Causes And Management Of Ureter Injuries In Yemeni Society Clinical

Descriptive Study

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INTRODUCTION

Ureteral trauma was first reported in 1868 by Alfred Poland when he described the first case of disruption from blunt trauma [4]. The patient was a 33-year-aid woman who died
days after being pinned between a platform and a railway carriage. At autopsy, in addition to many other injuries, the right ureter was avulsed below the renal pelvis [j (Morris H et al ,1868). Henry Morris described the first ureteral procedure
1904, when he performed an ureterectomy on a 30-year-old male who ‘Tfell from his van catching one of the wheels across his right loin11 [6] (Morris HC et al ,1904). In both cases, the ureteral injury was missed upon admission. Kirchner reported the first bilateral ureteral injury and repair, secondary to a single low-velocity penetrating missile, in 1981 [7]](Kirchner
KF Jr et al ,1981).
Genitourinary (GU) trauma is often overlooked in the setting of acute trauma due to immediate, life-threatening injuries taking precedence, but accounts for roughly lO% of all injuries seen in the emergency room. Ureteral trauma is uncommon, accounting for less than 1% of all urologic trauma[8. (Presti JC Jr et al ,1989) However, a missed ureteral injury can result in significant morbidity and mortality.

The rationale for this article is to review the literature since Zufall et al published the first indexed series on ureteral trauma in 1961 [9(ZufaI Ret aI,1961)

There are many factors that predispose to surgical ureteral trauma including, prior surgery, infection or inflammation (e.g., diverticulitis, pelvic inflammatory disease, endornetriosis) , radiation therapy, malignancy , uterine size >12-wk gestation, ovarian mass >4 cm, obesity and massive bleeding(l-6).

In the past, the majority of surgical ureteral injuries occurred during gynecological procedures, most frequently during abdominal hysterectomies 6)•

Higgins CC et al ,1967 - Ihse I et al ,1975 - Gangai MP, et al ,1976 - Dowling RA et al, 1986 - Assimos DG et al, 1994- Selzman AA et al ,1996)

The most common site was at the pelvic brim where the ovarian vessels cross the ureter in the infundibular pelvic ligament. With the advent of ureteroscopic surgery, however, urological procedures now cause most ureteral injuries;

fortunately, the majority of these are minor injuries and can be safely treated non surgically7'. (Fried FA, et al , 1995 - Canton CE Jr, et al ,1971)

Other surgical procedures that may injure the ureter include aortoiliac and aortofemoral arterial bypass surgery, low anterior bowel resection, and, rarely, lumbar laminectomy . Mechanisms of injury include kinking, crushing, electrocoagulation, devascularization, ligation, perforation, transection, and excision. Ureteral injuries constitute up to 3% of all genitourinary injuries from external trauma9. (Bright TC, et al ,1977) The ureter mobility and anatomic characteristics protect it from trauma; its narrow diameter and retroperitoneal location between major muscle groups and the spine make it an unlikely target. Most external ureteral injuries occur from gunshot wounds; stab wounds are infrequent aO-15)(

Presti JC in, et al ,1989 - Campbell EW Jr et al, 1992 - Brandes SB et al . 1994 - Azimuddin K,et al, 1998
- Liroff SA, et al ,1981 - Pitts IC et al, 1977)

• The bullet does not need to transect the ureter; if its path is simply near the ureter, the temporary cavitation created by the missile can cause significant tissue destruction and delayed necrosis. These injuries can be very difficult to identify and often present with delayed sequelae. Penetrating ureteral injuries are almost always associated with multiple organ injuries. The most common sites, in order of decreasing frequency, include the small bowel, colon, liver, and iliac vessels1422. The location of ureteral injuries is fairly evenly distributed, with the upper ureter slightly more prone to trauma (11 2225.(Campbell EW ir, et al
,1992 , Witters et al., 1986)
Ureteral injuries from blunt trauma are rare. They usually occur in children or young adults during rapid deceleration, which causes excessive hyperextension of the vertebral column and disruption at the ureteropelvic junction (UPJ). They also are associated with multiple organ injuries, most commonly to the liver, spleen, and skeletal system2631 . In general, UPJ disruptions occur almost exclusively in polytraurnatized patients, with most presenting in shock31.
Purpose:. Because few surgeons
see many cases of ureteral trauma, it has been difficult to identify the best diagnostic and treatment methods.
Failure to promptly recognize a ureteral injury frequently results in loss of functional renal parenchyma, sepsis, and possibly death. We present our experience
with 50 cases of ureteral injuries The aim is to identify the causes and mechanisms
of ureteral injuries and evaluation of diagnosis and management.

Materials and methods: Between January 2006 and February 2011 ,we did a descriptive study to identify the causes and to evaluate the diagnosis and management. 50 patients were collected in UROLOGY AND NEPHROLOGY CENTER IN ALTHAWRA MODERN GENERAL HOSPITAL .The patient's age ranged between 8-70 years ,with mean age of 35.9 years, six of them are children (12%), and females contribute to 60% from the total cases. We fulfill the case sheet including history, physical examination, laboratory and radiological investigations, diagnostic cystoscopy and retrograde ureteropyelography

RESULTS: In this study 50 patients were diagnosed and managed as ureter injuries. Most of these patients 42 (84%) iatrogenically injured and only 8 patients (16%) caused by external trauma all of them by gunshots . latrogenic ureter injuries distributed to endoscopically injured 12 patients (24%) (laparoscopy zero ,URS 12 (24%)) and surgically injured 30 (60%) (Gyn — obs 18 (36%) , urology 12 (24%)) and no ureter injuries caused by general pelvic and vascular surgeries. Urological procedures including URS and open urological surgeries representing the most common cause of ureter injury 12(24%) patients for each of them ,collectively 24 (48%) for both (figurel).

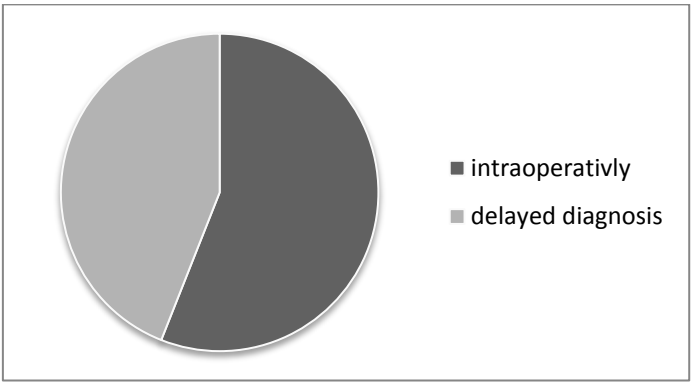
Cases of missed ureter injuries presented with flank pain is 5 cases & urine leak per vagina in 8 cases, urine leak from the wound or prolonged high drain output in 4cases, 2 cases presented with perinephric collection with or without fever and rigor and only 1 case presented with peritonitis and two cases with anuria and high serum creatinine (Table 1).

Tablel: showing clinical presentation of ureter injuries.

mia[prefltInq •	No:nfcases
• Flank pain	5
• Urine leak per vagina	8
• Urine leak from the wound or prolonged drain output	*4*
• Perinephric collection with or without fever and rigor	2
• Anuria with high serum creatinine	2
• Peritonitis	1
• Intranperative diannsis	28

Regarding the time of diagnosis 28 patients (56%) diagnosed intra operatively and 22 of patients (44%) diagnosed late postoperatively (figure 2).

Figure 2:showing distribution of patients according to timing of diagnosis



Both right and left sides are equally injured with 48% for each side and only 2 cases (4%) injured bilaterally (Table 2).

TabIe2: Showing side of ureter injury

Side of injury	No of cases	%
• Rt	24	48.0%
• It	24	48.0%
• Bilateral	2	4.0%
Total	50	100.0%

Approximately two third of the cases 34 (68%) were in the lower ureter; 10 (20%) of cases in the upper ureter and the mid ureter is the least injured with only 6 (12%) cases (Table 3).

Table 3: Showing level of ureter injury

Levul of injury	**No of cases**	**%**
• Upper	ID	20.0%
• Mid		12.0%
• Lawer	34	B8.D%
Total	**50**	**1011.0%**

The ureter may be injured in one of several ways ,with ligation being the most common
mechanism in 16 patients (32%) due to hysterectomy and L.S.C.S followed by avulsion 12
patients (24%) in addition to other mechanisms such as mucosal degloving in 4 patients (8%)
partial and complete transection , perforation, crushing injury 2 (4%) of each one.

There are 20 (40%) cases associated with other injuries 6 of them associated with urinary bladder injuries , 4 U.V.F , 4 V.V.F , 2 rectal injuries , 2 vascular injuries and 2 small intestinal injuries ***(Table*** 4).

Table 4: Showing associated injury with ureter injuries.

Associated injuries	**No of cases**	**%**
• IJVF	**4**	**8.0%**
• VVF	**4**	8.11%
• Colon injury	**2**	**4.0%**
• U.B injury	**4**	**8.0%**
• Rectal injury	**2**	**4.0%**
• Vascular injury	**2**	**4.11%**
• Small intestinal injure	**2**	**4.0%**
• Spleen injury	**0**	**0%**
• Liver injury	**0**	**0%**
Total	**211**	**40.11%**

UVF, uretrovaginal fistula VVF, vesicovaginal fistula U.B injury, urinary bladder injury Of all patients 3 have solitary kidneys two of them are children.

The cases were managed with temporary diversion by nephrostomy tubes in 12 patients (48%), two of them trial of DJ fixation failed . Followed by 18 cases reimplantation , 8 cases nephrectomy, 6 cases ureteroureterostomies and 2 cases send to abroad . Other cases

managed with DJ fixation 10 cases , ureteropyelostomy 3 cases , release of ligature and DJ fixation 2 cases, urinary diversion one case (Table 5). Eight patients who underwent nephrectomy 6 of them had lost function of the renal unit proved by renogram , the other two cases have irreparable ureter injuries with poorly functioning kidneys by IVP and not proved by renogram.
Good follow up really not done but 2 cases expired , one case complicated by secondary PUJ obstruction and one case by ureter stricture.
Table 5:sho wing different ways of managements of ureter injuries

Management. :.	. **No uf cases**	.•
Te Nephrostomy tule	I2 .. **;.**	24.0%
• Reimplantation	18	3B.0%
• Nephrectomy	8	IB.0%
• lirateropyelostomy	3	B.0%
• Uretarouretrostomy	B	12.0%
• Di fixation	ID	20.0%
• Urinary diversion	I	2.0%
• Release of ligation B Di fixation	2	4.0%
• PGN ahroad*	2	411%
Total	511	100.11%

***Two cases send abroad to be managed in special center due to very Tong strictures**

DISCUSSION: Ureteral injury is rare but, when it occurs, it has serious implications in terms of both morbidity and litigation. Because of its location , small size , and mobility , trauma to the ureter is relatively rare and accounts for only 3% of all GUI(7)
The incidence of ureteral injury varies between 0.1% and 30%, depending on the type of surgery. Prevention can be attempted by preoperative and intraoperative precautions, although the effectiveness of these measures has not been fully evaluated. Diagnosis of ureteral injury may be made intraoperatively but 70% are diagnosed postoperatively. Management depends on

Table 3: Showing level of ureter injury

Level uf injury	**Na Df cases**	
• Upper	10	20.0%
• Mid	5	12.0%
• Lower	34	58.0%
Tutal	**50**	**1011.0%**

The ureter may be injured in one of several ways ,with ligation being the most common
mechanism in 16 patients (32%) due to hysterectomy and L.S.C.S followed by avulsion 12
patients (24%) in addition to other mechanisms such as mucosal degloving in 4 patients (8%)
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There are 20 (40%) cases associated with other injuries 6 of them associated with urinary bladder injuries , 4 U.V.F , 4 V.V.F , 2 rectal injuries , 2 vascular injuries and 2 small intestinal injuries ***(Table*** 4).

Table 4: Showing associated inju!y with ureter injuries.

Assaciated injuries	No iif cases	%
• LJVF	4	8.0%
• VVF	4	8.0%
• Colon injury	2	4.0%
• JIB injury	4	811%
• Rectal injury	2	4.0%
• Vascular injury	2	4.0%
• Small intestinal injure	2	4.11%
• Spleen injury	U	0%
• Liver injury	11	0%
Total	20	40.0%

UVF, uretrovaginal fistula VVF, vesicovaginal fistula U.B injury, urinary bladder injury

Of all patients 3 have solitary kidneys two of them are children the timing of diagnosis, the aetiology, the length and location of the injury, the extent of the causative operation and the condition of the patients. Renal deterioration is inevitable unless urine flow is restored because the ureter is the sole conduit from the kidney(21).
In this study 50 patients were diagnosed as ureter injuries in 4 years duration. Most of these patients 42 (84%) iatrogenically injured and only eight patients (16%) caused by external trauma all of them by gunshot.
Tatrogenic ureter injuries distributed to endoscopically injured 12 patients (24%) (laparoscopy zero ,URS 12 patients (24%)) and surgically injured 30 patients (60%) (Gyn — obs 18 (36%) urology 12 patients (24%)) and no ureter injuries caused by general pelvic and vascular surgeries. Urological procedures including URS and open urological surgeries representing the most common cause of ureter injury 12 patients (24%) for each of them collectively 24 patients (48%) (FigurE 1).
In large studies of ureteral injuries , 75% are iatrogenic, 18% are from blunt trauma , and 7% were from penetrating trauma .Among iatrogenic injuries , 73% are gynecological in origin 14% are from general surgical cases and 14% are urological(22) (Table 6).
Table 6: showing causes of Surgical Ureteral Trauma, by Procedure

Reference	*Gynecologi*	*Urological*	*Colon*	*Vascular*	*Spinal*	*Total*
Higins(1967)(1)	60	*5*	12	7	2	86
Ihse(1975) (2)	23	13	6	*0*	*0*	42
Dowling (0653)(4)	14	8	3	*1*	*1*	*27*
Gangai (1986) (3)	9	*10*	*3*	*0*	*2*	*24*
Assimas (1984)(5)	*11*	*12*	*4*	*0*	*0*	*27*
Seltzrnan (1996)(6)	*56*	*70*	*28*	*10*	*1*	*165*
Total	*173*	*118*	*56*	*18*	*6*	*371*
	(46.6%)	(31.8%)	*(15.1%)*	(4.9%)	(1.6%)	

In comparison of our study with these studies we found that the iatrogenic cause still the most common cause of ureter injury but the urological causes (URS and open urological surgery)

more common than the Gyn-obs causes, which can be explained by the advent of ureteroscopy and its use with inexpert urologists and training doctors ; some urological operation still being done by general surgeon.

No ureter injuries caused by general surgery ,vascular surgery and spinal cord injury in our study which may be due to small sample or due to using of preventive measures to avoid ureter injuries during procedures; And this is similar to same studies and differ from others (see table 6& figurel).

Reports show conflicting results when comparing the incidence of ureteral injury following laparoscopic surgery with the incidence following open gynecological surgery. Some studies report similar figures'5 while others report a significantly higher incidence after laparoscopic surgery6 Despite the incidence of all major complications associated with laparoscopy declining, the incidence of ureteric injury has stayed constant at approximately in our study no laparoscopic ureter injuries because it is not widely used in Yemen and particularly in gynecological and pelvic surgery.

Most external ureteral injuries occur from gunshot wounds ; Stab wounds are infrequent(8-13) ,but in our study the cases of penetrating ureteral injuries are caused by gunshots; Because as we know the bullet does not need to transect the ureter ; if its path is simply near the ureter , the temporary cavitation created by the missile can cause significant tissue destruction and delayed necrosis.

Prompt diagnosis is the first step toward a successful outcome. With external ureteral trauma, this is complicated by the presence of multiple organ injuries and the absence of early clinical and laboratory findings specific for ureteral trauma. Indeed, hernaturia, which is a reliable indicator of renal trauma, is absent in approx 30% of ureteral injuries (8—13,14,15,16,17,18,19,20). Early clinical indicators of ureteral trauma are vague or nonexistent.

To avoid the additional morbidity associated with a delay in diagnosis, it is imperative that the evaluating physician maintains a high index of suspicion based on injury mechanism and location. Whether from an external or surgical cause, delayed signs or symptoms of a ureteral injury include prolonged illus, urinary obstruction, urinary leakage, azotemia, fever, persistent flank pain, fistula formation, and eventually sepsis. After abdominal or pelvic surgery, any
patient presenting with these signs or symptoms that suggest the possibility of a ureteral injury should be thoroughly evaluated. In addition, all patients with penetrating abdominal or flank trauma should be suspected of having a ureteral injury and appropriately assessed. Similarly, children and young adults with significant blunt abdominal trauma and multiple associated injuries, especially from a mechanism of rapid deceleration, should undergo radiographic ureteral assessment regardless of the findings on urinalysis.

In our study 56% of patients diagnosed intraoperatively while 44% diagnosed late thus cases diagnosed immediately or intraoperatively prompt and proper intervention was done while cases with delayed diagnosis had complications and some of them lost their ipsilateral renal function unit and ended by nephrectomy.

Selection of the appropriate management depends on the patient's condition (including the associated organ injuries), promptness in injury recognition, and location and grade of the ureteral injury. Most patients with external ureteral injuries require prompt operative exploration for management of their associated abdominal injuries. If suspected intraoperatively, the injured ureter should be carefully inspected for evidence of ischemia.

Ureteral injuries with a significant delay in diagnosis or in an unstable patient are best managed initially by percutaneous nephrostomy drainage or endoscopic ureteral stenting.

Percutaneous nephrostomy placement is safer and more universally applicable, whereas retrograde ureteral stenting should be attempted only for certain low-grade injuries.

In our study cases were managed with temporary diversion by nephrostomy tubes in 12 patients (24%), half of them trial of DJ

fixation failed and all of these cases are missed injuries or the general condition of the patients cannot tolerate definitive management.

Injuries to the distal lower third of the ureter were managed definitively by different types of reimplantation inl8 patients (36%). Unfortunately eight patients (16%) managed by nephrectomy due to loss of renal function in six patients and inoperable ureter injuries with severely reduced paranchyrnal thickness by U/S and poorly functioning kidneys by IVP in two patients (see table 5). The two cases who send abroad were long strictures need ileal interposition.

CONCLUSION: Ureter injure either due to external trauma or iatrogenic injury is rare . in our society iatrogenic ureter injuries are still the most common form of trauma to the ureter contributing to 84% of causes and only 16% by external trauma.

The attractive point in this study is that the urological causes (URS and open urological surgeries) are more common than Gyn —obst , which can be explained by the advent of ureteroscopy and its use with un inexpert urologists and training doctors ; some urological operation still being done by general surgeons.

In contrast to other studies slightly more than half (56%) were diagnosed immediately or intraoperatively and this is led to immediate implemented of corrective measures that minimize complication.

With all ureter injuries the clinical and radiographic evaluations are often indeterminate ;Consequently maintaining a high index of suspicion is paramount in making the diagnosis promptly . A delay in diagnosis is the most important contributory factor in morbidity related to ureter injury including peritonitis , anuria, renal failure in bilateral injury and injury of solitary kidney and chronically obstructed kidney which may lead to loss of renal functional unit leading to nephrectomy.

Adhering to these diagnostic and therapeutic principles will serve to minimize complication and maximize renal preservation in patient who sustain ureteral injury.

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