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#### URETERIC INJURIES FOLLOWING PELVIC OPERATIONS

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#### ABSTRACT

**Background:** Iatrogenic injuries to the ureter are hazardous complications of pelvic operations, causing severe morbidity and even mortality.

**Objective:** To present our 10 years experience in the management of such ureteric injuries.

**Design:** A retrospective study carried out between January 1990 and December 1999.

**Setting:** Two busy health institutions, namely Ife State hospital and Wesley Guild Hospital, both of the Obafemi Awolowo University (OAU) Teaching Hospitals Complex, Ile-Ife, Nigeria.

**Results:** The incidence of iatrogenic injury was 0.4%. Ureteral transection was the commonest lesion (58%). Ureteroneocystostomy was performed in 70% of the operated cases. Those diagnosed at the time of injury and treated with end-to-end anastomosis had the best results.

**Conclusion:** The proper identification and, when necessary, isolation of the ureter during operations in which there is a risk is crucial in reducing the incidence of ureteral injuries

#### INTRODUCTION

Nearly all gynaecologic procedures have been reported to cause ureteric injury, with an incidence which ranged from about 0.4% for non-malignant conditions(1), to as high as 30% for some older series of Wertheim's radical hysterectomies(2). The liability of the ureter to injury during pelvic surgical operations results from its proximity to the female reproductive system and its course in the pelvis. Ureteral injury has occurred in association with most gynaecological surgeries, particularly large pelvic cancer surgeries, hysterectomy for benign indications, oophorectomy and suspension of the bladder neck. While the knowledge, skill and diligence of the surgeon largely determines the incidence of operative ureteral damage, the difficulty of the surgical procedures is another major factor. Lately the incidence of ureteral injury is rising as more ambitious operations are undertaken laparoscopically(1).

In this study, we reviewed all the cases of ureteric, damage associated with gynaecologic surgical procedures in our hospitals over a ten-year period in order to study the aetiology, mode of presentation and treatment outcome.

#### MATERIALS AND METHODS

The Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria comprises two referral centers,

namely, the Ife State Hospitals, Ile-Ife and the Wesley Guild Hospital, Ilesa. We undertook a retrospective review of all the cases of major gynaecological operations performed in these hospitals from January 1990 to December 1999. All the cases of ureteral injuries were analysed with respect to the age of the patients, the indication for surgery, the primary surgical procedure, the type of ureteric injury, the timing of recognition (Intraoperatively or postoperatively), the type of definitive repair and the outcome in terms of renal function/ intravenous urographic findings post-operatively.

#### RESULTS

Two thousand nine hundred and twenty seven records of major gynaecological operations were available for review. Of these there were 12 ureteric damage, giving an incidence of 0.41%. The mean age of the patients was 37 years (range: 22 to 43).

Abdominal hysterectomy was the leading cause of injury, being responsible for 10 (83%) of the cases. Two (17%) of the cases were due to salpingo-oophorectomy. The type of injury was either transection, which occurred in seven (58%) of the cases, or ligation, which occurred in four (33%) of the cases. In one case, there was crushing of the ureter (8%). The right ureter was injured more than the left (occurring seven (58%) and five (42%) of the patients respectively). There was no bilateral ureteric damage in any of the cases. Diagnosis was made intraoperatively in five patients (42%), while in the remaining seven (58%) the diagnosis

was postoperative. Intraoperative diagnosis was by direct observation of urinary leakage (two patients), by performing a cystostomy to observe the appearance of intravenous of injected methylene blue dye (two patients), or by retrograde passage of ureteral catheter through the cystostomy wound (one patient). Postoperative presentations was with urinary incontinence from ureterovaginal fistula (five patients), and loin pain, pyrexia and loin tenderness (one patient); one patient presented with urinoma. Examination under anaesthesia (EUA) with dye study were performed in all the cases presenting with urinary incontinence. Of the cases presenting postoperatively, intravenous urography were done in only three cases; the other patients were unable to afford the investigation.

Ureteroneocystostomy and end-to-end ureteric anastomosis were the reconstructive methods, adopted. Thus treatment consisted of ureterovesical re-implantation in three cases, psoas hitch of bladder in two, Boari-Kuss bladder flap in two cases, and end-to-end ureterorrhaphy in three cases. Two of the patients defaulted and did not have repair done. In all the cases of ureteroneocystostomy, antireflux procedure was carried out. All cases of end-to-end anastomosis had stent. Drainage of the anastomotic site with either retroperineal or retropubic drains to detect intraperitoneal urine leakage was performed in all cases.

The short-term post-operative course was marked by the absence of symptoms such as loin pain and urinary incontinence, absence of intraperitoneal drainage of urine or loin tenderness in all the cases. Long-term post-operative follow-up revealed normal renal functions and absence of urinary tract infections in all the cases. IVU was done in five cases, which revealed a mild ureteric stenosis in one case, and ureteric reflux in another, with the rest of the patients having a satisfactory ureteral caliber. The mean (range) postoperative hospital

stay and long-term follow up period were 17 (15-20) days and 14 (8-22) months respectively.

The indications for offending surgery, the type of offending surgery, clinical presentation and reconstructive surgeries and outcomes for each case are detailed in Table 1.

## DISCUSSION

Iatrogenic injuries to the ureter are hazardous complications of pelvic and vaginal operations causing severe morbidity and even mortality. The reported incidence of iatrogenic ureteral injuries ranges from 0.05% to 30%. Nearly all gynaecological procedures have been reported to cause ureteric injury, and the incidence is rising as more ambitious are undertaken operations laparoscopically(1). Open gynaecological operations are still the leading cause of ureteric injuries in Nigeria, and may account for 87.8%(3). We reported an incidence of 0.4%, which, although low, was not an improvement over the previous decade during which an incidence of 0.36% was reported in our center(4). Because some ureteral injuries may be symptomless, leading to silent kidney loss, the quoted incidence may be too low, and a figure of up to 2.5% after gynaecologic operations has been suggested(5). The incidence is about ten cases during abdominal surgery and one case during vaginal surgery(5).

Risk factors for ureteric injury include cancer, haemorrhage, endometriosis, adhesions and an enlarged uterus(1). Thus an operation at the pelvic brim, distorted anatomy, removal of the adnexa or of ovarian neoplasm, may facilitate the occurrence of an ureteral trauma since attempts to achieve haemostasis may then be without proper identification of the ureter(6). The proper identification and when necessary, isolation of the ureter during operations in which there is a risk is

**Table 1**

*Iatrogenic injuries to the ureter: primary surgery, nature of injury and their management*

Primary disease	Primary surgery	Type of injury	Presentation/diagnosis	Definitive repair	Outcome
Rupture of gravid uterus	Caesarean hysterectomy	Transection	Intra-operative	Ureterocystostomy	Good
Tubo-ovarian complex	Salpingo-oophorectomy	Transection	Uretero-vaginal fistula	End-to-end anastomosis	Good
Uterine fibroid	TAH	Ligation	Loin pain, pyrexia	End-to-end anastomosis	*Good
Placenta praevia percreta	Caesarean hysterectomy	Ligation	Ureterovaginal fistula	Patient defaulted	-
Endometrial carcinoma	TAH+BSO	Transection	Intra-operative	Ureteroneocystostomy	Good
Uterine fibroid	TAH	Transection	Intra-operative	Ureteroneocystostomy	Good
Adnexal mass	TAH+BSO	Devitalisation	Uretero-vaginal fistula	Patient defaulted	-
Large ovarian cyst	Salpingo-oophorectomy	Ligation	Uretero-vaginal fistula	Ureteroneocystostomy	Good
Carcinoma of the cervix	Wertheim's hysterectomy	Transection	Intra-operative	Ureteroneocystostomy	Good
Uterine fibroid	TAH	Transection	Urinoma	Ureteroneocystostomy	**Fair
Carcinoma of the cervix	Wertheim's hysterectomy	Transection	Intra-operative	End-to-end anastomosis	Good
Uterine fibroid	TAH	Ligation	Uretero-vaginal fistula	Patient defaulted	-

TAH = Total abdominal hysterectomy

BSO = Bilateral salpingo-oophorectomy

\*Mild ureteric stenosis

\*\*Ureteric reflux

crucial in reducing the incidence of ureteral injuries.

Our results support the findings from other reports(7,8) that the type of injury to the ureters from pelvic procedure are mainly transection, followed by ligation. In the former, the diagnosis is usually obvious intra-operatively. However, ligations tend to be diagnosed postoperatively, when vaginal urinary fistula and loin pain associated with pyrexia may then occur(8). Although the diagnosis of ureteral injuries may be obvious intraoperatively, and postoperative presentation with loin pain, pyrexia, fistula or non-specific signs may occur, a significant number of injuries are asymptomatic(1). An early diagnosis is vital, urological investigations such as IVU should be considered in any patient who is not recovering as expected, so as to detect asymptomatic cases.

The management of ureteral injuries depends on their nature, extent, location, and time of discovery(9); consultation with a urologist is advisable. The management of ureteral trauma is positively influenced by an early recognition of the trauma. Ureteroneocystostomy with anti-reflux tunneling technique or end-to-end anastomosis with ureteral stent to treat the injury proved successful in all our cases. Attempt at ureteric catheterization in cases presenting with ureteric obstruction postoperatively has been carried out with success(10); catheterized failures could then be managed with ureterolysis and re-implantation. Catheterization has also been used for small ureteric fistula(10). This was not employed in any of our cases as the fistulae were large, requiring re-implantation.

The timing of ureteric reconstruction is vital to success. In our series, injuries recognised intraoperatively were repaired during the same operation. Delayed recognised injuries were repaired soon after diagnosis of the problem, with good results. The results following intra-operative repair during the offending surgery is usually good. For those diagnosed postoperatively, management with immediate repair as soon as diagnosis was made has been carried out with success(11). This shortens the length of hospital stay for the patients and alleviates much of the morbidity endured. Therefore the old dictum of waiting three to six months to allow oedema to subside, tissue planes to be re-established and the fistula to become smaller, before repair is attempted, should be reviewed.

The prevention of urological trauma during pelvic operations is of utmost importance. Unfortunately perioperative studies neither predict injury nor prevent missed injuries(12). In one study a total of 10 pre-and intraoperative studies were performed in patients with ureteral injuries, only two demonstrated the injury(12). Thus direct visualization of the injury remains the best and most accurate diagnostic modality in ureteral trauma.

There were no mortalities in our study group, nor did any patient require a nephrectomy. The course was marked by the development of ureteric stenosis (one case), vesico-ureteric reflux (one case). Those diagnosed at the time of injury and treated with end-to-end anastomosis had the least hospital stay (mean: 15 days; range: 15-16 days). Delayed diagnosis and treatment were associated with longer stay (mean: 19 days; range: 17-20 days). All patients recovered normal renal function after repair, using clinical and laboratory criteria. Repair of ureteric injury as soon as the patient is fit for surgery is recommended.

In conclusion, ureteric trauma still complicates pelvic surgeries. Early recognition and prompt repair of ureteric injuries is the key to a successful outcome. Treatment of these injuries by experienced team may minimise long-term consequences.

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