UIJ UroToday International Journal®

Table of Contents: February, 2013

ISSN 1944-5792 (print), ISSN 1944-5784 (online)

UIJ UroToday International Journal®

Pediatric Recipients of Adult Laparoscopic Donor Nephrectomy: A Single-Institution Outcome Analysis

Zachary Klaassen, Prakash R. Paragi, H. Stephen Fletcher, Ronald S. Chamberlain, Stuart Geffner

Submitted November 24, 2012 - Accepted for Publication January 6, 2013

ABSTRACT

Introduction: For more than a decade, adult laparoscopic donor nephrectomy (LDN) has been offered as a minimally invasive organ procurement modality for pediatric patients with end-stage renal disease. There is a paucity of literature reflecting pediatric recipient outcomes of adult LDN kidneys, and the objective of this study was to evaluate our institutional experience.

Methods: Thirty-six pediatric patients were identified as recipients of adult LDN from 2000 to 2009 at our institution.

Results: The most common renal disease was dysplasia (N = 6) for those 0 to 5 years of age and nephronophthisis (N = 7) for those 6 to 18 years if age. The mean operative time for those 0 to 5 years of age was 262 ± 38 min and 216 ± 69 min for those 6 to 18 years ($P < 0.04$). Perioperative complications were more common in those 0 to 5 years of age (73 vs 24%, $P < 0.01$) and the length of stay (19.3 ± 20.8 days vs 4.8 ± 2.7 days, $P < 0.001$) was longer compared with those 6 to 18 years.

Conclusion: Pediatric recipients of adult LDN kidneys present unique surgical and hemodynamic challenges. Although renal transplants in pediatric patients are associated with postoperative morbidity, graft survival is comparable to adult LDN recipients.

INTRODUCTION

More than 85 000 people remain on the Organ Procurement and Transplantation Network's (OPTN) list awaiting a kidney donor, including nearly 1 000 patients less than 17 years of age [1]. Following the first laparoscopic donor nephrectomy in 1995 [2], the United Network for Organ Sharing (UNOS) has reported an increase in living kidney donors, culminating in 2001 with the number of living donors exceeding the number of cadaveric kidneys used for transplantation [3]. The pediatric population (≦ 18 years of age) represents a unique subset of patients awaiting a kidney donor. Within the first few years of life, pediatric patients with nephronophthisis, congenital dysplasia, and obstructive and reflux nephropathy suffering from end-stage renal disease (ESRD) often require kidney transplantation or hemodialysis.

A number of studies have suggested that pediatric recipients of laparoscopically procured kidneys achieve favorable post-transplant outcomes similar to adult recipients [4-10]. However, more recently, Troppmann et al. [11] reported a large study by UNOS in which higher rates of delayed graft function (DGF) and acute rejection (AR) were reported for pediatric recipients of laparoscopically procured kidneys compared to open controls. These authors postulated that challenging intraoperative factors, hemodynamic changes at the time of graft reperfusion, and increased immune reactivity in the pediatric patient accounted for adverse outcomes [11].

Given the paucity of published data on outcomes of pediatric recipients of adult LDN-procured kidneys, we sought to review our own experience. Thirty-six patients ≦ 18 years of age who received kidneys via LDN formed the study cohort and were

KEYWORDS: Pediatric, laparoscopic donor nephrectomy, adult kidney donor, outcomes

CORRESPONDENCE: Ronald S. Chamberlain, MD, MPA, FACS, Chairman and Surgeon-in-Chief, Saint Barnabas Medical Center, 94 Old Short Hills Road, Livingston, New Jersey 07039 USA (rchamberlain@barnabashealth.org)

CITATION: *UroToday Int J*. 2013 February;6(1):art 7. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.07

analyzed for demographic and perioperative parameters, and they were compared to previously published results.

METHODS

Between 2000 and 2009 nearly 1 000 patients underwent LDN at the Saint Barnabas Medical Center, Livingston, New Jersey. Among these patients, 36 patients (males 44% [N = 16), and females 56% [N = 20]) were identified as kidney donors for pediatric recipients (≦ 18 years of age). Our technique for LDN kidney procurement has been previously described [12].

Briefly, the recipient surgical procedure for infants and small children was as follows: The patient was positioned supine and a standard midline incision was made. The right colon and small bowel were mobilized by the Cattell-Braasch maneuver and were reflected superiorly and medially to expose the aorta and vena cava, which were subsequently and partially occluded with vascular clamps. Appropriate retraction of the bowel was obtained to allow space for the transplant kidney to be positioned in the right side of the abdomen. The donor kidney was benched with cold Ringer's lactate and an albumin solution, and it was irrigated until the returning solution was clear. Subsequently, the renal vessels were mobilized, all side branches were ligated, the ureter was preserved, and all remaining perinephric fat was removed. The renal artery and vein were anastomosed with 6-0 PROLENE™ sutures to the aorta or iliac artery and vena cava, respectively. Vascular control was removed, flow was restored to the kidney, and hemostasis was obtained. Each recipient transplant procedure involved a transplant urologist who performed the ureteroneocystostomy and closure of the abdomen. For children > 5 years of age and adolescents, a standard right lower quadrant renal transplant incision was made to allow dissection of the retroperitoneum and mobilization of the common iliac artery and vein or external iliac artery and vein for subsequent vascular anastomosis.

Pediatric recipient patients of LDN-procured kidneys were retrospectively analyzed, and data was entered into a Microsoft Excel database. The data was arranged into 2 patient cohorts that included those 0 to 5 years of age and 6 to 18 years of age. The demographic parameters analyzed included: mean age, gender, body mass index (BMI), relationship of the donor to recipient, primary renal disease, and dialysis status at the time of transplantation. Perioperative parameters reviewed included: mean preoperative creatinine, comorbidities, single or multiple renal arteries for the donor kidney, the site of renal artery anastomosis, mean operative time, mean EBL, mean cold ischemic time (CIT), mean postoperative creatinine, postoperative complications, mean length of stay (LOS), and graft loss. Complications were graded using the Clavien Classification of Surgical Complications [13].

Statistical analysis for donor and recipient data included the Fisher's exact test for nonparametric data between 2 groups and a 2-tailed Student *t* test for comparison of parametric data between 2 groups. Statistical significance was defined as $P < 0.05$.

RESULTS

Demographic Data for 36 Pediatric Recipient Patients (Table 1)

Eleven patients in the 0 to 5 years of age cohort (mean age: 2.3 ± 2.0 years, 6 males and 5 females) and 25 patients in the 6 to 18 years of age cohort (mean age: 14.2 ± 3.9 years, 15 males and 10 females) were the recipients of adult-procured LDN kidneys. The mean BMI for the 0 to 5 years of age patients was 17.9 ± 2.1 while it was 21.8 ± 6.7 for those 6 to 18 years of age ($P = 0.07$). All donors for the 0 to 5 years of age cohort were related to the recipients. Similarly, 22 of 25 patients in the 6 to 18 years of age cohort were related to the recipients ($P = 0.54$). ESRD in the 0 to 5 years of age cohort resulted from: dysplasia in 6 patients (55%), obstructive nephropathy in 2 patients (18%), and single cases of focal segmental glomerular sclerosis (FSGS), Denys-Drash syndrome leading to infantile nephrotic syndrome, and hemolytic uremic syndrome due to streptococcal meningitis. ESRD in the 6 to 18 years of age cohort was due to nephronophthisis in 7 patients (28%); FSGS in 5 patients (20%); 3 patients with other congenital diseases (congenital nephritis, congenital nephrosis, and Alport syndrome) (12%); 3 patients with other diseases (systemic lupus erythematosus, neurogenic bladder, and steroid-resistant nephrotic syndrome) (12%); 2 patients with obstructive uropathy (8%); 2 patients with reflux nephropathy (8%); and one patient (4%) each with dysplasia, glomerulonephritis, and membranous nephropathy. Dysplasia was the only etiologic factor significantly different between the 2 groups ($P < 0.001$). Among patients 0 to 5 years of age, 8 patients were on peritoneal dialysis (73%) and 3 patients were not on dialysis (27%). In the 6 to 18 years of age cohort, 9 patients were on peritoneal dialysis (36%), 9 patients were not on dialysis (36%), and 7 patients were on hemodialysis (28%).

Perioperative Outcomes for 36 Pediatric Patients (Table 2)

Eight patients (73%) in the 0 to 5 years of age cohort and 15 patients (60%) in the 6 to 18 years of age cohort had comorbidities in addition to their ESRD ($P = 0.71$). Mean preoperative creatinine for those 0 to 5 years of age was 5.14 ± 1.71 mg/dL, while it was 7.07 ± 3.40 mg/dL for those 6 to 18 years of age ($P = 0.08$). Renal artery anastomosis sites for those 0 to 5 years of age included 10 patients (91%) with anastomosis to the aorta and 1 patient (9%) with anastomosis to the common iliac artery. Renal artery anastomosis sites for those 6 to 18 years of age included 18 patients (72%) with anastomosis to the common iliac artery, 5 patients (20%) with anastomosis to the external iliac artery, and 2 patients (8%) with anastomosis to the aorta. A statistical significance between the 2 groups was

Table 1. Demographic data for 36 pediatric patients (11 patients, 0 to 5 years of age; 25 patients 6 to 18 years of age) receiving a laparoscopic donor nephrectomy (LDN) procured adult kidney transplantation.

	0 to 5 Years of Age	6 to 18 Years of Age	*P* Value
patients, N = (%)	11 (31)	25 (69)	
age, years (mean ± SD)	2.3 ± 2	14.2 ± 3.9	
male/female	6/5	15/10	1
BMI, kg/m^2 (mean ± SD)	17.9 ± 2.1	21.8 ± 6.7	0.07
donor related/unrelated	11/0	22/3	0.54
underlying renal disease			
nephronophthisis, N = (%)	0	7 (28)	0.08
dysplasia, N = (%)	6 (55)	1 (4)	*0.001
FSGS, N = (%)	1 (9)	5 (20)	0.64
obstructive uropathy , N = (%)	2 (18)	2 (8)	0.57
reflux nephropathy, N = (%)	0	2 (8)	1
glomerulonephritis, N = (%)	0	1 (4)	1
membranous nephropathy, N = (%)	0	1 (4)	1
other congenital, N = (%)	1 (9)	3 (12)	1
other, N = (%)	1 (9)	3 (12)	1
dialysis status			
peritoneal, N = (%)	8 (73)	9 (36)	0.07
hemodialysis, N = (%)	0	7 (28)	0.08
no dialysis, N = (%)	3 (27)	9 (36)	0.71

Abbreviations: M/F = male/female; BMI = body mass index; FSGS = focal segmental glomerular sclerosis
*statistically significant to $P < 5$

noted for renal artery anastomosis to the aorta (P < 0.0001) and common iliac artery ($P < 0.0008$). Mean operative times, EBL, and CIT for those 0 to 5 years of age and 6 to 18 years of age was 262 ± 38 minutes vs 216 ± 69 minutes ($P < 0.04$), 42 ± 39 mL vs 118 ± 241 mL ($P = 0.31$), and 49 ± 10 minutes vs 45 ± 13 minutes ($P = 0.37$), respectively. Mean postoperative creatinine and LOS for those 0 to 5 years of age and 6 to 18 years of age was 0.98 ± 0.74 mg/dL vs 2.91 ± 2.48 ($P < 0.02$) and 19.3 ± 20.8 days vs 4.8 ± 2.7 days ($P < 0.001$), respectively. There were 8 (73%) perioperative complications among those 0 to 5 years of age (2 Clavien grade III [25%], 6 Clavien grade IV [75%]) and 6 complications (24%) among those 6 to 18 years of age (4 Clavien grade II [67%], 1 Clavien grade III [17%], 1 Clavien grade IV [17%]) ($P < 0.01$).

DISCUSSION

The advent of laparoscopic donor nephrectomy in the mid-1990s [2] and its popularization in the early part of the 21st century has propelled kidney transplantation into a new era and increased the pool of live organs. Although LDN is accepted as the new gold standard for kidney procurement for adult patients with ESRD, Nogueira et al. [14] recently suggested that laparoscopic procurement of kidneys confers poor early graft function. The authors reported that in 946 consecutive LDN donors/recipients at their institution there was a 16.3% incidence of poor early graft function, defined as patients receiving hemodialysis on postoperative day 1 through 7 or serum creatinine ≥ 3.0 mg/dL at postoperative day 5. Data pertaining to pediatric recipients of LDN is less prevalent. In the past 40 years, live donor kidney transplantation has become the treatment of choice for children suffering from ESRD [15]. However, pediatric patients present a unique set of perioperative challenges for laparoscopically procured kidneys that is not encountered with adult patients. Due to an overall lower systemic blood volume, infants and small children face significant hemodynamic effects when the adult donor kidney is initially perfused [11]. These patients may also have increased immune reactivity [15,16] leading to increased acute and chronic rejection, particularly if there is a procurement injury to the donor kidney.

Table 2. Perioperative outcome data for 36 pediatric patients (11 patients, 0 to 5 years of age; 25 patients 6 to 18 years of age) receiving a laparoscopic donor nephrectomy (LDN) procured adult kidney transplantation.

	0 to 5 Years of Age	6 to 18 Years of Age	*P* Value
patients, N = (%)	11 (31)	25 (69)	
preoperative cr, mg/dL (mean ± SD)	5.14 ± 1.71	7.07 ± 3.40	0.08
comorbidities, N = (%)	8 (73)	15 (60)	0.71
renal artery anastomosis site			
aorta, N = (%)	10 (91)	2 (8)	*0.0001
common iliac artery, N = (%)	1 (9)	18 (72)	*0.0008
external iliac artery, N = (%)	0	5 (20)	0.30
operative time, min (mean ± SD)	262 ± 38	216 ± 69	*0.04
EBL, mL (mean ± SD)	42 ± 39	118 ± 241	0.31
CIT, min (mean ± SD)	49 ± 10	45 ± 13	0.37
postoperative cr, mg/dL (mean ± SD)	0.98 ± 0.74	2.91 ± 2.48	*0.02
perioperative complication, N = (%)	8 (73)	6 (24)	*0.01
LOS, days (mean ± SD)	19.3 ± 20.8	4.8 ± 2.7	*0.001

Abbreviations: cr = creatinine; EBL = estimated blood loss; CIT = cold ischemic time; LOS = length of stay
*statistically significant to $P < 5$

A number of pediatric-specific perioperative initiatives have been instituted in an attempt to decrease morbidity in the pediatric LDN recipient. Aggressive intravenous hydration the day before surgery and intraoperatively has been suggested as a means to alleviate hemodynamic changes when the adult kidney is anastomosed to the native vessel [10]. Vigilant maintenance of systolic blood pressure over 120 mmHg and central venous pressure of 12 to 14 cm H2O are important to maintain overall hemodynamic stability during surgery [10]. Traditionally, pneumoperitoneum pressure for laparoscopic procedures is set at 15 mmHg in order to maintain renal blood flow and urine output; however, many nephrologists believe that a lower pneumoperitoneum pressure of 10 mmHg results in less adverse effects on renal physiology [17]. Singer et al. [10] have also published that maintaining a pneumoperitoneum of only 10 mmHg during LDN for pediatric transplantation allows additional renal-protective measures.

Two previous studies have reported results for pediatric recipients using 0- to 5-year-old and 6- to 18-year-old cohorts [10,11]. Troppmann et al. [11] analyzed recipients of 995 pediatric live donor transplants from the UNOS database between January 2000 and June 2002, which included 212 patients in the 0 to 5 age group (94 LDN recipients) and 783 patients in the 6 to 18 age group (389 LDN recipients). For both patient cohorts, DGF rates were higher for LDN patients compared to open patients; in addition, there were higher rates of acute rejection in LDN patients at 6 months in both 0- to 5- and 6- to 18-year-old cohorts and at 1 year in the 0 to 5 years of age cohort [11]. Singer et al. [10] retrospectively analyzed 34 LDN and 26 open donor nephrectomy (ODN) patients between 2000 and 2004. In the 34 LDN patients group, there were 9 patients less than 5 years of age and 25 patients older than 5 years of age. The postoperative creatinine level was the only factor significantly different between the 2 groups (0.5 ± 0.2 vs 1.1 ± 0.3) [10].

The current study represents the largest single-institution study analyzing the outcomes of pediatric recipients of adult LDN procured kidneys. The current study cohort is comparable to that of Troppmann et al. [11] in regards to the ratio of patients on pre-transplant dialysis to those not on dialysis (8/3 vs 71/23) and a mean LOS (19.3 ± 20.8 vs 16.6 ± 28.6 days). Similar to the Troppmann et al. [11] and Singer et al. studies [10], the current study reports that the majority of donors were relatives of the recipient (11/0 vs 89/5 vs 9/0), with the current study having a slightly higher percentage of patients surviving

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.07
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

allograft rejection (18% vs 11% vs 0%). Data for the 6 to 18 years of age cohort (Table 3) confirms a similar incidence of pre-dialysis/no dialysis to that of Troppmann et al. [11] but notes an asymmetrically decreased mean LOS (4.8 ± 2.7 vs 8.5 ± 7.3). All 3 studies have reported comparable graft loss for this age group (7 to 12%) [10,11].

The current literature for pediatric recipients of adult LDN kidneys (Table 4) demonstrates a predominance of male patients requiring kidney transplant (N = 477, 59%), with a considerable number of patients receiving dialysis prior to transplantation (N = 377, 63%). The increased vessel length provided by the procurement of a left-sided kidney has resulted in almost universal left-sided procurement at most centers (N = 142, 95%). Pediatric renal transplant continues to be a prolonged operation with all studies reporting operative times approaching 4 hours. Furthermore, the length of stay is prolonged (range: 6 to 10 days) and postoperative complications are not infrequent (range: 8 to 67%).

CONCLUSION

Renal transplantation continues to offer pediatric patients with ESRD an opportunity for improved growth, a better quality of life, and longer survival [18]. Although the operation may have significant complications and prolonged hospitalization, transplantation remains the gold-standard treatment for these patients. Adult LDN is now routinely performed at all major transplant centers in the United States and may be safely utilized as a source of organs for pediatric recipients suffering from ESRD.

REFERENCES

1. Organ Procurement and Transplantation Network/United Network for Organ Sharing (OPTN/UNOS). Available at http://www.unos.org.

2. Ratner, L. E., L. J. Ciseck, et al. (1995). "Laparoscopic live donor nephrectomy." *Transplantation* 60(9): 1047-1049. PubMed

3. Schnitzler, M. A., J. F. Whiting, et al. (2003). "The expanded criteria donor dilemma in cadaveric renal transplantation." *Transplantation* 75(12): 1940-1945. PubMed ; CrossRef

4. Mishra, S., A. Ganpule, et al. (2009). "Evaluating graft function in pediatric recipients for living donor renal transplantation: Is laparoscopic donor nephrectomy safe?" *Indian J Urol* 25(2): 195-198. PubMed ; CrossRef

Table 3. Published studies comparing demographic and perioperative outcomes for patients ≤ 5 years of age and > 5 years of age receiving a laparoscopic donor nephrectomy (LDN) procured adult kidney transplantation.

	≤ 5 Years of Age			> 5 Years of Age		
	current study	Troppmann et al. [11]	Singer et al. [10]	current study	Troppmann et al. [11]	Singer et al. [10]
patients, N = (%)	11	94	9	25	389	25
male/female	6/5	67/27	6/3	15/10	226/163	11/14
age, years (mean ± SD)	2.3 ± 2	2.4 ± 1.4	3 ± 1.1	14.2 ± 3.9	13.5 ± 3.5	15 ± 3.7
pre-dialysis/no dialysis	8/3	71/23	NR	16/9	233/156	NR
L/R nephrectomy	10/1	NR	9/0	22/3	NR	25/0
single/multiple RA	11/0	NR	NR	22/3	NR	NR
donor related/unrelated	11/0	89/5	9/0	22/3	346/43	25/0
operative time, min (mean ± SD)	262 ± 38	NR	NR	216 ± 69	NR	NR
complications, N = (%)	8 (73)	NR	NR	6 (24)	NR	NR
LOS, days (mean ± SD)	19.3 ± 20.8	16.6 ± 28.6	NR	4.8 ± 2.7	8.5 ± 7.3	NR
graft loss, N = (%)	2 (18)	10 (11)	0	2 (8)	28 (7)	3 (12)

Abbreviations: M/F = male/female; L/R = left/right; RA = renal artery(ies); LOS = length of stay; NR = not reported

Table 4. All published studies of pediatric patients receiving a laparoscopic donor nephrectomy (LDN) procured adult kidney transplantation.

	Current Study	Troppmann et al. [11]	Mamode et al. [20]	Chandak et al. [21]	Singer et al. [10]	Basiri et al. [19]	Abrahams et al. [9]	Mishra et al. [4]	Kayler et al. [7]	Troppmann et al. [6]	Bergman et al. [5]	Hsu et al. [8]
Patients, N =	36	483	119	46	34	20	20	15	13	11	10	7
male/female	21/15	293/190	75/44	25/21	17/17	9/11	12/8	4/11	7/6	7/4	5/5	2/5
mean age, years	10.5	11.3	10.7	9	12	12.1	12.8	14.8	9.8	11.9	10.5	9.5
pre-dialysis/no dialysis	24/12	304/179	NR	27/19	NR	NR	NR	10/5	5/8	7/4	9/1	NR
underlying renal disease												
nephronophthisis, N =	7	NR	NR	0	0	NR	NR	NR	NR	0	0	0
obstructive uropathy, N =	4	NR	NR	0	5	NR	NR	NR	NR	0	0	2
dysplasia, N =	7	NR	NR	0	7	NR	NR	NR	NR	3	1	1
FSGS, N =	6	NR	NR	2	0	NR	NR	NR	NR	3	1	1
reflux nephropathy, N =	2	NR	NR	0	1	NR	NR	NR	NR	2	0	0
glomerulonephritis, N =	1	NR	NR	0	8	NR	NR	NR	NR	0	0	0
other causes, N =	8	NR	NR	44	10	NR	NR	NR	NR	2	8	0
unknown, N =	0	NR	NR	0	3	NR	NR	NR	NR	2	0	3
SLE, N =	1	NR	NR	0	0	NR	NR	NR	NR	0	0	1
L/R nephrectomy	32/4	NR	NR	NR	34/0	20/0	19/1	15/0	13/0	9/2	10/0	7/0
single/multiple RA	33/3	NR	NR	NR	20/14	20/0	16/4	13/2	10/3	7/4	8/2	NR
donor related/unrelated	33/3	435/48	NR	NR	34/0	NR	19/1	3/12	NR	9/2	NR	5/2
operative time (min)	230	NR	NR	NR	233	NR	234	NR	NR	NR	248	NR
complications, N = (%)	14 (39)	NR	NR	27 (59)	NR	0	6 (30)	10 (67)	1 (8)	5 (45)	3 (30)	1 (14)
mean LOS (days)	9.3	10.1	NR	N/A	NR	NR	6	NR	NR	NR	15	NR
overall graft loss, N = (%)	4 (11)	38 (8)	1 (0.8)	0	3 (9)	0	0	1 (7)	0	1 (9)	0	0

Abbreviations: FSGS = focal segmental glomerular sclerosis; SLE = systemic lupus erythematosus; RA = renal artery(ies); LOS = length of stay; NR = not reported

5. Bergman, S., A. Feifer, et al. (2007). "Laparoscopic live donor nephrectomy: the pediatric recipient in a dual-site program." *Pediatr Transplant* 11(4): 429-432. PubMed ; CrossRef

6. Troppmann, C., J. L. Pierce, et al. (2002). "Early and late recipient graft function and donor outcome after laparoscopic vs open adult live donor nephrectomy for pediatric renal transplantation." *Arch Surg* 137(8): 908-915; discussion 915-906. PubMed

7. Kayler, L. K., R. M. Merion, et al. (2002). "Outcomes of pediatric living donor renal transplant after laparoscopic versus open donor nephrectomy." *Transplant Proc* 34(8): 3097-3098. PubMed ; CrossRef

8. Hsu, T. H., L. Su, et al. (2003). "Laparoscopic adult donor nephrectomy for pediatric renal transplantation." *Urology* 61(2): 320-322. PubMed ; CrossRef

9. Abrahams, H. M., M. V. Meng, et al. (2004). "Laparoscopic donor nephrectomy for pediatric recipients: outcomes analysis." *Urology* 63(1): 163-166. PubMed ; CrossRef

10. Singer, J. S., R. B. Ettenger, et al. (2005). "Laparoscopic versus open renal procurement for pediatric recipients of living donor renal transplantation." *Am J Transplant* 5(10): 2514-2520. PubMed ; CrossRef

11. Troppmann, C., M. A. McBride, et al. (2005). "Laparoscopic live donor nephrectomy: a risk factor for delayed function and rejection in pediatric kidney recipients? A UNOS analysis." *Am J Transplant* 5(1): 175-182. PubMed ; CrossRef

12. Fabrizio, M. D., L. E. Ratner, et al. (1999). "Laparoscopic live donor nephrectomy." *Urol Clin North Am* 26(1): 247-256, xi. PubMed ; CrossRef

13. Dindo, D., N. Demartines, et al. (2004). "Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey." *Ann Surg* 240(2): 205-213. PubMed ; CrossRef

14. Nogueira, J. M., A. Haririan, et al. (2009). "The detrimental effect of poor early graft function after laparoscopic live donor nephrectomy on graft outcomes." *Am J Transplant* 9(2): 337-347. PubMed ; CrossRef

15. Seikaly, M., P. L. Ho, et al. (2001). "The 12th Annual Report of the North American Pediatric Renal Transplant Cooperative Study: renal transplantation from 1987 through 1998." *Pediatr Transplant* 5(3): 215-231. PubMed

16. McDonald, R., L. Donaldson, et al. (2000). "A decade of living donor transplantation in North American children: the 1998 annual report of the North American Pediatric Renal Transplant Cooperative Study (NAPRTCS)." *Pediatr Transplant* 4(3): 221-234. PubMed ; CrossRef

17. McDougall, E. M., T. G. Monk, et al. (1996). "The effect of prolonged pneumoperitoneum on renal function in an animal model." *J Am Coll Surg* 182(4): 317-328. PubMed

18. Benfield, M. R. (2003). "Current status of kidney transplant: update 2003." *Pediatr Clin North Am* 50(6): 1301-1334. PubMed

19. Basiri, A., N. Simforoosh, et al. (2007). "Laparoscopic v open donor nephrectomy for pediatric kidney recipients: preliminary report of a randomized controlled trial." *J Endourol* 21(9): 1033-1036. PubMed ; CrossRef

20. Mamode, N., R. J. Johnson, et al. (2011). "Laparoscopic donor nephrectomy does not compromise outcomes for pediatric transplant recipients." *Transplantation* 91(9): 1005-1009. PubMed ; CrossRef

21. Chandak, P., N. Kessaris, et al. (2012). "Is laparoscopic donation safe for paediatric recipients?--a study of 85 paediatric recipients comparing open and laparoscopic donor nephrectomy." *Nephrol Dial Transplant* 27(2): 845-849. PubMed ; CrossRef

UIJ UroToday International Journal®

Supine Access for Percutaneous Nephrolithotomy: A Simple and Feasible Option

Sanjay Kolte, Parag Ingle, Vivek Bhargava, Meenal Kolte, Jalaj Jain

Submitted August 7, 2012 - Accepted for Publication January 6, 2013

ABSTRACT

Supine percutaneous nephrolithotomy (PCNL) is a less practiced modality for the treatment of upper-tract calculi. We hereby present our single center experience in 100 patients treated by supine PCNL over a period of 18 months. We found the procedure simple and feasible.

INTRODUCTION

First described in 1976, percutaneous nephrolithotomy (PCNL) has evolved into a widely accepted, safe, and efficacious management system for large upper tract calculi. It is the most widely practiced modality for the treatment of larger renal calculi in all centers throughout the world. Most of the centers perform it in the prone position [14]. Two recent meta-analyses in the literature have shown that supine PCNL has a significantly shorter operating time than PCNL in the prone position and an equivalent stone-free rate, complication rate, transfusion rate, and fever rate [9,12]. There is no clear-cut superiority of either prone or supine technique over the other, but in the last decade supine PCNL has gained wide acceptance at many centers in South America and Europe [13,14]. Although not universally adopted in our country—possibly because of a high efficiency of the prone PCNL and a lack of training of supine PCNL at most educational centers—supine positioning of the patient for PCNL confers several advantages from the patient, urologist, and through anesthesia [1,2,6-8,10,11]. Some centers advocate the use of this technique selectively while dealing with obese patients or high-risk anesthesia patients with cardiorespiratory compromise [6], but there are many who primarily perform PCNL in the supine position [1,2]. We use this technique at our center and have found it to be an immensely convenient, timesaving practice, and one that provides great versatility to the urologist in terms of a combined antegrade and retrograde approach. There is a high rate of calculi clearance in 1 step, at multiple locations in the urinary tract, and with benefits for the anesthetist in terms of ease of management of airways or cardiorespiratory resuscitation if required.

MATERIALS AND METHODS

In our study, a retrospective analysis of our experience with 100 patients having undergone supine access for PCNL is presented. From the period of August 2010 till March 2012, 100 patients were subjected to PCNL in the supine position at our center. There were 78 males and 22 females. Age ranged from 17 to 64 years old, with a mean of 43.4. All patients underwent the procedure under spinal anesthesia. Fourteen patients were ASA grade III or more and had comorbid conditions such as cardiac decompensation, obstructive airway disease, or diabetes mellitus. One patient with a recent fracture of the humerus had a sling applied so it was not possible to lie prone.

The inclusion criteria for PCNL were a stone size of more than 1.2 cm in the upper ureter and more than 1.5 cm in the kidney. In patients who had an infection or obstructive uropathy with renal insufficiency, a percutaneous nephrostomy tube was placed in the supine position and then PCNL performed after improvement in renal parameters and an overall general condition. Access was created under fluoroscopic guidance. The procedure was performed in the complete supine position. The first 2 cases were performed using a rolled towel underneath the ipsilateral flank to cause an elevation of 30 degrees. The

KEYWORDS: Supine PCNL, calculi, kidney

CORRESPONDENCE: Dr. Sanjay Kolte, Sparsh Urology & Kidney Hospital, 35 Balraj Marg, Dhantoli, Nagpur, Maharashtra, India 440012 (spkolte5@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 8. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.08

remaining cases were performed without flank elevation. The system was opacified by the passage of contrast through transurethral placement of a ureteric catheter in the ipsilateral ureter. While dealing with upper ureteric calculi, when the stones were far from the renal pelvis or when the ureter between the stone and the pelviureteric junction was not suitably dilated, the patient was placed in the lithotomy position and stones were pushed into the kidney by ureteroscopy, either in toto or after fragmentation. The punctures were made in the desired calyx through the posterior axillary line just below the subcostal margin in 90 patients and above the twelfth rib in 10 patients. The tract was dilated to 26 or 28 Fr using Alken dilators and an amplatz sheath of an appropriate size, placed depending on the size of the stones and the degree of dilatation of the calyx. The position of the urologist and the assisting nurse was sitting on a stool on the side of the stone, well away from fluoroscopy. In all patients, we needed the assistance of only 1 scrub nurse and 1 technician. In patients with left-sided stones, the IITV needed to be moved to the opposite side. In right-sided stones, no equipment movement was needed. Stone disintegration was carried out using pneumatic or ultrasonic lithotripsy (Calculiclast and Calcuson). In patients with stones both in the ureter and the kidney, the renal stones were dealt with first by PCNL. The ureteric stone was then fragmented or pushed into the kidney, and then retrieved through the renal tract. Postoperatively, an X-ray of the kidney, ureter, and bladder (KUB); ultrasonography (USG); or non-contrast computed tomography (NCCT) were done as deemed necessary after 24 hours for an evaluation of stone clearance. Any residual fragments, if found, were removed by relook PCNL.

In patients with a large stone burden, a 16 Fr catheter was placed as a nephrostomy. It was removed once stone-free status was ascertained. All patients had a Foley bladder catheter for 24 hours. DJ stents were placed in all patients where stones were removed piecemeal or in patients with infection.

RESULTS

We had 68 patients with stones on the right side and 32 had stones on the left side. Two patients had stones in solitary kidneys. There was a history of previous surgical interventions for stone treatment in 4 patients. Stones were single in 90 patients and multiple in 10 patients. Four of the multiple stones were staghorn stones. The stones were located in the renal pelvis in 70 patients, the upper calyx in 4, the middle calyx in 4, the lower calyx in10, the upper ureter in 12, the upper ureteric and lower calyx in 3, and the renal pelvis and lower calyx in 3. The size of the stones in the largest dimension ranged from 1.2 cm to 6.8 cm with a mean of 2.3 cm. Five patients were subjected to PCN prior to the PCNL. In 4 of these there was pyonephrosis, and 1 patient had a solitary kidney with an upper ureteric calculus and acute renal failure. We could achieve complete stone clearance in 90/100 patients (90%). In 10 patients, we had to resort to prone PCNL to achieve complete clearance. This included 3 patients with staghorn calculi, 1 patient with a solitary kidney who had multiple calculi, 4 patients with calyceal calculi and an undilated system, 1 renal pelvic calculus, and 1 upper ureteric calculus. One of the 3 patients with staghorn calculi had complete clearance but a fragment migrated unnoticed into the ureter, presenting 1 month later with a perinephric abscess. This abscess was drained percutaneously via percutaneous nephrostomy, and the stone was removed via ureteroscopy. This case was considered a failure.

The operative time ranged from 45 to 230 minutes, with a mean of 50 minutes. The procedure was completed in a single sitting in 80 patients, 2 sittings in 14, and 3 sittings in 6 patients. The mean number of sittings was 1.2. The number of tracts made was 1 in 84 patients, 2 in 14 patients, and 3 in 2 patients. The tracts were supracostal in 10 patients. There was no incidence of pleural injury or colonic perforation. In 1 patient there was renal-pelvic perforation that occurred during tract dilatation. The incidence of blood transfusions was 4/100 patients. Postoperatively, there was fever in 8/100 patients (which responded to antibiotics), insignificant hematuria in 12/100 patients, and pain in 20/100 patients. The punctures were through the lower calyx in 86 renal units, the middle calyx in 22, and through the upper calyx in 10. The mean hospital stay was 3.2 days, ranging from 2 to 12 days.

DISCUSSION

At our center, we have been performing PCNL in the prone position for the last 15 years and have no doubt about the efficacy, ease of performance, and near total success of the procedure. The need to use the supine position arose during our encounter with an obese female patient, where we performed a PCN in the supine position. She had a staghorn calculus of 4.5 cm in the largest dimension, multiple lower calyceal calculi in the lower moiety of the right duplex kidney, and pyonephrosis. She was a high risk for anesthesia. Her abdomen was protuberant, and she had respiratory distress and could not lie prone. Although we had no prior experience with supine PCNL, we attempted and succeeded in doing a PCN in the supine position.

As her renal function improved after PCN in a few days, we felt encouraged to do PCNL in the same position. We performed the procedure as originally described by Valdivia-Uria [1]. We could remove the entire calculus in a relatively short time (75 minutes) and experienced the convenience of this position. Having met with total success, we decided to pursue the procedure in more patients. In the period from August 2010 to March 2012, we performed supine PCNL in 100 patients at our center.

The prone position has been the popular approach for PCNL

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.08
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

since its inception [1,2,10] and is the only known approach for many urologists across the globe. It has stood the test of time and merits the gold-standard status in treatment of larger renal calculi. The supine position till some time ago was used rarely and only in special situations such as patients with renal allografts and pelvic ectopic kidneys [6]. However there are some concerns regarding the prone approach especially in morbidly obese patients and patients with compromised cardiopulmonary states [3]. First and foremost, a patient anaesthetized in the supine position needs to be turned prone for the procedure and then turned supine again, once the procedure is completed, to be woken up. Anaesthetized patients are unable to protect themselves or assist during positioning so there is a risk of injury to the neck, limbs, or spine in both the patient [2] and staff. This problem is more pronounced in patients subjected to general anesthesia. There is the risk of dislodgement of the endotracheal tubes, intravenous lines, and epidural, ureteral, or urethral catheters. In our series we performed the procedure under regional aesthesia in all patients. The prone position may be difficult for patients with some deformities such as kyphoscoliosis or neck or limb contractures [1,2]. We had 1 patient with an upper ureteric calculus with a fracture in the right humurus and he could not be made to lie prone. The PCNL was comfortably accomplished in the supine position. In prone PCNL, a safe positioning of the patient should involve a minimum of 6 people trained in the movement of patients into the prone position: 1 for the head, 2 on each side, and 1 controlling the feet and legs [11]. Finding this number of trained personnel can be even harder in non-institutional, solo practice set-ups. Furthermore, space gets limited once the trolley, the workstation comprising of electrically connected gadgets and imaging equipment, is in place. In prone PCNL, turning the patient and the movement of all the equipment may be difficult. This affects time and economic attributes for the operating surgeon, patient, and hospital in this cost-conscious era.

In our series, we have 68 patients with stones on the right side. This high number of right-sided patients is because the IITV along with the workstation in our operating room were positioned on the left side of the patient. So in patients with stones on the right side, the supine position did not require movement of these gadgets for the procedure. This saved time and ensured uninterrupted procedures. Reduced mobility and portability of heavy electrical equipment surely adds to the prolonged durability of equipment.

The posterior axillary line is the preferred site for puncture by most centers [1,2,5,4], but some also advocated punctures in the mid axillary line [4,7]. We preferred the posterior axillary line in all our patients. These laterally placed punctures decrease the chances of injury to the pleura, which have been reported in only 0.5% patients [7]. We did not have any pleural injuries even when punctures were supracostal in 10/100 patients. The risk of colon injury is lower in the supine position and to date only 1 patient has been reported to have had a colon injury [7]. The colon is retro-renal in only 2% of patients while in the supine position, whereas the incidence rises to 10% in the prone position [12]. There was no colon injury in our series.

In 4 patients with staghorn calculi, we needed more sittings and more than 1 tract. There were limitations for access to the anterior calyces as lateral deflection of the nephroscope is difficult because of the side of the table; hence, limited vision and lower success rates. In 3 of these 4, we needed to resort to prone conversion for the clearance of residual fragments (considered a failure of supine PCNL), whereas in 1 we achieved total clearance in the supine position. The success rates in such situations may be improved by judicious use of flexible nephroscopes [6].

Most series had operative times ranging from 15 minutes to 350 minutes. In most of the studies, the operative time was not clearly defined, but it is obvious that the operation time for PCNL is dramatically less in the supine position compared to the prone position [3]. In fact, the only parameter that has a statistically significant advantage of the supine position over the prone is the operative time [2,8,12]. The authors stated that this difference was attributed to turning the patient at the beginning and the end of PCNL in the prone position. We calculated the time from the time of induction of anesthesia to the placement of the Foley catheter at the end of the procedure. It ranged from 45 to 230 minutes, with a mean of 50 minutes. We believe that the dependent drainage provided by the oblique position of the Amplatz sheath is a great contributor for a shorter operative time in the supine position (Figure 1). The small fragments and dust created by fragmentation needs no attention and flows out while the fragmentation is in progress [12]. In the prone position, the small fragments tend to migrate to remote corners, increasing operative time and punctures.

With the available literature and from our experience with supine PCNL, we feel the procedure is here to stay. However, some factors we observed are bothersome during the process. First, the presence of the air bubble at the front of the nephroscope constantly obscures vision during the entire procedure. The tip of the sheath toward the stone end is at a higher position than the point of entry so the air that enters by the side of the nephroscope during the procedure tends to rise up and remain at the tip of the sheath and nephroscope. This is unwanted and requires constant "to and fro" movements of the nephroscope to displace it and achieve clear vision (Figure 2). This technical difficulty has not been mentioned in any of the studies so far but none can deny its existence. It would be interesting to explore the possibilities of effectively dealing with it. Another difficulty we observed was the limitation caused by the attachment of the light source cable on the inferior aspect and the water tubing

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.08
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

Figure 1. The downward-pointing Amplatz sheath facilitates the spontaneous passage of fragments.

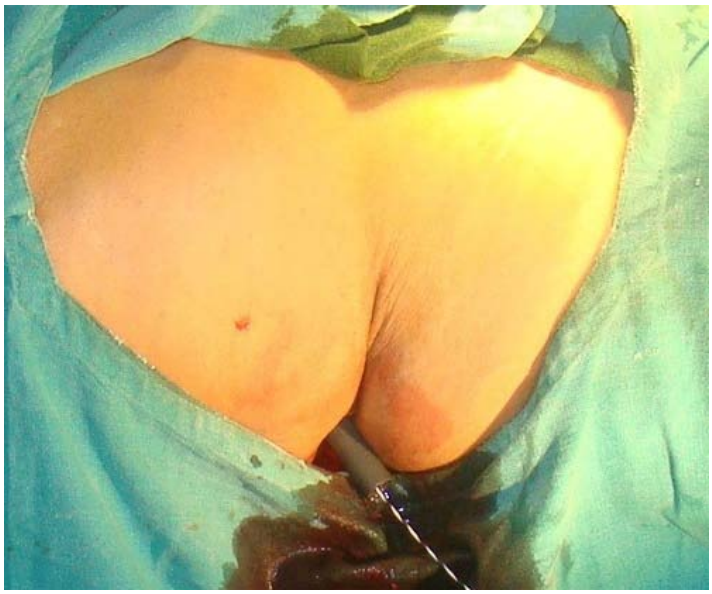
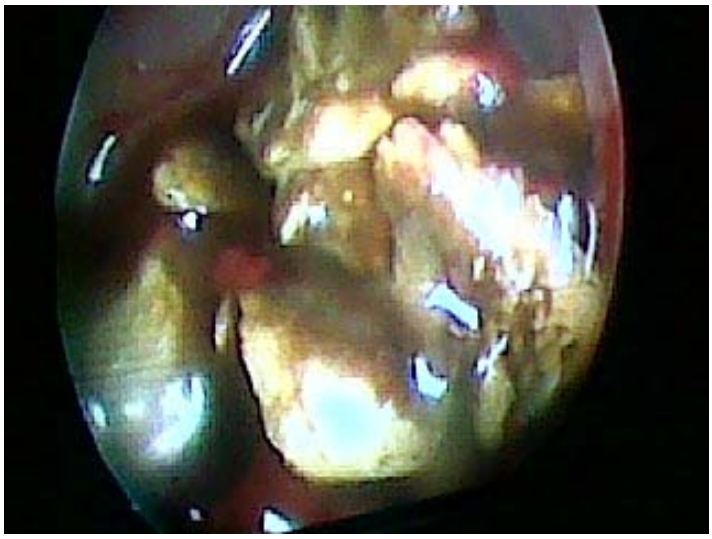
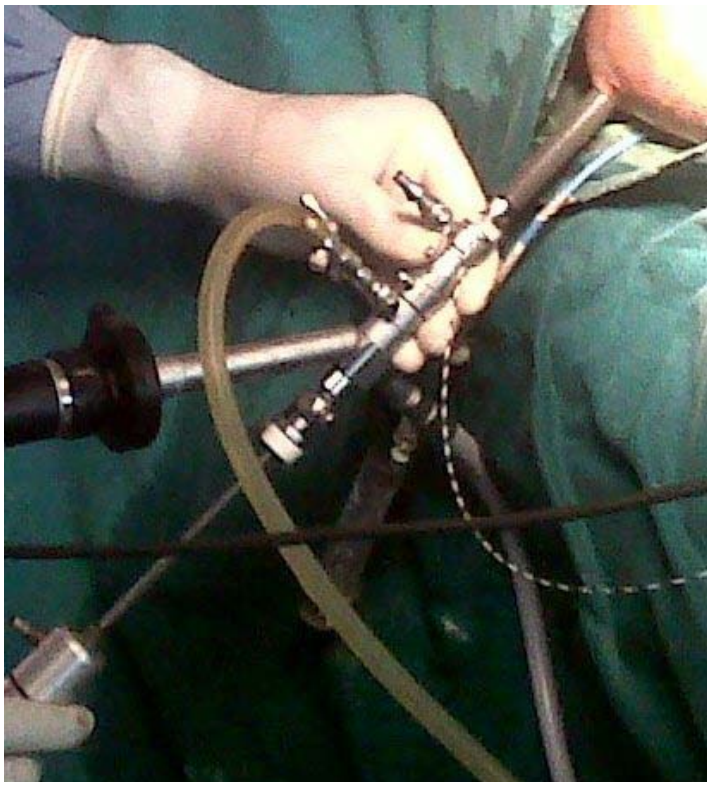


Figure 2. Vision through the air bubble that constantly remains at the tip of the nephroscope.



on the superior aspect of the nephroscope. This decreases the operating length and reachability of the nephroscope (Figure 3). This may be overcome by the use of extra long nephroscopes and sheaths, or the use of nephroscopes that have the water tubing and light source connections on the superior aspects, or nephroscopes that have rotating sheaths where both can be placed wherever suited. The third problem is that during imaging in some patients the overlap of some of the operating table artifacts can't be eliminated and we may have to proceed despite these artifacts or devise tables with radiolucent borders (Figure 4).

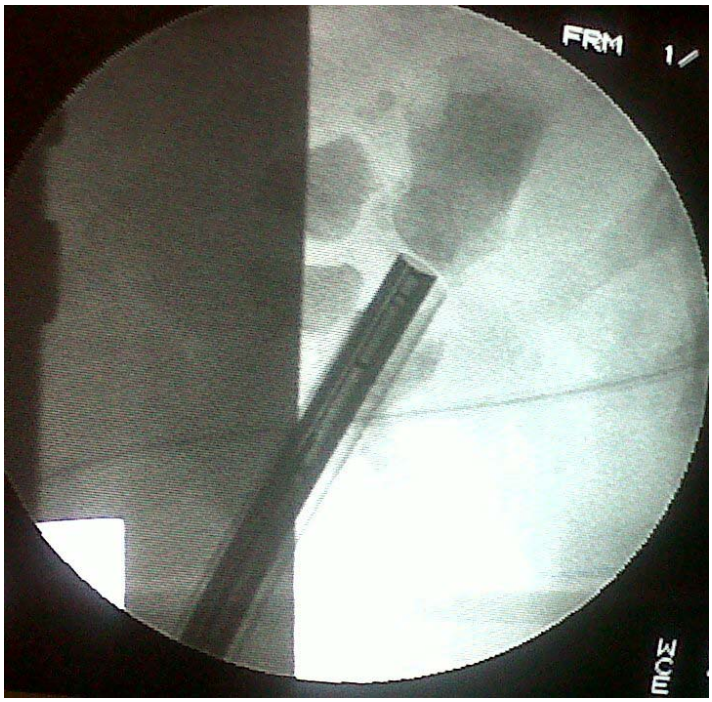
Figure 3. The length of the nephroscope becomes limited due to the light cable.



Other disadvantages of the supine position mentioned are a collapsed collecting system, difficulty in approaching the upper calyx, and a small surgical field for the access site [12]. We had puncture failure in 2/100 (2%) patients vs 2.7% mentioned in a survey conducted by clinical research of the Endourological Society [14]. We had 2 patients with solitary kidneys. One of these had total clearance of a renal pelvic calculus, whereas the other had multiple calyceal and renal pelvic calculi and needed to be turned prone for the removal of 2 small calculi that had migrated to the upper anterior calyces during supine PCNL. There were 2 patients with stones in horseshoe kidneys, 1 patient with malrotation, and 3 patients had duplex systems. These renal anomalies did not influence the outcome and we

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.08
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

Figure 4. Operating table artifacts that sometimes can't be eliminated.



achieved total clearance in all of them.

CONCLUSION

We found that supine PCNL is technically an easy and safe procedure in the hands of an endourologist who has expertise with the prone version of it. The limitation of our study is its retrospective nature and design, which is descriptive rather than comparative, but our observations can be a guiding example for urologists keen on adding more to their versatility and expertise.

There are a few technical difficulties in the procedure but they are clinically insignificant and easily surmountable. Moreover, it has a short learning curve and provides the endourologist the ability for simultaneous antegrade and retrograde manipulations for stones in the ureter and the kidney and thus reduces operative time. It increases self-sufficiency and reduces the need for additional support staff. If used in the right cohort of patients, its use may greatly facilitate successful outcomes and improve anesthetic risk handling. It is indeed an additional tool in the hands of the urologist for the treatment of renal calculi and we firmly believe that every endourologist must familiarize him or herself with this novel, emerging technique.

REFERENCES

1. Valdivia Uria, J. G., J. Valle Gerhold, et al. (1998). "Technique and complications of percutaneous nephroscopy: experience with 557 patients in the supine position." *J Urol* 160(6 Pt 1): 1975-1978. PubMed ; CrossRef

2. Falahatkar, S., A. A. Moghaddam, et al. (2008). "Complete supine percutaneous nephrolithotripsy comparison with the prone standard technique." *J Endourol* 22(11): 2513-2517. PubMed ; CrossRef

3. Basiri, A. and M. Mohammadi Sichani (2009). "Supine percutaneous nephrolithotomy, is it really effective? A systematic review of literature." *Urol J* 6(2): 73-77. PubMed

4. Ng, M. T., W. H. Sun, et al. (2004). "Supine position is safe and effective for percutaneous nephrolithotomy." *J Endourol* 18(5): 469-474. PubMed ; CrossRef

5. Shoma, A. M., I. Eraky, et al. (2002). "Percutaneous nephrolithotomy in the supine position: technical aspects and functional outcome compared with the prone technique." *Urology* 60(3): 388-392. PubMed ; CrossRef

6. Manohar, T., P. Jain, et al. (2007). "Supine percutaneous nephrolithotomy: Effective approach to high-risk and morbidly obese patients." *J Endourol* 21(1): 44-49. PubMed ; CrossRef

7. Rana, A. M., J. P. Bhojwani, et al. (2008). "Tubeless PCNL with patient in supine position: procedure for all seasons?--with comprehensive technique." *Urology* 71(4): 581-585. PubMed ; CrossRef

8. De Sio, M., R. Autorino, et al. (2008). "Modified supine versus prone position in percutaneous nephrolithotomy for renal stones treatable with a single percutaneous access: a prospective randomized trial." *Eur Urol* 54(1): 196-202. PubMed ; CrossRef

9. Wu, P., L. Wang, et al. (2011). "Supine versus prone position in percutaneous nephrolithotomy for kidney calculi: a meta-analysis." *Int Urol Nephrol* 43(1): 67-77. PubMed ; CrossRef

10. Ibarluzea, G., C. M. Scoffone, et al. (2007). "Supine Valdivia and modified lithotomy position for simultaneous anterograde and retrograde endourological access." *BJU Int* 100(1): 233-236. PubMed ; CrossRef

11. Atkinson, C. J., B. W. Turney, et al. (2011). "Supine vs prone percutaneous nephrolithotomy: an anaesthetist's view." *BJU Int* 108(3): 306-308. PubMed ; CrossRef

12. Liu, L., S. Zheng, et al. (2010). "Systematic review and meta-analysis of percutaneous nephrolithotomy for patients in the supine versus prone position." *J Endourol* 24(12): 1941-1946. PubMed ; CrossRef

13. Giusti G., S. Zandegiacomo, et al. (2011). "PCNL: Prone or supine?" *Eur Urol Suppl* 10(2): 69. CrossRef

14. Valdivia-Uria, J. G., R. M. Scarpa, et al. (2011). "Comparing patient characteristics and outcomes between supine and prone positions in PCNL." *Eur Urol Suppl* 10(2): 69. CrossRef

UroToday International Journal®

The Short-Term Outcome of Urethral Stricture Disease Management in HIV and Non-HIV Infected Patients: A Comparative Study

Mohamed Awny Labib, Michael Silumbe, Kasonde Bowa

Submitted April 30, 2012 - Accepted for Publication December 27, 2012

ABSTRACT

Purpose: This study intends to compare short-term outcomes of treatment of urethral stricture disease between human immunodeficiency virus (HIV) seropositive and HIV seronegative patients at the University Teaching Hospital (UTH) in Lusaka.

Methods: This was a prospective cohort study conducted on patients presenting with urethral stricture disease at the UTH, Lusaka, Zambia, between October 2009 and December 2010. One arm included HIV seropositive patients and the other arm had HIV seronegative patients. The recruited patients underwent urethral dilatation, anastomotic urethroplasty, and staged urethroplasty. They were followed-up postoperatively for 6 months, and recurrence and complication rates were compared between the 2 groups. Other parameters studied included patient demographics, cluster of differentiation (CD4) cell counts in positive patients, HIV World Health Organization (WHO) stages, stricture etiology, stricture sites, and stricture lengths. The collected data was analyzed using SPSS 16.

Results: A total of 71 patients with a mean age of 38.04 years who had urethral stricture disease were recruited for this study. Of the patients, 37% (26) were HIV seropositive while 63% (45) were seronegative, and 53.8% (14) of the seropositive patients were on highly active antiretroviral therapy (HAART). Of the urethral strictures, 45% (32) resulted from urethritis, and the prevalence of HIV in patients presenting with post-urethritis stricture disease was 50% (16/32). Of the strictures, 73.2% (N = 52) were located in the bulbar urethra, 19.7% (N = 14) were in the penile urethra, and 5.6% (N = 4) were located in the membranous urethra. Of the patients, 73% (N = 52) had urethral dilatation, 17% (N = 12) had anastomotic urethroplasty, and 10% (N = 7) had staged urethroplasty. The overall intraoperative complication rate was 2.8% (2) while postoperatively it was 12.7% (9); 55.2% (32/58) had urethral stricture disease recurrence after being followed-up for 6 months, with urethral dilatation accounting for most of the failures (28% [20/58]). Of the non-reactive patients, 47% (16/34) had recurrence while 67% (16/24) had recurrence. However, the 20% difference in recurrence between reactive and non-reactive patients was statistically insignificant ($P = 0.139$).

Conclusion: Urethral stricture disease affects patients from all age groups. The prevalence of HIV in patients with post-urethritis stricture disease is high. Stricture recurrence following treatment is not affected by the HIV status of the patient and CD4cc, although it is affected by stricture site and stricture length. Time to recurrence and cumulative survival of urethral stricture disease following treatment are also not influenced by the HIV status of the patient.

KEYWORDS: Aetiology, site, stricture, urethra

CORRESPONDENCE: Mohamed Awny Labib, FRCS (Ed), University Teaching Hospital, Lusaka, Central Zambia, Africa (mohamedlabib57@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 6. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.06

INTRODUCTION

According to Steencamp et al. [17], urethral stricture disease is one of the oldest known urological diseases, and it remains a common problem with a high morbidity, despite earlier predictions to the contrary. In many third-world countries with limited medical resources, male urethral stricture disease remains highly prevalent [19].

Sexually transmitted infections (STI) are now the commonest group of notifiable infectious diseases in most countries, particularly in infants and those aged between 15 to 50 years. The control of STIs is important considering their role in increasing the transmission of HIV. STIs are hyperendemic in many developing countries, and urethral stricture disease and infertility are frequent sequelae in men [6].

Some STIs cause urethritis, which is etiology for urethral stricture disease, and urethritis is a risk factor for HIV transmission. The etiology of urethritis, the significance of potential pathogens, and the relation of urethritis to HIV infection were determined in 335 men (cases) with and 100 men (controls) without urethral symptoms. The seroprevalence of HIV was 45% in the patients with urethritis [18].

The term urethral stricture refers to an abnormal narrowing of the tube (urethra) that carries urine out of the body from the bladder. Barbagli [2] described the male urethral anatomy as a tubular structure about 18 cm in length, originating in the bladder, at the inferior and anterior level. After crossing the pelvic floor and the perineum, it runs along the entire length of the penis, ending at the apex of the glans. The male urethra can be subdivided into the prostatic urethra, membranous urethra, bulbar urethra, and the penile urethra. The urethra receives its blood supply from the bulbar arteries arising from the pudendal arteries and from the dorsal artery of the penis in retrograde fashion. The etiology of urethral strictures [3] includes insult to the urethral epithelium or the corpus spongiosum leading to narrowing of the urethral caliber. The cause of anterior urethral stricture disease can be classified into congenital or acquired. Acquired strictures are due to four main causes:

- Iatrogenic: These are hospital-acquired strictures. The traumatic placement of urethral catheters is the most common cause.
- Infection: Strictures are mostly due to gonococcal urethritis.
- Inflammation: Balanitis xerotica obliterans and lichen sclerosis are the causes. It usually begins with inflammation of the glans and inevitably causes meatal stenosis.
- Trauma: Urethral injuries occur mostly in association with pelvic fractures. The membranous urethra is prone to injury in pelvic fractures as it is posterior and inferior to the pubic symphysis.

Patients with urethral stricture disease become symptomatic only after the urethral caliber falls to less than 10 Fr [3]. They present with a history of obstructive voiding symptoms (poor flow, straining to void, incomplete bladder emptying, urinary retention), urinary tract infections, urethral bleeding, and now more rarely urethrocutaneous fistula and periurethral abscess development. Investigations aim to establish a diagnosis, identify coexisting infections, and determine the location and nature of the stricture in order to devise a treatment plan [3,9].

- Urine culture: A urine culture is mandatory to identify infection and to treat it before contemplating treatment.
- Urinary flow rate: It provides useful information during the initial assessment and follow-up.
- Flexible urethroscopy: This has simplified the evaluation of the urethra.
- The urethrogram: It is the single most important investigation when evaluating urethral stricture disease. It provides information on the site, length, number, caliber, and relation of the stricture to other structures.
- Ultrasonic evaluation: This is more accurate in deter¬mining spongiofibrosis.

Treatment of urethral strictures is primarily surgery, but the choice of the appropriate treatment is based on the characteristics of the stenosis (site, etiology, length, adverse local factors) and on the patient's characteristics (age, clinical history, associated diseases, physical and mental condition) [2]. The basic treatment types are:

1. Periodical instrumental and clinical evaluation of the patient. This approach is commonly known as watchful waiting.
2. Progressive dilatation of the urethral caliber, periodically performed in an outpatient office using soft catheters.
3. Endoscopic opening of the stricture. This procedure is commonly known as internal urethrotomy using a cold knife or holmium laser.
4. Surgical repair of the stricture. This procedure is commonly known as urethroplasty.

PATIENTS AND METHODS

Inclusion criteria included patients irrespective of age with urethral stricture disease confirmed by a urethrogram and with a maximum urinary flow rate (Qmax) less than 15 mls/min. They also had an HIV test done and had no complications on recruitment. HIV-positive patients had CD4 cell counts done.
Patients with strictures less than 1 cm long underwent urethral dilatation while anastomotic urethroplasty was done for strictures between 1 and 3 cm. Staged substitution urethroplasty was used for strictures longer than 3 cm.

The data obtained was entered into Windows Excel 2007 and then exported to SPSS version 16. Assessment of the association between dependent and independent variables was done using the chi-square test. Multivariable logistic regression analysis was used to determine the factors associated with stricture

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.06 ISSN 1944-5792 (print), ISSN 1944-5784 (online)

recurrence, and a time-to-recurrence analysis was performed using the Kaplan-Meier method and log rank score.

RESULTS

A total of 71 patients were recruited in this study. Of those, 36.6% (N = 26) were aged below 30 years, 31% (N = 22) were aged 31 to 40 years, and 32.4% (N = 23) were aged above 41 years. The minimum age was 4 years and the maximum age was 84 years, with 38.04 years being the mean. Furthermore, 63% (N = 45) of the patients were HIV positive while HIV negative patients accounted for 37% (N = 26). All HIV seropositive patients had HIV WHO stage I disease and 53.8% (N = 14/26) were on HAART.

Stricture Characteristics and HIV

Figure 1 shows that urethritis is the commonest cause of urethral stricture disease, as 45.1% (N = 32) had post-urethritis urethral stricture disease. Of the patients, 16.9% (N = 12) had stricture disease resulting from external trauma while 25.4% (N = 18) had urethral stricture disease resulting from unknown aetiologies. Iatrogenic trauma was the least common etiology and was an etiology in 12.7% (N = 9) of the patients.

Table 1 shows that the bulbar urethra is the commonest location of urethral stricture disease, accounting for 73.2% (N = 52). Furthermore, 5.6% (N = 4) had strictures located in the membranous urethra, and 19.7% (N = 14) had strictures in the penile urethra. The stricture was located in the bulbomembranous urethra in 1.4% (N = 1) of the patients.

Figure 2 shows that 76.0% (N = 54) of the patients had strictures less than or equal to 1 cm in length while 14.1% (N = 10) had strictures between 1.1 cm and 3 cm. Finally, 9.9% (N = 7) had strictures longer than 3 cm. As illustrated by Table 2, 50% (N = 16/32) of patients with post-urethritis stricture disease were HIV positive. Table 3 shows that 2.8% (N = 2) of the patients had intraoperative complications. The complications included pain, minimal bleeding, and mild haemorrhaging. Table 4 shows that 12.7% (N = 9) of the patients had postoperative complications, 4.2% (N = 3) had postoperative wound infections, and 8.5% (N = 6) had urethrocutaneous fistulas. Of the patients who had urethral dilatation, 52.5% (21/40) had recurrence while all patients (100%) had staged urethroplasty recurrence (Table 5). Anastomotic urethroplasty had the lowest recurrence percentage at 36.4% (4/11). In total, 44.8% (26/58) of the patients had no recurrence after being followed-up for 6 months, 55.2% (32/58) had recurrence, and 18.3% (13/71) were lost to follow-up.

Figure 1. Stricture etiology.

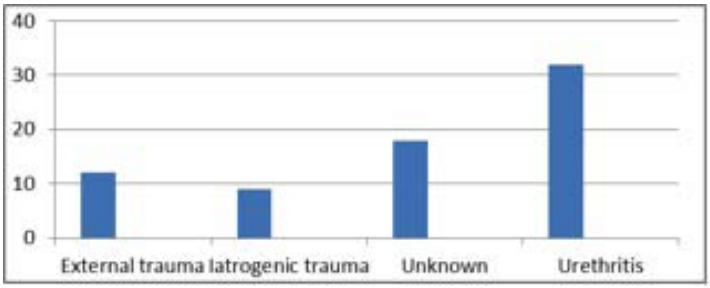
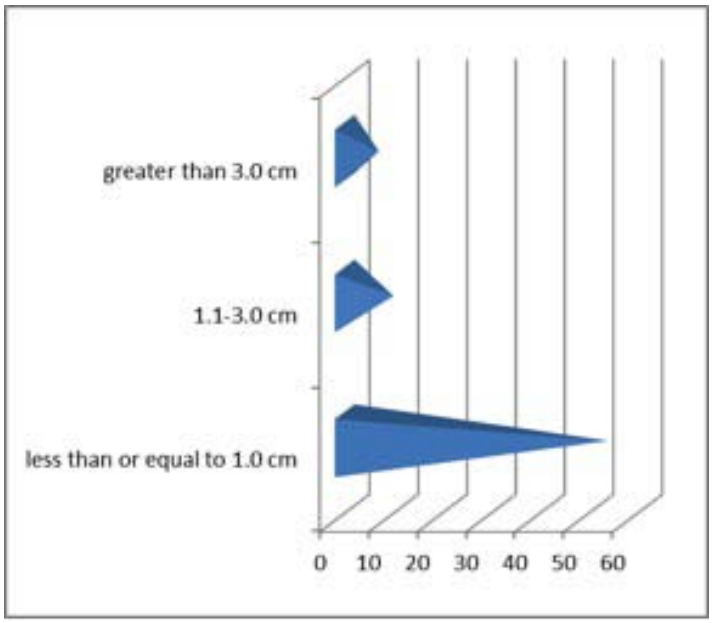


Figure 2. Stricture length.



Of the patients who had urethral dilatation, 36.2% (21/58) had recurrence while 6% (4/58) who had anastomotic urethroplasty had recurrence. Of the post-staged urethroplasty patients, 10% (7/58) had urethral stricture disease recurrence. Of the non-reactive patients, 47% (N = 16/34) had recurrence while 67% (N = 16/24) of the reactive patients had recurrence (Table 6).

Chi-square tests were carried out to determine the association between dependent and independent variables (Table 7). The

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.06
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

Table 1. Stricture location..

	Frequency	%	Valid %	Cum. %
bulbar urethra	52	73.2	73.2	73.2
bulbomembranous urethra	1	1.4	1.4	74.6
membranous urethra	4	5.6	5.6	80.3
penile urethra	14	19.7	19.7	100
total	71	100	100	n/a

Table 2. Stricture etiology and HIV status crosstabulation..

		HIV status		Total
		non-reactive	reactive	
stricture etiology	urethritis	16	16	32
	iatrogenic trauma	7	2	9
	external trauma	9	3	12
	unknown	13	5	18
total		45	26	71

null hypothesis was rejected on association between recurrence and stricture length and stricture location.

Multivariable Logistic Regression Analysis

The multivariable logistic regression analysis (Table 8) was used to know the effect of independent variables on stricture recurrence. There was no statistically significant result.

Kaplan-Meier Plots

A time-to-recurrence analysis was done using the Kaplan-Meier method. Table 9 shows that 25% of the non-reactive patients took 55 days for stricture recurrence to occur while 25% of the reactive patients took 98 days for stricture recurrence to take place. Figure 3 places the cumulative survival at 50 days for non-reactive patients as being 0.3 and for reactive patients as being 0.55. The cumulative survival in most parts of the curve is higher in reactive patients.

Table 3. Intraoperative complications.

	Frequency	%	Cumulative %
no complication	69	97.2	97.2
pain and mild bleeding	1	1.4	98.6
mild bleeding	1	1.4	100
total	71	1.4	100

Table 4. Postoperative complications..

	Frequency	%	Valid %	Cum. %
wound infection	3	4.2	33.3	33.3
fistula	6	8.5	66.7	100
no complication	62	87.3	n/a	n/a
total	71	100	n/a	n/a

Table 5. Procedure type versus recurrence.

Procedure	Patients enrolled	Lost to follow-up	Completed study	Recurrence
urethral dilatation	52	12	40	21
anastomotic urethroplasty	12	1	11	4
staged urethroplasty	7	0	7	7
total	71	13	58	32

DISCUSSION

Sociodemographic Characteristics of Patients

The mean age of patients presenting with urethral stricture disease in this study was 38.04 years. This mean age is close to what is reported in other African studies. Shittu [15], in Nigeria, reported the mean age as being 42.2 years. Another study by Ramyil et al. [14] found the mean age to be 30.6 years. Heyns and Marais [10] showed that the mean age of patients presenting with urethral stricture disease was 48 years. Most patients were below 30 years old [11]. This is the most sexually active age group and most strictures can be attributed to urethritis.

Stricture Characteristics and HIV

In this study, urethritis was the commonest cause of urethral stricture disease as 45.1% (N = 32) of the patients had post-urethritis urethral stricture disease, 16.9% (N = 12) had stricture disease resulting from external traumsa, and 25.4% (N = 18) patients had stricture disease resulting from unknown etiologies. Iatrogenic trauma was the least common etiology and was an etiology in 12.7% (N = 9) of the patients. This conforms with other studies done in Africa that have shown urethritis as the commonest cause of urethral stricture disease. At the Urology Unit, Department of Surgery, University College Hospital, Ibadan, Nigeria, a study carried out indicated the etiology of stricture disease as being post-infective in 80% of the cases [15]. At the Urology Department of the Conakry University Hospital, Republic of Guinea, the majority of strictures were caused by infection followed by post-traumatic strictures, accounting for 84 and 10%, respectively [5].

The pattern, however, is different in developed countries. A study by Fenton et al. [7] in the United States of America found that most strictures were idiopathic (34%) or iatrogenic (32%); fewer were inflammatory (20%) or traumatic (14%). The high prevalence of post-urethritis urethral stricture disease is due to the high prevalence of untreated STIs where sequelae are urethral stricture disease. The lower percent of post-infective strictures in this study compared to other African studies may be because some participants felt stigmatized when mentioning urethritis as an etiology. Such participants' etiology thus fell under unknown causes.

In this study, the commonest location of urethral stricture disease was the bulbar urethra accounting for 73.2 % (N = 52). Of our patients, 5.6% (N = 4) had strictures located in the membranous urethra, and 19.7% (N = 14) had strictures in the penile urethra.

Table 6. HIV status versus stricture recurrence.

		No recurrence	Recurrence	Total
HIV status	non-reactive	18	16	34
	reactive	8	16	24
total		26	32	58

Table 7. Chi-square tests.

Hypothesis	Chi-square statistics	Degree of freedom	*P* value	Comment
recurrence and stricture length	10.0009	1	0.002	reject the null hypothesis
reccurence and stricture location	6.568	3	0.047	reject the null hypothesis

Table 8. Regression analysis.

Valuable	OR	*P*	(c-i)
stricture location	0.407	0.008	0.210-0.789
stricture length	1.946	0.199	0.705-5.377
stricture etiology	0.534	0.167	0.219-1.301
CD4cc	0.633	0.598	0.116-3.457
HAART	1.745	0.675	0.129-23.548
education	1.295	0.565	0.537-3.126
occupation	3.062	0.281	0.400-23.412
HIV status	2.900	0.037	1.069-7.870

The stricture was located in the bulbomembranous urethra in 1.4% (N = 1) of the patients.

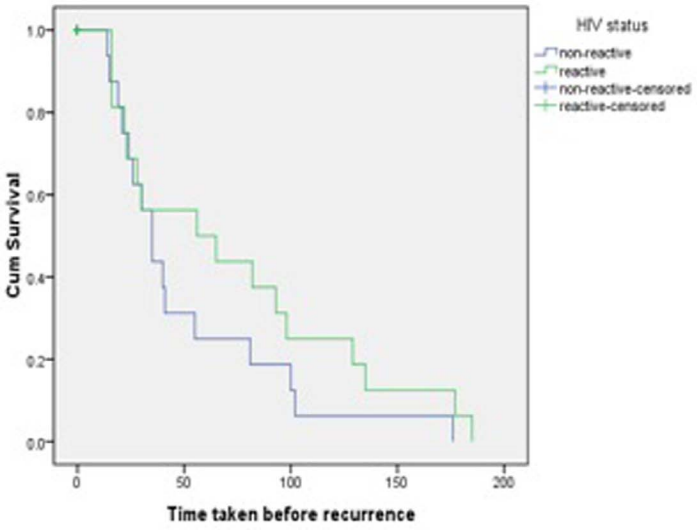
Ramyil and group [16] showed that strictures were bulbar in

Table 9. Kaplan-Meier percentiles.

	Est.	Std. error	Est.	Std. error	Est.	Std. error
non-reactive	55	34.641	35	4.961	21	4.330
reactive	98	31.177	56	35	22	6.062
overall	93	11.635	35	7.778	22	3.062

Est. = Estimate

Figure 3. Survival functions.



89%. The pattern was similar in the United States of America where Fenton et al. [7] found that most strictures involved the bulbar urethra (52%). Therefore, the pattern of stricture location in this study is similar to what is seen in other developing and developed countries.

Stricture length was important, as it determined the type of operation to undertake. Of our patients, 76.1% (N = 56) had strictures less than or equal to 1 cm in length, 14.1% (N = 10) had strictures between 1.1 cm and 3 cm, and 9.9% (N = 7) had strictures longer than 3 cm. The average urethral stricture length in this study was 1.4 cm. The average stricture length in a study by Fenton et al. [7] was 4.1 cm. The average stricture length in this study was lower than in the Fenton et al. study, and this may be because most strictures in this study were bulbar and mostly less than 1 cm.

The number of HIV seropositive and HIV seronegative patients was predetermined when calculating the sample size. Of the patients, 63% (N = 45) were HIV positive while 37% (N = 26) were HIV negative. The 2011 WHO HIV classification system was used, and all the patients who were HIV positive had stage I disease. Patients in this stage were either asymptomatic or had persistent generalized lymphadenopathy.

Patients with WHO stages II, III, and IV may not be fit for surgery. However, patients with WHO stages II, III, and IV were not excluded but were not available. The 2011 CDC HIV classification system was not used in this study as it is based on the lowest documented CD4 cell count and on previously diagnosed HIV-related conditions where details in the questionnaire were not captured.

In this study, 50% (N = 16/32) of patients with post-urethritis urethral stricture disease were HIV positive. This corresponds to a study done by Sturm et al. [18] who found the seroprevalence of HIV to be 45% in patients with urethritis. However, the study by Sturm et al. only considered urethritis and not urethral stricture disease, which is a sequelae of urethritis. This shows that the prevalence of HIV in patients with urethritis is high, as urethritis is a risk factor for HIV acquisition. STIs cause urethritis, which is an etiology for urethral stricture disease, and there is an association between urethritis and HIV.

Of the patients who were reactive, 53.8% (N = 14/26) were on HAART while 46.2% (N = 12/26) were not on HAART. HAART improves the immune status of patients by improving CD4cc, and this is a good predictor of a good surgical outcomes [12].

OPERATIONS AND OUTCOMES

Operations done included urethral dilatation, anastomotic urethroplasty, and staged urethroplasty. Of the patients, 73% (N = 52) had urethral dilatation while 17% (N = 12) underwent anastomotic urethroplasty; 10% (N = 7) had staged urethroplasty. In a study by Abdalla [20], the postoperative complication rate was 19%, and complications included secondary haemorrhage, ischemia, and sloughing of the penile skin and urethrocutaneous fistula. In this study, only 2.8% (N = 2) of the patients had intraoperative complications, which included pain, minimal bleeding, and mild haemorrhage. However, postoperative complications were seen in 12.7% (N = 9) of the patients and included wound infection and urethrocutaneous fistulae. The postoperative complication rate was lower than that highlighted in the study by Abdalla.

After following-up patients postoperatively for 6 months, the overall urethral stricture recurrence rate was 55.2% (N = 32/58). Overall, 36.2% (21/58) of the patients who had urethral dilatation had urethral stricture recurrence while 6% (4/58) of the patients who had anastomotic urethroplasty had urethral

stricture recurrence. Of the patients who underwent staged urethroplasty, 10% (7/58) had urethral stricture recurrence. Per procedure type, 52.5% (21/40) of patients who had urethral dilatation had recurrence while all patients (100%) had staged urethroplasty recurrence. Anastomotic urethroplasty had the lowest recurrence percent at 36.4% (4/11).

In a 5-year retrospective study by Nwofor and Ugezu [13], 51 patient records were reviewed, and it was found that urethroplasty gave better results with a 16.7% recurrence rate. Of the patients who had urethral dilatation, 61.5% required repeated dilatations between 6 and 12 months in order to maintain a satisfactory urine flow. The overall recurrence rate following urethroplasty in this study was 16% (6% for anastomotic urethroplasty and 10% for anastomotic urethroplasty), and this is similar to the recurrence rate in the study by Nwofor and Ugezu. The recurrence rate following dilatation was lower in this study probably because the follow-up period was shorter.

No known study has been done to compare urethral stricture disease management between HIV seropositive and seronegative patients. The overall urethral stricture recurrence rate in this study irrespective of HIV status was 55.2% (N = 32/58). With respect to HIV status, 47% (N = 16/34) of the non-reactive patients had urethral stricture recurrence while 67% (N = 16/24) of the reactive patients had urethral stricture recurrence. The difference in urethral stricture recurrence rates between reactive and non-reactive patients was 20%. There were more non-reactive patients (N = 34) than reactive patients (N = 24), and this contributed to the difference. However, this difference was also not statistically significant as there was no association in this study between urethral stricture recurrence and HIV status (P = 0.139).

Association Between Dependent and Independent Variables

Chi-square tests were carried out to know the association between dependent and independent variables. The null hypothesis was rejected upon the association between recurrence and stricture length and stricture location. The association between stricture recurrence and stricture length gave a chi-square test of 10.009 with 2 as the degree of freedom. The P value was 0.002, hence rejecting the null hypothesis. In the association between stricture recurrence and stricture location, the chi-square test was 6.568 and the P value was 0.047. The degree of freedom was 3, hence rejecting the null hypothesis. Therefore, there is an association between stricture recurrence and stricture location and length. However, there is no association between stricture recurrence and HIV status. In the association between urethral stricture disease recurrence and CD4cc, the chi-square statistic was 4.195 and the P value was 0.109. Therefore, there is no association between urethral stricture recurrence and CD4cc.

Multivariable Logistic Regression Analysis

Multivariable logistic regression analysis was used to know the effect of independent variables on stricture recurrence. All the independent variables could not fit into the model at once. The independent variables were fed into the model in batches and the results obtained were assembled into 1 table. This could be attributed to a small sample size. However, there was no statistically significant result.

Kaplan-Meier Plots

Analysis of the time-to-recurrence was carried out using Kaplan-Meier methods. Of the non reactive patients, 25% took 55 days to have stricture recurrence while 25% of the reactive patients took 98 days for a stricture to recur. This shows that HIV status in this study was not significant in determining stricture recurrence. This is further affirmed by the survival function curve, which showed the cumulative survival at 50 days for non-reactive patients as being 0.3 and for reactive patients as being 0.55.

CONCLUSION

Urethral stricture disease affects patients from all age groups, as the youngest patient in this study was 4 years old and the oldest was 84 years old. The commonest etiology of urethral stricture disease at UTH is urethritis. The prevalence of HIV in patients presenting with post-urethritis stricture disease is high.

The recurrence rate of urethral stricture disease following treatment is not affected by the HIV status and the CD4cc of the patient. However, urethral stricture disease recurrence is affected by the location of the stricture, length of the stricture, and the procedure used. The time to recurrence and cumulative survival of urethral stricture disease following treatment are also not influenced by the HIV status of the patient.

REFERENCES

1. Bayley, A. C. (1990). "Surgical pathology of HIV infection: lessons from Africa." *Br J Surg* 77(8): 863-868. PubMed ; CrossRef

2. Barbagli, G. (2009). "Penile and bulbar urethroplasty, surgical techniques and results." Proceedings of the Urethroplasty Workshop in Hong Kong, February 9-10, 2009. Hong Kong Urological Association, Tuen Mun Hospital.

3. Bhargava, S. and C. R. Chapple. (2005). "Urethral stricture disease." 23(4): 141-145.

4. Bowa, K. (2004). "Surgical challenges in Zambia." http://www.facs.org. Accessed: November, 2004.

5. Daillo, et al. (2006). "Surgical management of male urethral stricture at the Urology Department of Conakry, observations on 250 cases." *African J Urol* 12(4): 200-208.

6. De Schryver, A. and A. Meheus (1990). "Epidemiology of sexually transmitted diseases: the global picture." *Bull World Health Organ* 68(5): 639-654. PubMed

7. Fenton, A. S., A. F. Morey, et al. (2005). "Anterior urethral strictures: etiology and characteristics." *Urology* 65(6): 1055-1058. PubMed ; CrossRef

8. Gnanaraj, J., A. Devasia, et al. (1999). "Intermittent self catheterization versus regular outpatient dilatation in urethral stricture: a comparison." *Aust N Z J Surg* 69(1): 41-43. PubMed ; CrossRef

9. Harrison, W. J., C. P. Lewis, et al. (2002). "Wound healing after implant surgery in HIV-positive patients." *J Bone Joint Surg Br* 84(6): 802-806. PubMed ; CrossRef

10. Heyns, C. F. and D. C. Marais (2002). "Prospective evaluation of the American Urological Association symptom index and peak urinary flow rate for the followup of men with known urethral stricture disease." *J Urol* 168(5): 2051-2054. PubMed ; CrossRef

11. Karpelowsky, J. S., E. Leva, et al. (2009). "Outcomes of human immunodeficiency virus-infected and -exposed children undergoing surgery--a prospective study." *J Pediatr Surg* 44(4): 681-687. PubMed ; CrossRef

12. Kumar, P. and M. Clark. (2002). "The effects of HAART on immune function in HIV infection." *Clinical Medicine, 5th ed*. WB Saunders. Edinburgh, UK: 212.

13. Nwofor, A. M. E. and A. I. Ugezu. (2004). "Urethral Stricture Management. Experience at Nnewi, South East Nigeria." *African J Urol* 10(2): 107-115.

14. Ramyil, et al. (2007). "Internal Urethrotomy in the Management of Anterior Urethral Stricture." *African J Urol* 13(4): 267-272.

15. Shittu, O. B. (2001). "Internal optical urethrotomy in the management of urethral strictures in Nigerians, technique and outcome." *African J Urol* 7(2): 62-65.

16. Stack, R. S. and S. M. Schlossberg (1998). "[General principles in treatment of urethral strictures]." *Urologe A* 37(1): 10-20. PubMed

17. Steenkamp, J. W., C. F. Heyns, et al. (1997). "Internal urethrotomy versus dilation as treatment for male urethral strictures: a prospective, randomized comparison." *J Urol* 157(1): 98-101. PubMed ; CrossRef

18. Sturm, P. D., P. Moodley, et al. (2004). "Aetiology of male urethritis in patients recruited from a population with a high HIV prevalence." *Int J Antimicrob Agents* 24 Suppl 1: S8-14. PubMed ; CrossRef

19. Zulu, R. (2003). "The role of intermittent self-dilatation in recurrent urethral stricture disease at the University Teaching Hospital in Lusaka." Unpublished dissertation. University of Zambia, Lusaka, Zambia.

20. Abdalla, M. A. (2008). "Experience with Penile Circular Fasciocutaneous Flap in the Treatment of Long Anterior Urethral Strictures." African J Urol 14(2): 81-85.

UIJ UroToday International Journal®

Urethral Stricture Etiology Revisited: An Indian Scenario

Jitendra Singh, Vinod Priyadarshi, Praveen Pandey, Mukesh Vijay, Malay Bera, Sudip Chakraborty, Anup Kundu, Dilip Pal

Submitted October 26, 2012 - Accepted for Publication December 16, 2012

ABSTRACT

Objectives: Urethral stricture disease remains a common cause of morbidity among men. Many questions about the etiology of urethral stricture disease remains unanswered till now. This study was done in a tertiary care center along with a review of the literature to evaluate the etiology of urethral strictures and to determine the factors that may influence possible preventive or curative strategies.

Methods: This was a retrospective and prospective study of 404 patients with urethral strictures. The case records of all these cases diagnosed as urethral stricture were analyzed to determine the possible cause of the stricture, demographic profiles, and clinical presentation. Data were entered both prospectively by a careful patient questioning and retrospectively from a detailed chart review. A subanalysis of the stricture etiology of patients aged less than 40 years vs patients aged 40 or more was done. Statistical analysis with the Fisher's exact test was done, and a P value < 0.05 was considered statistically significant.

Results: The mean age of presentation was 41.2 years (range: 3 to 81 years). Overall, the iatrogenic cause was the most common (40.6%), but stricture etiology varied with age and the stricture site.

Conclusions: The etiology of urethral strictures is not uniform across the world. The iatrogenic and idiopathic strictures are surprisingly common. Avoiding unnecessary urethral catheterization and repeated urethral instrumentation can reduce iatrogenic strictures.

INTRODUCTION

Urethral stricture disease causes a great deal of morbidity among men. Specific studies of stricture etiology are scarce. A Medline search revealed only a 1% publication on the specific topic of stricture etiology. This study along with review of literature was done in a tertiary care center to evaluate the etiology of urethral strictures and to determine the common themes that may influence possible prevention or treatment strategies.

MATERIALS AND METHODS

This was a retrospective and prospective study of 404 patients with urethral strictures who were admitted from January 2001 to December 2011 to the Urology Department of the Institute of Postgraduate Medical Education and Research at SSKM Hospital in Kolkata. The case records of all the cases diagnosed as urethral strictures were analyzed to determine the possible cause of stricture, their demographic profile, and their clinical presentation. Data were entered both prospectively through careful patient interrogation and retrospectively from a detailed chart review. Subanalysis was done of patients less than 40 years of age vs patients 40 years of age or greater. Their stricture sites were also taken into account. A cutoff of 40 years was chosen, since above this age the probability of iatrogenic manipulation of the urethra increases due to the increased incidence of benign prostatic hyperplasia, prostate cancer, bladder tumor, and urethral catheterization. Four stricture sites were determined: the posterior urethra, the bulbar urethra, the penile urethra, and the pan urethra. Statistical analysis was done (with the Fisher's exact test), and a p value < 0.05 was considered statistically significant. A comprehensive electronic literature search was conducted using the keywords "etiology,

KEYWORDS: Aetiology, site, stricture, urethra

CORRESPONDENCE: Jitendra Pratap Singh, MS, Department of Urology, Institute of Postgraduate Medical Education & Research, Kolkata, West Bengal, India (jpims99@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 5. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.05

Table 1. Showing the aetiology of strictures by site.

Cause (no.)		Site: no. penile (%)	No. bulbar (%)	No. pan urethral (%)	No. posterier (%)
idiopathic (112)		23	74	12	0
iatrogenic (164)	urethral catheterization	18	26	14	0
	TUR	11	36	7	9
	cystoscopy	3	3	4	0
	prostatectomy	0	0	0	7
	brachytherapy	0	0	0	2
	hypospadias repair	23	1	0	0
inflammatory (41)	urethritis	18	16	7	0
lichen sclerosis (39)		22	0	17	n/a
traumatic (48)	perineal trauma	0	9	0	0
	pelvic fracture	0	8	0	27
	penile fracture	4	0	0	0
total (404)		125 (30.9)	173 (42.8)	61 (15.1)	45 (11.2)

urethra, and stricture."

RESULTS

The results are shown in Table 1 and Table 2. The mean age of presentation was 41.2 years (age range: 3 to 81 years). Overall, the iatrogenic cause was the most common (40.6%), but the stricture etiology varied with age and stricture site. In the younger age group, idiopathic hypospadias surgery and pelvic fractures were more prevalent (p value: < 0.05), while in the older age group, transurethral resection and prostatectomy were the prevalent cause for strictures of the urethra. Bulbar urethra involvement (42.8%) was the most common, while penile urethral (30.9%). Iatrogenic causes (40.59%) were the most common ones for penile and pan urethral stricture. Idiopathic etiology was the most common feature with the bulbar urethra whereas the traumatic one was in the posterior urethra.

DISCUSSION

A review of literature showed considerable overall variation in the frequency distribution of etiological factors. Historically, strictures were more or less associated with gonococcal urethritis [1]. But later on, it was found that a stricture was rarely due to a single infection and it takes 20 years for a stricture to develop after a single episode of untreated gonorrhea [1]. Nowadays, the incidence of postinflammatory stricture has decreased dramatically in the developed world (less than 10%) due to prevention campaigns for sexually transmitted diseases, public awareness of these diseases, and rapid and effective antibiotic treatment for urethritis [2-4]. In our study, its incidence was 10.2% but in the developing world it remains an important cause of stricture (54% to 66.5% of cases) [5]. In the developed world, most strictures today are either iatrogenic or idiopathic [6,7]. Major iatrogenic causes include urethral catheterization, cystoscopy, TURP, and hypospadias surgery. Our study also showed a similar result. Iatrogenic strictures occur at any age, commonly involving the membranous urethra and urethral sphincter mechanism, after transurethral resection of the prostate (TURP) (so-called "sphincter strictures") [8]. The incidence of iatrogenic stricture by TURP (2.2 to 9.8%) or radical (8.4%) or simple prostatectomy (1.9%) are higher in the older group patients [9-11]. The probable causes of stricture after TURP are traumatic insertion of the resectoscope with perforation of the bulbous urethra, instrument friction at the penoscrotal angle (as the instrument moves up and down within the urethra some 800 times), and monopolar current leakage due to insufficient resectoscope insulation [9,12].

In younger patients, hypospadias surgery is the most important iatrogenic cause. Urethral stricture incidence after hypospadias surgery varies from 2.5% to 11% of patients [13,14]. Mostly these strictures develop in the distal penile urethra at the site of surgery or at the meatus. It may be apparent shortly after

Table 2. Showing the distribution of stricture aetiology with age.

		Age: 40 years or less	Age: 40 years or greater	*P* value
Cause				
idiopathic		63	49	< 0.05
iatrogenic (164)	urethral catheterization (58)	19	39	not significant
	TUR (63)	5	58	< 0.05
	cystoscopy (10)	0	10	not significant
	prostatectomy (7)	0	7	< 0.05
	brachytherapy (2)	0	7	< 0.05
	hypospadias repair (24)	22	2	< 0.05
inflammatory	urethritis (41)	20	21	not significant
lichen sclerosis (39)		12	27	not significant
traumatic (48)	perineal trauma (9)	4	5	not significant
	pelvic fracture (35)	26	9	< 0.05
	penile fracture (4)	3	1	not significant
total (404)		171	233	

the surgery, in adolescent or in early adult life [13,14]. Our study also showed the prevalence of hypospadias surgery in the younger age group and it contributed 14.5% of total iatrogenic causes.

A history of urethral catheterization is another important iatrogenic cause [6]. In this study, urethral catheterization contributed 35.9% of total iatrogenic causes in both age subgroups. It may typically occur at the junction of the bulbar and penile urethra or in the proximal bulbar urethra. But penile urethra, pan urethra, and multifocal anterior urethral involvement are also common. Improper urethral catheter insertion causes 3.2 urethral injuries per 1 000 patients [15]. Prolonged catheterization leads to urethral inflammation and ischemia, and leads ultimately to urethral stricture [6]. Leaching of toxic compounds from poor quality catheters and microvascular disease (as in smokers and in diabetics) may increase the risk [15,16]. Adequate and strict indications for urinary catheterization, skilled urethral catheter insertion, and the consideration of suprapubic catheter placement in prolonged catheterization may decrease the incidence of these iatrogenic strictures.

Idiopathic strictures or strictures without an apparent reason are surprisingly common [4,6]. In this study, idiopathic cause contributed 27.6% of total stricture cases. They were more prevalent in younger age subgroups and in bulbar urethras (42.7%). These strictures are significantly more prevalent in the bulbar area and they are significantly more common in younger patients. There are several explanations for the so-called idiopathic stricture. It may be the delayed manifestation of unrecognized (childhood) trauma [17], congenital in origin [18] (possibly due to an incomplete rupture of the urogenital membrane and related to what is called Cobb's collar [19] by some and Moorman's ring [20] by others) or mainly ischemic in origin, especially in elderly men [21].

Lichen sclerosis (LS) is still commonly known by its initials BXO [22]. It is now the most common identifiable cause of penile strictures in young and middle-aged adults. LS was detected in 9.7% of our cases across both age groups. Its exact etiology is not clear, although infective and autoimmune mechanisms have been suggested [22]. It typically starts as an itchy patch of white discoloration on the inner aspect of the foreskin or glans

and spreads proximally to involve the fossa navicularis and then to the penile urethra causing it to be strictured. It can rarely affect the bulbar urethra.

Pelvic fractures causing disruption at the bulbomembranous junction is by far the main etiology of strictures in the posterior urethra. It is more prevalent in younger patients. The high-risk group is motorcyclists and bicyclists or pedestrians struck by a car [23]. Idiopathic strictures do not exist in this area. In this study, traumatic etiology was present in 11.9% of total stricture cases, pelvic fracture was the most common cause, and posterior urethra was the most common site of involvement (60% of traumatic cases). This fact is reflected in a higher incidence of up to 31% of traumatic strictures in countries with poor vehicular conditions and traffic regulations [5,24] compared to less than 11.2% of stricture cases in developed nations. Other minor causes are prostatectomy and brachytherapy, and they are localized at the prostatic urethra or bladder neck. Brachytherapy currently accounts for only 1.8% cases however; the incidence of this type of stricture may increase due to increased use of this modality [10]. We have not seen any case of urethral stricture with penile tumor involvement after foreign body insertion or penile surgery, such as penile prosthesis implantation.

This study has few limitations as a major part of data is retrospectively collected, and a study was done in a tertiary care referral center, which may result in selection bias.

CONCLUSION

Our study and a review of the literature suggest that the distribution of urethral stricture etiology is not uniform across the world. It also varies with age and it may influence the site of stricture in urethra. Our results showed that iatrogenic and idiopathic strictures are surprisingly common. Avoiding unnecessary urethral catheterization and repeated urethral instrumentation can reduce these iatrogenic strictures. Further studies are needed to know the etiology and ways to reduce the incidence of idiopathic strictures.

REFERENCES

1. Beard, D. E. and W. E. Goodyear (1948). "Urethral stricture; a pathological study." *J Urol* 59(4): 619-626. PubMed

2. Albers, P., J. Fichtner, et al. (1996). "Long-term results of internal urethrotomy." *J Urol* 156(5): 1611-1614. PubMed ; CrossRef

3. Pitkamaki, K. K., T. L. Tammela, et al. (1992). "Recurrence of urethral stricture and late results after optical urethrotomy: comparison of strictures caused by toxic latex catheters and other causes." *Scand J Urol Nephrol* 26(4): 327-331. PubMed ; CrossRef

4. Barbagli, G., G. Guazzoni, et al. (2008). "One-stage bulbar urethroplasty: retrospective analysis of the results in 375 patients." *Eur Urol* 53(4): 828-833. PubMed ; CrossRef

5. Ahmed, A. and G. D. Kalayi (1998). "Urethral stricture at Ahmadu Bello University Teaching Hospital, Zaria." *East Afr Med J* 75(10): 582-585. PubMed

6. Fenton, A. S., A. F. Morey, et al. (2005). "Anterior urethral strictures: etiology and characteristics." *Urology* 65(6): 1055-1058. PubMed ; CrossRef

7. Lumen, N., P. Hoebeke, et al. (2009). "Etiology of urethral stricture disease in the 21st century." *J Urol* 182(3): 983-987. PubMed ; CrossRef

8. Mundy, A. R. (1989). "The treatment of sphincter strictures." *Br J Urol* 64(6): 626-628. PubMed ; CrossRef

9. Rassweiler, J., D. Teber, et al. (2006). "Complications of transurethral resection of the prostate (TURP)—incidence, management, and prevention." *Eur Urol* 50(5): 969-979; discussion 980. PubMed ; CrossRef

10. Elliott, S. P., M. V. Meng, et al. (2007). "Incidence of urethral stricture after primary treatment for prostate cancer: data From CaPSURE." *J Urol* 178(2): 529-534; discussion 534. PubMed ; CrossRef

11. Varkarakis, I., Z. Kyriakakis, et al. (2004). "Long-term results of open transvesical prostatectomy from a contemporary series of patients." *Urology* 64(2): 306-310. PubMed ; CrossRef

12. Roehrborn, C. G. (1996). "Standard Surgical Interventions." In: R. S. Kirby, J. McConnell, J. Fitzpatrick, C. Roehrborn, P. Boyle, eds. *Textbook of Benign Prostatic Hyperplasia*. Isis Medical Media. Oxford, United Kingdom: 350-377.

13. Abu-Arafeh, W., B. Chertin, et al. (1998). "One-stage repair of hypospadias--experience with 856 cases." *Eur Urol* 34(4): 365-367. PubMed ; CrossRef

14. Shapiro, S. R. (1984). "Complications of hypospadias repair." *J Urol* 131(3): 518-522. PubMed

15. Kashefi, C., K. Messer, et al. (2008). "Incidence and prevention of iatrogenic urethral injuries." *J Urol* 179(6): 2254-2257; discussion 2257-2258. PubMed ; CrossRef

16. Nacey, J. N. and B. Delahunt (1991). "Urinary catheter toxicity." *N Z Med J* 104(918): 355-356. PubMed

17. Baskin, L. S. and J. W. McAninch (1993). "Childhood urethral injuries: perspectives on outcome and treatment." *Br J Urol* 72(2): 241-246. PubMed

18. Netto, N. R., Jr., R. C. Martucci, et al. (1976). "Congenital stricture of male urethra." *Int Urol Nephrol* 8(1): 55-61. PubMed ; CrossRef

19. Cobb, B. G., J. A. Wolf, Jr., et al. (1968). "Congenital stricture of the proximal urethral bulb." *J Urol* 99(5): 629-631. PubMed

20. Moorman, J. G. (1968). "Congenital anomalies of the urethra." Br J Urol 40: 636-639.

21. Andrich, D. E. and A. R. Mundy (2008). "What is the best technique for urethroplasty?" *Eur Urol* 54(5): 1031-1041. PubMed ; CrossRef

22. Mundy, A. R. and D. E. Andrich (2011). "Urethral strictures." *BJU Int* 107(1): 6-26. PubMed ; CrossRef

23. Markogiannakis, H., E. Sanidas, et al. (2006). "Motor vehicle trauma: analysis of injury profiles by road-user category." *Emerg Med J* 23(1): 27-31. PubMed ; CrossRef

24. Tazi, K., M. Nouri, et al. (2000). "[Treatment of inflammatory urethral stenosis with endoscopic urethrotomy]." *Ann Urol* (Paris) 34(3): 184-188. PubMed

UIJ UroToday International Journal®

Tuberculosis of the Prostate: Four Cases and a Review of the Literature

Jitendra Singh, Pramod Sharma, Mukesh Kumar Vijay, Anup Kumar Kundu, Dilip Kumar Pal

Submitted September 17, 2012 - Accepted for Publication December 16, 2012

ABSTRACT

Objectives: Tuberculosis of the prostate is a very rare disease. Most urologists are not familiar with it. Here, we wish to present our experience with 4 cases of this disease and a review of literature.

Methods: This was a retrospective study in a tertiary care center from January 2001 to December 2009.

Results: All the patients were in their fourth or fifth decade of life. Irritative voiding (100%) followed by hemospermia (50%) were the common presenting symptoms. A history of pulmonary tuberculosis was absent in all cases. Three out of 4 cases (75%) had a suspicious prostate on the digital rectal examination. PSA assays were slightly elevated with a mean of 8.26 ng/ml. Urine analysis revealed sterile pyuria in all patients, and the urine culture was negative. The urine and seminal fluid positivity rate was 33.33% for the AFB test, 66.6% for the M. tuberculosis culture test, and 100% for PCR. The transrectal ultrasonogram showed hypoechoic areas with irregular outlines in 3 cases (75%) and calcification in 2 cases (50%). All patients were scheduled to receive 6 months of chemotherapy with isoniazid, rifampicin, and Ethambutol or pyrazinamide.

Conclusions: A high index of suspicion with a wide range of investigations may be required to achieve a complete diagnosis of prostatic tuberculosis. Although short-term multi-drug chemotherapy is an ideal mainstay of treatment, surgery has a definitive role in advanced disease.

INTRODUCTION

Tuberculosis of the prostate is an extremely rare disease [1,2]. It is mainly found in immune-compromised patients [3]. Many urologists are not familiar with the disease due to its rare incidence. Here, we present our experience of 4 cases of this disease in the last 10 years and reviews of the related literature.

MATERIALS AND METHODS

This is a retrospective study of a total of 4 patients who were diagnosed with prostatic tuberculosis between January 2000 and December 2009 in the Urology Department of I.P.G.M.E. & R & S.S.K.M. Hospital, Kolkata. The case records of these 4 cases were analyzed for clinical presentations; their urine and seminal fluid were analyzed for an acid-fast bacilli (AFB) smear, M. tuberculosis culture, polymerase chain reaction (PCR) for M. tuberculosis, and a radiological and histopathological examination. Detailed clinical data of these 4 cases are summarized in Table 1. An online literature search was made from PubMed.

RESULTS

All patients were in their fourth or fifth decades of life. Irritative voiding (100%) followed by hemospermia (50%) were the common presenting symptoms. One case was incidentally diagnosed on histopathological examination after transurethral resection of the prostate (TURP) for lower urinary tract symptoms due to prostatic enlargement. A history of pulmonary tuberculosis was absent in all cases. Three out of 4 cases (75%) were suspected to be prostate tuberculosis

KEYWORDS: Chemothearpy, genitourinary, prostate, tuberculosis

CORRESPONDENCE: Jitendra Pratap Singh, Hno 166-b, Shakti Nagar, Faizabad Road, Lucknow, West Bengal India (jpims99@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 13. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.13

on the digital rectal examination. The PSA assay was slightly elevated with a mean of 8.26 ng/ml. The urine analysis revealed sterile pyuria in all these patients, and their urine culture was negative. Chest X-ray was normal, ESR was raised in 50%, and Mantoux test score was positive in 2 (66 %) out of 3 cases.

The urine and seminal fluid of 2 patients presenting with hemospermia and of 1 patient presenting irritative voiding symptoms with abnormal DRE were sent for an AFB smear, mycobacterial culture, and PCR. The test results were positive for at least 1 test; the positivity rate was 33.33% for the AFB test, 66.6% for the M. tuberculosis culture test, and 100% for PCR. A transrectal ultrasonogram (TRUS) showed hypoechoic areas with irregular outlines in 3 cases (75%) and calcification in 2 cases (50%) (Figure 1). The TRUS-guided prostate biopsy showed granulomatous infection with caseous necrosis (Figure 2, Figure 3). These areas of caseation in these 3 patients confirmed the diagnosis. Following this, an extensive search, including an IV pyelogram test for tuberculous foci in the body, was made but no lesions in another area were found. All the patients were scheduled to receive 6 months of chemotherapy with isoniazid, rifampicin, and Ethambutol or pyrazinamide according to the Centers for Disease Control and American Thoracic Society protocol. They showed improvement in their symptoms on regular follow-up. After 6 months of chemotherapy, all of them became negative for mycobacterium in their urine and seminal fluid analysis on an AFB smear, mycobacterial culture, and PCR.

Figure 1. A transrectal ultrasonogram showing a hypoechoic area of granulomatous lesions in the prostate.

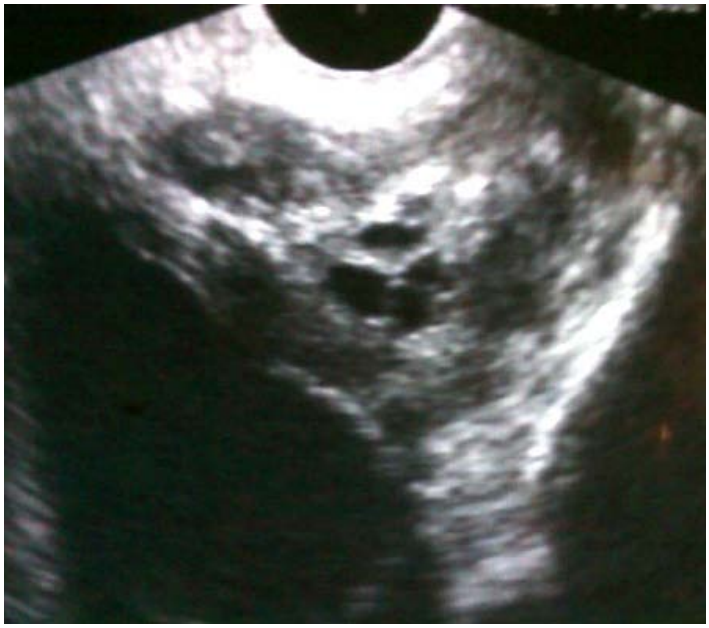
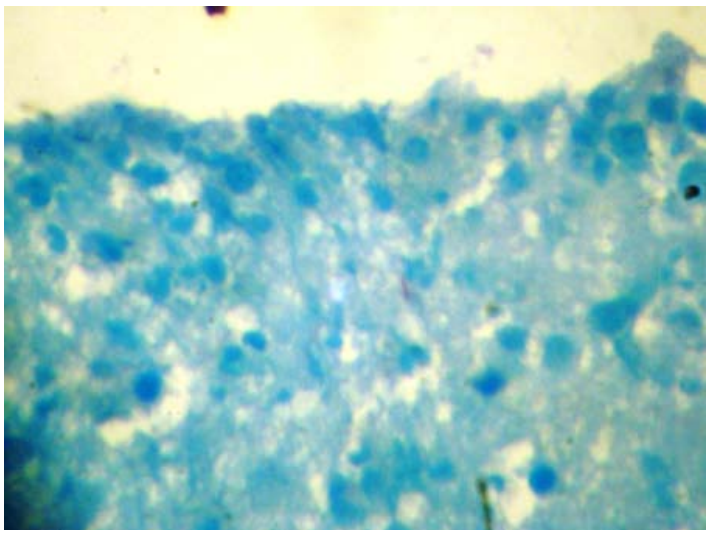


Figure 2. A low-power microphotograph showing chronic granulomatous inflammation and caesation in the prostate



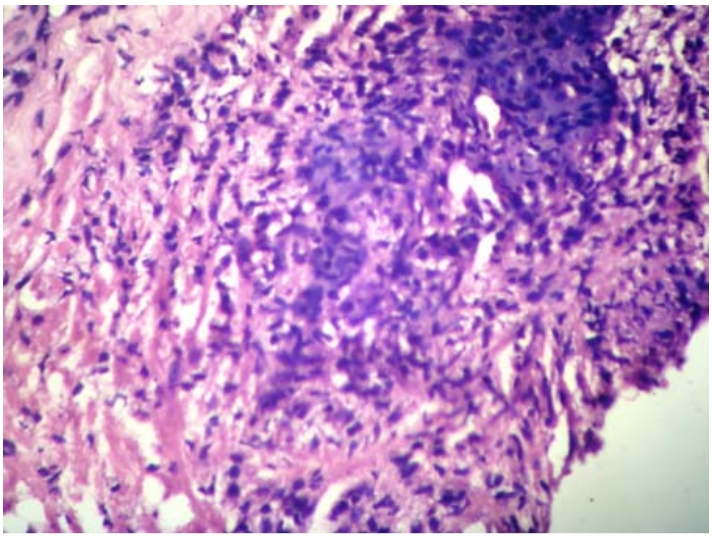
DISCUSSION

The term genitourinary tuberculosis (GUTB) was first introduced by Willbolz et al. It is the second most common form of extrapulmonary tuberculosis after lymph node involvement [1]. The primary organ affected in the urinary tract is the kidney and the epididymis in male genitalia [1]. Since prostatic tuberculosis is a rare disease, it is generally not properly diagnosed or it is under reported. Sporer [5] reported 728 autopsies of tuberculosis cases of which 100 showed prostatic involvement. In Medlar's [6] series of cases of genital TB, the prostate was involved in all.

Primarily prostatic tubercular lesions are very rare [2]. Tuberculous infection of the prostate is usually the result of hematogenous spreading [3]. It can also occur as a result of descending infection from the urinary tract or local spreading from the genital tract [4]. Although sexual transmission of M. tuberculosis has been reported, it is extremely rare [3]. Tubercular infection of the prostate results in chronic granulomatous inflammation. The resulting caseation necrosis then either heals by fibrosis or causes cavitations and sloughing (i.e., autoprostatectomy, as in the case with poor host defenses) [4].

Initially, patients are usually asymptomatic or present with non-specific irritative voiding symptoms or hemospermia. Hemospermia gives a strong suspicion of tubercular infection

Figure 3. A high-power microphotograph showing the granulomatous infection and caseous necrosis with acid-fast stain bacillus in the prostatic tissue.



and its sequelae in the prostate [2]. Sometimes the disease spreads rapidly and glandular destruction results, reducing the volume of semen. Advanced cases may present perineal sinus [4,5]. On palpation, most often the prostate was found to be non-tender, nodular, firm to hard, and rarely enlarged [4]. Prostatic tuberculosis may cause transient elevation of PSA levels that decreases with resolution of inflammation [7]. In our series, serum PSA came down to normal range after 6 weeks of anti-tubercular treatment.

A confirmed diagnosis required positive cultures, Ziehl-Nielsen staining, PCR, and/or histological examination [8]. However, staining has a low sensitivity (52.7% in one study), especially in extrapulmonary TB, and cultures require up to 8 weeks for maximal sensitivity [8]. PCR is highly sensitive and specific (the sensitivity and specificity of PCR of urine is 95.59% and 98.12%, respectively), but it is unable to detect whether the infection is biologically active or is in its latent phase [8]. The diagnosis can be confirmed only by prostate biopsy. In our series, although PCR sensitivity was 100%, the confirmatory diagnosis was made

Table 1. Showing the clinical data of all 4 cases.

Case No	Age	Clinical Feature	Digital Rectal Exam	Serum PSA	USG of Prostate	Semen for AFB Stain, Culture, and PCR for M. Tuberculosis	X-ray Chest	Montoux Test	IVU	Histo-pathological Exam	Treatment
1	39	irritative voiding symptoms with hemospermia	multinodular and firm prostate	13.67	multiple hypoechoic nodule with calcification	all 3 + ve	NAD	+ ve	NAD	TB	ATD
2	45	hemospermia	mild induration in left prostatic lobe	5.76	hypoechoic left nodule	culture and PCR + ve	NAD	+ ve	NAD	TB	ATD
3	34	irritative voiding symptoms	NAD	4.21	normal	PCR + ve	NAD	NAD	NAD	TB	ATD
4	49	lower urinary tract symptoms	asymetrically enlarged prostate	9.41	heterogenous echotexture with calcification	—	NAD	—	NAD	TB	TURP + ATD

NAD: No abnormality detected
ATD: Antitubercular drug

after histopathological examination in all cases.

A transrectal ultrasonogram (TRUS) of the prostate revealed an enlarged irregular gland with solitary (rare) or multiple irregular hypoechoic zones of varying sizes. The irregularity disappears with medical treatment [6]. The TRUS findings are variable, usually showing a heterogenous echotexture and dystrophic calcification. The tuberculous lesions are typically located in the peripheral part and lateral lobes of the prostate [8]. Contrast-enhanced computed tomography (CT) demonstrates these lesions more clearly [6]. Granulomatous prostatitis lesions show low signal intensity in the peripheral zone on long TR/TE images. A prostatic abscess is seen as an area of intermediate signal intensity on short TR/TE images and high signal intensity on long TR/TE images [6].

Short-course combination chemotherapy (SCC) is the standard care for the treatment of this disease [9]. Six-month regimens containing rifampicin and pyrazinamide are very effective with the fastest rates of culture-conversion and the lowest rates of relapse [9]. However, extensive prostatic involvements may show resistance to medical treatment. In such cases, surgery is used as a second-line intervention [10].

CONCLUSION

Tuberculosis of prostate is a very, very rare disease. A high index of suspicion is necessary and a wide range of investigations may be required to achieve a complete diagnosis. Short-term, multi-drug chemotherapy is the ideal mainstay of treatment. It showed an excellent treatment outcome, but surgery also has a definitive role in advanced stages.

REFERENCES

1. Sharma, S. K. and A. Mohan (2004). "Extrapulmonary tuberculosis." *Indian J Med Res* 120(4): 316-353. PubMed

2. Pal, D. K. (2002). "Tuberculosis of prostate." *Indian J Urol* 18: 120-2.

3. Gebo, K. A. (2002). "Prostatic tuberculosis in an HIV infected male." *Sex Transm Infect* 78(2): 147-148. PubMed | CrossRef

4. Hemal, A. K., M. Aron, et al. (1998). "'Autoprostatectomy': an unusual manifestation in genitourinary tuberculosis." *Br J Urol* 82(1): 140-141. PubMed | CrossRef

5. Sporer, A. and O. Auerbach (1978). "Tuberculosis of prostate." *Urology* 11(4): 362-365. PubMed | CrossRef

6. Merchant, S. A. (1993). "Tuberculosis of the genitourinary system. Part 2: Genital tract Tuberculosis." *Ind J Radial Imaging* 3: 275-286.

7. Speights, V. O., Jr. and P. N. Brawn (1996). "Serum prostate specific antigen levels in non-specific granulomatous prostatitis." *Br J Urol* 77(3): 408-410. PubMed | CrossRef

8. Gupta, N., A. K. Mandal, et al. (2008). "Tuberculosis of the prostate and urethra: A review." *Indian J Urol* 24(3): 388-391. PubMed

9. Kadhiravan, T. and S. K. Sharma (2008). "Medical management of genitourinary tuberculosis." *Indian J Urol* 24(3): 362-368. PubMed

10. Carl, P. and L. Stark (1997). "Indications for surgical management of genitourinary tuberculosis." *World J Surg* 21(5): 505-510. PubMed | CrossRef

UIJ UroToday International Journal®

A Renal Abscess in the Isthmus of a Horseshoe Kidney

Satáa Sallami, Olfa Zrayer, Habiba Mizouni

Submitted July 28, 2012 - Accepted for Publication October 8, 2012

ABSTRACT

Horseshoe kidney is a rare congenital malformation predisposing the patient to urinary tract infections. We present a case of a renal abscess occurring in an adult patient with a horseshoe kidney. A computed tomography scan confirmed the diagnosis of an abscess in the isthmus of the horseshoe kidney. A compete regression of the abscess was achieved by a prolonged course of antibiotics.

INTRODUCTION

A renal abscess is a rare complication of kidney bacterial infections [1]. A literature review revealed only rare cases of severe renal infection in a horseshoe kidney [2,3]. Herein, we present a case of renal abscess in a horseshoe kidney, in an adult, that was managed successfully with antibiotics as the sole treatment. To the best of our knowledge, this is the first observation of an abscess associated with a horseshoe kidney.

CASE REPORT

A 46-year-old man with no known prior medical history presented with hyperthermia and abdominal pain. The physical examination showed mild pallor, tachycardia, and a temperature of 102.74° F. An abdominal examination revealed pain in the right lumbar region and lower abdomen. Laboratory tests revealed hemoglobin of 6.9 gm/dL, a leukocyte count of 17 900/mm3 with polymorphs of 72%, a platelet count of 259 000/mL, blood glucose levels of 1.02 g/L, serum creatinine of 14 mg/l, and a C-reactive protein level of 332 mg/l.

The patient's abdominal ultrasound showed a horseshoe kidney with bilateral, middle hydronephrosis. The abdominal computed tomography (CT) scan (Figure 1) showed a rounded, low-density, and nonenhancing lesion 2 cm in size in the isthmus of a horseshoe kidney, suggestive of a renal abscess. *Escherichia coli* sensitive to ceftriaxone and ofloxacin grew in the patient's urine culture. Three blood cell cultures were negative. Intravenous antibiotics were started (gentamicin: 160 mg/day and ofloxacin: 2 g/day). After 48 hours of treatment, the patient became afebrile. He was discharged, and he was given a 2-week treatment of oral antibiotics (ofloxacin: 400 mg/day). A CT scan after 1 month was unremarkable (Figure 2) (new CT section at the same level as Figure 1). The patient remained afebrile and asymptomatic. His urine culture was negative.

COMMENTARY

A renal abscess is a rare entity resulting from an infection of the kidney. In the past, they were associated with high morbidity and mortality rates due, in part, to a late diagnosis [4,5]. A renal abscess develops from ascending infections of the lower urinary tract or by hematogenous seeding from primary sites of infection. Ascending infections account for more than 75% of all renal abscesses. *Escherichia coli*, pseudomonas, proteus, and *Klebsiella pneumoniae* are the most frequently isolated germs [6]. In contrast, renal abscesses that develop by hematogenous bacterial seeding are usually associated with *Staphylococcus aureus* [1,7]. The mean age of patients with renal abscesses ranged from 41 to 53 years [8,9] with a slight female predominance (sex ratio of about 1:3) [5].

Clinical symptoms are vague and nonspecific, making the diagnosis late and difficult [4,5]. Fever, back pain and/or abdominal pain, chills, and vomiting are the most common clinical manifestations [3]. Urinary symptoms may be absent [3]. There are no symptoms or specific signs that allow us to differentiate this process from simple acute pyelonephritis. However, the persistence of fever and symptoms for more than

KEYWORDS: Horseshoe kidney, abscess, CT scan

CORRESPONDENCE: Satáa Sallami, MD, La Rabta Hospital-University, Tunis, Tunisia (sataa_sallami@yahoo.fr)

CITATION: *UroToday Int J*. 2013 February;6(1):art 2. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.02

48 hours, despite an efficient antibiotherapy, should suspect the existence of a renal abscess [6]. The diagnosis is confirmed on the radiological findings [10].

In several studies, urinary obstruction and renal stones have been reported as common predisposing conditions, with an incidence of 21 to 50% and 24 to 54%, respectively [11]. Horseshoe kidney is a congenital malformation that may predispose the patient to severe urinary tract infections due to pelvic ectasia, which is inherent in the malrotation of the 2 renal units [3]. To the best of our knowledge, it has not been previously reported in association with renal abscess, but it could be considered a predisposing factor.

For some authors, ultrasonography (US) is the technique of choice for an initial assessment of patients with suggestive signs of severe kidney infection. It's safe, easy to handle, and offers a low cost [6]. The renal abscess appears as a uni- or multifocal hypoechoic lesion, but may be iso- or hyperechoic, interrupting the corticomedullary differentiation [3].

Documentation has considered CT scans superior to US for diagnosing renal abscesses, with an accuracy rate of 90 to 100%. CT scans detect small-sized abscesses and help differentiate abscesses from other mass-like lesions. A nonlobar, homogeneous, low-density intrarenal lesion strongly suggests necrosis and abscess formation [4,5,12]. The role of magnetic resonance imaging (MRI) is not well defined. This technique, considered superior to a CT scan in differentiating between benign and malignant renal masses, provides no more information on renal infections [6,8].

A renal abscess requires prolonged treatment with broad-spectrum antibiotics, which must initially be administered intravenously. Treatment must continue for a period of 3 to 6 weeks [3]. If antibiotic treatment was not enough to achieve clinical remission, percutaneous or open surgery drainage is required. Open surgical drainage is costly and exposes the patient to the risks and morbidity of surgery, including possible nephrectomy. However, percutaneous abscess drainage provides a nonoperative alternative [10]. Siegel et al. [13] suggested an algorithmic approach to the management of renal abscesses. They recommend primary conservative management using antibiotics in small abscesses (< 3 cm) and drainage (percutaneous or surgical) in large abscesses (> 5 cm). In the present case, the abscess was small so medical treatment was indicated.

We emphasize close follow-up in patients with diabetes mellitus or urinary obstructions and the management of possible risk factors of this serious infection.

CONCLUSION

Figure 1. The abdominal CT scan shows an abscess in the isthmus of a horseshoe kidney (arrow).

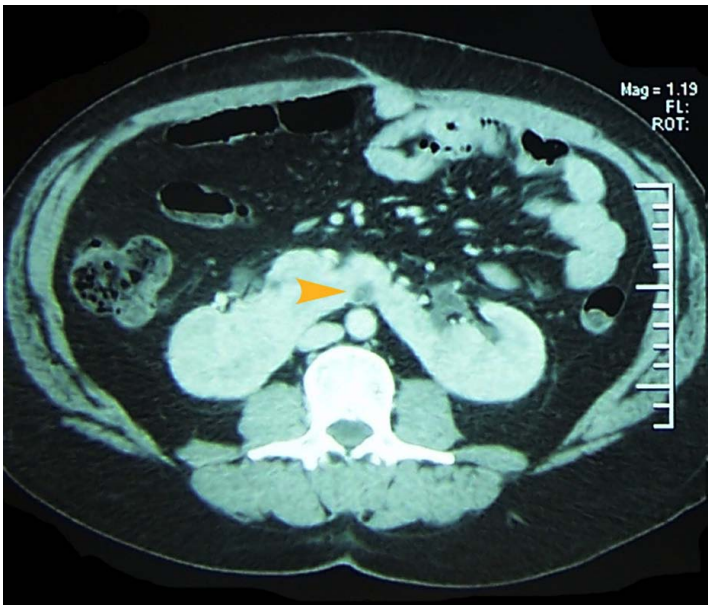
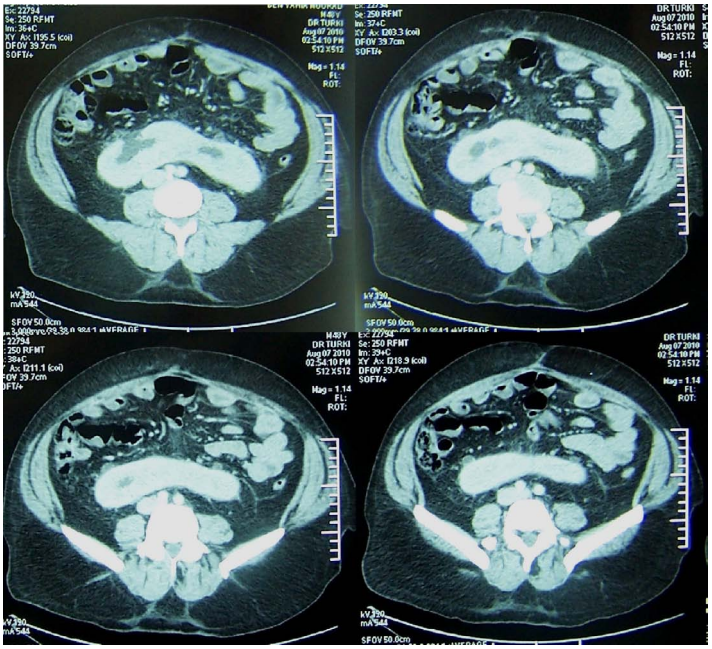


Figure 2. An abdominal CT scan of a horseshoe kidney with normal aspect parenchyma.



Medical therapy, without surgery, should be considered a valuable option for the treatment of a renal abscess with an early diagnosis, even with renal abnormality.

REFERENCES

1. d'Escrivan, T., A. Duval, et al. (2006). "Severe emphysematous pyelonephritis on a horseshoe kidney." *Med Mal Infect* 36(8): 432-433. PubMed ; CrossRef

2. Mongha, R., A. Dutta, et al. (2010). "Xanthogranulomatous pyelonephritis in a horse-shoe kidney." *Saudi J Kidney Dis Transpl* 21(3): 515-517. PubMed

3. Rodriguez Alonso, A., A. Gonzalez Blanco, et al. (2002). "[Acute diffuse bacterial nephritis in horse shoe kidney]." *Actas Urol Esp* 26(10): 806-810. PubMed

4. Capitan Manjon, C., A. Tejido Sanchez, et al. (2003). "Retroperitoneal abscesses--analysis of a series of 66 cases." *Scand J Urol Nephrol* 37(2): 139-144. PubMed

5. Fowler, J. E., Jr. and T. Perkins (1994). "Presentation, diagnosis and treatment of renal abscesses: 1972-1988." *J Urol* 151(4): 847-851. PubMed

6. Boam, W. D. and W. F. Miser (1995). "Acute focal bacterial pyelonephritis." *Am Fam Physician* 52(3): 919-924. PubMed

7. Dembry, L. M. and V. T. Andriole (1997). "Renal and perirenal abscesses." *Infect Dis Clin North Am* 11(3): 663-680. PubMed ; CrossRef

8. Lee, B. E., H. Y. Seol, et al. (2008). "Recent clinical overview of renal and perirenal abscesses in 56 consecutive cases." *Korean J Intern Med* 23(3): 140-148. PubMed ; CrossRef

9. Coelho, R. F., E. D. Schneider-Monteiro, et al. (2007). "Renal and perinephric abscesses: analysis of 65 consecutive cases." *World J Surg* 31(2): 431-436. PubMed ; CrossRef

10. Deyoe, L. A., J. J. Cronan, et al. (1990). "Percutaneous drainage of renal and perirenal abscesses: results in 30 patients." *AJR Am J Roentgenol* 155(1): 81-83. PubMed

11. Angel, C., T. Shu, et al. (2003). "Renal and peri-renal abscesses in children: proposed physio-pathologic mechanisms and treatment algorithm." *Pediatr Surg Int* 19(1-2): 35-39. PubMed ; CrossRef

12. Meng, M. V., L. A. Mario, et al. (2002). "Current treatment and outcomes of perinephric abscesses." *J Urol* 168(4 Pt 1): 1337-1340. PubMed

13. Siegel, J. F., A. Smith, et al. (1996). "Minimally invasive treatment of renal abscess." *J Urol* 155(1): 52-55. PubMed ; CrossRef

UIJ UroToday International Journal®

Adenosquamous Carcinoma of the Prostate: A Rare Aggressive Tumor with a Review of the Literature

Jitendra Singh, Kaushik Sarkar, Mukesh Vijay, Debashis Chakraborty, Dilip Pal, Anup Kundu

Submitted July 28, 2012 - Accepted for Publication October 8, 2012

ABSTRACT

Adenosquamous carcinoma (ASCC) of the prostate is an extremely rare, aggressive neoplasm with only few cases are reported in literature. Till now, it has no well-established therapeutic guideline. Here we are reporting a case of this rare entity and a review of literature for its management.

KEY MESSAGE

Adenosquamous cell carcinoma (ASCC) of the prostate is an extremely rare, aggressive tumor associated with a poor prognosis.

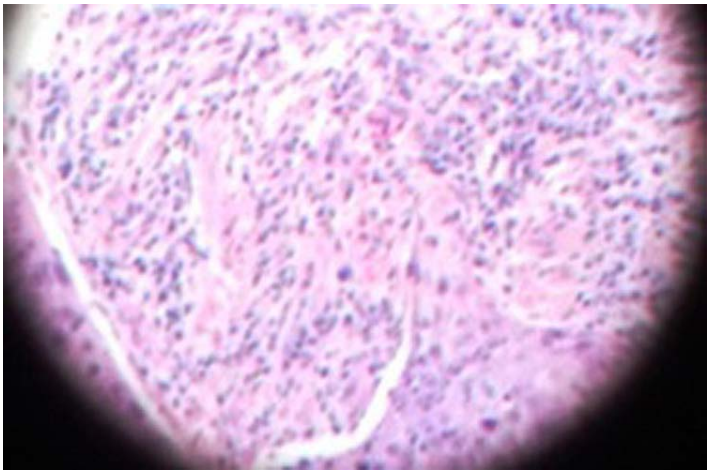
INTRODUCTION

Adenocarcinoma of the prostate gland is the most common malignant tumor affecting adult males [1]. Among other rare histological variants of carcinoma of the prostate—such as clear-cell carcinoma and small-cell carcinoma—adenosquamous carcinoma of the prostate is an extremely rare neoplasm associated with a poor prognosis [2]. Till now, there is no well-established guideline for the treatment of adenosquamous carcinoma. Here we are reporting a case of this rare entity and a review of literature for its management.

CASE HISTORY

A 65-year-old male patient presented with poor urinary flow and increased urinary frequency. On examination, the bladder was not palpable. The external genitalia were normal but the prostate was non-tender, enlarged with an obliterated median sulcus (grade III), hard, and nodular. His urine analysis and blood biochemistry, including serum PSA (1.07 ng/ml), were normal. Ultrasonography revealed a prostate size of 68 gm with non-homogenous texture and post-void residual urine of 110 ml. After 12 transrectal ultrasonogram-guided prostatic core biopsies, the final impression came out as adenosquamous carcinoma of the prostate (Figure 1). On further evaluation with a computed tomography (CT) scan, the prostate was heterogeneous with no discrete lesions. The irregular margin and tissue plane, including adjacent organs, were obliterated. A bone scan was normal. On radiotherapy consultation, taxane-based chemotherapy was given, but unfortunately the patient did not receive the next cycle and died in 1 month.

Figure 1. A low-power view of a prostate core biopsy showing squamous-cell carcinoma with a glandular component.



KEYWORDS: Adenosquamous, carcinoma, prognosis, treatment

CORRESPONDENCE: Jitendra Pratap Singh, Hno 166-b, Shakti Nagar, Faizabad Road, Lucknow, West Bengal India (jpims99@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 3. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.03

DISCUSSION

ASCC is defined by the presence of both glandular (acinar) and squamous components [1-3]. Since the first description by Thompson, approximately 33 cases of ASCC of the prostate have been reported [3-8]. Of all ASCC cases reported in the literature, two-thirds involved patients previously treated for prostatic adenocarcinoma with hormones and/or radiation [3,4-8]. The timeframe for the appearance of squamous differentiation in the carcinoma varies from 3 months to many (up to 9) years after therapy. The remaining one-third of patients had no history of prostate cancer or hormonal therapy [4]. However, the present case lacks this history, suggesting that the 2 types of epithelia may have developed concurrently.

There are several theories to explain the histogenesis of ASCC of the prostate: 1) metaplastic transformation of adenocarcinoma cells [5,6], 2) a collision-type tumor, 3) ASCC derived from pluripotent stem cells capable of multidirectional differentiation [5], or 4) a more plausible explanation would be clonal evolution/divergence of persistent carcinoma, secondary to the selective pressure of therapy, for ASCC occurring after radiation or androgen deprivation therapy [5]. Prostatic ASCC, like glandular adenocarcinomas, can spread along nerves; extend locally into periprostatic soft tissue, the bladder, and seminal vesicles; and metastasize to lymph nodes and bones [6-8]. However, in bones, the metastases are routinely osteolytic rather than osteoplastic. In widely disseminated disease, metastatic deposits have been detected in the peritoneum, diaphragm, liver, and lungs. Clinically, these patients often present with bladder outlet obstruction and dysuria, and are quite large. The prostate-specific antigen (PSA) level may or may not be elevated depending on the squamous component. The digital rectal examination (DRE) is usually positive. Diagnosis is confirmed by transrectal ultrasonography- (TRUS) guided prostatic biopsy. Glandular and squamous components could be distinct or could show direct transition. The Gleason score can be used for the glandular component, but not for the squamous component, of ASCC. The adenocarcinoma element is often high-grade, while the grade of the squamous portion is variable [5].

Since there is no clinical trial specifically designed for ASCC of the prostate, the optimal treatment strategy has not been established. Radical prostatectomy, radiation therapy, or chemotherapy have been used alone or in combination. Radical prostatectomy should be offered to those with localized prostate cancer, including healthier elderly patients with a good performance status. Some authors suggested that ASCC of the prostate responds, at least initially, to hormone therapy [4,6,7] while others reported that these tumors generally were refractory to hormone therapy [7]. However, information on response and efficacy of chemotherapy is lacking.

The prognosis for patients with ASCC is very poor, even in those patients with localized disease who subsequently underwent prostatectomy, suggesting this is a disease with a propensity for early microscopic dissemination. The 5-year cancer specific survival rate of 30.3% was significantly lower compared to the 99.9% survival rate of prostate cancer as a whole [4,6-8].

REFERENCES

1. Bennett, R. S. and E. O. Edgerton (1973). "Mixed prostatic carcinoma." *J Urol* 110(5): 561-563. PubMed

2. Grignon, D. J. (2004). "Unusual subtypes of prostate cancer." *Mod Pathol* 17(3): 316-327. PubMed ; CrossRef

3. Parwani, A. V., J. D. Kronz, et al. (2004). "Prostate carcinoma with squamous differentiation: an analysis of 33 cases." *Am J Surg Pathol* 28(5): 651-657. PubMed ; CrossRef

4. Orhan, D., S. D. Sak, et al. (1996). "Adenosquamous carcinoma of the prostate." *Br J Urol* 78(4): 646-647. PubMed ; CrossRef

5. Randolph, T. L., M. B. Amin, et al. (1997). "Histologic variants of adenocarcinoma and other carcinomas of prostate: pathologic criteria and clinical significance." *Mod Pathol* 10(6): 612-629. PubMed

6. Bassler, T. J., Jr., R. Orozco, et al. (1999). "Adenosquamous carcinoma of the prostate: case report with DNA analysis, immunohistochemistry, and literature review." *Urology* 53(4): 832-834. PubMed ; CrossRef

7. Gattuso, P., H. J. Carson, et al. (1995). "Adenosquamous carcinoma of the prostate." *Hum Pathol* 26(1): 123-126. PubMed ; CrossRef

8. Kin, T., T. Tsukamoto T, et al. (2000). "Adenosquamous carcinoma of the prostate with elevated serum parathyroid hormonerelated protein and squamous cell carcinoma antigen." *BJU International* 86: 562.

UIJ UroToday International Journal®

Bilateral Metachronous Colon Cancer Metastasis to Kidneys: A Rare Case with a Treatment Dilemma

Zachary Klaassen, Radhika Prabhakar, Rabii Madi, W. Bruce Shingleton, Martha K. Terris

Submitted November 23, 2012 - Accepted for Publication January 6, 2013

ABSTRACT

Colorectal cancer continues to remain one of the most common and lethal cancers, with well-established locations for metastases to the liver, lung, and peritoneum. Improved chemotherapy regimens have resulted in patients with advanced disease experiencing prolonged survival resulting in these patients experiencing new atypical locations for metastases. We report the first case of primary colorectal carcinoma metachronously metastasizing to the kidneys bilaterally in a patient who presented with stage II colorectal cancer 8 years prior to kidney metastasis. The appropriate management of patients with renal lesions in the setting of advanced systemic disease may be challenging. Treatment should be based on preventing dialysis dependence during palliative therapy, performing potentially curative surgery in the setting of decreased systemic disease after neoadjuvant chemotherapy, and providing options for palliative intervention for the symptomatic patient.

INTRODUCTION

Colorectal cancer is the third most common cancer in the United States, with more than 1.5 million new cases and nearly 600 000 projected deaths in 2012 [1]. In general, colorectal cancer most commonly metastasizes to the lungs, peritoneum, and liver; metastases to the kidneys from a primary colorectal adenocarcinoma are rare. In a study of 11 300 autopsies for malignant disease, only 2.8% of kidney metastases arose from a primary colon tumor [2], and to date there have only been 12 non-autopsy cases of renal pelvic or renal parenchymal colon metastasis reported in the literature [3-14]. We present the first case of bilateral metachronous metastases to the kidneys from a primary colon adenocarcinoma.

CASE REPORT

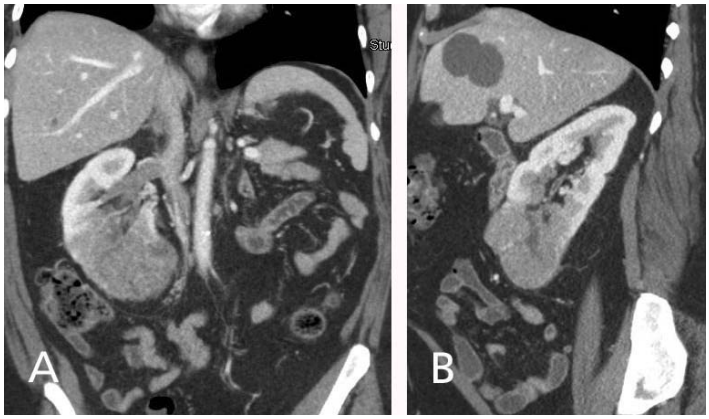
In 2002, a 55-year-old African American female underwent a left hemicolectomy via an open approach for stage IIA (T3N0M0) colon cancer followed by 6 weeks of adjuvant chemotherapy (5-Fluorouracil [5-FU] and leucovorin). Her medical history was significant for COPD and industrial exposure to dyes and formaldehyde. After a disease-free interval of 6 years, a positron emission tomography (PET)-computed tomography (CT) found a 4 cm macrolobulated mass in the upper lobe of her right lung. Subsequent CT-guided biopsy confirmed this mass as metastatic colon adenocarcinoma, and she was treated with a second chemotherapy regimen of irinotecan and oxaliplatin. A PET-CT 1 year later was negative; however, a subsequent PET-CT in 2010 showed a new 2 cm mass in the middle lobe of her right lung (CT-guided biopsy confirmed metastatic colonic adenocarcinoma), in addition to a 6 cm heterogenous enhancing mass in the left kidney. She subsequently underwent a left nephrectomy at another institution, confirming metastatic colonic adenocarcinoma and was started on a third chemotherapy regimen consisting of cetuximab, bevacizumab, and irinotecan. More recently, a surveillance CT-scan found a new 8 mm mass in the upper lobe of the right lung and a 3.8 cm x 4.3 cm nodular, heterogeneously enhancing mass in the lower pole of her right kidney. Subsequent biopsy confirmed the kidney mass as metastatic adenocarcinoma and CT scan 3 months later demonstrated that the mass had enlarged to 6.9 cm x 4.5 cm (Figure 1a, Figure 1b). At the present time the patient has elected for further chemotherapy, with the option for palliative invasive therapy if the tumor becomes symptomatic.

KEYWORDS: Colon cancer, renal metastasis, nephron-sparing surgery

CORRESPONDENCE: Zachary Klaassen, MD, Department of Surgery, Section of Urology, Georgia Health Sciences University, 1120 15th Street, Augusta, GA 30912 (zklaassen@georgiahealth.edu)

CITATION: *UroToday Int J*. 2013 February;6(1):art 11. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.11

Figure 1. (a) Coronal and (b) sagittal computed tomography of a 6.9 cm x 4.5 cm mass in the lower pole of the right kidney (metastatic colon adenocarcinoma).



DISCUSSION

Colorectal cancer continues to remain one of the most common and lethal cancers in the US with well-established locations for metastases (lung, liver, etc.) [1]. Improved treatment regimens, in particular chemotherapy, including the use of oxaliplatin, have resulted in patients with advanced disease experiencing prolonged survival [15]. As a result, patients may experience new atypical locations for metastases. For example, the current case represents the first reported in the literature of metachronous metastases of colorectal cancer to the kidneys and the thirteenth case overall of metastasis to the kidney (Table 1). Among these cases, the mean age at diagnosis of colon cancer was 62 ± 12 years (median: 56 years) and the mean interval between diagnosis of colon cancer and the discovery of kidney metastases was 42 ± 35 months (median: 33 months). Furthermore, the average life expectancy after the diagnosis of a kidney tumor was only 7 ± 3 months (median: 8 months).

The treatment of kidney lesions for metastasis of colorectal cancer is ill defined. A radical or partial nephrectomy provides the only definitive curative option, while at the same time it provides an accurate pathologic diagnosis of the tumor [3]. Other potential indications for surgery may include tumors that are a threat to patients with concomitant perirenal hematomas and may rupture [4]. Radical nephrectomy eliminates the possibility of hematogenous seeding of tumor cells to distant organs from the kidney, and it has the benefit of providing symptomatic relief during the palliative treatment of metastatic disease [5].

In the setting of metastatic colorectal carcinoma, the argument against surgical management of a renal lesion includes morbidity accompanying a radical or partial nephrectomy [16] and the potential delay of further chemotherapy during the recovery period [6]. These patients may be candidates for palliative therapy, of which Milbank et al. [7] advocate percutaneous resection of a renal pelvic tumor as a less-invasive surgical alternative (particularly for solitary, low-grade tumors). Since percutaneous resection is less morbid and offers a shorter recovery interval than a nephroureterectomy for renal pelvic tumors or radical/partial nephrectomy for renal parenchymal tumors, presumably patients may be candidates to resume chemotherapy more expeditiously than after invasive surgery. Additional minimally invasive treatment modalities include angioinfarction, cryoablation, or radiofrequency ablation of parenchymal lesions or nephrostomy drainage for obstructing lesions [7].

In light of a dismal prognosis for patients with colorectal metastasis to the kidneys (in addition to other systemic evidence of metastasis), treatment of the kidney lesion should be selected with the following objectives in mind: 1. Prevent the patient from becoming dialysis dependent during palliative treatment; 2. Perform a potentially curative surgery in the setting of decreased systemic disease after neoadjuvant chemotherapy; and 3. Provide options for palliative intervention for the symptomatic patient. As medical management for advanced stages of cancer continues to improve and prolong survival, treatment dilemmas for atypical patterns of metastatic spread will continue to emerge, necessitating dialogue regarding optimal treatment algorithms for these patients.

REFERENCES

1. Siegel, R., D. Naishadham, et al. (2012). "Cancer statistics, 2012." *CA Cancer J Clin* 62(1): 10-29. PubMed | CrossRef

2. Bracken, R. B., G. Chica, et al. (1979). "Secondary renal neoplasms: an autopsy study." *South Med J* 72(7): 806-807. PubMed | CrossRef

3. Waleczek, H., M. N. Wente, et al. (2005). "Complex pattern of colon cancer recurrence including a kidney metastasis: a case report." *World J Gastroenterol* 11(35): 5571-5572. PubMed

4. Wolff, J. M., W. Boeckmann, et al. (1994). "Spontaneous kidney rupture due to a metastatic renal tumour. Case report." *Scand J Urol Nephrol* 28(4): 415-417. PubMed | CrossRef

5. Kibar, Y., S. Deveci, et al. (2005). "Renal papillae metastasis of sigmoid colon adenocarcinoma." *Int J Urol* 12(1): 93-95. PubMed | CrossRef

Table 1. Thirteen cases of metastatic colorectal adenocarcinoma to the kidneys.

Reference	Age at Diagnosis of CRC (years)	Therapy	Duration of Metastatic CRC at the Diagnosis of Kidney Tumor (months)	Procedure for Kidney Tumor	Subsequent Thearapy	Patient Status	Survival After Diagnosis of Kidney Tumor or Nephrectomy
present case	55	5-FU and FA followed by irinotecan and oxaliplatin	left kidney, 96	nephrectomy	cetuximab, irinotecan, bevacizumab	AWD	117
			right kidney, 111	none	TBD	AWD	6
Melichar et al. [8] (2010)	49	HAI FOLFIRI	23	Biopsy	FOLFOX	DOD	9
Komeya et al. [9] (2009)	56	NR	0	nephrectomy	NR	NR	NR
Ho et al. [10] (2009)	84	unspecified	NR	partial nephrectomy	NR	NR	NR
Brambilla et al. [11] (2007)	52	5-FU and FA	18	nephrectomy	FOLFOX	NED	2
Kibar et al. [5] (2005)	54	cisplatin and radiotherapy	26	nephrectomy	patient refused	DOD	7
Waleczek et al. [3] (2005)	77	5-FU and FA	40	partial nephrectomy	patient refused	NR	NR
Milbank et al. [7] (2004)	72	unspecified	48	percutaneous resection	none	DOD	NR
Julianov et al. [12] (2004)	58	5-FU and FA	60	nephrectomy	FOLFIRI	AWD	12
Aksu et al. [6] (2003)	NR	not applicable	0	nephrectomy	5-FU and FA, subsequently capecitabine	DOD	9
Wolff et al. [4] (1994)	NR	NR	NR	nephrectomy	NR	NR	NR
Lowe et al. [13] (1992)	68	unspecified	24	percutaneous resection	NR	NR	NR
Shiraishi et al. [14] (1989)	55	NR	62	none, confirmed at autopsy	5-FU	DOD	2

CRC: colorectal cancer; DOD: died of disease; FOLFIRI: leucovorin, 5-fluorouracil, irinotecan; FOLFOX: leucovorin, 5-fluorouracil, oxaliplatin; HAI: hepatic arterial infusion; NR: not reported; AWD: alive with disease; NED: no evidence of disease; TBD: to be determined; FA: leucovorin

6. Aksu, G., M. Fayda, et al. (2003). "Colon cancer with isolated metastasis to the kidney at the time of initial diagnosis." *Int J Gastrointest Cancer* 34(2-3): 73-77. PubMed | CrossRef

7. Milbank, A. J., S. J. Savage, et al. (2004). "Metastatic cancer to the renal pelvis: a novel approach to management." *Urology* 64(4): 807-809. PubMed | CrossRef

8. Melichar, B., P. Moravek, et al. (2010). "Metastatic colorectal carcinoma and kidney tumors: a report of four cases." *Tumori* 96(3): 483-486. PubMed

9. Komeya, M., N. Nakaigawa, et al. (2009). "[A case of upper urinary tract metastases from sigmoid colon cancer]." *Hinyokika Kiyo* 55(6): 339-343. PubMed

10. Ho, L., H. Wassef, et al. (2009). "Renal metastasis from primary colon cancer on FDG PET-CT." *Clin Nucl Med* 34(9): 596-597. PubMed | CrossRef

11. Brambilla, E., A. A. Heck, et al. (2007). "Isolated renal metastasis after colon cancer." *Can J Urol* 14(4): 3649-3650. PubMed

12. Julianov, A., H. Stoyanov, et al. (2004). "Late renal metastasis from sigmoid adenocarcinoma." *Lancet Oncol* 5(12): 726. PubMed | CrossRef

13. Lowe, L. H., R. J. Zagoria, et al. (1992). "Intraluminal renal metastasis from colon cancer simulating a fungus ball." *Urol Radiol* 13(4): 226-227. PubMed

14. Shiraishi, T., Y. Hasegawa, et al. (1989). "Implantation of colon cancer cells onto renal pelvic mucosa. A case report." *APMIS* 97(2): 181-184. PubMed | CrossRef

15. Samantas, E., C. Dervenis, et al. (2007). "Adjuvant chemotherapy for colon cancer: evidence on improvement in survival." *Dig Dis* 25(1): 67-75. PubMed | CrossRef

16. Roos, F. C., W. Brenner, et al. (2012). "Functional analysis of elective nephron-sparing surgery vs radical nephrectomy for renal tumors larger than 4 cm." *Urology* 79(3): 607-613. PubMed | CrossRef

UIJ UroToday International Journal®

Chromophobe Subtype Renal Cell Carcinoma in Childhood: A Case Report and Overview of the Literature

Ignacio Puche-Sanz, Fernando Vázquez-Alonso, Carmen Carreras-Blesa, José Flores-Martín, José Manuel Cózar-Olmo

Submitted November 23, 2012 - Accepted for Publication January 6, 2013

ABSTRACT

Introduction: Renal cell carcinoma (RCC) is the most frequent renal tumor in adults, and chromophobe represents the third most frequent subtype, following clear cell and papillary. However, they are extraordinarily rare in childhood, accounting for less than 2% of all renal tumors, and chromophobe subtype in particular is almost anecdotal.

Methods and results: We report the case of a 14-year-old child presenting with hematuria. Imaging tests revealed a large renal mass. After a percutaneous biopsy to exclude other entities, the patient underwent radical nephrectomy with lymphadenectomy and was diagnosed with an eosinophilic chromophobe RCC. At the 6-year follow-up, there was no evidence of recurrence.

Conclusions: RCC in childhood may represent a different entity from adult RCC, with distinct morphologic characteristics and unique genetic abnormalities. The role of the pathologist is crucial, as the diagnosis and classification of RCC in children is still a matter of discussion. New protocols are being tested that will provide more accurate knowledge and therefore may change the clinical management of pediatric RCC.

INTRODUCTION

Renal cell carcinomas (RCCs) are rare in children, accounting for approximately 2% of all new pediatric renal tumors with an annual incidence in children of approximately 4 per million. This is in contrast to the incidence rate in children of Wilms tumor, which is almost 30 times higher. Benign renal masses predominate in early infancy. Beyond the first year of life, Wilms tumor is the most common neoplasm. From adolescence, RCCs occur at a similar or higher frequency than Wilms tumor [1].

The most common subtype of RCC in children is the translocation RCC. A recent, up-to-date review suggests that conventional clear-cell RCCs are extraordinarily rare in childhood; many cases reported as clear RCC are in fact histologically atypical or have morphologic features of translocation RCC [2]. Chromophobe RCC is even less frequent than other RCC types in children, with less than 20 cases reported in the literature during the last 20 years [3-7].

METHODS AND RESULTS

We present the case of a 14-year-old male with no previous personal or familial medical history of interest. He was referred to our department because of a self-limiting episode of hematuria. The patient was feeling generally well, and no other urinary symptoms were reported. Physical examination did not reveal any significant findings. Blood tests were normal except for a lactate dehydrogenase (LDH) level of 1 540 U/L. Ultrasound imaging identified a solid, well-defined 15 cm x 14 cm x 12 cm mass in the upper pole of the left kidney with an area of calcification inside. A subsequent computed tomography (CT) scan revealed that the mass was enhanced with contrast dye and had a low-density central area that suggested necrosis (Figure 1). No evidence of lymphatic or vascular dissemination was

KEYWORDS: Renal cell carcinoma, chromophobe renal cell carcinoma, pediatric oncology

CORRESPONDENCE: Ignacio Puche-Sanz, MD, Urology Department, Hospital Universitario Virgen de las Nieves, Av Fuerzas Armadas 2, 18014, Granada, Spain (nacho.puchesanz@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 12. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.12

Figure 1. The CT scan revealed a 15 cm x 14 cm x 12 cm mass in the upper pole of the left kidney that was enhanced with contrast dye and had a low-density central area that suggested necrosis

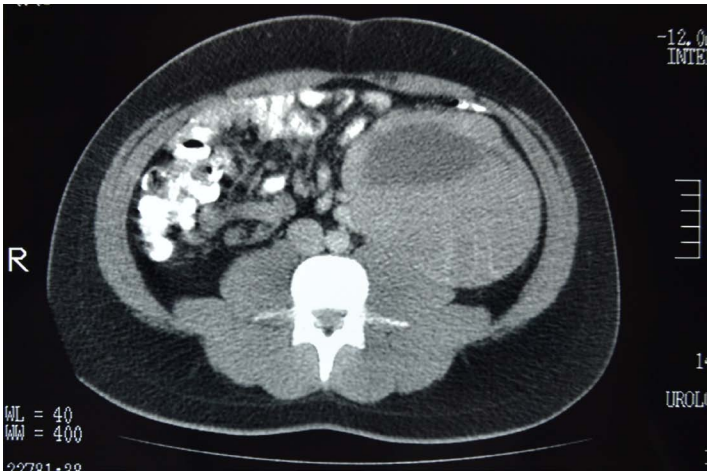
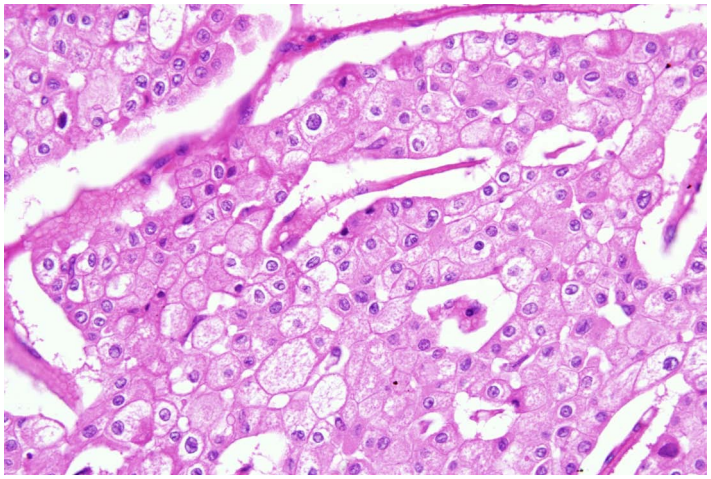
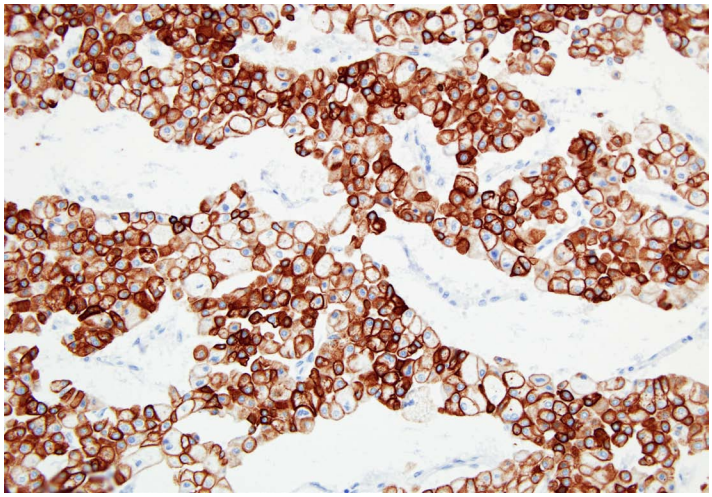


Figure 2. Classical chromophobe RCC findings were observed on hematoxylin-eosin staining: marked nuclear pleomorphism, a rasinoid nuclear membrane, a perinuclear halo, and a prominent cell border.



observed. We performed an ultrasound-guided percutaneous biopsy. Microscopic examination of the specimens excluded Wilms tumor and rhabdoid tumor, and led to a preliminary differential diagnosis between oncocytoma and an eosinophilic variant of renal cell carcinoma. The patient underwent an open left radical nephrectomy with lymphadenectomy (9 nodes). His postoperative course was unremarkable. The pathology examination revealed a chromophobe renal cell carcinoma, eosinophilic variant, Fuhrman grade II with disseminated calcification and necrotic areas (Figure 2 and Figure 3). The kidney-capsule limits were preserved and all regional and paraaortic nodes were free from neoplastic cells (pT2bN0M0). We followed the patient with periodic CT scans and ultrasound imaging. After a 6-year follow-up there was no evidence of local or distant recurrence.

Figure 3. Immunohistochemical staining for cytokeratin 7 is useful for the differential diagnosis with renal oncocytoma. Normally, whereas chromophobe RCCs exhibit strong cytoplasmic staining with peripheral cell accentuation, oncocytomas are entirely negative or show only weak and focal staining.



DISCUSSION

According to the data obtained so far, pediatric RCCs may be a different entity from adult RCCs, with distinct morphologic characteristics, unique genetic abnormalities, and, consequently, a different biology [3,4]. In accordance with this statement, up to 25% of pediatric RCCs cannot be categorized and elude precise classification. For this reason, classification and histologic diagnoses of RCC in children are difficult and remain a source of controversy.

Four subtypes of RCC are typically described in children. The most common subtype is the Xp11 (TFE3) translocation RCC (20 to 40%), followed closely by papillary RCC (30%), which includes types 1 and 2. Translocation RCC may occur following chemotherapy, and papillary RCC may appear in the setting of preexisting neoplasms, such as Wilms tumor, metanephric adenoma, or metanephric adenofibroma. The other two

subtypes are much less common: renal medullary carcinoma, which is a highly aggressive tumor arising in patients with the sickle cell gene; and oncocytic RCC, which has been identified in patients previously diagnosed with neuroblastoma [2]. Chromophobe RCC in children is extremely rare. It is thought to develop from the same type of cells as renal oncocytomas. There are also hybrid tumors with features common to both oncocytoma and chromophobe RCC [2].

Unlike adults, flank pain (55%), hematuria (30%), and abdominal masses (12.5%) are common presenting features of RCC in children. General symptoms such as fever (22%), weight loss (5%), vomiting/nausea (20%), anemia (10%), and malaise (10%) are also frequent. Only 15% of patients do not have specific symptoms at the time of diagnosis [6]. Normally, high levels of serum LDH are found only in cases with large tumors, as was observed in this case.

The mean age of presentation of RCC in children is 10 years. The typical solid intrarenal mass cannot be distinguished from a Wilms tumor in imaging tests. Ring-like calcifications within the mass are characteristic of RCC but are infrequent. A clinically relevant feature for distinguishing RCC from a possible Wilms tumor is the older age of the RCC patient [8]. The need of a percutaneous biopsy for the differential diagnosis is under discussion. It could be useful in the case of planning neoadjuvant chemotherapy for Wilms tumor [9].

RCCs in children normally present as a single lesion. Multifocality is unusual and suggests the presence of associated disorders. Up to one-third of the patients exhibit underlying syndromes such as Von Hippel-Lindau disease, tuberous sclerosis, hereditary leiomyomatosis, familial RCC, or RCC following other neoplasms (rhabdomyosarcoma, neuroblastoma, leiomyosarcoma). Chromophobe RCC may appear as part of 2 genetic syndromes: Birt-Hogg-Dubé syndrome (which can involve multifocal RCC, cutaneous fibrofolliculoma, lung cysts, and spontaneous pneumothorax), associated with the BHD gene; or hereditary pheochromocytoma or paraganglioma syndrome, associated with the SDH gene. It is important to note that RCCs associated with such syndromes are not frequently encountered in childhood but typically appear in adulthood. Some institutions encourage genetic screening when any of the above are suspected, but there is no agreed-upon recommendation about whether to perform a systematic genetic test or screen either the patient or their family members using ultrasound [1].

The higher incidence of regional lymph node involvement seen with pediatric RCC, reported to be between 25 to 33%, compared to 10 to 15% of adult RCC cases is an important distinguishing feature [10]. Thus, radical nephrectomy with lymphadenectomy and metastasectomy is the recommended treatment. In some small series, partial nephrectomy was chosen and exhibited similar results to radical nephrectomy. Nephrologically, this approach should ensure maximal preservation of renal function in patients with obviously extended life spans. Thus, partial nephrectomy could be an option in carefully selected patients with local, low-volume lesions [11]. However, there is not any long-term study in this regard that compares the experience of RCC in adults with children. Therefore, the risk-to-benefit ratio of potentially higher statistical chances of local recurrence will have to be compared to that of contralateral metachronous disease and renal insufficiency related to the functional residual mass after radical vs partial nephrectomy [11]. Additionally, although there are extremely limited reports of laparoscopic or robotic partial nephrectomy for oncologic surgery in children, another consideration should be if these goals could be accomplished with minimal invasiveness [10]. There is no evidence that adjuvant therapy is beneficial in children with positive nodes and no metastatic disease [12,13]. The treatment of non-surgical metastatic cases is as unsatisfactory as it is in adults. Radiotherapy is also not effective, and there are no targeted therapy protocols.

Another major difference between children and adults is the prognostic importance of local node involvement. Whereas adults exhibit a 5-year overall survival (OS) rate of 20%, children have up to a 75% 5-year OS rate when they have node involvement at the time of diagnosis [12]. The almost systematic lymph node dissection in children may in part facilitate such results, as current medical therapies are infrequently curative for unresected disease [10]. Nevertheless, other pathologic parameters typically associated with poor outcomes in adults, such as metastasis, high tumor stage, high Fuhrman nuclear grade, angiolymphatic invasion, and tumor necrosis do not seem to worsen the prognosis in children [14]. These data are in agreement with the hypothesis that pediatric RCCs have a different biology from adult RCCs.

CONCLUSIONS

Chromophobe RCC normally has an excellent prognosis after radical surgery, even when it is locally advanced. It is necessary to be aware of the possibility of underlying syndromes. Biopsy is useful to exclude other diagnoses, such as Wilms tumor, that could benefit from other management strategies. The role of the pathologist is crucial in the diagnosis of RCC in children. Although the limited number of cases and the discrepancy in diagnoses have thus far impeded the development of an adequate standard of care for these patients, new protocols from the Children´s Oncology Group are being tested that will provide more accurate knowledge and therefore may change the clinical management of RCC in childhood [2].

REFERENCES

1. Pastore, G., A. Znaor, et al. (2006). "Malignant renal tumours incidence and survival in European children (1978-1997): report from the Automated Childhood Cancer Information System project." *Eur J Cancer* 42(13): 2103-2114. PubMed | CrossRef

2. Perlman, E. J. (2010). "Pediatric Renal Cell Carcinoma." *Surg Pathol Clin* 3(3): 641-651. PubMed | CrossRef

3. Carcao, M. D., G. P. Taylor, et al. (1998). "Renal-cell carcinoma in children: a different disorder from its adult counterpart?" *Med Pediatr Oncol* 31(3): 153-158. PubMed

4. Silberstein, J., J. Grabowski, et al. (2009). "Renal cell carcinoma in the pediatric population: Results from the California Cancer Registry." *Pediatr Blood Cancer* 52(2): 237-241. PubMed | CrossRef

5. Baek, M., J. Y. Jung, et al. (2010). "Characteristics and clinical outcomes of renal cell carcinoma in children: a single center experience." *Int J Urol* 17(8): 737-740. PubMed | CrossRef

6. Selle, B., R. Furtwangler, et al. (2006). "Population-based study of renal cell carcinoma in children in Germany, 1980-2005: more frequently localized tumors and underlying disorders compared with adult counterparts." *Cancer* 107(12): 2906-2914. PubMed | CrossRef

7. Campus, R., P. Nozza, et al. (2008). "Eosinophilic chromophobe renal cell carcinoma in a child with hypospadias." *Pediatr Blood Cancer* 50(2): 413-415. PubMed | CrossRef

8. Estrada, C. R., A. M. Suthar, et al. (2005). "Renal cell carcinoma: Children's Hospital Boston experience." *Urology* 66(6): 1296-1300. PubMed | CrossRef

9. Bhatnagar, S. (2009). "Management of Wilms' tumor: NWTS vs SIOP." *J Indian Assoc Pediatr Surg* 14(1): 6-14. PubMed | CrossRef

10. Cost, N. G., J. I. Geller, et al. (2012). "A robotic-assisted laparoscopic approach for pediatric renal cell carcinoma allows for both nephron-sparing surgery and extended lymph node dissection." *J Pediatr Surg* 47(10): 1946-1950. PubMed | CrossRef

11. Cook, A., A.J. Lorenzo, et al. (2006). "Pediatric renal cell carcinoma: single institution 25-year case series and initial experience with partial nephrectomy". J Urol 175(4): 1456-60. PubMed | CrossRef

12. Geller, J. I., P. Argani, et al. (2008). "Translocation renal cell carcinoma: lack of negative impact due to lymph node spread." *Cancer* 112(7): 1607-1616. PubMed | CrossRef

13. Stachowicz-Stencel, T., E. Bien, et al. (2011). "Diagnosis and treatment of renal cell carcinoma in children: a report from the Polish pediatric rare tumor study group." *Klin Padiatr* 223(3): 138-141. PubMed | CrossRef

14. Wang, J., B. M. Shehata, et al. (2012). "Clear cell, papillary and chromophobe renal cell carcinoma in patients younger than 20 years old: a clinicopathologic study with follow-up." *J Pediatr Urol* 8(5): 531-534. PubMed ; CrossRef

UroToday International Journal®

Congenital Bladder Diverticulum Presenting in an Adult: A Rare Case Report

Nipun Kumar Awasthi, Hemant Kumar Goel, Vinod Priyadarshi, Praveen Kumar Pandey, Dilip Kumar Pal

Submitted October 16, 2012 - Accepted for Publication December 16, 2012

ABSTRACT

Congenital bladder diverticulum is usually found in childhood, and its presentation in adults is very rare. We present a case of large congenital bladder diverticulum in a 60-year-old male, with a successful outcome after a diverticulectomy.

INTRODUCTION

Bladder diverticulum represents a herniation of the bladder urothelium through the muscularis propria of the bladder wall. Congenital diverticula usually present during childhood, with a peak occurrence in patients less than 10 years old [1]. These are mainly solitary, often in association with vesicoureteral reflux [1]. The primary cause in those without coexisting lower urinary tract obstruction appears to be a congenital weakness at the level of the ureterovesical junction and not bladder outlet obstruction [2].

CASE REPORT

A 60-year-old male presented with a decreased flow of urine for the last 1 year. This symptom became aggravated during that 1 year. There was no history of any other storage or voiding lower urinary tract symptoms.

On physical examination, the patient's abdomen was found to be soft and non-tender. There were no appreciable masses. The external genitalia were normal. All blood laboratory values were found to be within normal limits. The patient's urinalysis was within normal limits. Ultrasonography revealed a large diverticulum in the right posterolateral wall, showing few echogenic calculi within the diverticulum. The kidneys were normal in shape, size, and position. Corticomedullary differentiation was normal, and both the ureters were normal. Urodynamic studies showed normal findings.

The voiding cystourethrogram (VCUG) showed a large diverticulum with multiple calculi, without any evidence of any vesicoureteric reflux (VUR) (Figure 1, Figure 2). Diverticulectomy was done by a combined intra- and extravesical approach, and a single large diverticulum was found in the posterior wall with a wide mouth. Nine calculi, the largest measuring 1.5 cm, were retrieved from within the diverticulum. Postoperatively, a suprapubic catheter was maintained for 3 weeks; then a voiding cystourethrogram was done and showed no evidence of diverticulum, but there was grade II vesicoureteric reflux (Figure 3). The patient was placed on chemoprophylaxis, and after 6 months the vesicoureteric reflux subsided spontaneously.

DISCUSSION

Congenital bladder diverticula in an adult are a rare pathology. They usually present during childhood, but in this case presentation, at 60 years of age was unusual. The incidence in children is 1.7% [1], and no congenital diverticulum has been reported till now in adult patients.

They are usually asymptomatic and detected during investigations of lower urinary symptoms (i.e., recurrent urinary infections, hematuria, or bladder emptying disorders). They can be further complicated with vesicoureteral reflux, lithiasis, tumors, ureteral obstructions, and, more rarely, with

KEYWORDS: Congenital diverticulum, adult

CORRESPONDENCE: Dr. Nipun Kumar Awasthi, Department of Urology, Institute of Post Graduate Medical Education & Research, House no 135, Gayatri Nagar, Bareilly, Uttar Pradesh, India 243002 (drnipunawasthi@gmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 9. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.09

Figure 1. Preoperatively ascending urethrogram (ASU).

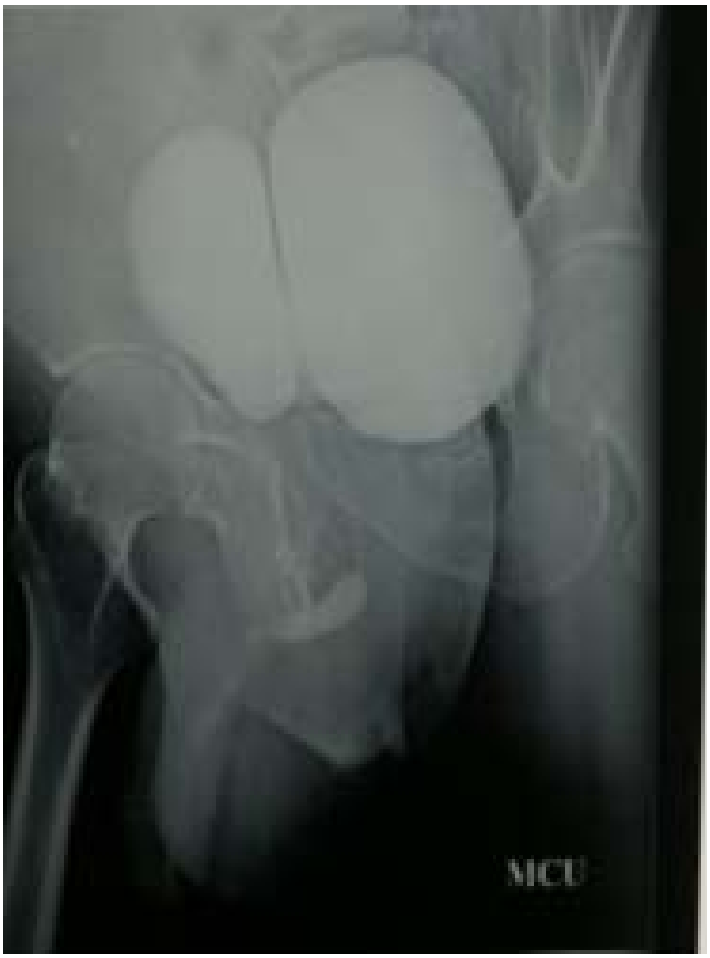


Figure 2. Preoperative voiding cystourethrogram.

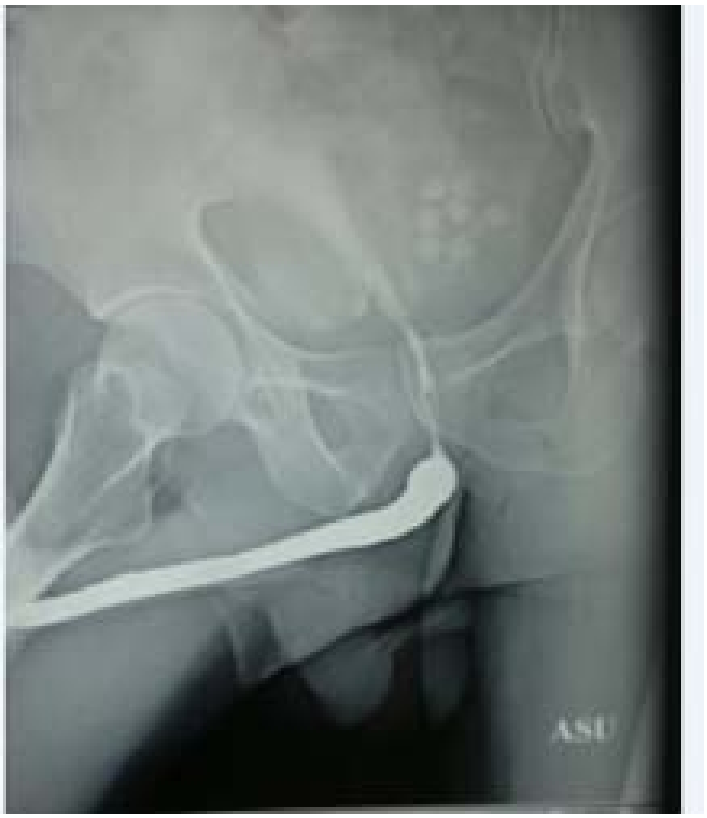
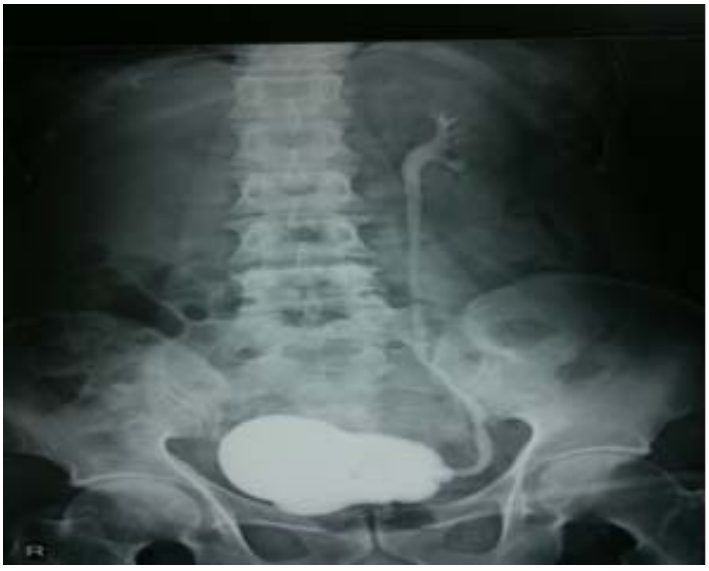


Figure 3. Postoperative voiding cystourethrogram.



acute urine retention and acute abdomen due to rupture [3]. Rarely, a congenital bladder diverticulum occurs in adults and may be the cause of outflow obstruction. Diagnosis is made through ultrasound imaging, but they are better visualized through urethrocystography [2]. A urodynamic study was done to rule out bladder outlet obstruction, impaired compliance, and neurogenic voiding dysfunction [3].

No further therapy is required in incidentally found congenital or acquired bladder diverticula unless they present persistent symptoms of recurrent infections, obstruction, stones, malignancy, or other complicating factors such as ipsilateral vesicoureteral reflux [2]. An open diverticulectomy with a combined intra- and extravesical approach was carried out in this patient. Vesicoureteric reflux can be seen temporarily due to muscle weakness and weakness of the ureteric orifice but resolves spontaneously, as it was in this case. The patient voided successfully after catheter removal. After 6 months of

follow-up, the patient has been doing well with satisfactory voiding.

REFERENCES

1. (2011). A. J. Wein, R. L. Kavoussi, C. A. Novick, W. A. Partin, A. C. Peters, eds. *Campbell-Walsh Urology*, 10th ed. Elsevier-Saunders; Philedelphia, PA: 2262.

2. Shukla, A. R., R. A. Bellah, et al. (2004). "Giant bladder diverticula causing bladder outlet obstruction in children." *J Urol* 172(5 Pt 1): 1977-1979. PubMed ; CrossRef

3. Salim, V. F., J. L. G. Manuel, et al. (2012). "Giant congenital bladder diverticulum." *Rev Mex Urol* 72: 35-38.

UroToday International Journal®

Female Hypospadias and Urethral Stricture Disease in a Circumcised Postmenopausal African Woman: Diagnosis and Management

Jibril Oyekunle Bello, Bernard Itopa Ododo, Halima Sani Bello

Submitted October 3, 2012 - Accepted for Publication December 16, 2012

ABSTRACT

Globally, both female hypospadias and female urethral stricture are uncommon conditions. Female genital mutilation, on the other hand, is a common practice in the West African sub-region, with up to half of the female population circumcised. We report a case of female hypospadias with stricture in an elderly West African lady who had also been subjected to female genital mutilation during childhood. Urethral dilatation with long-term clean intermittent self-catheterization may suffice in these situations, with scarred vaginas avoiding the need for invasive, cumbersome, and difficult surgical reconstruction of the urethra.

INTRODUCTION

Both female hypospadias and female urethral stricture are uncommon urologic conditions [1,2]. Female hypospadias refers to an abnormality of the urethra with the external meatus located on the anterior vaginal wall within the introitus, and it is often associated with recurrent lower urinary tract infections [1]. Its diagnosis, though simple, is often overlooked and usually made after difficult urethral catheterizations. Female urethral stricture occurs in 4 to 18% of women with bladder outlet obstruction, and, unlike extensively researched male urethral stricture disease, only limited studies on small series are reported in literature [2,3]. The most common etiologies of female urethral stricture are traumatic urethral injury, iatrogenic urethral injury, and inflammatory urethral disease; its optimal management is still under evaluation [4].

Female genital mutilation is an abhorrent traditional practice not uncommon in the West African sub-region, often resulting in scarring of the female external genitalia and life-long morbidity [5]. Here we describe our management of hypospadias with urethral stricture in an elderly West African lady who additionally had been previously subjected to female genital mutilation during childhood.

CASE REPORT

A 68-year-old widowed West African lady presented to our Emergency Department with chronic urinary retention. She had a preceding 10-year history of worsening obstructive lower urinary tract symptoms but no hematuria or necroturia. She also had multiple episodes of cystitis over several decades; mostly post-coital. Her first pregnancy 40 years prior ended in obstructed labor and caesarean section delivery of a live baby; however, she subsequently had six uneventful vaginal deliveries. The patient had been subjected to female genital mutilation during early childhood, which is a tradition practiced by her West African Yoruba tribe. Physical examination revealed painless suprapubic swelling over 20 weeks and a hypertrophic midline infraumbilical scar. Examination of the external genitalia revealed an amputated rudimentary clitoris and defects in and scarring of the labia minora with vagina atrophy; the dimple of the urethral meatus was seen not at its normal anatomic position but on the anterior vaginal wall juxtaposed to the edge of the vaginal introitus (Figure 1 and Figure 2). The opening could not admit a 12 Fr urethral catheter. Serum assays showed deranged electrolytes with hyperkalemia, with elevated urea and creatinine. An abdominopelvic ultrasound revealed bilateral hydronephrosis and a grossly distended

KEYWORDS: Female hypospadias; female urethral stricture; female genital mutilation

CORRESPONDENCE: Jibril Oyekunle Bello, MD, Urology Division, Department of Surgery, University of Ilorin Teaching Hospital, Nigeria (jabarng@yahoo.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 10. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.10

Figure 1. Scarred and atrophic vagina.

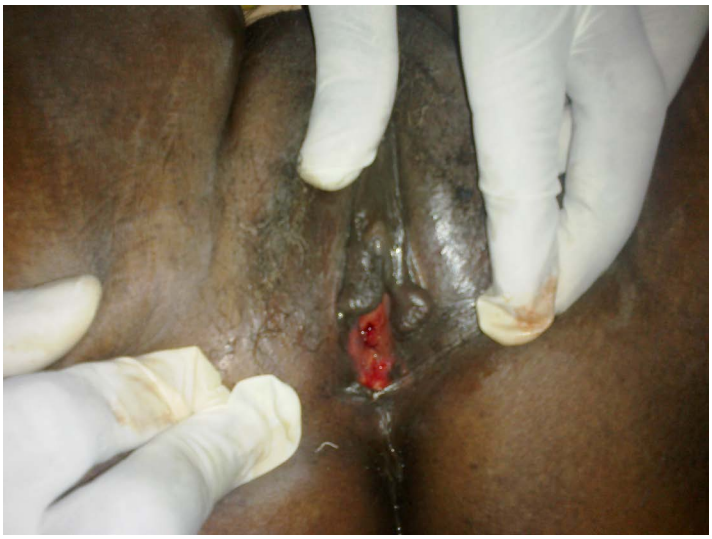
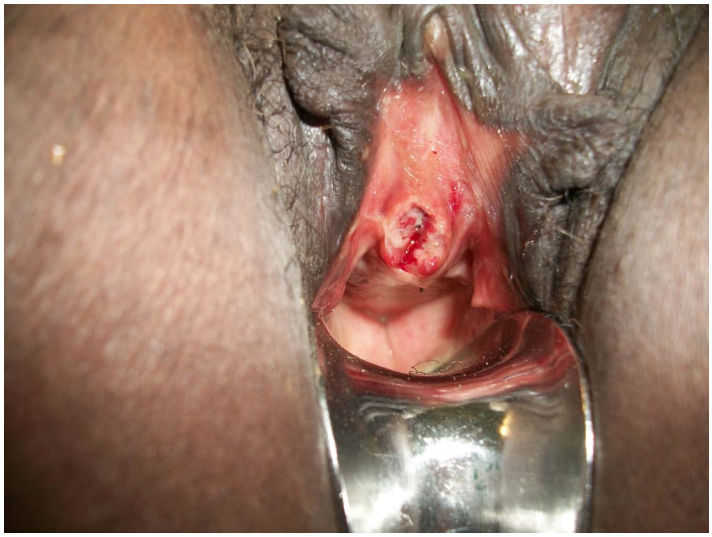
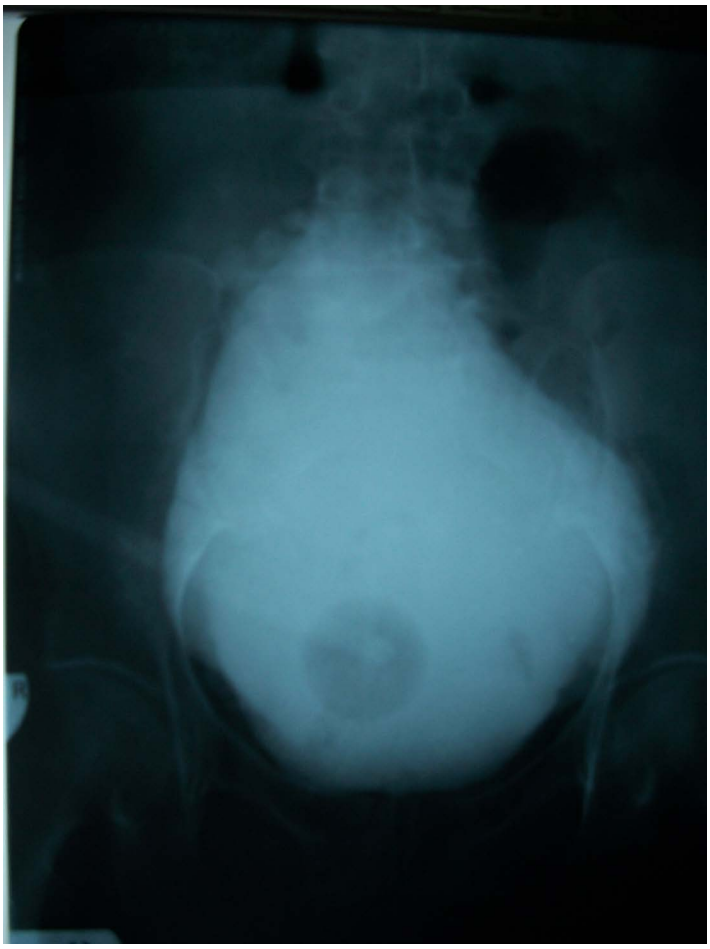


Figure 2. Female external genitalia: An amputated rudimentary clitoris, scarred labia minora, and an atrophic vagina with the external urethral meatus located on the anterior vaginal wall juxtaposed to the edge of the vaginal introitus.



bladder with 0.5 cm thickened walls. She had a suprapubic cystostomy done, and an indwelling suprapubic catheter was placed for continuous drainage. Post obstructive diuresis occurred and resolved after 4 days, with normalization of the deranged electrolytes. A cystogram showed evidence

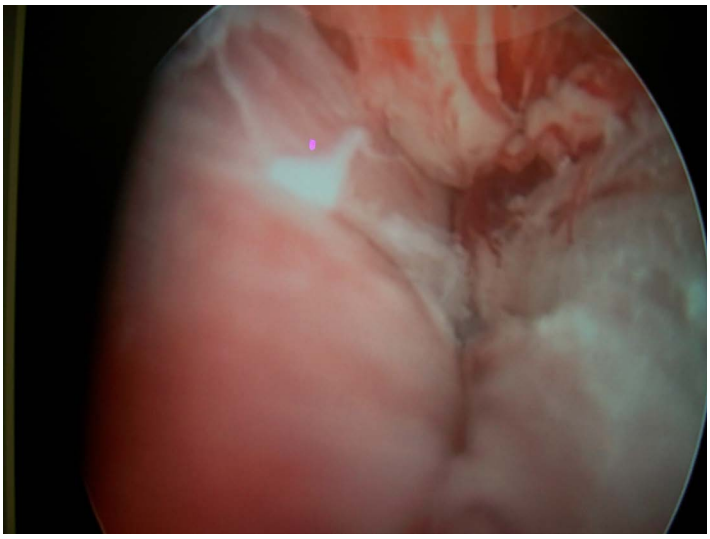
Figure 3. Cystogram: Evidence of long-standing bladder outlet obstruction with extensive trabeculation of the bladder (irregular walls). An attempt at obtaining a micturating film failed, as the bladder neck did not open and the urethra was not outlined despite a distressing urge to micturate and straining.



of extensive trabeculations in the bladder and an attempt at obtaining a micturating film failed, as the bladder neck did not open and the urethra was not outlined despite distressing urge (Figure 3). A 6 Fr feeding tube was successfully negotiated through the dimple of the external urethra under fluoroscopic guidance, and urethral dilatations to 20 Fr were done easily over a guide wire. This made urethrocystoscopy possible, which revealed fibrosis and fixed narrowing of the distal third of the urethra (Figure 4), a normal proximal urethra, extensive trabeculation, and sacculations in the bladder. The urethra was subsequently dilated to 30 Fr, an indwelling 16 Fr Foley urethral catheter was placed, and the suprapubic catheter removed. The urethral catheter was removed after a week and she voided satisfactorily with a Qmax of 20 ml/sec. She was taught clean

intermittent self-catheterizations with an18 Fr catheter and instructed to do it thrice weekly for the first month; this was reduced to once weekly during the second month, as she was voiding satisfactorily with no evidence of residual stricture. At the sixth month of follow-up, the patient still voids satisfactorily with no new episodes of symptomatic urinary tract infection; she empties her bladder with only insignificant post-void residual urine volume (40 ml) seen on ultrasonography and the previous hydronephrosis noted has resolved. Uroflowmetry revealed normal flow, with a Qmax of 25 ml/sec and a voiding volume of 520 ml.

Figure 4. Urethroscopy: Urethroscopic view showing scarring and fibrosis of the distal urethra.



DISCUSSION

Female hypospadias, though often asymptomatic, may be associated with bothersome symptoms of vaginal voiding, post-coital cystitis, or urethral syndrome [1]. Treatment involves surgical reconstructions of the hypospadias; two common techniques in use include vaginal flap urethroplasty and urethrolysis with meatal transposition (with or without submucosal tunneling) [1,6]. To our knowledge, stricture of the female hypospadiac urethra has not been previously reported. We suspect the stricture in the index case may be due to periurethral fibrosis resulting from recurrent lower urinary tract infections commonly associated with the anomaly [1,6]. At present, there are no defined diagnostic criteria for female urethral stricture; however, lower urinary tract symptoms and difficulty in placing a 12 Fr urethral catheter or larger is suggestive [7].

Smith et al. demonstrated the efficacy of urethral dilatation and long-term clean intermittent self-catheterization (CISC) for female urethral stricture, and its success was shown to hold off the need for major reconstructive surgery; this is particularly true for patients compliant with the CISC regime, though the best size of catheter or the best regime for CISC remains unknown [8]. This option is attractive for those patients desiring less invasive treatment and motivated to perform CISC. It may also prove useful for the patient with a scarred vagina in whom urethral reconstruction may be difficult and prone to failure. In our region (sub-Saharan Africa), there are additional issues of cost of and compliance with CISC to consider. The index patient is well motivated, and the empirically prescribed CISC frequency of once weekly lessens the cost burden. A recent report with larger series and longer follow-up than that reported by Smith et al. described a poorer outcome following urethral dilatation for female urethral stricture [3]; however, the patients in the series did not receive long-term CISC, which may have been responsible for the observed lack of sustained response.

Various urethroplasty techniques for female urethral strictures have been described [6,9-12]. A vaginal inlay flap is simple and involves the advancement of an inverted U-shaped flap of anterior vaginal mucosa into a posterior stricturotomy of the diseased urethra; the technique has shown satisfactory long-term results [6]. A Y-shaped vaginal vestibular flap, which is rotated and interposed into an anterior stricturotomy, is a slightly more complex procedure but has also shown acceptable results [9]. Dorsal and ventral onlay urethroplasty using buccal, lingual, and vaginal mucosal grafts has also been reported with durable results [10-12].

Surgical repair of female hypospadias with stricture may be more complex, as the stricture would further shorten the already short hypospadiac urethra. Reconstruction may involve a combination of urethrolysis, urethral transposition, and urethroplasty, or some other cumbersome amalgam of procedures that may be especially daunting in a scarred vagina from FGM, as is the case in the index patient. Urethral dilatation with long-term CISC appears to be a reasonable alternative in this situation.

Female genital mutilation is not uncommon in West Africa; though overall prevalence appears to be decreasing, up to half of all females are circumcised, and a quarter of the young girls are still being circumcised today [5]. Just as some male urethral reconstruction surgery is potentially made more difficult following circumcision, female genital mutilation may result in more difficult female urethral and genital reconstructive surgery, and conservative treatment may be a reasonable alternative for these patients.

CONCLUSION

Patients with female hypospadias have recurrent lower urinary tract infections, which may lead to periurethral fibrosis and urethral stricture disease. Surgical reconstruction may be cumbersome and difficult, especially in a scarred vagina. Urethral dilatation with long-term CISC may be reasonable and effective in these situations, especially in the compliant patient, thus avoiding the need for invasive and difficult surgical reconstruction of the urethra.

REFERENCES

1. Bhat, A., R. Saxena, et al. (2010). "Female hypospadias with vaginal stones: a rare congenital anomaly." *J Pediatr Urol* 6(1): 70-74. PubMed | CrossRef

2. Santucci, R. A., C. K. Payne, et al. (2008). "Office dilation of the female urethra: a quality of care problem in the field of urology." *J Urol* 180(5): 2068-2075. CrossRef

3. Blaivas, J. G., J. A. Santos, et al. (2012). "Management of urethral stricture in women." *J Urol* 188(5): 1778-1782. PubMed | CrossRef

4. Keegan, K. A., D. K. Nanigian, et al. (2008). "Female urethral stricture disease." *Curr Urol Rep* 9(5): 419-423. PubMed ; CrossRef

5. Adeokun, L. A., M. Oduwole, et al. (2006). "Trends in female circumcision between 1933 and 2003 in Osun and Ogun States, Nigeria (a cohort analysis)." *Afr J Reprod Health* 10(2): 48-56. PubMed | CrossRef

6. Ronzoni, G., L. De Giovanni, et al. (2001). "Transposing the urethral meatus in the treatment of recurrent and postcoital cystitis in women with hypospadias." *BJU Int* 87(9): 894-896. PubMed | CrossRef

7. Gormley, E. A. (2010). "Vaginal flap urethroplasty for female urethral stricture disease." *Neurourol Urodyn* 29 Suppl 1: S42-45. PubMed | CrossRef

8. Smith, A. L., V. J. Ferlise, et al. (2006). "Female urethral strictures: successful management with long-term clean intermittent catheterization after urethral dilatation." *BJU Int* 98(1): 96-99. PubMed | CrossRef

9. Montorsi, F., A. Salonia, et al. (2002). "Vestibular flap urethroplasty for strictures of the female urethra. Impact on symptoms and flow patterns." *Urol Int* 69(1): 12-16. PubMed | CrossRef

10. Tsivian, A. and A. A. Sidi (2006). "Dorsal graft urethroplasty for female urethral stricture." *J Urol* 176(2): 611-613; discussion 613. PubMed | CrossRef

11. Sharma, G. K., A. Pandey, et al. (2010). "Dorsal onlay lingual mucosal graft urethroplasty for urethral strictures in women." *BJU Int* 105(9): 1309-1312. PubMed | CrossRef

12. Onol, F. F., B. Antar, et al. (2011). "Techniques and results of urethroplasty for female urethral strictures: our experience with 17 patients." *Urology* 77(6): 1318-1324. PubMed | CrossRef

UroToday International Journal®

Hypertrophied Column of Bertin: A Mimicker of a Renal Mass

D Paul Vincent, Hari PS

Submitted October 2, 2012 - Accepted for Publication November 13, 2012

ABSTRACT

Introduction: Renal pseudotumors simulate malignancy but they are, in fact, comprised of normal renal tissue. Renal pseudotumors include both congenital as well as acquired causes, and they cause considerable anxiety. Many reports are available in the literature where the diagnosis has been clinched only after nephrectomy.

Case report: We report the case of a 52-year-old male who was referred with the diagnosis of left renal-cell carcinoma upon ultrasound. A contrast-enhanced computed tomography scan finalized the diagnosis of hypertrophied column of Bertin, as there was uniform uptake of contrast noted in the entire kidney. The patient was reassured, and he was relieved of his anxiety. This case is highlighted because congenital hypertrophied columns of Bertin can mimic a renal mass lesion.

Conclusion: Renal pseudotumors are not uncommon, and if they are diagnosed preoperatively with appropriate imaging, invasive interventions like biopsy and radical surgeries can be avoided.

INTRODUCTION

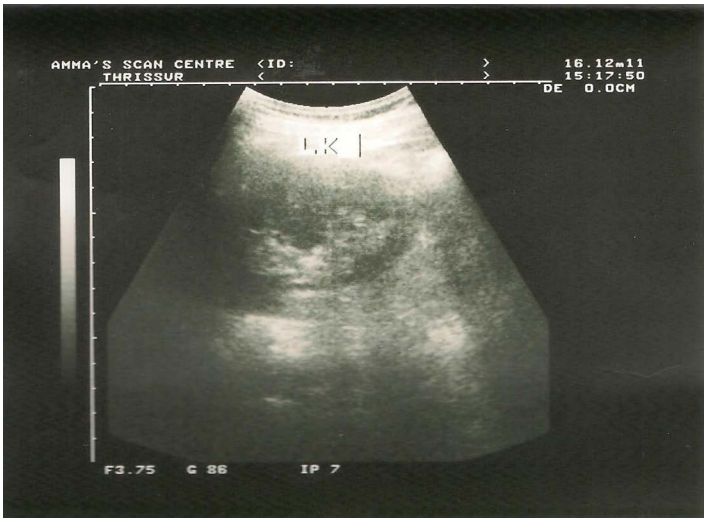
Renal pseudo tumors mimic renal mass lesion. Not uncommon, we came across reports of radical nephrectomy for this subtype of renal mass lesion. The prompt diagnosis of renal pseudo tumor goes a long way in avoiding unnecessary anxiety and unwarranted surgery.

CASE REPORT

A 52-year-old male presented with complaints of upper abdominal pain and a retrosternal burning sensation for 2 weeks. He consulted a general practitioner and was advised to have an ultrasound of his abdomen. The ultrasound revealed a 3.7 cm x 3.3 cm hypoechoic mass lesion in the mid pole of the left kidney, suggestive of renal cell carcinoma. The other organs were normal. He was referred to our department for the same. He came to us with suspicion of renal cell carcinoma and was very anxious.

On reviewing his history, he did not have hematuria or any other urinary complaints. He did not have any comorbidities

Figure 1. An ultrasound showing a hypoechoic mass lesion in the mid pole of the left kidney.



KEYWORDS: Renal pseudotumor, hypertrophied column of Bertin, renal mass

CORRESPONDENCE: D. Paul Vincent, MBBS, DNB (Surgery), DNB (Urology), Consultant Urologist, MIMS Hospital, Kottakkal, Malappuram District, Kerala, India 676503 (pauldevincent@rediffmail.com)

CITATION: *UroToday Int J*. 2013 February;6(1):art 4. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.04

Figure 2. An axial image showing a hypertrophied column of Bertin.

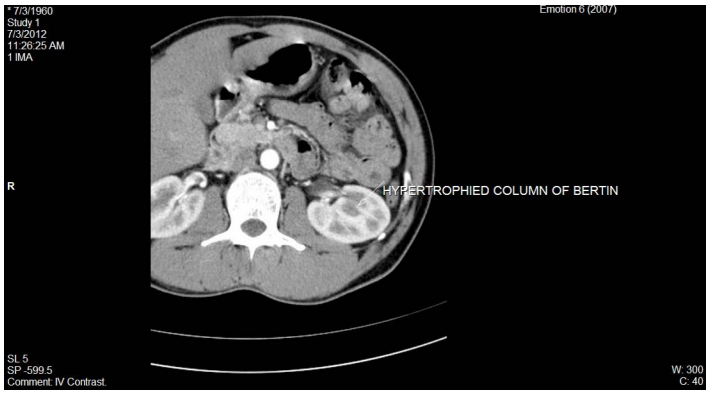


Figure 3. A saggital image showing a hypertrophied column of Bertin.

or prior surgeries. He was not a smoker. A contrast-enhanced computed tomography (CT) scan was done to evaluate the left renal mass. On CT scan, a small isodense projection was noted from the renal parenchyma into the renal sinus and was indenting the renal sinus in the mid-portion of the left kidney. On contrast CT, there was similar enhancement as that of the rest of the parenchyma. The rest of the study was unremarkable. He was reassured that this appearance is due to a congenital condition, and he was relieved of his anxiety.

DISCUSSION

Renal pseudo tumors simulate neoplasm on imaging but histologically they contain normal renal tissue. Previously they were more commonly seen at intravenous urography (IVU), but it is also possible to see during an ultrasound and CT. This can occur due to several reasons, both congenital as well as acquired. The various developmental reasons are a hypertrophied column of Bertin, fetal lobulation, dromedary hump, splenorenal fusion, and cross-fused ectopic kidney [2]. The acquired causes are renal sinus lipomatosis, xanthogranulomatous pyelonephritis, renal tuberculosis, nodular compensatory hypertrophy, sarcoidosis, actinomycosis, Wegener granulomatosis, arteriovenous malformation, and compression by blood vessels.

It has been rarely described after acute necrotising pancreatitis [7]. A case of retained gauze after partial nephrectomy appearing as a hyperechoic renal mass was diagnosed at surgery [3]. In another case of polycystic kidneys, a retained sponge mimicking a renal mass has also been described. Pathologic alterations due to abscesses, hematomas, and pyelonephritic changes are not included as they represent some pathology.
A hypertrophied column of Bertin is one of the congenital causes of renal pseudo tumor. The columns of Bertin are normal structures seen in the renal cortical tissue. In 1744, French anatomist Exupere Joseph Bertin explained that the renal cortex extended in radial fashion surrounding the renal pyramids. These are called columns of Bertin. Hypertrophied columns of Bertin represent a central unfolding of cortical tissue for varying depths within the renal medulla [2]. Hypertrophied columns of Bertin are actually not hypertrophic but they occur due to an incomplete fusion of the fetal lobes. They result from the fusion of two adjacent septa into a large column with double thickness [8]. Unlike fetal lobulation, this mass effect is entirely internal.

Usually they are noted in the mid pole with a predilection toward the left side. In 18% of cases, it can be bilateral. More commonly, it is seen in duplex kidneys between the renal pelvis. The ultrasonographic (USG) features of hypertrophied columns of Bertin are the lateral indentation of the renal sinus, with the largest dimension being less than 3 cm, continuous with the renal cortex, and the same echogenicity as that of the cortex and clearly defined from the renal sinus [4,8]. On the ultrasound, characteristic splaying of the central sinus echoes in a claw-like fashion is noted, called as the "split sinus sign" [5]. Contrast-enhanced ultrasound has been suggested as an alternative to CT and magnetic resonance imaging (MRI) by demonstrating the same perfusion and reperfusion as that of the normal parenchyma after microbubble breakage [1,6]. A nuclear scan is diagnostic, as it reveals a uniform uptake of the radiotracer without any cold areas. Angiograms, if performed for any other reason, will show normal renal vasculature with an absence of neovascularity.

The importance of diagnosing this condition is that it is benign and does not warrant any further invasive procedures such as biopsy or surgery.

UIJ / Vol 6 / Iss 1 / February / http://dx.doi.org/10.3834/uij.1944-5784.2013.02.04
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

CONCLUSION

With more emphasis on nephron-sparing surgery nowadays, it is of the utmost importance to diagnose renal pseudo tumors before embarking on radical surgery. With the availability of advanced imaging technologies, most of the cases can be diagnosed preoperatively with certainty.

REFERENCES

1. Ascenti, G., G. Zimbaro, et al. (2001). "Contrast-enhanced power Doppler US in the diagnosis of renal pseudotumors." *Eur Radiol* 11(12): 2496-2499. PubMed ; CrossRef

2. Wespes, E., D. Van Gansbeke, et al. (1984). "Renal pseudotumors." *World J Urol* 2(2): 89-91. CrossRef

3. Grieten, M., H. Van Poppel, et al. (1992). "Renal pseudotumor due to a retained perirenal sponge: CT features." *J Comput Assist Tomogr* 16(2): 305-307. PubMed ; CrossRef

4. Leekam, R. N., M. A. Matzinger, et al. (1983). "The sonography of renal columnar hypertrophy." *J Clin Ultrasound* 11(9): 491-494. PubMed ; CrossRef

5. Mahony, B. S., R. B. Jeffrey, et al. (1983). "Septa of Bertin: a sonographic pseudotumor." *J Clin Ultrasound* 11(6): 317-319. PubMed ; CrossRef

6. Mazziotti, S., F. Zimbaro, et al. (2010). "Usefulness of contrast-enhanced ultrasonography in the diagnosis of renal pseudotumors." *Abdom Imaging* 35(2): 241-245. PubMed ; CrossRef

7. Pedrosa, I., J. J. Naidich, et al. (2001). "Renal pseudotumors due to fat necrosis in acute pancreatitis." *J Comput Assist Tomogr* 25(2): 236-238. PubMed ; CrossRef

8. Shweta, B., G. MacLennan, et al. (2007). "Renal Pseudotumors." *AJR* 188: 1380-1387. PubMed ; CrossRef

UIJ UroToday International Journal®

Recreational Urethral Sounding with a Telephone Wire: An Unusually Complicated Case Report

Ignacio Puche-Sanz, Fernando Vázquez-Alonso, José Flores-Martín, José Manuel Cózar-Olmo

Submitted October 23, 2012 - Accepted for Publication November 19, 2012

ABSTRACT

Introduction: Urethral sounding is defined as the insertion of an object or liquid into the urethra. The most common reason reported in the medical literature for deliberate urethral insertion is erotic gratification. The most unexpected complication of this practice is the inability to retrieve the object after it becomes lodged in the urethra or the bladder.

Methods and Results: The aim of this report is to describe a rare complication of this practice. We present the case of a middle-aged male who presented to our emergency department with a telephone wire stuck in his bladder after he had introduced it through his urethra with masturbatory intentions. Although the majority of foreign body extractions are managed endoscopically, we describe an unusual case of recreational urethral sounding that required open surgery. No evidence of a psychological disorder was found in our patient. A review of the literature on this issue was made.

Conclusion: Some reports claim that certain segments of society engage more readily in recreational sounding and that this practice can lead to complications. Clinicians must be aware of these practices so that they can provide proper care to such patients, apart from the mere resolution of the acute problem. For patients who have complications and seek medical care, a psychological evaluation and advice for safe sexual practices may be useful for better managing this rare clinical situation.

INTRODUCTION

Urethral sounding is defined as the insertion of an object or liquid into the urethra. Sounding is routinely used in urological procedures to dilate strictures or obtain access to the bladder. The most common reason reported in the medical literature for deliberate urethral insertion is erotic gratification [1], and the most unexpected complication of this practice is the inability to retrieve the object that becomes lodged in the urethra or the bladder. The majority of foreign body extractions are managed endoscopically or by performing various maneuvers under local or general anesthesia. We present an unusual case of recreational urethral sounding that required open surgery. The systematic psychiatric evaluation of these patients is controversial.

MATERIALS AND METHODS

A 49-year-old, single, heterosexual male presented to our Emergency Department with a telephone wire stuck in his bladder after he had introduced it through his urethra with masturbatory intentions. No sexual partner was involved. The patient reported previous sexual gratification using this practice. For no particular reason, he had started the practice 1 year prior to the current incident. He was single and had never been married. The patient had an unremarkable medical and psychological history. A physical examination was performed, and both ends of the wire were visible through the urethral opening (Figure 1). An abdominal X-ray showed that the wire had become twisted and formed a knot inside the bladder so that it could not be removed by manual extraction (Figure 2). The patient's only complaint was urinary incontinence owing

KEYWORDS: Recreational urethral sounding, sexual gratification, urethral foreign body, masturbation, sexual behavior

CORRESPONDENCE: Ignacio Puche-Sanz, MD, Urology Departament, Hospital Universitario Virgen de las Nieves, Av Fuerzas Armadas 2, 18014, Granada, Spain (nacho.puchesanz@gmail.com)

CITATION: *UroToday Int J*. 2013 February;5(6):art 01. http://dx.doi.org/10.3834/uij.1944-5784.2013.02.01

Figure 1. When the patient presented to the Emergency Department, both ends of the wire were visible through the urethral opening.

Figure 2. The abdominal X-ray showing the twisted wire inside the bladder

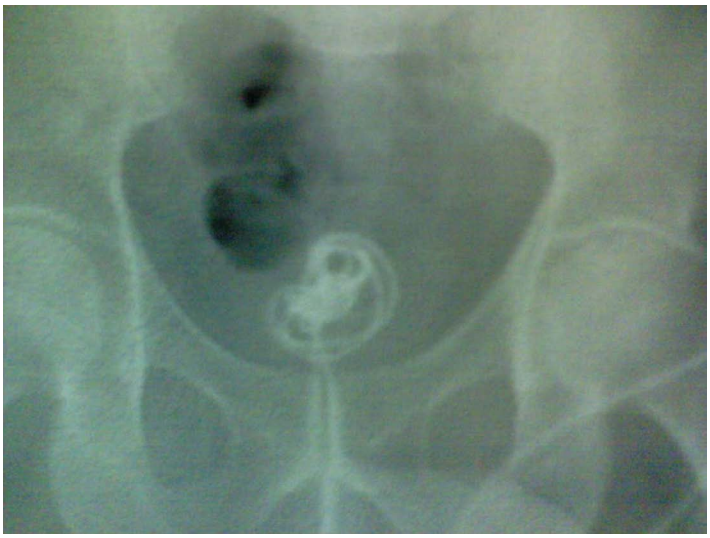
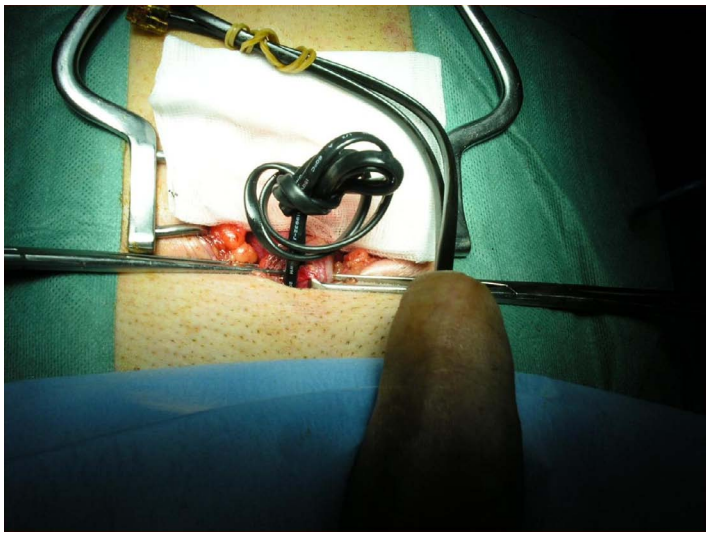


Figure 3. An open suprapubic cystotomy incision was needed to cut and remove the knotted part of the wire.



to the irritation caused by the urethrovesical foreign body. No hematuria, pain, or other symptoms were reported. Because of the impossibility of an endoscopic approach, an open suprapubic cystotomy was planned (Figure 3). The knotted portion of the wire was cut and removed via the incision, and the remaining wire was manually removed through the urethra. No complications occurred after surgery. The patient was discharged the following day, and a urethral catheter was left in place for a week. A psychological evaluation was performed during his stay, but no evidence of a mental disorder was found.

DISCUSSION

Currently, a wide range of sexual toys for personal sexual gratification is commercially available. However, the use of ordinary, household objects for this purpose is still common. There is an ever-growing list of objects reportedly used for this purpose, such as clips, screws, pencils, wires, glue containers, or phallus-shaped fruits and vegetables [2,3]. When complications arise, the general approach is to present to the emergency room seeking medical care. The most common complaint is the inability to remove objects that become lodged in the different bodily orifices or genital cavities.

The insertion of foreign bodies into the bladder or genital cavities for sexual gratification rarely leads to major complications in individuals without mental disorders, as they promptly seek medical attention. However, decreased patient mental capacity or radiologically transparent objects can cause a foreign body to remain lodged for days, which can lead to the development of complications, such as urinary tract infections, perforation, fistulae, sepsis, or even penile necrosis [4,5]. Differentiating between patients with a known psychiatric history and those with no previous psychiatric issues is essential; whether a psychiatric evaluation should be performed on all patients

is still controversial. Likely, most of these patients would be psychologically normal. However, some authors recommend psychiatric consultation for patients who insert foreign bodies into their urethras so that a patient profile can be developed [6]. Nevertheless, no studies have been conducted on this issue.

It has also been suggested that systematic psychological assessment might be legitimate due to the forensic implications of the self-introduction of a foreign body into the urinary tract. This practice could represent an index of potentially harmful "self-destructive" behaviors. If the self-destructive ideations are not recognized in the clinical setting and the patient subsequently self-inflicts an injury or commits suicide, this outcome could be thought to follow from negligent clinical care, which may lead to legal problems for the clinician [7].

Urethral sounding for erotic or sexual purposes is a practice that is not commonly encountered by clinicians, but is not unusual among certain groups of people [1,8]. Most of the reports describing urethral sounding for sexual gratification refer solely to foreign body retrieval. However, little is known about the individuals who perform these practices but do not seek medical care. A recent cross-sectional, international, internet-based survey of 2 000 men who have sex with men highlights a small but significant incidence (10%) of recreational urethral sounding [8]. The study also noted that urethral sounding for sexual gratification is associated with high-risk sexual behaviors, such as multiple sexual partners, sex with strangers, and a higher rate of sexually transmitted infections. Another study showed an even higher incidence of recreational urethral sounding among 445 men wearing genital piercings [1]. Although obviously limited, these studies suggest that certain segments of society may engage more readily in recreational sounding, and also that this practice can lead to complications.

CONCLUSION

Clinicians must be aware of these practices so that they can provide proper care to such patients. We want to highlight that this practice may not be so rare among certain groups of apparently psychologically normal people. It would be useful to determine the actual prevalence of this practice in today's society. Although psychological evaluation was not helpful in our case, we believe that evaluating patients who experience complications and seek medical care would help to better understand this rare clinical scenario. We also believe that comprehensive care should include additional advice on safe sexual practices, recommendations for safer subsequent urethral soundings, and further psychological assistance if necessary, rather than the mere resolution of the infrequent acute complication.

REFERENCES

1. Rinard, K., T. Nelius, et al. (2010). "Cross-sectional study examining four types of male penile and urethral "play"." *Urology* 76(6): 1326-1333. PubMed ; CrossRef

2. Arrabal-Polo, M. A., V. Lopez-Leon, et al. (2011). "Cylindrical glue container into bladder due to sexual practice." *Arch Sex Behav* 40(3): 491-492. PubMed ; CrossRef

3. Martinez-Valls, P. L., B. Honrubia Vilchez, et al. (2008). "[Voiding symptoms as presentation of an intravesical foreign body]." *Arch Esp Urol* 61(7): 781-785. PubMed

4. Hwang, E. C., J. S. Kim, et al. (2010). "Delayed diagnosis of an intraurethral foreign body causing urosepsis and penile necrosis." *Korean J Urol* 51(2): 149-151. PubMed ; CrossRef

5. Rahman, N., N. C. Featherstone, et al. (2010). "Spider-man, magnets, and urethral-cutaneous fistula." *Urology* 76(1): 162-163. PubMed ; CrossRef

6. Kenney, R. D. (1988). "Adolescent males who insert genitourinary foreign bodies: is psychiatric referral required?" *Urology* 32(2): 127-129. PubMed ; CrossRef

7. Boscolo-Berto, R., M. Iafrate, et al. (2010). "Forensic implications in self-insertion of urethral foreign bodies." *Can J Urol* 17(1): 5026-5027. PubMed

8. Breyer, B. N. and A. W. Shindel (2012). "Recreational urethral sounding is associated with high risk sexual behaviour and sexually transmitted infections." *BJU Int* 110(5): 720-725. PubMed ; CrossRef