33$  months) with ileocecourethrostomy with multiple transverse teniomyotomies (ICUS+T, 10 patients, mean follow up 103 ( $\pm 19$  months) and ileal detubularized reservoir (IR, 8 patients, mean follow-up 87 ( $\pm 44.2$  months). In brackets standard deviation and median (n.s. = not significant).*

	ICUS + T	IR	p
Max. capacity (ml)	330.75 ( $\pm 104$ ; 309)	310.75 ( $\pm 46.7$ ; 325)	n.s.
Pressure at the end of filling (ml)	49 ( $\pm 28.6$ ; 34)	25.7 ( $\pm 17.3$ ; 24)	n.s.
Max. intravesical pressure (cm H <sub>2</sub> O)	84.7 ( $\pm 54$ ; 85.5)	52.75 ( $\pm 20.5$ ; 52.5)	n.s.
First urination stimulus (ml)	183 ( $\pm 135$ ; 140)	147 ( $\pm 29.4$ ; 148)	n.s.
Normal urination stimulus (ml)	328 ( $\pm 106.3$ ; 347)	276.7 ( $\pm 44.6$ ; 267.5)	n.s.
Q ave. (ml/sec)	6.3 ( $\pm 3.8$ ; 8)	5.7 ( $\pm 3$ ; 6)	n.s.
Q max (ml/sec)	16.5 ( $\pm 1.7$ ; 16)	16 ( $\pm 3.2$ ; 15.5)	n.s.
Micturition time (sec)	106 ( $\pm 108.3$ ; 45)	59.2 ( $\pm 18$ ; 63.5)	n.s.
Postmicturition residual (ml)	16 ( $\pm 23$ ; 0)	22.5 ( $\pm 17.1$ ; 25)	n.s.

cm of detubularized ileum folded into an 'S'. Between 1987 and 2000, 64 more patients received bladder substitutes via ileocecourethrostomy with multiple transverse incisions of taeniae coli (ICUS+T), using the following materials: a) 10 cm of cecum functioning as a reservoir, made more extendable by practising 5-8 incisions on the omental and anterior taeniae without detubularization; b) 5-6 cm of terminal ileum anastomosed to the ureters; and c) the ileocecal junction used as an antireflux device (5). Patients (all males) suffered from invasive bladder neoplasia. ICUS+T was the diversion of choice; patients were addressed to IR when difficulties in mobilization or previous or actual pathologies of cecum make its use impossible.

Eighteen patients in total with the longest disease-free follow-up were enrolled in the study, with a mean follow-up period of 95 $\pm$ 33 months (median 96) and mean age 66.4 years at the time of the study: 10 patients with mean a follow-up of 102 $\pm$ 21 months (median 108) and a mean age of 67.7 years had ICUS+T; the remaining 8 with mean a follow-up of 87 $\pm$ 44 months (median 84) and a mean age of 65 had IR. The difference of the follow-up between the two groups was not significant ( $p > 0.5$ ). The VUDM study required the use of the General Electric Prestilix DRX digital angiographic device, whose software allows the computerized management of the exam and the simultaneous digital filing of data and images. A double lumen 6F transurethral small catheter was applied to patients in recumbent position. The neobladder, after being completely voided, was filled with contrast medium through the catheter. A pressure transducer was placed into the rectal ampulla. In order to carry out the exam in ideal physiological conditions, the filling procedure was performed through low speed infusion (40 ml/min). The maximum volume was assessed when the patient referred urgent micturition stimulus similar to the urgency felt during normal daily activity. Perineal floor electromyography was also performed – through surface electrodes – to evaluate the response of the striated sphincter during the filling pro-

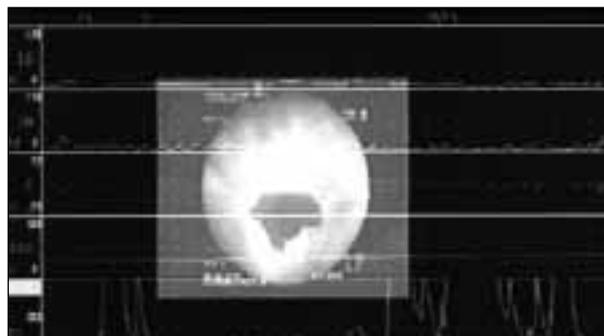
cedure both under stimulus (coughing or Valsalva's manoeuvre) and during micturition. Finally, the post-micturition residue was assessed as well.

## RESULTS

The results attained by the videourodynamic exam are shown in Table 1. In this series all patients are continent by day with intervals between micturitions ranging from 3.5 to 5 hours, while by night intervals ranged from 2 to 4.5 hours and 16% (3/18) of patients showed urine leakages between micturitions.

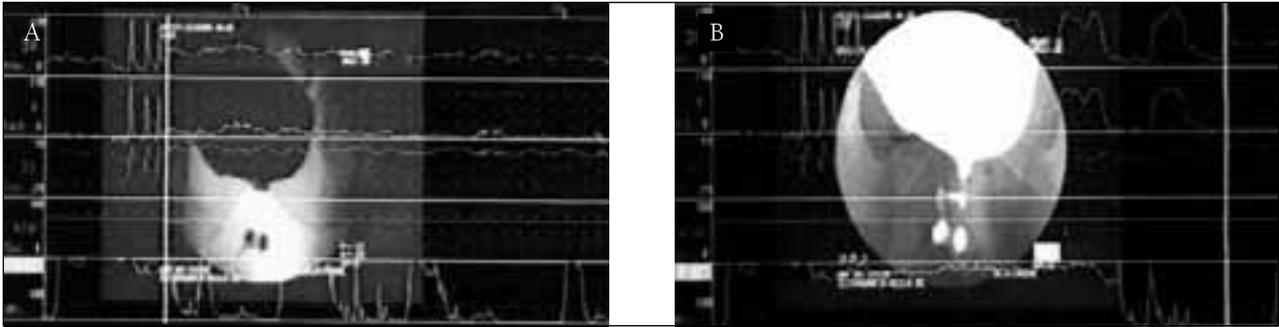
First of all in our case records we noticed that, even after a long time, cyclical smooth muscle contractions, even though reduced, were still recorded not only in non-detubularized ICUS+T but also in detubularized IR (Figure 1). Non-inhibited contractions were also present in almost all patients (72.2%, 13/18). However the striated sphincter was able to counter the increased pressure caused by residual peristaltic activity. We found that, even for a long time after surgery, the external urethral sphincter generally reacted to activation manoeuvre such as Valsalva's or cough with a simultaneous increase

**Figure 1.**  
*Detubularized ileal reservoir: a residual cyclic intestinal activity is evident at 84 months of follow-up.*



**Figure 2.**

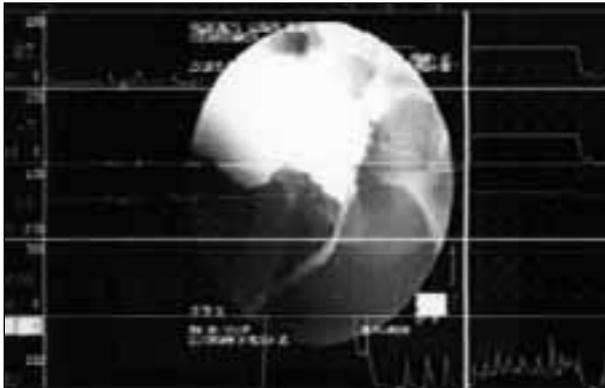
Detubularized ileal reservoir (follow-up 60 months): under cough good contractions of the pelvic floor are visible and point out the excellent work of the urethral sphincter without urinary leakages (A). Urine leakage is visible under Valsalva's manoeuvre: a prolonged high internal pressure has overcome the resistance of the striated sphincter (B).



of its basal tone, and this reflex action was able to counter pressure increases caused by non-inhibited contractions triggered from time to time (Figure 2a). Only 4 patients (2 with ICUS+T and 2 with IR) among those examined showed uncontrolled urine leakage following uninhibited contractions or during normal Valsalva's

**Figure 3.**

Ileocecourethrostomy with multiple transverse teniomyotomies (follow-up 156 months): despite an apparent subjective good micturition, the voiding is affected by an incomplete relaxation of the pelvic floor.



manoeuvre. These findings are in contrast with patients' conditions since they did not claim any urine leakage during normal daily activities. In particular, 2 patients with ICUS+T (follow-up 108 months) who had leakage during normal Valsalva's manoeuvre urinated every 4-5 hours by day and every 3-4 hours by night, while the remaining 2 (follow-up 84 months) who had leakage during uninhibited contractions ( $P_{max} \leq 78 \text{ cmH}_2\text{O}$ ) urinated every 4-5 hours by day and every 2 hours by night.

On the other hand, tracings showed that the striated sphincter, which can withstand transient pressure peaks, yielded to prolonged upstream pressure increases. This happened in 4 patients. They showed continence when coughing but urine leakage following prolonged Valsalva's manoeuvre (Figure 2b).

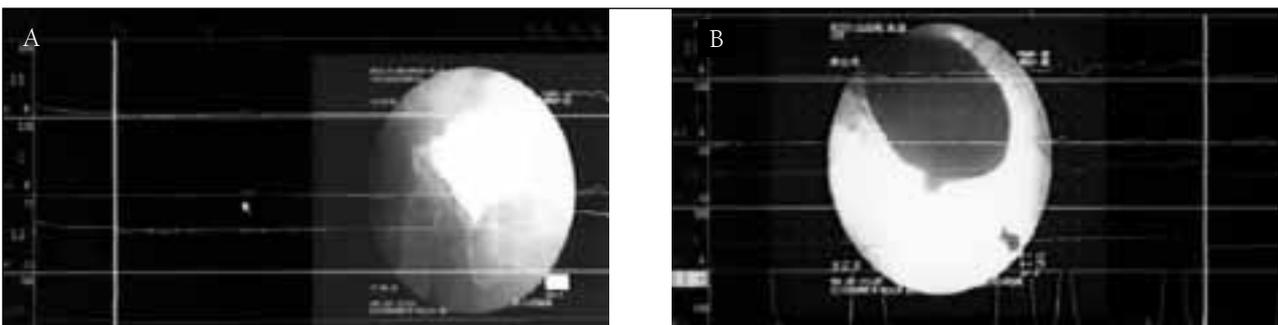
In 2 of the 10 cases with ICUS+T the desired spherical shape was not showed, but this fact was not essential for the clinical results, since the patients had diurnal and nocturnal micturitions every 3-4 hours (the mean follow-up period was 78 months).

In 5 cases (4 with ICUS+T and 1 with IR and a mean follow-up period of 88 months), voiding was achieved without abdominal straining, by maintaining the tone of the neobladder wall and relaxing the striated sphincter. On the other hand, 4 patients clearly showed simulta-

**Figure 4.**

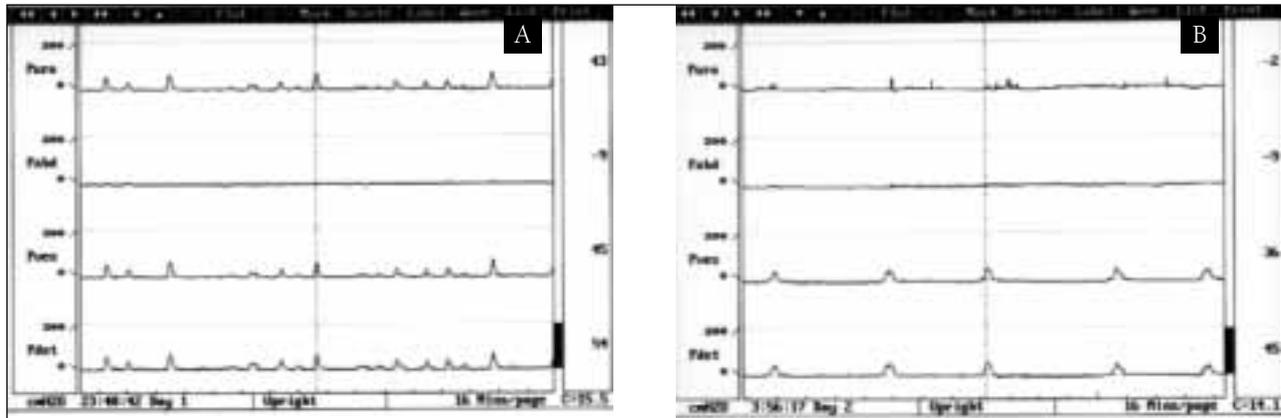
A: Ileocecourethrostomy with multiple transverse teniomyotomies (follow-up 120 months): during filling, the good compliance of the intestinal tract allows for low basal pressures and for acceptable pressure under contraction; the recording shows residual intestinal activity, but without incontinence nor reflux.

B: Detubularized ileal reservoir (follow-up 60 months): at filling of 274 ml, good compliance and morphology are evident, with low neobladder pressures.



**Figure 5.**

*A residual cyclic intestinal activity is evident during the vesical Holter recording, both for ileocecourethroostomy with multiple transverse teniomyotomies neobladder (A) and detubularized ileal reservoir (B).*



neous activation of abdominal straining and pelvic floor during micturition: the patients apparently urinated easily but against the resistance of the contracted pelvic floor. The EMG in the pelvic floor showed those pictures (Figure 3).

**DISCUSSION**

The reasons for neobladder urinary dysfunction are still unclear (6). Neobladder continence relies almost entirely on the urethral striated sphincter: in most cases it can prevent leakage for sufficiently long intervals during daytime. Conversely, nocturnal continence remains problematic in all cases reported in literature, with definitely lower rates in respect to diurnal continence (7, 8). The results attained through neobladder detubularization and reconfiguration could help the striated sphincter activity, which remains crucial. Despite that, some studies proved that complete continence, especially during night-time, might be unattainable (8). However, the first experiences regarding the creation of ileal reservoirs large enough to allow some hours between micturitions proved less than successful because of their negative effects on metabolic balance and the high percentage of self-catheterization (9, 10).

Our techniques provided for a small initial reservoir capacity (250 ml for ICUS+T and 150 ml for IR), in view of the apparent tendency to volume enlargement shown by intestinal neobladders, especially when detubularized (11, 12). This choice aimed at assuring good life conditions to accurately selected patients who were expected to have long life expectancy. Inevitably, during the first postoperative months, intervals between micturitions and continence rates were less than optimal. After some months, however, the clinical situation improved as expected (10), with satisfactory results that remained stable over the years. We began this study relying on the good subjective conditions of our patients, and collected some interesting data, which came as a surprise to us as well.

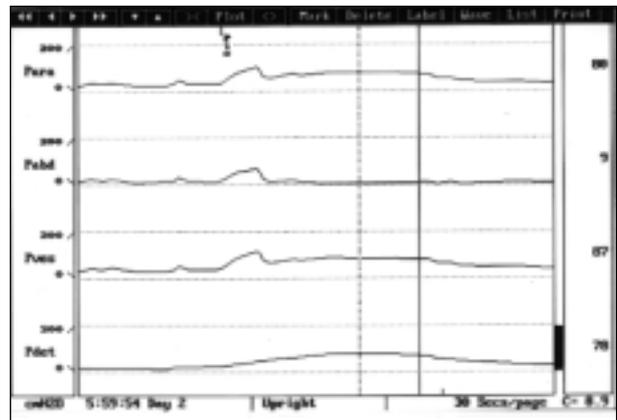
A spherical shape was also achieved some time after surgery by implementing ICUS+T, whose good intravesical pressure profile explained the high continence rate

experienced during evaluations. A similar good result was obtained with IR, whose detubularization allowed for the creation of an almost spherical reservoir (Figure 4). The rationale for a spherical shape of the neobladder is sure to provide a favourable volume/pressure characteristic in order to achieve good clinical results: but in those cases where, in spite of all our efforts, the desired shape were not achieved, pressure and clinical data were anyway satisfying as we can see in 2 of the 10 cases with ICUS+T studied.

During the exam, incontinence in the form of urine leakage was observed in 4 cases (22.2%). Detubularization and reconstruction were aimed not only at improving the shape but also at blocking the contractions of bowel smooth muscles. Some authors reported, despite detubularization, the presence of pressure peaks, generally with a small amplitude if the ileum and ileocecum were used (13). We noticed that, even after a long time, cycli-

**Figure 6.**

*Vesical Holter recording: an external painful stimulus felt by the patient when a blood sample was taken (PIC in the trace) coincided with a pressure peak inside the neobladder, due to an abdominal contraction followed by a permanent internal pressure increase; the neobladder appeared to be not completely autonomous in respect to external stimuli.*



cal smooth muscle contractions were still recorded in both our diversions (Figure 1). We think that this activity might be decreased by our intervention on the loop, but it cannot be totally eliminated. These results appeared even more evident in 12 hour Holter monitoring at rest (Figure 5) (data not published).

In most cases, however, the striated sphincter was able to counter the increased pressure caused by residual peristaltic activity. Clearly, the striated sphincter played a crucial role in continence, since all other techniques could only help its action. Actually, the maximum pressure of urethral closure was reported to be tightly linked to continence, and a high percentage of patients with nocturnal incontinence had poor sphincteric function (16-18). We found that, even long time after surgery, the external urethral sphincter generally reacted to activation manoeuvre such as Valsalva's or cough with a simultaneous increase of its basal tone, countering pressure increases caused by non-inhibited contractions triggered from time to time (Figure 2a). On the other hand, tracings showed that the striated sphincter, yielded to prolonged upstream pressure increases (Figure 2b). What we saw with Valsalva's manoeuvre presumably happened during night-time, when the impossibility of regularly voiding the neobladder caused a prolonged pressure increase upstream of the sphincter, which finally yielded.

On the other hand, the presence of peristaltic contractions in the intestinal segment seemed to help and improve neobladder voiding (14). So the rationale for having ICUS+T with intact circular muscles is the creation of neobladders which maintain a physiological capacity and a basal tone in order to ease evacuation. In 4 of studied cases voiding was achieved without abdominal straining, by maintaining the tone of the neobladder wall and relaxing the striated sphincter. These dynamic features produced low postmicturition residue as much as it's not required self-catheterization, contrary to other case-records (7, 10, 15, 16).

During the study we revealed an anecdotal but interesting data, which should be taken into due consideration when assessing continence in these patients. The Holter recordings showed the neobladder responded to external stimuli: the painful stimulus felt by the patient in Figure 6 when the blood sample was taken (according to his diary) coincided with an immediate pressure peak inside the neobladder, possibly due to an abdominal contraction followed by a series of uninhibited contractions, which might have disrupted continence. In practice, the neobladder appeared to be not completely autonomous in respect to external stimuli.

Another interesting data was that some patients apparently urinated easily but against the resistance of the contracted pelvic floor due to simultaneous activation of abdominal straining and pelvic floor during micturition. Some authors already reported the presence of urinary discomfort consequent to a natural counter-contraction (pseudo-dyssynergy) of the sphincters, as a natural response to abdominal contractions (18). It is important that the patient with orthotopic diversion and dysynergy learns, after an appropriate physiotherapy, to modulate the physiological contraction of the sphincters

in order to get a fit, but innatural, way to relax the external urethral sphincter during micturition with Valsalva's manoeuvre. This is important also because the obstacle to flow, owned to the dissynergy, could trigger a vicious circle, because the bowel segments, including cecum, developed, as the detrusor muscles, high pressure phasic contractions in response to obstructions with consequent deterioration of micturition. The elimination of the obstruction, organic or functional, seemed to suppress these contractions (14).

Thus the rehabilitation of the perineal floor should pursue two objectives: appropriate exercise and re-education of the perineal floor can reduce the risk of incontinence, whereas recovering co-ordination between perineal floor/striated sphincter and abdominal muscles will develop the capacity of suppressing the counter-contractions that disrupt micturition (18).

## CONCLUSIONS

The digital videourodynamic exam proved extremely useful in studying neobladder micturition dynamics. This method, especially when applied to patients with protracted follow-ups, showed that smooth intestinal muscles remain active both in non-detubularized and detubularized bladders even after years. Continence is mostly assured by the striated sphincter, which can withstand transient high pressure peaks but is less effective when facing prolonged pressure increases. Detubularization techniques or the incision of taenia coli can help its function by increasing compliance. One interesting result from our study is that non-spherical neobladders were compatible with good clinical results as well, proving that neobladder shape was less important in achieving good functional performance. Furthermore, in some cases the optimal relaxation of the perineal floor made abdominal straining superfluous when neobladders had physiological capacity. Thus the rehabilitation of perineal floor musculature and its co-ordination with abdominal muscles may improve both continence rates and quality of micturition.

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# Classification of cystic structures located at the midline of the prostate: our experience.

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## Summary

**Objectives:** Between January 1994 and February 2002, 9086 men underwent biplane TRUS at our institution for a variety of reasons. 781 of the 9086 men (8.6%) showed evidence of one or more intraprostatic cystic lesions. We propose a new classification of cystic structures located at the midline of the prostate. **Material and methods:** We have designed a methodology that reclassifies cystic structures located at the prostate midline through the ultrasonically guided transrectal aspiration of the cystic structure, the analysis of the PSA level of the aspirated fluid and the presence of spermatozoa, radiological studies (cyst injection with contrast medium, vasography, retrograde and/or voiding cystourethrography and utricle injection with contrast medium) and endoscopic studies (cystourethroscopy). **Results:** Upon completion of the methodology, we have classified and defined these structures as the following: simple prostatic cysts, cysts of the müllerian ducts, megautricle, megautricle with inclusion of the ejaculatory ducts, "pseudocystic" dilation of the ejaculatory ducts and utriculoceles. **Conclusions:** This new classification of cystic structures located at the prostate midline is simple, useful and steers one away from any possible confusion.

**KEY WORDS:** Intraprostatic cystic lesion; Utriculoceles; Müllerian ducts; Megautricle; Vasography.

## INTRODUCTION

Since the generalised use of transrectal ultrasonography, there has been an important increase in the number of cases of "cystic" lesions located at the prostate midline. Hamper et al. (1) have published that of 277 patients who underwent transrectal ultrasonography (TRUS) explorations, an 8% were found to have one or more intraprostatic cystic lesions. Kim et al. (2) report the largest series defining the prevalence of TRUS-identified cystic lesions of the prostate in a non-fertility population, being 5%. In contrast, these abnormalities were present in 17% of the "at risk" infertile men who had had TRUS performed.

During an analysis of the literature, we observed a confusion of the classification and denomination of these structures, a point also made by other authors (3, 4).

We propose a new classification applying a methodology based on morphological parameters (both radiological contrast and endoscopic explorations), embryological and analytical (presence of spermatozoa and PSA levels of the cyst content). As such, we are attempting to use terminology correctly.

## MATERIALS AND METHODS

Between January 1994 and February 2002, 9086 men underwent biplane TRUS at our institution for a variety of reasons. 781 of the 9086 men (8.6%) showed evidence of one or more intraprostatic cystic lesions. Only those patients who presented symptoms attributable to an intraprostatic lesion (80 in total), were included in our study. Of the 80 patients, 26 (32.5%) consulted us for primary sterility, 10 (12.5%) for ejaculatory pain and 44 (55%) for obstructive and irritative urinary tract symptoms. Asymptomatic patients with an opportune diagnosis of cystic lesions via TRUS were not included in the study.

We have designed a methodology that reclassifies cystic structures located at the prostate midline through the ultrasonically-guided transrectal aspiration of the cystic structure, the analysis of the PSA level of the aspirated fluid and the presence of spermatozoa, radiological studies (cyst injection with contrast medium, vasography, retrograde and/or voiding cystourethrography and utricle injection with contrast medium) and endoscopic studies (cystourethroscopy).

**Figure 1.**

*Müllerian duct cyst: contrast medium injection shows communication neither to the seminal tract nor to the urinary tract.*



**Figure 2.**

*Vasogram: "Pseudocystic" dilation of the ejaculatory ducts.*



**Figure 3.**

*Voiding cystourethrogram: Megautricle.*



## RESULTS

Upon completion of the methodology, we achieved the following results: that "cystic" lesions located at the prostate midline can be classified according to the following six types:

### *Type I*

Those whose aspirated fluid of the cystic structure is yellowish, or slightly brownish, without spermatozoa and with very high levels of PSA (64-1944 ng/ml) with respect to the serum. After the injection of contrast medium, once the cystic contents was aspirated, the absence of a communication to the seminal or urinary tracts was found. Endoscopically, the posterior urethra was normal.

### *Type II* (Figure 1)

Cystic structures found at the intra-prostate (aspirated fluid is transparent), without communication to either seminal or urinary tracts after injections of contrast medium, absence of spermatozoa and with undetectable or lower PSA levels than those of the serum.

### *Type III* (Figure 2)

Those whose aspirated fluid of the cystic structure is whitish, greyish or brownish, with the presence of spermatozoa. After the injection of contrast, communication to the seminal tract was observed. The vasography confirmed the previous findings.

### *Type IV* (Figure 3)

Those whose aspirated fluid of the cystic structure is yellowish, without spermatozoa, with high PSA levels, and containing numerous leukocytes. After the injection of contrast medium, communication to the urinary tract was observed. The voiding cystourethrogram showed how the structure corresponded to an enlarged prostatic utricle that elevated the posterior urethra wall to the level of the verumontanum, as seen in the urethroscopy. The orifices of the utricle and of the ejaculatory ducts were intact.

### *Type V* (Figure 4)

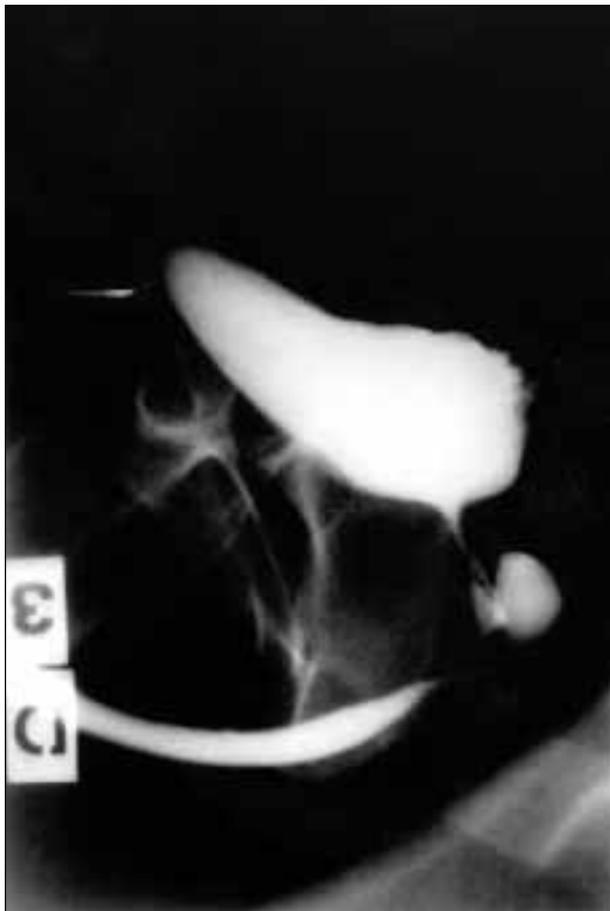
Those whose aspirated fluid of the cystic structure is yellowish without spermatozoa and with high PSA level. After the injection of contrast medium, no communication to the urinary or seminal tract was observed. In the endoscopic study, an elevation of the posterior urethra wall as well as the absence of or the obstruction of the drain hole of the prostate utricle into the urethra were detected.

### *Type VI* (Figure 5)

Those whose aspirated fluid of the cystic structure is whitish with spermatozoa. The cystogram showed communication to the urinary tract and both seminal tracts. In the endoscopic study, an elevation of the posterior urethra wall to the level of the verumontanum was observed, as well as the absence of the drain holes of the ejaculatory ducts, and the presence of the utricular orifice. The utriculography demonstrated how the ejaculatory ducts drain into the interior of a utricle that had increased in size.

**Figure 4.**

*Utriculocele due to an utricle cyst. An endoscopic view. By courtesy of A. Roca, M.D. and R. Maximiano, M.D., H.G. Santa María del Puerto. Cádiz.*



**Figure 5.**

*Utriculography: Mega-utricle with inclusion of the ejaculatory ducts. By courtesy of J.M. Garat, M.D., Puigvert Foundation.*



## DISCUSSION

Traditionally the terms used to denominate cystic structures without spermatozoa found at the prostate midline, cysts of the Müllerian ducts, utricular cysts, utriculoceles, and mega-utricles have been used indistinctively (5-7). However, recent studies (8) suggest that embryologically the cysts found on the Müllerian ducts, on one hand, and utricle cysts, utriculoceles, and mega-utricles, on the other, are two different entities. The prostatic utricle is the result of the union of the urogenital sinus (of endodermic origin), and the utricular cord, formed by the Müllerian ducts (of mesodermic origin), fuse in the midline. As the Müllerian ducts degenerate, a portion of the distal of the utricular cord is left attached to the urogenital sinus. This sinoutricular cord becomes canalised and the resulting cavity becomes dilated to form the prostatic utricle (9). The regression of the Müllerian ducts begins in the eighth week and depends on the presence of the antimüllerian factor secreted by the testicular Sertoli cells. Equally, the development of the urogenital sinus is influenced by the androgenic hormones secreted by the pre-Leydig cells of the foetal testis.

When there is an alteration or delay in the production

of the inhibiting factor of the Müllerian conducts, or of the androgenic hormones, a growth of the utricle occurs at the expense of the Müllerian portion or the urogenital sinus respectively. When the mega-utricle develops, principally at the expense of the growth of the urogenital sinus component, it pulls the distal extremes of the Wolffian ducts and consequently the ejaculatory ducts drain into the neck of the mega-utricle (10). When the mega-utricle develops, mainly at the expense of the Müllerian ducts, the ejaculatory ducts drain outside the mega-utricle. Given that a premature androgen failure is the cause of deficiencies in the closure of the urethra, it is for this reason that hypospadias as well as criptoquidia and intersex are associated (11, 12). This is not observed with the Müllerian duct cysts.

There also exists a semantic confusion in publications when cyst of utricle, utriculocele and mega-utricle are referred to. We believe that the word "cyst" should be reserved for that closed structure which does not communicate to the urinary or seminal tracts. The term mega-utricle should be reserved for those dilatations of the prostatic utricle that are in communication to the urinary tract and may or may not contain the ejaculatory duct drains. We name Utriculocele (Figure 4) the endo-

scopic view of the wall of the posterior urethra, protruding towards the urinary tract, generally as a consequence of an utricular cyst.

Some authors classify Müllerian conduct cysts or prostate utricle cysts as any structure located at the prostate midline that do not contain spermatozoa (13, 14). Yasumoto et al., after analysing the PSA contents of the cyst concluded that not all the cystic lesions found at the prostate midline are cysts of the Müllerian ducts, and that there is a high probability that such lesions be cystadenomas or simple prostate cysts (15). If a cystic lesion located at the prostate midline were a Müllerian conduct cyst, one should not be able to detect PSA in the analysis of the fluid, as embryologically the prostate does not derive from the said conduct.

Morphological, embryological and analytical criteria have permitted a modification of the classification of the cystic structures that are found at the prostate midline by transrectal ultrasonography. We denominate Cysts of the Müllerian ducts (Figure 1) as those structures which, upon the injection of contrast medium show that they do not communicate to the urinary and/or seminal tracts and upon analysis show the absence of spermatozoa and undetectable PSA levels or below that of the serum levels. These cysts can be found throughout the path of the Müllerian ducts, from the verumontanum until the appendix testis (3). When they are found near the verumontanum, they can produce extrinsic displacement of the ejaculatory ducts (Figure 6); when they are found in a retrovesical position, they can reach considerable proportions (3, 16, 17). There are authors who have described the malignization of the Müllerian duct cyst (18).

We call Simple prostatic cysts those structures which radiologically show that they do not communicate to the urinary and/or seminal tracts and whose contents show the absence of spermatozoa and very high PSA level. Embryologically speaking, these structures do not originate from the Müllerian ducts. Their localisation can be variable in the prostate being difficult to distinguish, by means of transrectal ultrasonography, from the cysts of the Müllerian ducts when found at the prostate midline. We call Megautricle (Figure 3) that structure, which

upon injection of contrast shows communication to the urinary tract, as is shown on the performing of a urethrography and is a consequence of an enlargement of the prostatic utricle. The cause is rooted in an alteration of the Inhibitor factor of the Müllerian ducts or foetal androgens. For this reason, it is usually associated with hypospadias (11). Being in communication to the urinary tract, it is liable to infection. In clinical practice, this allows us to make a faster diagnosis (4). The mega-utricle were classified by Ikoma et al. in relation to its size, and they correlated it to the degree of hypospadias that were associated with it (19). One subtype is the Mega-utricle with inclusion of the ejaculatory ducts (Figure 5), which contain spermatozoa and upon injection of contrast medium, communication to both seminal and urinary tracts can be found. The injection of contrast medium in the utricle confirms this. We call a Utricle cyst the resulting structure from the close of the communication of an utricle or of a megautricle to the urinary tract, in relation with infectious and/or inflammatory processes. They contain PSA, as has been demonstrated by Werner et al. (20) the epithelia of the utricle and that of the prostatic glands in adults is identical both morphologically and immunohistochemically. It shows up in endoscopic examination, due to its closeness to the posterior urethra wall, as an utriculocele with the opening obstructed or absent (Figure 4).

The "Pseudocystic" dilation of the ejaculatory ducts (Figure 2) is that structure which upon injection of contrast medium in its interior shows communication to the seminal tract, the same as if a vasography had been performed. The etiology tends to be a congenital or acquired obstruction of the ejaculatory ducts (21). We have called it thus because it does not fulfil the criteria of a cyst as they are not closed structures; rather, they communicate to the seminal tract.

## CONCLUSIONS

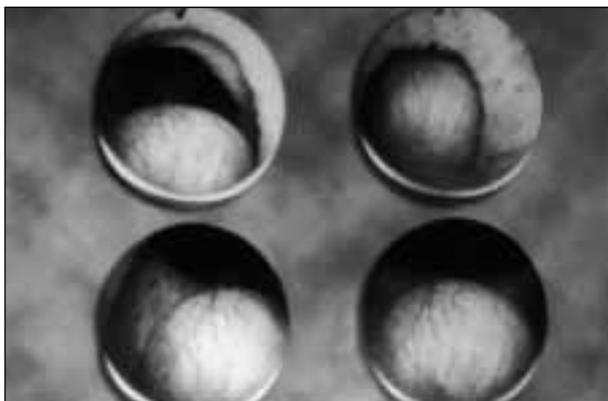
This new classification of cystic structures located at the prostate midline is simple, useful and steers one away from any possible confusion.

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**Figura 6.**

*Vasogram: Extrinsic displacement of the ejaculatory ducts caused by a cyst of the Müllerian duct.*



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# Incidence and evolution of aortic aneurysm in patients with bladder cancer.

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## Summary

*Objective. The incidence of aortic aneurysm is increasing, due to age, hypertension, hyperlipemia and voluptuary abuse like smoking, the last one of the most important cause of bladder cancer. Our study analyzes the incidence of aortic aneurysm in a group of patients who underwent radical cystectomy for bladder cancer and its evolution during follow-up in relationship with surgical procedure and adjuvant therapy.*

*Materials and Method During pre-operative staging of 173 patients, all affected by bladder cancer and then treated with radical cystectomy, we studied aorta and iliac artery diameters, as a part of our ultrasound scan evaluation. All patients underwent post-operative measurement of normal and abnormal aorta and common iliac artery during follow-up. Results. At the pre-operative staging 19 patients (10.9%) had aneurysms in the aortic-iliac axis (A.A.). During follow-up in 5 patients the A.A. did not develop, whereas in 14 cases it increased within 12 months after surgery and then with an increase <0.5 mm per year, with no relationship with type of surgical procedure, urinary diversion, adjuvant therapy. No cases required a vascular surgical approach during the follow-up. Only 1 patient of basal 154 normal ones developed an aneurysm of the common right iliac artery, treated with endoprosthesis. Conclusions. The natural development or risk of aneurysm rupture in patients with bladder cancer depends on its dimensions but also on radical surgery, urinary diversion or adjuvant therapies. In our experience all these factors seem not to influence aneurysms if present nor determine de-novo development.*

**KEY WORDS:** Aortic aneurysm; Evolution; Treatment; Cystectomy.

## INTRODUCTION

In the last few years there has been an increase in the incidence of aneurysms of the aorta and the common iliac arteries, often concomitant (aneurysm of aortoiliac axis A.A.), connected both to the extension of life expectancy and to the increase in risk factors such as smoking, hypertension, hyperlipemias. Most of the morphological and diagnostic research have increased the accidental detection of this disease often at its initial stage and so at its asymptomatic phase. The overall rate of this disease on the general population is between 2 and 4%, with an autoptic incidence between 1.8 and 6.6% (1).

Fifty-and 70-years old male patients, affected by hypertension and/or smokers, are those mostly struck (male/female ratio 3:1). The incidence among smokers is eight times higher than that among no-smokers patients. Bladder tumors are frequently found in 50 and 70-years old patients with an increase in incidence, due to smoking; in about 20% of cases tumors presented at high stage, thus requiring a radical treatment (surgery, radiotherapy).

In the presence of aortoiliac aneurysms and bladder neoplasias, the surgical approach on bladder tumors and the following urinary diversions should be modulated on the concomitant type of aneurysms.

At the same time, studies on the relationships between radical pelvic surgery (with pelvic lymphadenectomy) and vascular pathology, in particular aneurysms are well known.

Our work evaluated the incidence of aneurysms in a group of patients who underwent radical cystectomy for bladder cancers, A.A. development during follow up and the eventual new onset in relation to surgery and adjuvant therapy.

## MATERIALS AND METHODS

The study focuses on 173 patients who underwent radical cystectomy for bladder cancer between 1991 and 2001: all of them are homogeneous for data and type of follow-up.

All the patients underwent a pre-operative staging including urinary citologies, abdominal and transrectal ultrasound, PSA dosage (total and free), abdominal-pelvic CT scan, urograms, bone scan and preliminary TURB.

During the abdominal ultrasound (or CT) scan, we measured aorta and common iliac artery considering the following diameters as normal: aorta 20 mm, iliac common arteries 10-13 mm.

All the patients then underwent radical cystectomy with pelvic lymphadenectomy, including lymph nodes of iliac bifurcation, external and internal iliac lymph nodes, the obturator and presacral lymph nodes; various types of urinary diversions have been made on the basis of age, general conditions and prognosis of the disease. All the patients were then followed with periodical blood assays, chest X-rays, bone scintigraphy, and in particular with abdominal ultrasound and/or abdominal-pelvic CT, with concomitant evaluation of vascular diameters.

## RESULTS

At the operation, the mean age of the patients was 62.5 years (range 40-85 years); 146 were male (85%) and 27 female (15%).

Pathological examination gave the following results: 5 T0 cases, 10 multi-focal CIS cases, 6 multi-focal T1 cases, 10 T2 cases, 65 T3 cases, 77 T4 cases; we found 25 N+ patients (14.4%).

As secondary data, thirty-nine patients (22.5%) had incidental prostatic tumors, although PSA values were normal and ER and transrectal ultrasound scan were negative.

The urinary diversions were: 64 orthotopic neobladders according to Camey II (37%), 2 orthotopic neobladders according to Studer (1.2%), 54 urinary diversion according to Bricker (31.3%), 6 rectal detubularized neobladders (3.4%), 47 ureterostomies (27.1%).

The mean follow-up was 39 months (range 14-86 months), with a 5 years cancer-specific survival of 35.3%. 78.9% of patients had hypertension, all of them were smokers and 10.5% had hyperlipemia under therapy.

At the pre-operative staging 19 patients (10.9%) had aneurysms in the aortoiliac axis.

All of them had aneurysm of the abdominal aorta (mean diameter 28.05 mm, range 21-50 mm); 2 patients had also aneurysms of common iliac arteries (respectively 15 and 18 mm).

The urinary diversions performed in these patients were: 8 orthotopic neobladders according to Camey II (diameter of aneurysms ranged from 21 to 34 mm), 4 urinary diversion according to Bricker (diameter 27-32 mm), 5 ureterostomies (diameter 24-48 mm) 2 rectal detubularized neobladders (diameter 25-40 mm).

Among patients with A.A., one underwent adjuvant radiotherapy; 4 adjuvant chemotherapy and 1 a combined treatment with radio-chemotherapy.

Six patients died 3 years later for progression of disease and distance metastases, 1 patient died 7 years later for upper urinary tract involvement and 1 patient died 4 years later for local recurrence.

During their follow-up (mean 41 months), in 5 patients the A.A. did not develop, whereas in 14 cases (mean diameter 29.3 mm) it augmented within 12 months after surgery (< 3-4 mm), with a subsequent mean increase < 0.5 mm per year, reaching at final follow-up a mean diameter of 34.4 mm.

No cases required a surgical approach during the follow-up independently of the adjuvant treatment adopted.

Among 154 patients with normal aortoiliac axis, only one patient developed an aneurysm of the common right iliac artery in the post-operative period (6 months later), treated with endoprosthesis, whereas in the other cases, at a mean 38 months follow-up there were no other vascular ectasia.

## DISCUSSION

The pathogenesis of the aneurysm of the abdominal aorta, as well as frequent ectasia of the iliac arteries, is complicated and not clear yet, although multifactorial.

Among the causes there are atherosclerosis which becomes worse by age, and other well-known risk factors such as systemic hypertension (2), cigarette smoking (3) and some types of hyperlipemia (hypercholesterolemia), even if data are not completely clear yet (4).

Other risk factors, not completely clear yet, are familial tendency and genetic factors, enzymatic disorders and a particular biochemical profile.

In fact, it is well known the high incidence of aneurysms in parents and the relationships with the increase in elastic and collagen activity of the aneurysmal walls (5), associated with an altered relationships between type I and type III collagen, with variations in quantity of elastine (6).

The natural development of the aneurysms provides for a gradual increase in sizes, varying according to the initial dimensions. The average increase per year is 0.17-0.57 cm, higher for bigger diameters (7).

The risk of aneurysmal rupture depends on its dimensions, with percentage lower than 3% per year for aorta less than 5-6 cm in diameters, with a death rate of 50% at 5 years (8); rupture percentage reaches 10% per year for aneurysms greater than 5 cm in diameter (9).

Anyway, there are factors that rapidly increase the dimensions of the aneurysms till their rupture.

In patients affected by bladder tumors these factors are firstly found in catabolic conditions that can be associated with tumors, in which the processes determine the exhaustion of the aneurysmatic walls, and in radical surgery that increase some enzymatic activities such as hyaluronidase and elastase, thus negatively influencing the elastic and connective fibers of the arteries (10).

It is important to remind that vessels can be sometimes damaged because of lymphadenectomy, which provides for resection of lymphatic perivascular tissue that directly exhaust vessels for the interruption of micro-circulatory system, till the direct lesion of vessels thus forming false aneurysms (11).

Other risk factors are the possible toxicity for adjuvant or neoadjuvant therapies: chemotherapy can damage the vessels for the known mechanism of systemic toxicity (12) or for the overload of fluids, introduced during

the treatment (13), whereas radiotherapy for the rapid activation of phlogosis factors, activation of proteolytic enzymes and liberation of free radical as described in literature, especially for vessels of the neck (14).

According to literature the incidence between aneurysms of the aortoiliac axis and pelvic tumours is 3.9% considering all types of tumour (15).

In our study (bladder tumors) the incidence is 10.9%, also considering the initial vascular ecstasies.

The surgical debulking, the loco-regional lymphadenectomy, the type of urinary diversion performed and the adjuvant therapy (chemo and/or radiotherapy) seemed not to influence the development of aneurysms if present nor determined ex-novo development, although these data refer to a short-term follow-up.

Another important matter was the surgical choice (16). In our case study we did not have A.A. requiring an immediate vascular treatment, anyway we think it is important to follow the guidelines given by the literature: giving priority to the treatment of vascular disease if the aneurysms is symptomatic or in rupture phase, otherwise postpone the treatment taking into account life expectancy which is strictly connected to the stage of bladder disease (17).

The last point is the choice of the urinary diversion for patients affected by aneurysms when the vascular correction can be postponed.

The availability of endoprosthetic procedures for the vascular surgery, as an alternative to traditional open surgery, allowed us to solve problems linked to the surgical priority (18) and to the kind of urinary diversions on patients affected by A.A. thus permitting to reconstruct orthotopic neobladders: the only patient that needed surgical approach for iliac aneurysms, with orthotopic neobladder, was easily treated with endoprosthesis.

## CONCLUSIONS

In the presence of aorto-iliac aneurysms and bladder tumor, the surgical approach on bladder malignancy, the following urinary diversions and adjuvant therapy should be modulated on the concomitant type of aneurysms.

We found no correlation between aneurysm development or evolution and bladder cancer treatment; vascular endoprosthesis, if necessary, could solve the dilemma: "abdominal aortic aneurysm and malignant disease: how and when treat them?".

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# Twenty-years experience on genitourinary tuberculosis.

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## Summary

**Objective.** We reviewed our surgical experience on genitourinary tuberculosis in the past 20 years in order to evaluate if any change in the incidence and management of this disease has occurred. **Patients and Methods.** From 1980 to 1999, at our Institution, 102 patients underwent surgery for genitourinary tuberculosis. We recorded the data and the surgical procedure of these subjects and compared patients treated in period 1980-1989 to those submitted to surgery in the period 1990-1999. **Results.** The overall incidence of surgical management of genitourinary tuberculosis in the past 20 years was 0.50% (102 cases on a total of 20,299 urological surgical procedures). In the decade 1980-1989 the incidence was 0.67% (70 cases out of 10,428 patients) and in the decade 1990-1999 it was 0.32% (32 cases out of 9,871 patients). Nephrectomy was the most prevalent surgical procedure performed in both decades. **Conclusions.** Despite the availability of effective antimycobacteric drugs, surgery continues to play a role in the management of genitourinary tuberculosis. This disease is very slow to progress with minimal and subtle symptoms, often resulting in irreversible damage of the organs involved by the time a diagnosis is established.

**KEY WORDS:** Tuberculosis; Genitourinary Tuberculosis; Surgery of genitourinary Tuberculosis.

## INTRODUCTION

Available data indicate that tuberculosis is still a problem of enormous dimension worldwide. WHO estimates that approximately one third (1.9 billion people) of the world's population is infected with M. Tuberculosis. The disease is thought to cause at least 3 million deaths each year and the annual number of new cases is now near 8 million (1-3). Genitourinary tuberculosis which is the second most common extra-thoracic form of tuberculosis raises major diagnostic problems due to its frequently atypical and misleading clinical features. Even in developed countries, despite the introduction of chemotherapeutic treatment, surgery continues to play an important role in the management of genitourinary tuberculosis and more than 80% of patients now require some operative procedure (4-6).

## MATERIALS AND METHODS

We reviewed the cases of genitourinary tuberculosis referred at the Department of Urology of the University of Florence in the past 20 years. Of these patients we recorded sex, age, race and the surgical management;

data of patients treated in the period 1980-1989 were compared to those of patients submitted to surgery in the period 1990-1999 in order to evaluate if any change in the incidence and treatment of this disease has occurred.

## RESULTS

Out of 20,299 urological surgical procedures performed at our Institution in the period 1980-1999, 102 were related to genitourinary tuberculosis. The overall incidence of tuberculosis in these years was 0.50%, but in the period 1980-1989 it was 0.67% (70 cases out of 10,428 patients) and in the period 1990-1999 it was 0.32% (32 cases out of 9,871 patients) (Table 1). Of these 102 patients (58 males and 44 females), 99 were Italians born and living in our country, and 3 young men affected with orchiepydidimitis who have moved from China in the past five years. The diagnosis of genitourinary tuberculosis has been established by means of radiological evaluations and confirmed by positive acid fast stains and mycobacterial culture of first early morning voided urine specimens.

**Table 1.**

*Incidence of genitourinary tuberculosis at our Institution in the period 1980-1999.*

	<b>Urological surgical procedures</b>	<b>G.U. Tuberculosis</b>	<b>%</b>	<b>Males</b>	<b>Females</b>
1980-1989	10,428	70	0.67	39	31
1990-1999	9,871	32	0.32	19	13
Total	20,299	102	0.50	58	44

The analysis of age distribution of our cases shows the most prevalence of the disease in the V and VI decades (Table 2).

Sixty-five patients (63.72%) had chest radiographic abnormalities and 58 of them reported previous hospitalization and courses of chemotherapy for pulmonary tuberculosis.

Renal function was impaired in 25 patients (24.50%). Because of the frequency of extrapulmonary tuberculosis among HIV infected patients, laboratory studies have been performed in our patients ranging from 1993. No HIV positive case has been documented.

After surgical procedures all the patients were submitted to a six-month treatment regimen with anti-tuberculosis drugs.

Surgical procedures performed in each year of the period 1980-1989 and 1990-1999 are reported in Tables 3 and 4 respectively. In addition in Table 5 we have compared the surgical management of genitourinary tuberculosis performed in the two periods.

**DISCUSSION**

Although the incidence of tuberculosis has declined in Italy as in the developed countries in the past decades, the genitourinary form of this disease still remains a serious concern (7).

Genitourinary tuberculosis presents more of a diagnostic and therapeutic problem than does pulmonary tuberculosis. In addition, genitourinary tuberculosis involves relatively inaccessible sites and often, because

the vulnerability of the areas involved, much greater damage can be caused by fewer bacilli. Moreover, it is important to underline that mycobacteria have the ability to remain viable but dormant in sequestered sites of the body, only to become active again in proper conditions (diet unbalance, recurrent illness, impaired immune response). At our Institution we observed a significant decrease of surgical procedures for genitourinary tuberculosis in the period 1990-1999 compared to 1980-1989 and this decline is certainly the result of effective chemotherapy of the primary pulmonary focus. The reduced environmental circulation of mycobacteria is related to the higher incidence of genitourinary tuberculosis we observed in the elder age groups. In these patients the disease is a consequence of the infection acquired years or decades before. The older a person is, the more likely he or she is to have acquired tuberculous infection, having lived during a time when the disease was more prevalent in Italy than today.

Out of the six cases of genitourinary tuberculosis observed in the age group 21-30 years, three were immigrants from China, where the prevalence of tuberculosis is higher than in our country.

Ablative surgery (nephrectomy, nephroureterectomy, orchiepididymectomy) has resulted as the most prevalent surgical management performed in both periods (Table 6). This in part relates to being genitourinary tuberculosis less common and therefore less familiar to most clinicians whereas diagnostic evaluation is not undertaken until the process is advanced.

Reconstructive surgery accounted only for 10.78% of all surgical procedures performed at our Institution. Ureteral strictures involving the lower end of the ureter have been managed, according to the length of the area involved, by means a reflux preventing direct ureteral reimplantation (1 case), psoas hitch ureteral reimplantation (2 cases) and Boari flap procedure (1 cases). Ileal ureteral substitution has been carried out in 1982 in a patient with involvement of the whole ureter.

Bladder augmentation has been performed in 6 patients with retracted bladder with markedly reduced capacity, urge symptoms or secondary reflux. A low pressure reservoir has been provided by complete detubularization of a segment of ileum and antirefluxive ureteral implantation (8).

**CONCLUSIONS**

The significant decrease of genitourinary tuberculosis we observed at our Institution in the decades 1980-

**Table 2.**

*Age distribution of our patients with genitourinary tuberculosis.*

<b>Age (years)</b>	<b>no. of patients</b>	<b>%</b>
21-30	6	5.88
31-40	11	10.78
41-50	25	24.51
51-60	35	34.32
61-70	17	16.67
71-80	8	7.88
Total	102	

**Table 3.**  
Surgical management of genitourinary tuberculosis in the decade 1980-1989.

Year	no. of cases	Males	Females
1980	9	Nephrectomy Nephrectomy Nephrectomy Nephrectomy Nephroureterectomy Ureterocystoneostomy Ureterocystoneostomy	Augmentation cystoplasty
1981	7	Nephrectomy Nephroyreterectomy Orchiepididymectomy	Nephrectomy Nephrectomy Nephrectomy Augmentation cystoplasty
1982	9	Nephrectomy Nephroureterectomy Nephroureterectomy Nephroureterectomy Ileal uretral substitution Orchiepididymectomy	Nephrectomy Nephrectomy Nephroureterectomy
1983	6	Nephrectomy Nephrectomy Nephrectomy	Nephrectomy Nephrectomy Nephrectomy
1984	3	Nephrectomy	Nephrectomy Nephroureterectomy
1985	11	Nephrectomy Nephrectomy Nephroureterectomy Orchiepididymectomy Orchiepididymectomy Orchiepididymectomy	Nephrectomy Nephrectomy Nephrectomy Nephrectomy Nephroureterectomy
1986	9	Nephrectomy Nephrectomy Nephrectomy Nephroureterectomy Orchiepididymectomy	Nephrectomy Nephrectomy Nephrectomy Nephrectomy
1987	5	Nephroureterectomy	Nephrectomy Nephrectomy Nephrectomy Nephroureterectomy
1988	5	Nephrectomy Augmentation Cystoplasty Orchiepididymectomy	Nephrectomy Augmentation cystoplasty
1989	6	Nephrectomy Nephrectomy Nephrectomy	Nephrectomy Nephrectomy Nephrectomy

**Table 4.***Surgical management of genitourinary tuberculosis in the decade 1990-1999.*

<b>Year</b>	<b>no of cases</b>	<b>Males</b>	<b>Females</b>
1990	3	Orchiepididymectomy	Nephrectomy Augmentation cystoplasty
1991	2	Ureterocystoneostomy	Augmentation cystoplasty
1992	3	Nephrectomy	Nephrectomy Nephrectomy
1993	6	Orchiepididymectomy Orchiepididymectomy	Nephrectomy Nephrectomy Nephroureterectomy Partial nephrectomy
1994	5	Nephrectomy Nephrectomy Orchiepididymectomy Orchiepididymectomy	Nephrectomy
1995	3	Nephrectomy Nephrectomy Orchiepididymectomy	
1996	4	Nephrectomy Partial nephrectomy Orchiepididymectomy	Nephroureterectomy
1997	2	Nephrectomy	Nephrectomy
1998	2	Nephrectomy Orchiepididymectomy	
1999	2	Orchiepididymectomy	Ureteral reimplantation

**Table 5.***Comparison between surgical procedures performed in the decades 1980-1989 and 1990-1999.*

<b>Surgical procedures</b>	<b>1980-1989</b>	<b>%</b>	<b>1990-1999</b>	<b>%</b>
Nephrectomy	44	62.86	15	46.87
Nephroureterectomy	12	17.14	2	6.25
Partial nephrectomy	0	0	2	6.25
Orchiepididymectomy	7	10.00	9	28.12
Augmentation cystoplasty	4	5.71	2	6.25
Ureterocystoneostomy	2	2.86	1	3.13
Ileal uretral substitution	1	1.43	0	0
Ureteral reimplantation	0	0	1	3.13
<b>Total cases</b>	<b>70</b>		<b>32</b>	

1999 parallels that of tuberculosis in Italy in the same period; nevertheless it is important to underline that the cases of genitourinary tuberculosis requiring surgical management represent the "tip of the iceberg" and the magnitude of the disease remains still underestimated. Owing to its subtle and misleading symptoms, the dia-

gnosis of genitourinary tuberculosis is often delayed and the disease can progress resulting in the irreversible damage of the involved organs and tissues. If detected in an early stage, genitourinary tuberculosis responds as well as the pulmonary form to antimycobacterial chemotherapy (9, 10). Conversely, chemotherapy proves of little benefit in the treatment of those

**Table 6.**

*Ablative surgery versus conservative surgery in our experience on genitourinary tuberculosis.*

<b>Genitourinary tuberculosis (1980 – 1999)</b>		
<b>Surgical procedures</b>		
Ablative Surgery	no of cases	%
Nephrectomy	59	57.84
Partial nephrectomy	2	1.96
Nephroureterectomy	14	13.72
Orchiepididymectomy	16	15.68
<b>Total</b>	<b>91</b>	<b>89.22</b>
Reconstructive surgery	no of cases	%
Augmentation cystoplasty	6	5.88
Ureterocystoneostomy	3	2.94
Ureteral reimplantation	1	0.98
Ureteral ileal substitution	1	0.98
<b>Total</b>	<b>11</b>	<b>10.78</b>

forms of tuberculosis and its complications associated with irreversible morphologic changes in organs and tissues. Surgical methods are indispensable in such cases to remove destroyed organs, to correct ureteral strictures and to augment the capacity of a contracted bladder.

Moreover, in combination with chemotherapy, surgery can ensure sufficiently radical removal of localized lesions, hold back the progression of tuberculosis, create better condition for reparative processes (11).

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# Renal papillary adenocarcinoma with unusual metastases: case report and review of the literature.

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## Summary

*Objective: This study focuses on a case report on a patient with renal carcinoma who developed metastases at unusual sites. We also reviewed the literature, including the theories proposed by various authors on the possible etiology of these odd localizations. Case report: A 48-year-old patient underwent conservative surgery for renal carcinoma (papillary adenocarcinoma). Twenty-two months later, he developed mediastinal metastases and underwent immunotherapy; two years after that he had metastases to unusual sites such as the urethra and the prostate. The mechanisms responsible for metastases to these unusual sites are not entirely clear yet. We feel it is important to note the highly aggressive and multifocal nature of papillary adenocarcinoma, and the need to perform closer follow-up on these patients, particularly if nephron-sparing surgery has been performed.*

**KEY WORDS:** Kidney cancer; Papillary adenocarcinoma; Metastases.

## INTRODUCTION

The introduction of non-invasive diagnostic techniques such as ultrasound scan has led to a gradual increase in incidental diagnoses of renal carcinoma. This has been accompanied by a rise in the identification of tumors with a small diameter and low stage that theoretically have a better prognosis, although at diagnosis about 20-30% of patients are generally in an advanced or metastatic stage (1).

Renal carcinoma tends to metastasize to pulmonary and mediastinal level (50%), bones (49%), skin (11%), liver (8%) and brain (3%) (2); however, there can be several unusual sites such as the bladder, ureter, seminal vesicles and prostate.

We report a case in which renal adenocarcinoma metastasized to the typical sites (mediastinal and brain) as well as to unusual ones (prostate, urethra and the maxillofacial area). We also analyze literature to overview the theories proposed by various authors on the possible etiology of these odd localizations.

## CASE REPORT

In 1997, a 48-year-old male was referred for suspected left renal-urethral colic. Ultrasound scan revealed a hypoechogenic lesion at the inferior pole of the left kidney, with a diameter of 37 mm, confirmed by CT scan.

Preoperative staging was completed with a chest X-ray and a bone scan.

Nephron-sparing surgery was performed: the renal mass was resected together with a margin of about 10 mm of peritumoral tissue: histological examination showed a papillary adenocarcinoma G2 (Furhman's classification); surgical margins were negative.

The post-operative course was normal; the patient was disease-free until 1999 when, following the onset of intractable dyspnea, a chest X-ray revealed isolated mediastinal lymphadenopathy. A CT-guided fine-needle biopsy was performed and showed a papillary adenocarcinoma. The patient underwent a cycle of INF-alpha followed by a cycle of combined therapy with INF-alpha and ILK for 10 months, with a poor response, and then he began radiotherapy (30 Gy) after which the mediastinal disease stabilized and the dyspnoic symptoms disappeared.

Follow-up was negative until April 2001, when the patient was referred for the onset of paresthesia involving the face and lower extremities. All exams were negative (chest X-ray, bone scan and total body CT). The patient gave informed consent and began a cycle of treatment with thalidomide (3 weekly cycles for 3 months at a dosage of 400/200 mg/die), with a little reduction of symptoms.

In December 2001, the patient presented urethrorrhagia

and haematuria; at ultrasound scan bladder was normal while it revealed a small hypoechoogenic lesion of the prostatic right lobe surrounded by a hyperechoogenic rim (Figure 1).

Cystoscopy with biopsy was performed: there was lardaceous tissue at the pendulous and prostatic urethra, without any evident bladder lesions; the biopsy again revealed a low-grade papillary adenocarcinoma. The patient was treated with a cycle of local radiotherapy for hemostatic purposes (15 Gy): this did not resolve the hematuria, which was treated with endoscopic resection of the prostate, coagulation of the urethral area and permanent catheterization. The histological examination of the surgical pieces confirmed the presence of papillary adenocarcinoma (Figure 2).

One month later, without macrohematuria, the patient complained headache, associated with dyspnea. A cranial CT was performed, revealing the presence of widespread metastases in the maxillary sinuses, nasal septum and fossa, and multiple localizations in the brain, the patient underwent radiotherapy to relieve pain but died 25 days later.

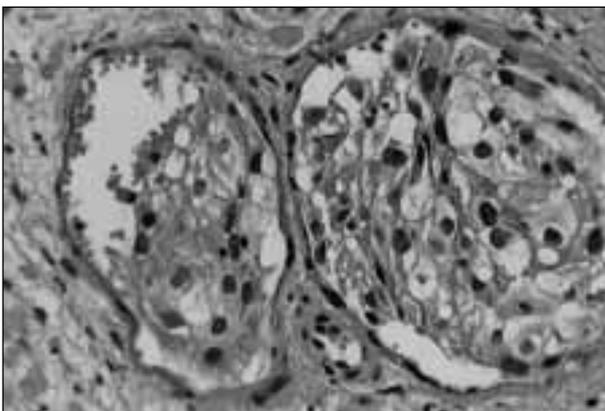
**Figure 1.**

*TRUS: the scan shows a low echogenic lesion of the right prostate lobe surrounded by a high echogenic ring: metastases of the prostatic urethra.*



**Figure 2.**

*Histological specimen of the lesion of prostatic urethra: low grade papillary adenocarcinoma.*



## DISCUSSION

The most frequent sites of renal tumour metastases are lymph-nodes, followed by lung, brain, bones and liver. As described in the literature, however, there are more unusual metastatic sites, represented by the upper urinary tract, bladder, seminal vesicles, prostate, glands and gall bladder (1, 3-9), thus underscoring the difficulty in predicting the natural evolution of the disease.

The presence of metastatic illness at diagnosis, independently of the site, reduces the survival rate to <10% at 1 year (1). In our case, at diagnosis the patient was T1, N0, M0. In these cases, as demonstrated in the literature and by our own experience, nephron-sparing surgery guarantees a survival rate similar to radical nephrectomy, despite the fact that a higher incidence of synchronous or asynchronous, ipsilateral or contralateral disease has been observed for the papillary histological type. Our patient developed a disease spreading to anomalous sites such as prostatic, bulbar and pendulous urethra.

In urogenital localizations, there are three theories of metastatic spread: 1) by continuity-contiguity; 2) by a retrograde venous route; 3) retrograde lymphatic spread (5).

In our case of urethral involvement, the complete negativity in the bladder leads us to exclude the possibility that the disease spreads by continuity-contiguity. Metastases via a retrograde venous route may be the cause, given the fact that the primary tumor was in the left kidney, whose vein – as demonstrated in the literature (6) – has an ample series of collateral circles, such as the vertebral venous system and the ipsilateral gonadic vein, or a spread of the disease through the lymphatic system, as put forth by Swanson in 1982.

The effectiveness of palliative endoscopic therapy of the urethral and prostatic metastases was good, as shown by the disappearance of macrohematuria, which had not responded to hemostatic radiotherapy. However, we cannot express any further opinions for the rapid multifocal metastatic spread that culminated in the patient's death.

In our experience on renal carcinoma, we found (at a same follow-up) a mortality rate of 27% for papillary adenocarcinoma (every cases were pT1 disease) and a rate of 19% for clear cell carcinoma (with a 62% of pT1 cases), with a global incidence of multifocal disease of 5.6% (in about 80% of cases primary lesion was papillary adenocarcinoma).

Unfortunately, this relationship between histotype and multicentricity cannot be gleaned by examining the particular cases in the literature, due to the lack of histological data.

We feel it is useful once again to emphasize the highly aggressive nature of papillary renal carcinoma. The higher risk of multifocal disease associated with the papillary tumor, which was already clear with regard to renal multicentricity, should be viewed as organic multifocality.

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# Ureteral endometriosis: an unusual case of a pelvic mass arising in the ureter and involving the rectum and uterine cervix.

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## Summary

*The case of a 41-year-old woman with a pelvic mass arising in the left ureter is reported. The diagnosis of endometriosis was made on transperineal biopsy exclusively. After unsuccessful treatment with LH-RH analogues, the patient underwent ureteral resection and ureteroneocystostomy. At six months' follow-up, she is asymptomatic with no evidence of hydronephrosis.*

**KEY WORDS:** Endometriosis; Hydronephrosis; Ureteral obstruction; Pelvic pain.

## INTRODUCTION

Endometriosis is defined as the presence of normal endometrial glands and stroma at an ectopic site. It affects up to 15% of menstruating women, most frequently between 20 and 40 years of age, rarely occurring before the menarche and usually becoming quiescent with the menopause (1). Urinary tract involvement is present in 1.2% of cases, with the bladder, ureter and kidney being affected in a ratio of 40:5:1 (2). Endometriosis of the ureter is uncommon and approximately 100 cases are reported in the literature. However, as obstructive uropathy is frequently asymptomatic, the incidence is probably underestimated.

We present a case of endometriosis of the ureter causing severe hydroureteronephrosis that was treated with ureteral resection and ureteroneocystostomy after hormonal therapy failed.

## CASE REPORT

A 41-year-old white woman, gravida 1, para 1, was admitted when a lower abdominal mass was detected during a gynecologic check-up. The patient also complained of suprapubic discomfort. There were no urologic symptoms and her family history was noncontributory. Routine laboratory tests were normal. CA.125 was 220 U/mL (n.v. 0-35). An excretory urogram demonstrated severe hydroureteronephrosis, suggestive of a poorly defined obstruction of the pelvic ureter (Figure 1). Abdominopelvic ultrasonography (US) confirmed hydroureteronephrosis with dilation of the ure-

ter as far as the left parametrium. Transrectal ultrasonography (TRUS) clearly showed a 3-cm mass in the left parametrium, embedding the rectum and the uterine cervix. These findings were confirmed on computerized tomography (CT) and magnetic resonance imaging (MRI) (Figures 2A and 2B). Transperineal sonography guided biopsies were taken and microscopic examination demonstrated endometriosis. Percutaneous nephrostomy was performed. On consideration of the location and extent of the lesion and also of the previous estrogen stimulation, medical treatment with LH-RH analogues (3.75 mg intramuscularly monthly for six months) was carried out. Six months later, there had been no significant change in the size of the mass and the patient underwent laparotomy through a Pfannenstiel incision. Abundant scar tissue encasing the ureter was found and ureteral resection with ureteroneocystostomy was performed. The final pathology report confirmed endometriosis (Figure 3).

The postoperative course was uneventful and the patient was discharged two weeks after surgery. At six months' follow-up the patient was asymptomatic and urography showed resolution of hydroureteronephrosis (Figure 4).

## DISCUSSION

Endometriosis of the genito-urinary tract is a rare clinical condition. In 1860 Von Rokitansky gave the earliest description of endometriosis on autopsy material, and

**Figure 1.**  
*Excretory urography: left hydroureteronephrosis, with blockade in distal pelvic ureter.*



in 1921 Judd first reported a case with urinary tract involvement (1). It usually occurs in 10-30% of women in the menstrual years, but may also be seen after the menopause.

Many theories have been put forward attempting to explain the presence of endometrium in the ureter. Stanley and associates have suggested that ureteral and

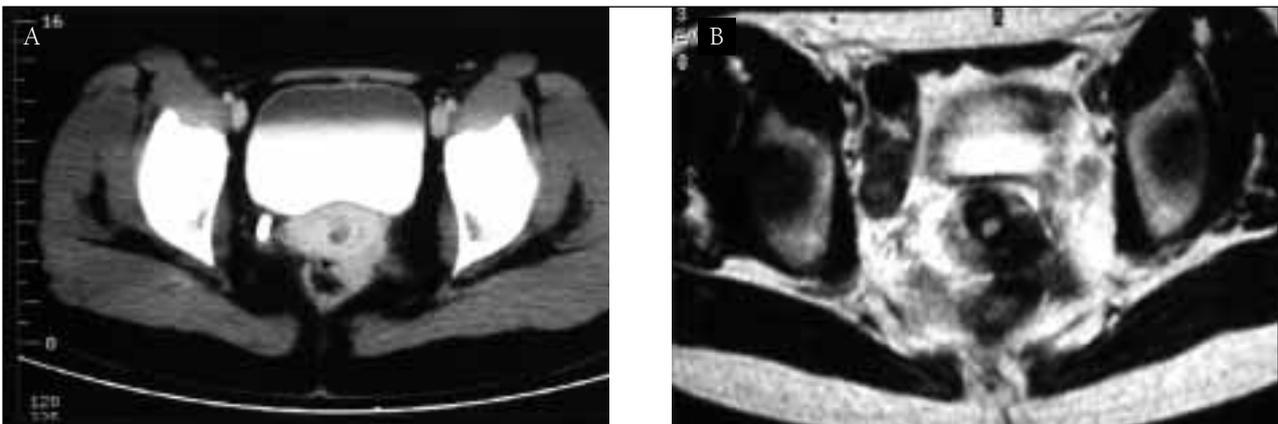
bladder involvement may arise from pelvic foci (2). Implantation secondary to lymphatic or blood vessel invasion is well documented. Sampson's theory of retrograde menstruation is also well known, as well as the possibility of metaplastic changes of the urothelium (3). After estrogen stimulation, the ectopic endometrial tissue causes menstruation and hemorrhaging. Inflammatory reaction in the adjacent tissues subsequently leads to fibrosis, scarring and adhesions.

Ureteral endometriosis is usually unilateral, confined to the lower third of the ureter, and associated with endometriosis elsewhere in the pelvis (4). Only one case of ureteral endometriosis above the pelvic brim has been reported so far (5). Involvement of the peritoneum, uterosacral ligament, rectovaginal septum, cervix labia and vagina or ovary may result in extrinsic compression of the ureteral wall (80%). Less commonly, endometriosis is intrinsic, causing thickening of the ureteral wall. In rare cases, it may give rise to a polypoid tumor-like mass projecting into the lumen. Unilateral hydronephrosis due to intraluminal obstruction of the ureter by adenosquamous endometrioid carcinoma derived from disseminated endometriosis has been described by Jimenez et al (6).

Clinically, menstrual disorders have been reported in 28% of cases, flank pain in 23%, gross hematuria in 13%, and abnormal findings on pelvic examination in 50%. Patients generally complain of vague abdominal or urinary symptoms occurring around the time of menstruation, with as many as 50% of the patients having a history of previous pelvic surgery (7). Physical examination may reveal flank tenderness and an enlarged, palpable kidney, but only in cases with severe obstruction. A pelvic mass has been reported in up to 42% of patients (8). Radiologic investigation, such as excretory urography and US, may reveal a filling defect. CT and MRI are useful in defining the extent of ureteral and/or pelvic lesions. The diagnosis is confirmed histologically.

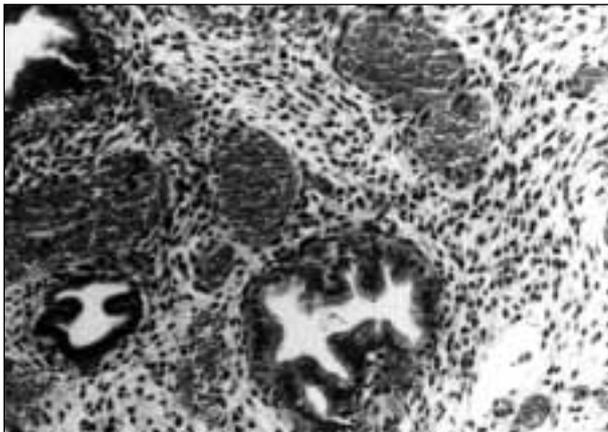
Treatment is either medical or surgical, depending on the patient's age and symptoms and her desire to preserve the reproductive function. When the ureter is

**Figure 2.**  
*Dynamic CT: low enhancement of the pelvic mass involving the rectum and the uterus; the left ureter appears dilated (A). MRI: the pelvic mass infiltrating the uterus and the rectum, with low dishomogeneous intensity of the signal (B).*



**Figure 3.**

The endometrial gland epithelium surrounded by typical endometrial stromal cells (hematoxylin-eosin, original magnification X125).

**Figure 4.**

Urography after reimplantation showing complete resolution of hydronephrosis.



involved, the gold standard treatment is removal of the obstruction and preservation of the renal function. Minimal ureteral surgery without removal of the reproductive organs has given poor results, with a high rate of persistent ureteral obstruction and subsequent nephrectomy. Surgical management of ureteral obstruction encompasses gynecologic surgery (often with hysterectomy and bilateral salpingo-oophorectomy) and urologic surgery (ureterolysis, resection with re-anastomosis or reimplantation, or nephroureterectomy, depending on the degree of obstruction). Surgery is indicated in those patients who are infertile and wish to restore their fertility by having their ovaries and tubes freed of fibrosis and adhesions. In addition to surgical treatment, hormonal manipulation using agents such as danazol and, more recently, LH-RH analogues has also been tried (9). Medications are designed to inhibit ovulation and lower hormone levels, thus preventing cyclic stimulation of endometriotic implants and decreasing their size, but are of little effect in cases with fibrous sequelae.

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# Renal sarcoma associated with adult polycystic kidney disease. A case report and literature review.

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## Summary

*The development of renal cell carcinoma in Adult Polycystic Kidney Disease (APKD) has been reported in the literature; one of the features of renal malignancy in APKD is the difficulty to make a diagnosis, and the majority of cases reported are incidental findings at surgery or autopsy. We report a rare case of renal sarcoma in a patient with APKD. Sarcoma associated with APKD does not seem to have particular biological characteristics when compared with primary renal sarcoma; however the polycystic kidney represents an aggravating circumstance, because of the difficulty in making an early diagnosis of a disease with a poor prognosis.*

**KEY WORDS:** Autosomal Dominant Polycystic Kidney Disease; Renal Sarcoma.

## INTRODUCTION

Autosomal Dominant Polycystic Kidney Disease (APKD) occurs in approximately 1 in 500 to 1 in 1,000 live births (1) and is present in 10-12% of end-stage renal disease patients, making it the most common hereditary disease (2, 3). The development of renal cell carcinoma in APDK has been reported in the literature (3-6).

Soft tissue sarcomas of the genito-urinary tract are relatively common in the pediatric population, where they account for up to 8 per cent of all malignant diseases in children less than 15 years of age (7, 8), whereas they are uncommon in adults.

One of the features of renal malignancy in APKD is the difficulty to diagnose, due to overlapping clinical features and marked architectural distortion (9); the majority of cases reported in the literature are incidental findings at surgery or at autopsy (3).

We report a rare case of renal sarcoma in a patient with APKD.

## CASE REPORT

A 61-years old man with APKD came to our observation because of gross haematuria, recent onset of pain in the right loin and iliac fossa, a palpable mass, weight loss, epigastric pain and fatigue.

A Magnetic Resonance Imaging (MRI) of the abdomen showed a marked increase in the size of both kidneys

with multiple huge cystic lesions and a 10 cm diameter solid mass in the right kidney; no other lesions were evident in abdominal organs (Figure 1). No lesions were found in the chest X-ray or at bone scan.

Blood results showed Haemoglobin 9.2 gr/dl, urea nitrogen 100 mg/dl and creatinine 2.2 mg/dl.

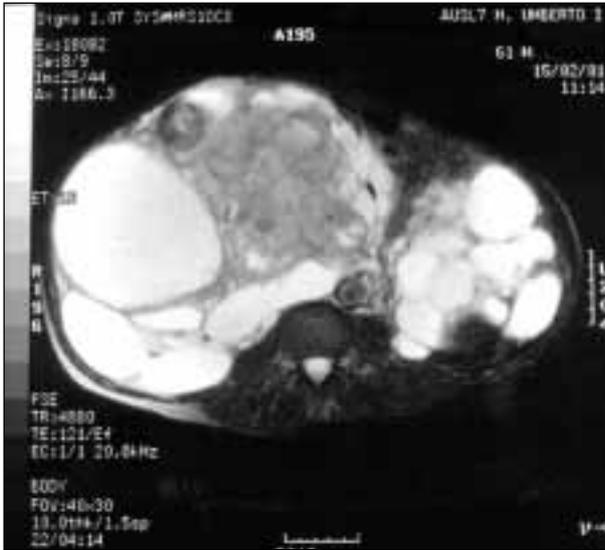
A right nephrectomy through a midline abdominal incision was performed (Figure 2); only at surgery a thrombosis of the inferior vena cava was discovered; the thrombus was removed and a filter was placed proximally towards the right atrium.

The post-operative course was regular and the patient was discharged after 2 weeks.

At pathological examination, the right kidney was 30 cm in length and 8 kg in weight. Numerous cysts were divided by necrotic tumoral tissue, with difficulties in distinguishing the residual kidney parenchyma; the tumour was composed by a proliferation of atypical fusiform and polymorphic cells, extensively infiltrating the renal parenchyma and the surrounding tissues (Gerota fascia and pericolic fatty tissue). At morphological and immunohistochemical investigation aspects of epithelial differentiation were not detected (the staining with CAM 5.2, cheratin AE1 - AE3, EMA, HMB45 was negative); the staining with vimentine, actine and desmine was positive; therefore the morphological aspects give evidence of an high grade sarcoma (grade 3)(Figure 3).

**Figure 1.**

Abdominal MRI scan showing a marked increase of both kidneys with multiple cystic lesions and a solid mass in the right kidney.



An abdominal MRI performed after 4 months showed a huge relapse of the tumour in the right renal fossa. The patient died 2 months later because of metastatic disease.

**DISCUSSION**

Due to the increased survival rates of patients with APKD undergoing dialysis, and eventually transplantation, the presence of a coexisting carcinoma must be taken into consideration when complex cysts are discovered within the kidney on diagnostic studies performed for various symptoms or during screening (3). One of the features of genitourinary sarcomas, distinguishing them from other sarcomas, is the fact that the vast majority of these lesions are high-grade histologically; in fact it has been observed (8) that fully 86 per-

cent of these lesions are high-grade and 56 percent are greater than 5 cm in size at diagnosis. This has obvious prognostic implications for patients, and a relatively poor 5-years actuarial survival for patients with high grade histology or large tumour size has been observed (10). Kidney (as well as prostate) sarcomas have shown a poor prognosis when compared to paratesticular or bladder sarcomas (8); complete tumour resection is possible only in 72% of patients with renal sarcomas and 86.6% of them die within 23 months after surgery (10). By a literature review, we have found that the association between adult polycystic kidney disease and renal cell carcinoma of conventional type (clear cells) has been described; to our knowledge no case has been reported describing the association between APKD and renal sarcoma.

The primary treatment for these lesions, as with sarcomas elsewhere in the body, is complete resection with histologically negative margins.

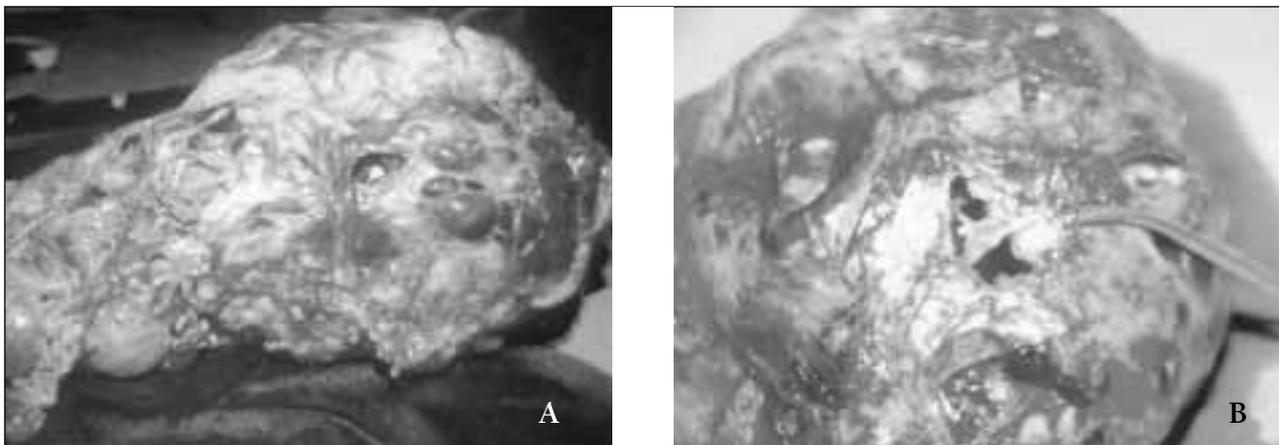
Sarcoma associated with APKD does not seem to have particular biological characteristics when compared with primary renal sarcoma; however the polycystic kidney represents an aggravating circumstance, because of the difficulty in making an early diagnosis of a disease with a poor prognosis.

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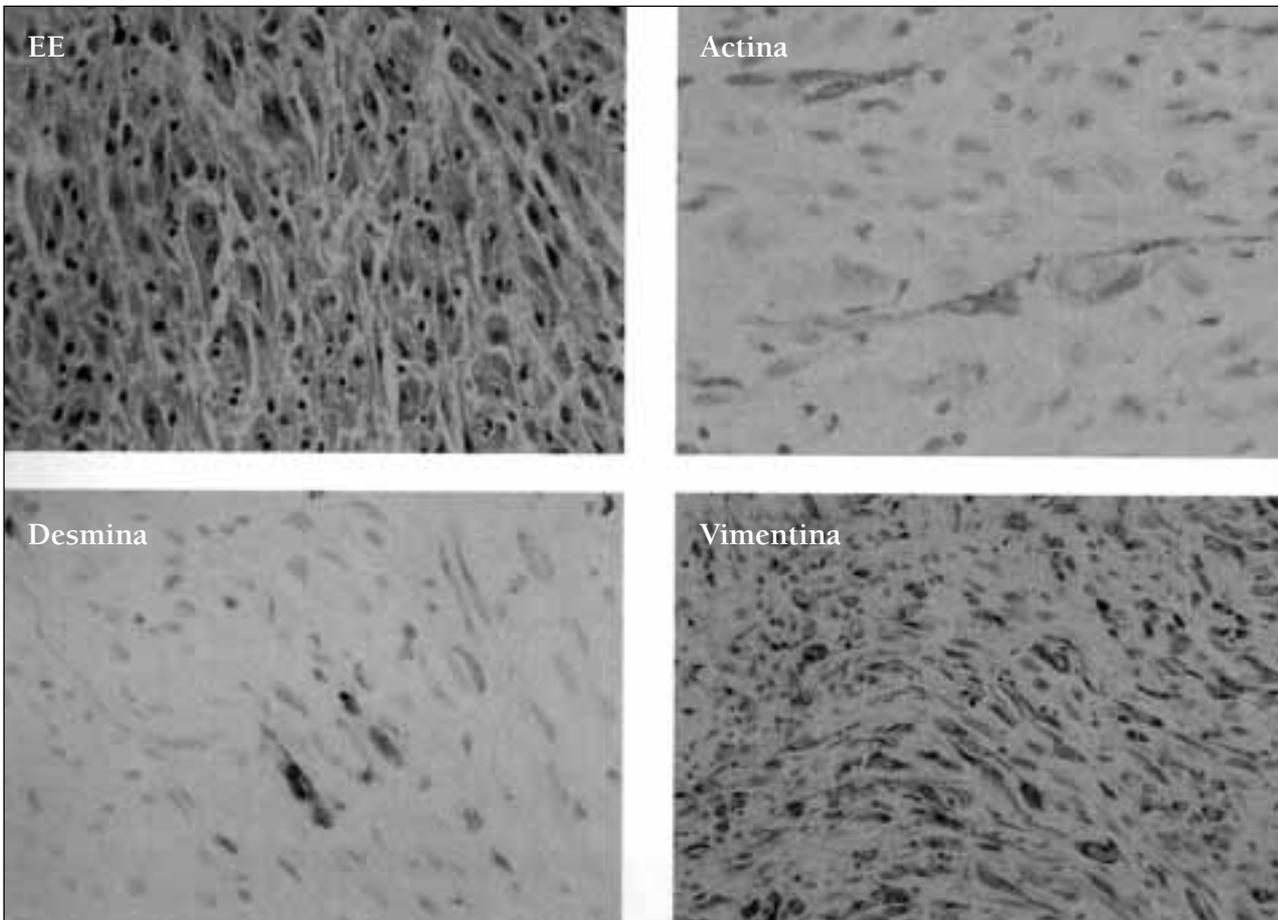
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**Figure 2.**

Appearance of the right kidney once removed.



**Figure 3.**  
Results of immunohistochemical investigation showing no epithelial differentiation and positive staining for vimentine, actine and desmine.



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## Persistent priapism and histological modifications of the erectile tissue. Two case reports.

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### Summary

*Prolonged veno-occlusive priapism is associated with a high risk of fibrosis of the corpora and impotence. We present 2 cases of prolonged low-flow priapism who came under our observation more than 72 hours after the onset of priapism. The first case was a 51-years old man in which the aethiology of priapism was cauda equina compression by a L4-L5 discal haernia, not recovered after surgical decompression. The second case was a 23-years old man suffering of painful priapism lasting for more than 7 days due by abuse of cocaine, alcohol and psycopharmaceuticals. In both cases drainge and irrigation of the corpora followed by injection with an  $\alpha$ -agonist agent has been insufficient. Detumescence has been obtained with shunt procedure and compressive bondage. The biopsy of the corpora cavernosa showed fibosis.*

**KEY WORDS:** Prolonged priapism; Discal haernia; Psychopharmaceutical agents; Fibrosis; Impotence.

### INTRODUCTION

Priapism is a condition of prolonged penile erection which often causes pain and is unrelated to sexual desire. There is a high risk of impotence despite immediate intervention. The incidence has doubled since the introduction of intracorporean injection therapy for impotence. A relationship between the onset of priapism and perineal trauma, sickle cell disease, other rare types of anaemia, leukaemia, thrombo-embolic disease and carcinoma of the pelvic organs has been recognized (1).

Many medications have been associated with priapism (2) and some authors have focused on the influence of the consumption and abuse of alcohol and drugs causing psychic and physical dependence. Some authors have observed rare cases of priapism in patients with neurological disorders (3, 4).

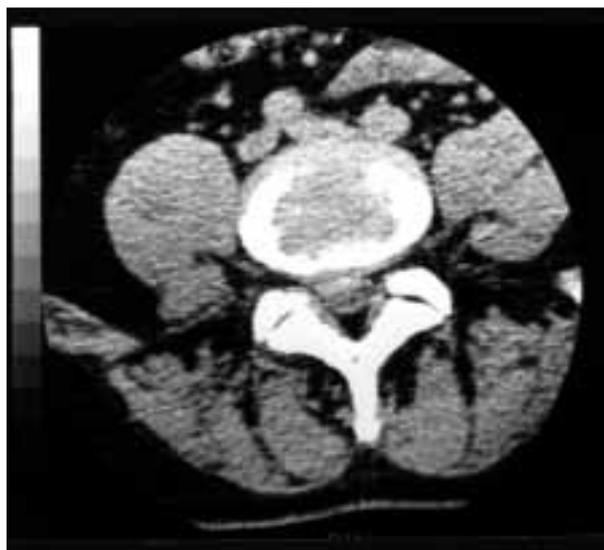
### CASE REPORT - 1

A 51-years old white man came under our observation for persistent priapism; the patient had been complaining of right sciatic pain for 3 weeks and therefore was admitted to the Hospital for treatment; at physical examination, signs of radicular syndrome at the level of L5-S1 right spinal nerves were evident. A CT and MRI (computed tomography and magnetic resonance imaging) scan of the lumbo-sacral region was performed,

that showed a right postero-lateral discal hernia (Figure 1) at the level of L4-L5, lapping the L5-S1 intervertebral space (Figure 2). From the day before orthopedic

**Figure 1.**

*Ct scan of lumbo-sacral region showed a right postero-lateral discal hernia at the level of L4-L5.*



**Figure 2.**  
Magnetic resonance imaging showed spinal compression at the level of L5-S1.



surgery, the patient complained of the onset of priapism, that did not regress after surgical decompression. When the patient presented to us 72 hours after the onset of priapism, cavernosal blood-gas analysis showed the presence of poorly oxygenated blood; a color-doppler ultrasound suggested a veno-occlusive mechanism as the etiology of priapism. Needle aspiration of the corpora was attempted unsuccessfully, and therefore irrigation with normal saline and an intracorporeal injection with 50 µg of phenylephrine was attempted, but it was not sufficient to cause detumescence. A Magnetic Resonance of the abdomen and an arteriography of the internal pudendal arteries were performed, that resulted to be normal. A Winter procedure (5, 6) was then attempted, with partial improvement. A core biopsy of the corpora cavernosa was taken, that showed endocavernosal thrombosis with loss of the endothelium, leukocytes and fibroblasts infiltration and slight fibrosis. We have advised the patient to position a penile prosthesis.

### CASE REPORT - 2

A 23-years old white man presented to our observation because of a painful priapism lasting for more than 7 days. The patient referred abuse of alcohol, psychopharmaceuticals and cocaine. Cavernosal blood-gas analysis showed the presence of poorly oxygenated blood; a color-Doppler ultrasound showed persistent blood flow through the cavernosal arteries. For the purpose of pain relief, needle aspiration of the corpora was attempted and afterward irrigation with normal saline and an intracorporeal injection with 50 µg of phenylephrine, but it was not sufficient to cause detumescence. A Winter procedure was then attempted, with slight improvement. A core biopsy of the corpora cavernosa was taken, that showed endocavernosal thrombosis with loss of the endothelium, leukocytes

and fibroblasts infiltration and fibrosis. We have advised the patient to position a penile prosthesis.

### DISCUSSION

Priapism is well known as a side-effect of intracavernous injection of vaso-active drugs for the treatment of impotence (1, 7). The most common form of priapism is called veno-occlusive, or low flow, and is caused by prolonged blood engorgement inside the lacunar spaces, as a result of an intraluminal or extraluminal outflow blockage; it is characterized by inadequate venous outflow, leading to hypoxic painful erection; the less common type, the high-flow priapism, is arteriogenic, is almost always associated with a blunt penile or perineal trauma, leading to laceration of the cavernosal arteries or its branches with a creation of a fistula between the artery and the corpora cavernosa; it causes less pain and no ischemia (8). If the erection persists for more than 48 hours, permanent damage to the penile microvascular system may change veno-occlusive priapism into the high-flow type (6, 9). The duration of priapism is important in planning adequate therapy; in persistent erection, superselective embolization of the cavernosal arteries using adsorbable emboli has been advocated to obtain detumescence (6). Our cases are peculiar for the long time of duration of priapism, respectively 3 and 7 days, and for the rarity of the causes leading to it. As a result from the mechanical irritation provoked on the sacral roots, the cauda equina compression syndrome can involve, as part of its symptomatic state, involuntary erections and micturitional disorders; it can cause priapism as a result of mechanical compression, probably because of the interference with nervous mechanisms that induce detumescence; the symptoms arise when the patient is standing and stretching the spine, i.e. are intermittent; usually surgical decompression can resolve priapism. In our case the priapism was not intermittent, probably because of the size of the lumbar hernia, and surgery was not accompanied by penile detumescence; infact, at time of surgery, the priapism was lasting for more than 24 hours and timely treatment was not performed.

As far as the second case report is concerned, in some series (1) an high percentage of heavy alcohol drinkers in priapism patients has been found (37%); alcohol is known to influence the development of many diseases, both directly through its effect on the nervous and haematopoietic system or indirectly via the liver; in our case the patient was also addicted to psychopharmaceutical agents; it has been reported that the rate of such agents associated with priapism was 5%; phenothiazines and trazodone in particular are known to be involved in priapism; the exact mechanism by which they induce priapism is not quite understood, but most authors attribute it to their  $\alpha$ -adrenoceptor-blocking action (2, 7). Our case is particular for the duration of priapism (7 days). Histological studies have shown a clear cascade of events during priapism (10); after more than 48 hours the main aspects consist of endocavernosal thrombosis with loss of the endothelium, leukocytes and fibroblasts infiltration and fibrosis. It has been observed that the majority of

cases of priapism lasting less than 36 hours can be treated by needle aspiration and  $\alpha$ -adrenergic drugs without important fibrosis; after 36 hours no patient responded to  $\alpha$ -adrenergic drugs and all of them developed intracavernosal fibrosis. The goal of treatment of priapism is to preserve penile function and to avoid the development of fibrosis. In summary, when low-flow priapism is present for more than 72 hours and cavernosal blood-gas analysis shows poorly oxygenated blood, the permanent damage to the penile microvascular system do not leave any chance to preserve erectile function.

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# Post-traumatic ureteropelvic junction obstruction.

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## Summary

*Ureteropelvic junction (UPJ) injuries secondary to blunt abdominal trauma are rare, have been traditionally described in children and consist in laceration or avulsion of the ureter. The diagnosis is typically delayed owing to associated severe lesions and absence of hematuria in many cases. Late sequelae of non penetrating ureteral injuries have only been anecdotally described in world literature. To the best of our knowledge we report on the first case of UPJ obstruction in an adult man diagnosed 10 years after a blunt abdominal trauma.*

**KEY WORDS:** Ureteropelvic junction obstruction; Ureteral injury; Abdominal trauma; Urinary extravasation; Ureterolysis

## INTRODUCTION

Ureteral injuries following abdominal trauma are rare, accounting for approximately 3% of all genitourinary injuries. The ureter's mobility, narrow diameter and retroperitoneal location between the spine, major muscle groups and peritoneal organs protect it from external mechanical forces, making it an unlikely target (1).

Ureteral lesions after blunt abdominal trauma are exceedingly rare. They usually involve the UPJ, predominantly occur in children, especially young boys, and can cause complete avulsion or partial laceration of the ureter depending on the entity of the trauma (2). The typical injury mechanism is a sudden deceleration with consequent hyperextension of the vertebral column, which creates tensile stress on the renal pedicle resulting, eventually, in disruption of the ureter at its proximal point of fixation (3, 4).

A misdiagnosis is quite common because of either more relevant associated injuries, which deserve immediate attention due to hemodynamic instability, or absence of hematuria in approximately one-third of cases (5, 6).

A meticulous contrast-enhanced CT scanning of the abdomen with delayed films during the excretory phase, supplemented by retrograde pyelography in selected cases only, is of paramount importance for a correct and prompt diagnosis.

While clinical and radiological features of UPJ and ureteral injuries early after the trauma are well known (7-9), late findings, mainly leading to renal obstruction, have been only anecdotally described (10).

We report on an adult man diagnosed with UPJ obstruction 10 years after a blunt abdominal trauma.

## CASE REPORT

A 59-year-old man presented in April 2000 with the complaint of right loin pain of 9 months' duration. His medical history revealed blunt abdominal trauma with pyramidal facial fracture sustained after a bicycle fall 10 years earlier. An abdominal CT scan performed immediately after the accident to rule out suspected spleen rupture demonstrated neither visceral injuries nor pre-existing genitourinary abnormalities. The patient never experienced right flank pain before presentation at our Institution. History of symptomatic urinary tract lithiasis and infections before and after the trauma was ruled out. The patient had never undergone abdominal surgery and did not suffer any other health problem except for arterial hypertension which he had been treating with Enalapril for 3 years. On admission physical examination detected no pathologic findings and renal function tests were within normal limits. Abdominal ultrasonography showed a 9 cm long right kidney with moderate hydronephrosis and no stone-like images. Intravenous pyelography demonstrated right hydronephrosis with delayed drainage of pyelocalyceal system and lack of ipsilateral ureteral opacification (Figure 1). Retrograde pyelography showed a 2.5 cm long non opacified ureteral segment immediately below the UPJ (Figure 2). Abdominal CT scan revealed small clustered spherical lesions encasing the UPJ, with heterogeneous hypoattenuation and no enhancement, for a maximum size of 3 cm (Figure 3).

At surgical exploration the UPJ and the very proximal ureter were encased by a thick-walled mass with multiple loculations containing yellowish liquid, which was en bloc removed, thus mobilizing and freeing the ureter.

**Figure 1.**

*Intravenous pyelography revealing right hydronephrosis suggestive of UPJ obstruction.*



**Figure 2.**

*Retrograde pyelography demonstrating a 2.5 cm long non opacified ureteral segment immediately below the UPJ.*



**Figure 3.**

*Abdominal CT scan with contrast showing small multiple cystic lesions without enhancement clustered around the right renal pelvis.*



Chemical and cytological analysis of the fluid showed few urate crystals with no inflammatory or malignant cells. Histopathologic examination of the cyst walls on

frozen sections revealed connective tissue with focal chronic inflammatory infiltrates. A 6 F double J ureteral stent was kept in place for 1 month after surgery. The patient has been followed for 30 months with no recurrence of either lumbar pain or hydronephrosis.

### DISCUSSION

Blunt injuries involving the UPJ are quite rare occurrences and have been traditionally described in children, but as more cases reports have evolved, roughly one half of these injuries involve now adults.

It is well established that the diagnosis may be initially elusive or even completely missed, but to the best of our knowledge there is little in the urological literature that reports on the incidence and characteristics of late sequelae of those ureteral injuries left undiagnosed at the time of trauma.

In particular, in a computerised literature search performed through the PubMed database we were unable to find other cases of UPJ obstruction secondary to external blunt abdominal trauma in an adult man with such a delayed presentation time (10 years) after occurrence.

Even though radiological and histological data may be not strictly indicative, the historical and clinical features hardly suggest that the most likely explanation of the present case of extrinsic UPJ obstruction is the pseudocystic organization of a small urinary extravasation

caused by an undetected laceration of the renal pelvis or upper ureter at the time of trauma.

With regard to possible therapeutic choices, an endourologic approach was deemed not justified since the nature of the lesion had not been entirely clarified even after CT imaging, and a dismembered pyeloplasty would have not been as minimally morbid as the surgical procedure we adopted, the ureterolysis, which has moreover proven to be long-term effective.

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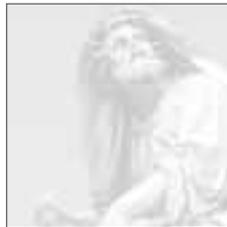
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