

# Latrogenic Injuries of Renal Pelvis and Ureter Following Open Surgery for Urolithiasis

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## Abstract

**Objective:** To study the types of injuries of renal pelvis and ureter following open surgical procedures for urolithiasis and predisposing factors leading to such injuries and discuss various options for the management of iatrogenic injuries of the renal pelvis and ureter.

**Patients and Method:** Case files and available radiographs of the patients who were managed for ureteral and renal pelvic injuries were reviewed. Initial procedure, mode of injury and clinical course were noted.

**Results:** The study consisted of 13 patients (9 males and 4 females). Age of the patients ranged from 18 to 65 years. Eight patients had injuries of renal pelvis or ureteropelvic junction and 5 patients got ureteral injuries. Primary management of ureteral and renal pelvic injuries was successful in 9 patients. Four patients required further surgery. Three out of 4 patients underwent nephrectomy and in 1 patient renal function deteriorated despite secondary pyeloplasty. Among 3 patients who had nephrectomy, one died postoperatively due to sepsis and haemorrhage.

**Conclusion:** Injuries of the renal pelvis and ureter have significant morbidity and even mortality. Peroperative recognition of these injuries and appropriate management can prevent the late sequelae of these injuries such as stricture formation leading to progressive renal damage (JPMA 51 :282;2001).

## Introduction

Iatrogenic injuries of renal pelvis and ureter are not uncommon after open surgery on kidney and ureter. Though ureteral injuries are often attributed to gynaecological, colorectal and laparoscopic procedures<sup>1-5</sup>, urologists are also responsible for such type of injuries. Strictures of the ureteropelvic junction (UPJ) are common after pyelolithotomy and pyeloplasty<sup>6</sup>. We report 13 cases of renal pelvic and ureteral injuries following open surgery for urolithiasis, which were managed at our department during last 12 years.

## Material and Methods

Case files and available radiographs of 13 patients who were managed for ureteral and renal pelvic injuries were reviewed. Initial procedure, mode of injury and clinical course were noted. Out of these 13 patients, 3 were initially operated at some other centers and were referred to our department while in 10 patients, initial procedure was done in our department.

## Results

Among the 13 patients there were 9 males and 4 females. Age of the patients ranged from 18 to 65 years. In 8 patients pyelolithotomy was responsible for renal pelvis or ureteropelvic junction (UPJ) injury. In 5 patients with ureteral injuries there was a history of ureterolithotomy in 4 patients and 1 patient had transection of ureter while mobilizing the lower pole of kidney during pyelolithotomy. Six patients presented with external urinary fistula, 2 had persistent flank pain following surgery, one had symptoms of uraemia because of obstructive uropathy and one developed frank haematuria

postoperatively which was severe enough to end up with nephrectomy. Three patients had an uneventful recovery after the repair of injury. Duration of symptoms was from immediate postoperative period to 7 months.

Avulsion of the renal pelvis or UPJ occurred during pyelolithotomy in 7 patients, which was repaired peroperatively. Repair was successful in 3 cases and 4 patients needed further surgery. Three out of these 4 ultimately had nephrectomy. One patient who had undergone pyeloplasty, the renal function gradually deteriorated and dialysis was required.

One patient had transection of ureter which was recognized during operation and successfully repaired by end to end anastomosis over a splint. In 5 subjects no recognizable injury was noted per-operatively. All these 5 presented with external urinary fistula. Residual calculus was excluded by doing plain X-ray abdomen (KUB). Out of these 5 case 2 were managed by double J stenting and one required percutaneous nephrostomy (PCN). Fistula healed 3 weeks after PCN. In 2 patients open surgery was performed. Excision of damaged ureteral segment and end to end anastomosis with omental wrap was done in one individual and the other had re-implantation of ureter into bladder with psoas hitch.

Overall primary management for ureteral and renal pelvic injuries was successful in 9 out of 13 patients. Four patients needed further surgery. Three of them underwent nephrectomy and in one patient renal function deteriorated despite secondary pyeloplasty. Among 3 patients who had nephrectomy one died postoperatively due to sepsis and haemorrhage. Summary of results is presented in the table.

**Table. Summary of the Results.**

Pt No	Age/ Yrs	Sex	Procedure done	Complication	Presentation	Primary Management	Outcome	Secondary Management	Outcome
1.	65	M	R) Extended Pyelolithotomy	Transection of ureter -	Recognized per operatively	End to end anastomosis	Success	-	-
2.	35	M	L) Lumbotomy	Damage to ureteral blood supply?	External urinary fistula	Excision & end to end anastomosis of urete	Success	-	-
3.	20	M	R) Extended preolithotomy	Avulsion of renal pelvis	Recognised per operatively	Repair + Nephrostomy	Stricture at PUJ	Pyeloplasty	Kidney function deteriorated patient went on dialysis
4.	18	M	L) Ureterolithotomy	Damage to ureteral blood supply?	External urinary fistula	Re-implantation by psoas hitch	Success	-	-
5.	48	M	R) Ureterolithotomy	Damage to ureteral blood supply?	External urinary fistula	PCN, tube clamped after 3 weeks	Success	-	-
6.	40	M	L) Extended pyelolithotomy	Avulsion of renal pelvis	Recognised per operatively	Repair	External urinary fistula	Uretero-calicosotomy	Severe haemorrhage post operatively Nephrectomy
7.	50	M	L) Extended pyelolithotomy	Damage to blood supply? Infection?	External urinary fistula	D.J. stenting	Success	-	-
8.	30	F	R) Pyelolithotomy	Avulsion of ureter at PUJ.	Recognised per operatively	Repair over splint	Stricture at PUJ	Uretero-calicostomy	Sepsis of kidney Nephrectomy
9.	45	F	L) Ureterolithotomy	Damage to blood supply?	External urinary fistula	D.J. stenting	Success	-	-
10.	55	M	L) Extended pyelolithotomy	Avulsion of renal pelvis	Recognised per operatively	Repair with flap renal capsule + Nephrostomy	Success	-	-
*11.	30	F	L) Pyelolithotomy	Avulsion of renal pelvis	Recognised per operatively	Repair over splint + Nephrostomy	Success	-	-
12.	45	F	R) Pyelolithotomy	Avulsion of ureter at PUJ	Recognised per operatively	Repair over splint	Success	-	-
13.	38	M	L) Extended Pyelolithotomy	Avulsion of renal pelvis	Recognised per operatively	Repair	Sepsis of kidney, severe haematuria	Nephrectomy	Patient died post operatively due to septicaemia

## Discussion

Various types of injuries can be caused to the renal pelvis and ureter during open surgery on kidney and ureter<sup>1,2</sup>. Common injuries are transection, avulsion, denuding of adventitia, ligation, perforation and crush injuries. Ligation and crush injuries are common in gynaecological operations while transection and avulsion follow open urological procedures. Perforation commonly occurs during endourological procedures e.g. ureteroscopy<sup>4,7</sup>.

Many factors are involved for iatrogenic injuries to ureter and renal pelvis. Size, degree of impaction of stone, duration of impaction, perirenal and periureteral adhesions, neighbouring inflammation and scarring due to previous surgery are contributing factors<sup>8</sup>. Location of pelvis is also an important factor as intrarenal pelvis are more prone to peroperative injuries. Extended dissection in renal sinus up to

calyceal necks as described by Gil Vernet in 1965<sup>9</sup> provides best access for stone in intrarenal pelvis and for staghorn calculi.

Poor surgical technique, excessive mobilization, rough dissection and denuding of subadventitial layer of ureter compromising the blood supply of the ureter, all contribute to fistula formation<sup>8</sup>. As extravasation of urine in perirenal and periureteral space leads to fibrosis<sup>10</sup>, so watertight closure of renal pelvis and ureter is necessary to avoid this complication. Damage during surgery can be minimized by meticulous surgical technique. Injury if occurs perioperatively should be recognised and repaired over a splint or stent. There should be adequate drainage of perirenal and periureteral space to avoid urinoma formation<sup>11</sup>, As infection is the single most important factor responsible for local destruction and systemic complications such as septicaemia, should be prevented by appropriate antibiotics.

Various procedures are available to deal with injuries of renal pelvis and ureter. The procedure should be chosen according to the situation. In our series 7 avulsion injuries of renal pelvis were repaired over a splint at the time of surgery. Repair was successful in 3 patients, 3 developed stricture at UPJ and needed further surgery. Pyeloplasty was done in 1 patient and ureterocalicostomy in two. One patient developed sepsis of kidney after primary repair of pelvis and got severe haematuria. Nephrectomy was done but patient died postoperatively due to septicaemia. Two ureterocalicostomies that were done for stricture at UPJ failed and nephrectomies were done because of haemorrhage and sepsis. In one series of 35 patients there is 8% incidence of nephrectomy<sup>12</sup>. Smith in 1988 reported 5 ureterocalicostomies for post pyelolithotomy stricture at UPJ, all were successful<sup>13</sup>. In another study McQuitty et al reported 100% success rate in lower pole ureterocalicostomy for the management of iatrogenic UPJ stricture<sup>14</sup>. Infection and compromise of blood supply may be the cause of failure in our series.

All five ureteral injuries in our series were managed successfully. Two required less invasive procedures (one had percutaneous nephrostomy and other Di stenting). The remaining 3 patients underwent surgical repair over a splint. Stenting or splintage of injured ureter, diversion of urine by nephrostomy, adequate drainage of periureteral area and prevention of infection with antibiotics are important factors for the healing of injury and prevent subsequent stricture formation.

Many procedures are available to the Urologist for the management of ureteral stricture<sup>4,15,16</sup>. Presently first endoscopic and percutaneous procedures are tried. In a large series of endoscopic balloon dilatation of ureteral stricture in 44 patients, the success rate was 48 per cent<sup>17</sup>. In review of literature by Kramolowsky and associates<sup>18</sup> it was noted that success rate varied widely with respect to various endourological techniques.

Definitive procedures available for upper ureteral and UPJ injuries are pyeloplasty; Davis intubated pyeloplasty and ureterocalicostomy<sup>13,14</sup>. Mid ureteral strictures can be excised and end to end anastomosis is performed after spatulation of both ends. It is possible to bridge a gap of 4-5 cm by mobilizing the ureteric ends<sup>8</sup>. For lower ureteral strictures reimplantation of ureter into bladder is the procedure of choice. Reimplantation with or without psoas hitch is successful in 90 per cent of cases<sup>13</sup>. Sometimes Boari flap is combined with psoas hitch if the gap between ureteral end and bladder is large. Alternatively gap can be reduced by bladder elongation techniques<sup>11,19</sup>. Rarely miscellaneous procedures like renal autotransplantation, ileal substitution of ureter and nephrectomy has to be considered in special situations<sup>11</sup>.

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