

Missed ureteric injuries

Abdulghafoor S. Abdulkareem, Zaid S.Khudher

Department of Surgery, College of Medicine, University of Mosul

(Ann. Coll. Med. Mosul 2006; 32(1&2): 12-17)
Received: 12th May, 2005; Accepted: 23rd Aug, 2006

ABSTRACT

Objective: ureteric injuries may be missed and present as a complication.

Design: A case series study.

Setting: Retrospective study conducted during the period from January 1998 to March 2002 in the urosurgical departments at Al-Jumhoori and Al- Salaam teaching hospitals, Mosul.

Participants: Ten cases of missed ureteric injuries were consulted for or referred to the urosurgical departments, during or after their initial surgical procedures either from the general surgical or gynecological departments.

Results: There were (6) males and (4) females; mean age was (25 years). Eighty percent of cases diagnosed post operatively. They were missed for variable duration from 24 hours to 2 months. Complications like urinary fistula, loin abscess, fever or loin pain were diagnosed. Two cases were diagnosed and managed intra operatively. The cause of injury was bullets in (50%) of cases, gynecological operations in (30%) and RTA in (20%). Lower parts of the ureter was involved more frequently (60%) specially in pelvic surgery, while the whole ureter was involved by missiles. Both sides were equally implicated. Missed or improperly treated ureteric injury carries high morbidity like hospital stay, re-exploration (70%) and loosing renal unit function. Uretero- common iliac artery fistula is a rare but serious complication reported in one of the cases.

Conclusion: Sound knowledge of pelvic anatomy, preoperative ureteric stenting, isolated uterine artery ligation, keeping the ureteric injury in mind and deliberate ureteric identification during shell injuries decrease the chance of missed ones and their sequelae.

الخلاصة

الهدف: إصابات الحالب تكون عادة منسية وتشخص بعد إجراء العملية الجراحية الأولى نتيجة حدوث الاختلاطات.
التصميم: دراسة سلسلة من الحالات.

موقع إجراء الدراسة: دراسة مستعادة خلال الفترة من كانون الثاني 1998 إلى آذار 2002 في أقسام الجراحة البولية في مستشفى الجمهوري والسلام التعليمي، الموصل.

المشاركون: عشرة حالات تمت إحالتهم أو طلبت المشورة الطبية لهم خلال أو بعد إجراء العملية الجراحية الأولى لهم من أقسام الجراحة العامة أو النسائية والتوليد.

النتائج: كان هناك ستة ذكور وأربعة إناث، معدل العمر (25) سنة. تم تشخيص (80%) من الحالات بعد إجراء العملية الأولى بسبب الاختلاطات كارتفاع الحرارة وآلام البطن أو حدوث ناسور بولي بمدة (24) ساعة وحتى شهرين باستخدام الأشعة السينية بالصيغة الوريدية وقسطرة الحالب، و(20%) أثناء إجراء العملية الأولى. أسباب الإصابات كانت الأطلاقات النارية (50%)، عمليات الحوض النسائية (30%) وحوادث الطرق (20%). نصيب الثلث السفلي للحالب كان (60%) من الإصابات في عمليات الحوض موزعة بالتساوي لكلا الجهتين بينما إصابات الاطلاقات النارية تصيب أي مكان من الحالب.

إصابات الحالب المنسية لها معاناة مرضية أكثر مثل المكوث في المستشفى والتعرض لعملية جراحية إضافية أو أكثر (70%) وفقدان وظائف الكلية. ومن الاختلاطات النادرة والخطرة التي سجلت، ناسور بين الحالب والشريان الحرقي

المشترك.

الاستنتاج: المعرفة التشريحية الشاملة للحوض، وقسطرة الحالب قبل العمليات المعقدة في الحوض، وعقد الشريان الرحمي بصورة منفردة وأخذ بنظر الاعتبار احتمالية إصابة الحالب والكشف عن الحالب بصورة متمعددة خلال العملية الجراحية في الإصابات النارية يقلل من نسبة إصابات الحالب المنسية ومعاناتها المرضية واختلاطاتها.

Ureteric injuries from external trauma are rare; the ureter's mobility, narrow diameter, retroperitoneal location (between the spine and major muscle groups) and overlying peritoneal contents all protect it and make it an unlikely target for injury. Furthermore, the presenting signs of ureteric injury are often not specific, and diagnostic tests often specific but not sensitive^(2,3).

Gun shot and blunt trauma account for about 95% of all traumatic ureteral injuries⁽⁴⁾. Gynecological surgery, mainly abdominal hysterectomy, is the main cause of iatrogenic ureteric injury (75%)^(5,6). Other causes include colorectal and vascular surgery and various urological endoscopic procedures.

Ureteric injury may be unrecognized at the time of surgery or at the initial presentation of a patient with multiple injuries. The time of diagnosing ureteric injuries is variable; intra operatively, immediately post operatively or after different periods of time that could extend up to 7 years⁽⁷⁾. The delayed presentation is principally responsible for the morbidity, such as urinoma, fistula, stricture, sepsis, loss of renal unit and death of the patient due to septicemia or the severity of injury that is associated with a ureteral injury. The possibility of ureteral injury should be considered not only in the form of laceration or transection but also confusion alone might lead to future extravasation^(1,8).

Patients and methods

From January 1998 to April 2002, ten cases of ureteric injuries were dealt with at Al-Salam and Al-Jumhoori Teaching Hospitals in Mosul. All patients were referred from the general surgical and gynecological wards after a suspicion of possible ureteric injury. Detailed history, physical examination and previous surgical findings at laparotomy were recorded. The time lapse between the first exploration and diagnosing ureteric injury was also recorded.

Investigations, including urine examination, urine culture, serum urea and creatinine, and complete blood picture were done. All patients were subjected to imaging studies including

serial follow up ultrasound examination (US), intravenous pyelography (IVU) and retrograde pyelography. CT scan and MRI were done only for two cases to evaluate a retroperitoneal hematoma or collections and spinal trauma.

Those patients with partial ureteric injury and successful JJ stent insertion were kept on stent for six to eight weeks. Those who were subjected to re-exploration and reconstruction of the ureter were approached trasperitoneally, and JJ stent catheter was inserted in all cases, with retro or intraperitoneal drain. The follow up time was variable from one to five years. It included evaluation of the general condition, urine examination, US examination and IVU.

Results

Ten cases with ureteric injury were included in this retrospective study. There were (6) males and (4) females, their age ranged from 6 to 45 years, with a mean at (25 years). All patients were consulted for or referred from surgical or gynecological units after initial laparotomy and a suspicion of ureteric injury or the development of postoperative complications like urine leak, fever, loin pain and abscess formation.

Two cases were diagnosed intra-operatively after deliberate ureteric exploration because of a high suspicion of ureteric involvement. eight cases (80%) were diagnosed post operatively for variable duration from 24 hours to 2 months due to the development of the aforementioned complications. Bullets or shells were the cause of the injury in 5 cases (50%), 3 patients had an iatrogenic injury (30%) and road traffic accidents (RTA) accounted for the remaining 2 (20%). Urine leak was present in 7 patients out of 8 in the post operatively diagnosed cases (87%), abdominal wall abscess in 2 cases and loin pain with fever in one patient. Eighty percent of patients with ureteric injury due to bullets had associated bowel perforations. and those with RTA had associated pelvic or lumbar spine fractures (fig1).

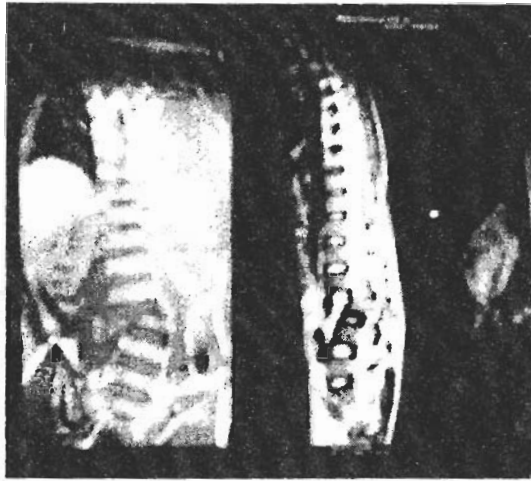


Figure (1): MRI showing severe spinal fracture; ureteric injury in a blunt abdominal trauma indicates the severity of the trauma.

IVU findings were either contrast leak in 6 patients (75%), persistent nephrogram in one and hydronephrosis in one patient, while retrograde pyelography was diagnostic in all 8 cases (100%), (fig 2&3).

Ureteric stenting using JJ catheter was successful in two patients with partial ureteric injury without the need for exploration (fig 4&5).

The lower third of the ureter was involved more frequently than other parts of the ureter (60 %). Both sides were equally involved. Hospital stay was variable from seven days for uncomplicated cases to six months for complicated ones. Seven patients out of ten were subjected to abdominal re-exploration and two of them to four times (on suspicion of duodenal fistula). Five patients

demonstrated residual hydronephrosis after definitive treatment, two patients were subjected to nephrectomy because of the complicated ureteric injuries (development of ureteric obstruction after JJ stent removal and pyonephrosis). One patient had uretero-common iliac artery fistula and two patients ran uneventful follow up time.

Right uretero- common iliac artery fistula occurred in one of our patients (presented with severe hematuria and shock), diagnosed by angiography and treated in Baghdad; at Ibn Al-Nafees center for cardiovascular surgery; it is a very rare and life threatening complication. The table below summarizes the patients' events. No mortality was recorded in our cases solely from ureteric injury.



Figures (2) and (3): show right ureteric contrast extravasation in IVU and right retrograde pyelography (complete ureteric transection).



Figures: (4) and (5) Left retrograde pyelography showing contrast extravasation with complete collecting system visualization and successful JJ stenting (partial ureteric injury).

Table(1): Showing the summary of the patients and their course of treatment and complications.

patient	sex	age	Cause	Initial finding	Ureteral injury	presentation	Image Finding	Time of diagnosis	Treatment method	complications
KA (1)	M	22	Bullet	Small bowel perforations	Right upper ureter	Fever, loin pain	Contrast leak in IVU	Intra-operative	Ureteroureterostomy	Common iliac ureteric fistula
AB(2)	M	20	Bullet	Retroperit. hematoma	Left middle ureter	Urine leak	Contrast leak in IVU	7th post-operative day	JJ stent	Residual hydronephrosis
MA(3)	M	25	RTA	fractured pelvis, shock	Left lower ureter	Abscess, urine leak	Contrast leak hydronephrosis	14th postoperative day	Boari's flap	Residual hydronephrosis
HH(4)	F	45	L.hysterectomy	Intraoperative bleeding	Right lower ureter clip	Loin pain, fever	Nephrogram in IVU	24 hours post-op.	Clip removal	Residual hydronephrosis
HA(5)	M	35	Bullet	Bowel perforation	Left upper ureter	Urine leak	Left hydronephrosis	5th post-operative day	Ureteroureterostomy	Left nephrectomy
AS(6)	M	6	Bullet	Bowel perforation	Right lower ureter	Urine leak	Contrast leak	15th postoperative day	Ureteroureterostomy	-ve
AN(7)	F	25	C/S	-ve	Left lower ureter	Urine leak	Contrast leak	2nd postoperative day	JJ stent	Left hydronephrosis
SF(8)	F	30	Ov.cystectomy	-ve	Left lower ureter	-ve	-ve	Intra-operative	JJ stent	-ve
BA(9)	F	35	Bullet	Bowel perforation	Right lower ureter	Urine leak	Hydronephrosis Ureteric obstruction	2nd postoperative day	Rt. Ureteric reimplantation	Repeated UTI hydronephrosis
BR(10)	M	8	RTA	fractured L3, paraparesis	Right upper ureter	Repeated loin abscess, drained then urine leak	Contrast leak	Two months post-operative	Right nephrostomy	Rt nephrectomy

RTA: road traffic accident; C/S: caesarean section

Discussion

Ureteric injury is a rare event all over the world, there are only a few series with a sizeable experience, and they are all retrospective⁽²⁾. The percentage of missed ureteric injury varies in different centers depending on the experience and the availability of immediate diagnostic investigations, and the missed ones manifest themselves with complications at different post operative time⁽⁹⁾.

Elliot et al reported 36 cases of ureteric injury in 25 years period, ie 1.44 patient/year (one of the largest published series concerned with ureteral injury in San Francisco general hospital), 86% caused by penetrating injury (72% by gun shot), the upper part of the ureter was involved in 70%, and 3 cases (8%) were missed⁽¹⁰⁾. In our study it was 2.5 patient/year, 50% of them caused by gun shot, the lower part of the ureter was involved in 60% of cases, and 80% were missed and diagnosed post operatively. Shittu reported 0.4% incidence of ureteric injury during 20 years period mainly due to gynecological or road traffic accidents, no bullet injury as a cause was reported⁽¹¹⁾.

Bencheckroun et al reported a series of 42 cases of ureteric injury observed over a 20-year period. There were 33(78%) females and 9 males (21%), mean age 38 years. There were 31 missed cases(73.9%) diagnosed post-operatively after an interval of 3 to 20 days and 2 after an interval of 3 months and the clinical features were dominated by urinary fistula in 33 (78.5%)⁽⁵⁾.

Szpakowski et al and Dorairajan et al observed that preoperative ureteric stenting for exact intraoperative ureteric identification is very important before applying clamp cutting or suturing to reduce the risk of ureteric injury^(12,13). Khaleel et al also concluded that pre-operative ureteric catheterization or J stenting significantly reduces the incidence of missed ureteric injuries in urological, gynecological and general surgical pelvic operations from 31.7% to 11.8%, and early diagnosis of ureteric injuries is associated with less morbidity⁽¹⁴⁾. In our surgical or gynecological cases preoperative ureteric stenting is rarely applied preoperatively.

There were 34 ureteric injuries in Yuvaraja et al study during 20 year period, 25 cases discovered intraoperatively and nine cases missed and diagnosed post operatively after different periods, of time and they concluded that missed ureteric injury causes prolonged

morbidity and their management can be difficult⁽¹⁵⁾.

Vani Dandolu et al performed cystoscopy in every gynecological surgery for early detection of ureteric injury but they were unable to discover 2 out of 7 cases of missed ureteric injuries during surgery in ten years period⁽¹⁶⁾.

Tahmaz et al reported 12 patients with missed ureteric injury following a previous surgical exploration for gun shots; the causes were attributed to intra operative bleeding, shock and blast effect of high velocity missiles⁽¹⁷⁾. In our cases 50% were due to high velocity missiles which cause more severe and extensive injury and associated retroperitoneal bleeding.

Liapis et al recorded 18 cases of missed ureteric injury during different gynecological procedures, nine of them (50%) diagnosed on table and the other nine cases diagnosed post operatively after variable period of time⁽¹⁸⁾. Higher percent of missed ureteric injury was recorded in gynecological cases in our study(66%).

Mohammad et al reported 18 patients with iatrogenic ureteric injuries during gynecological surgery including two patients with bilateral ureteric ligation and anuria. The delay in diagnosis was 7 years in one patient⁽⁶⁾. The causes were attributed to mass and blind uterine or internal iliac artery ligation or distorted anatomy of the pelvis and ureter because of adhesions or malignancy.

We report a single case of ureteric injury after Caesarean section because of distorted anatomy due to previous three Caesarean sections and the condition diagnosed in the second postoperative day. The incidence of ureteric injury following Caesarean section is extremely low (0.09%), Thomas et al reported 3 cases of ureteric injury following Caesarean section, one of them diagnosed three months post operatively⁽¹⁹⁾.

Even in orthopedic surgery two cases of missed ureteric injury were reported by Khastgir et al after hindquarter amputation for malignant bone tumors⁽²⁰⁾, and Egawa et al diagnosed a case of left lower ureteric injury 3 months after left hip joint arthrodesis by the nails⁽²¹⁾. The cause of injury was attributed to lack of pre operative evaluation of the ureter and its course.

Abu-Zidan et al study supports the presence of urologists within military surgical team because of the missed ureteric injuries diagnosed following the initial surgical procedures done by general surgeons⁽²²⁾.

Uretero arterial fistulae are very rare. About 60 cases have been described in the available world's literature so far. The condition is a very rare cause of hematuria. The causes were attributed to prosthetic vascular surgery. In our case the tangential vascular injury by bullet and the JJ ureteric stent accounted for its occurrence⁽²³⁾.

References

1. Steif CG, Jonas U, Petry KU. Ureteric reconstruction. *BJU international* 2003; 91: 138-9.
2. Brandes S, Coburn M, Armenakas N, McAninch J. Diagnosis and management of ureteric injury: an evidence-based analysis. *BJU international* 2004; 94: 277-289.
3. McAninch JW, Santucci RA. Genitourinary trauma. In: Walsh PC, Retik AB, Vaughan ED, Wein AJ, Kavoussi LR. *Campbell's Urology*. 8th ed. Philadelphia Saunders. 2002; 3715-21.
4. Spimak JP. Ureteral injuries. In: Resnik MI, Novick AC. *urology secrets*. 2nd ed. Hanley & Belfus Inc. 1991; 256-8.
5. Benchekroun A, Lachkar A, Soumana A, Farih MH, Belahnech Z, Marzouk M, Faik M. Ureter injuries. Apropos of 42 cases. *Ann Urol* 1997; 3: 267- 72.
6. Drake JG, Hoffman MS. Incidence and outcome of ureteral injuries in an obstetrics and gynecology teaching program. *J Gyne Surg* 2001; 17: 1-5.
7. Mohammad R, Hanif MA. Management of iatrogenic ureteric injuries associated with gynecological Surgery. *Int Urol Neph* 2002; 34: 31- 5.
8. Al-ali M, Haddad LF. The late treatment of 63 overlooked or complicated ureteral missile injuries; the promise of nephrostomy and role of autotransplantation. *The Journal of urology* 1996; 156: 1918-21.
9. Watterson JD, Mahoney JE, Futter NG, Gaffield J. Iatrogenic Ureteric injuries: Approach to etiology and management. *Can J Surg* 1998; 41: 379-82.
10. Elliot SP, McAninch JW. Ureteral injury from external violence: the 25 year experience at San Francisco general hospital. *J Urol*. 2003; 170: 1213-6.
11. Shittu OB. Urologic Trauma in Nigeria. *African Journal of Trauma* 2004; 1: 30-4.
12. Szpakowski M, Kaminski T, Wilczynski JK. Analysis of urinary tract injury during gynecological surgery performed with preoperative ureter catheterization or intraoperative ureter control. *Ginekol Pol* 2001; 72: 1507-1512.
13. Dorairajan G, Reddi RP, Habeebullah S, Dorairajan LN. Urological injuries during hysterectomies: A 6-year review. *J Obstet Gynaecol Res* 2004; 30: 430-435.
14. Khaleel A, Elijah O, Adel A, Ahmed A. Iatrogenic ureteric injuries: Incidence, aetiological factors and effect of early management on subsequent outcome. *Int Urol Neph* 2005; 37: 235-241.
15. Yuvaraja TB, Wuntakal R, Mahishwari A, Kerkar RA, Tongaonkar HB. Management and long -term follow up ureteric injuries during radical hysterectomy: Single center experience. *J Gynecol Surg* 2003; 19: 133-9.
16. Dandolu V, Mathai E, Chatwani A, Harmanli O, Pontari M, Hernandez E. Accuracy of cystoscopy in the diagnosis of ureteral injury in benign gynecological surgery. *Int Urogynecol J & pelvic floor dysfunction* 2003; 14: 427-31.
17. Tahmaz L, Kilciler M, Yagci S, Saglam M, Erduran D, Harmankaya C. Missed ureteral injuries following surgical exploration with percutaneous nephrostomy and drainage treatment. *Ulus Travma Derg* 2000; 6: 284-7.
18. Liapis A, Bakas P, Giannopoulos V, Creatsas G. Ureteral injuries during gynecological surgery. *Int Urogynecol J Pelvic Floor Dysfunction* 2001; 12: 391-393.
19. Thomas DP, Burgess NA, Gower RL, Peeling WB. Ureteric injury at Caesarean section. *BJU* 1994; 74: 122-3.
20. Khastgir J, Arya M, Patel H, Shah P. Ureteral injury during radical orthopedic cancer surgery. *J Urol* 2001; 165: 900.
21. Egawa S, Shiokawa H, Uchida T, Mashimo S, Koshihara K. Delayed Presentation of ureteric injury following arthrodesis of the hip joint. *BJU* 1994; 73: 212-3.
22. Abu-Zidan FM, AL- Tawheed A, Ali YM. Urologic injury during Gulf war. *Int Urol Neph* 1999; 31: 577-83.
23. Jovanovic MM, Wolski Z, Molski S. A fistula between ureter and aorto-femoral graft, a very late complication after arterial prosthetic surgery – a case report. *Clin Pract Rev* 2004; 5: 114- 117.