

Iatrogenic Ureteral Injuries in Non – Urological Surgeries: An Institutional Experience

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Abstract: Ureteral injuries during surgeries cause significant postoperative morbidity particularly pelvic and abdominal surgical procedures with challenging complications and interventions. The study was done with the intent to analyse the demographic profile, causes of iatrogenic ureteric injuries, various clinical presentation, identification, diagnosis, and management of iatrogenic ureteric injuries in various non urological surgical procedures. We prospectively analysed 24 consecutive adult patients, who were operated in the various department of our hospital and had iatrogenic ureteric injuries which were identified during intra-operative or post operative period. Our study showed the injuries were predominantly due to gynaecological surgery(75%), of which abdominal hysterectomy was the major contributor(53%). Also timing of identification of injury was also predominantly postoperative period. Lower ureter was the most common site, and partial injury(45.8%) was the predominant type. Endoscopic management was much helpful in the injuries identified in postoperative period.

Keywords: Ureteral injuries, non urological surgeries, management of ureteral injuries

I. Introduction

Iatrogenic injury to the ureter is an inherent risk of any pelvic or abdominal surgery. Such an injury may cause serious morbidity that result in increased hospital stay, compromise of the original surgical outcome, secondary invasive interventions, reoperation, potential loss of renal function and significant deterioration of patient quality of life. Injuries include ligation, kinking by ligature, division, partial and complete laceration, crushing and devascularization, which are secondary to gynecologic, urologic, general surgical and vascular procedures. Advent of laparoscopy and ureteroscopy in the mid-1980s, the incidence, cause and management of ureteric injuries have undergone significant changes [1]. Careful perioperative consideration, and attention to anatomic detail and anomalies of the urinary tract, can prevent many injuries. Surgical injury to the urinary tract is most frequently reported as an obstetric complication or occurs after abdominal or vaginal hysterectomy for benign disease, radical hysterectomy for cervical malignancy, oophorectomy, bladder neck suspension or laparoscopy [2]. Ureteral injury is a potential complication of any abdominal or pelvic operation with an incidence of 0.5 to 1%. When unrecognized, these injuries may cause sepsis and lead to loss of renal function. Gynecological surgery has traditionally accounted for more than 50% of all injuries, while general operations have been responsible for 5 to 15%. The rate of clinically apparent ureteral injuries ranges from 0.2% to 2.5% for routine gynecologic pelvic operation and 10% to 30% for radical procedures for malignant conditions [3].

During open pelvic operations, difficulty achieving hemostasis or attempted hemostasis without prior identification of the ureters is the most common precipitating factor [2]. Often, iatrogenic ureteric injuries are a consequence of nonurologic procedures, usually occurring during gynecologic or general surgery. However, with the introduction of laparoscopy and ureteroscopy the pattern of these injuries has changed [1]. Most ureteral injuries are not noticed intraoperatively (“acutely diagnosed”) but are diagnosed later. Injuries recognized intraoperatively must be treated immediately [2].

II. Materials and Methods

We prospectively analysed 24 consecutive adult patients, who were operated in our hospital and had iatrogenic ureteric injuries which were identified during intra-operative or post operative period in Government Stanley Medical College and Hospital, Chennai. Our study duration was for 30 months from August 2012 to January 2015. The cases in our study were identified intra operatively or in the post operative period by the treating surgical team from various departments including general surgeons, surgical gastroenterologists, gynecological colleagues, oncological and vascular surgeons. The procedure causing the injuries, timing and method of diagnosis, type of repair and outcome were determined. For the purpose of our study a ureteral injury was defined as any laceration, transection or ligation identified during an open operation that required an unplanned repair or stent drainage. Patients with unrecognized injuries who had either postoperative hydronephrosis sufficient to require further intervention or extravasation of contrast medium identified

on imaging studies were included. All ureteric injuries were managed by hospital urological team and the iatrogenic ureteric injuries were treated as per the standard surgical protocol management.

2.1 Inclusion Criteria

1. All patients with diagnosis of iatrogenic ureteric injuries in non urological surgeries from various surgical procedures performed by general surgeons, surgical gastroenterologists, gynecological surgeons, oncological surgeons and vascular surgeons in our hospital.

2.2 Exclusion Criteria:

1. All patients with traumatic ureteric injuries and due to urological surgeries.
2. Patients who were operated outside and presented to our hospital with iatrogenic ureteric injuries were excluded.
3. Patients who needed ureteric resections as planned part of the surgical procedure were excluded.
4. Paediatric ureteric injuries were not included.

III. Results

In our study period from August 2012 to January 2015, we studied 24 patients who had iatrogenic ureteric injuries in our hospital. The gender ratio was 3.8:1. (Female :Male). Analysing in respect to the age distribution in our study, we found there was a higher incidence of iatrogenic ureteral injury in the age group between 51-60 years of age irrespective of gender, followed by 31-40 years of age.

The majority of ureteric injuries were found in gynecological surgeries 18 cases (75%), followed by colorectal surgeries 4 cases (16.6%) and retro peritoneal tumour resection 2 cases (8.3%). Among the gynecological surgeries, open abdominal hysterectomy (AH) was more common (53%). Other gynecological surgeries which led to ureteric injuries were laparoscopy assisted vaginal hysterectomy and caesarian section, oophorectomy, also pelvic floor surgeries. (TABLE.1). 4 cases in the colorectal surgeries included were right hemicolectomy, left hemicolectomy, anterior resection and abdominoperineal resection one in each.

6 cases (25%) of ureteric injuries were found intra-operatively and they were managed at the same setting. A total of 18 injuries (75%) were detected post operatively, at mean period of 8.2 days after the surgical procedure. Of the 18 cases which were diagnosed postoperatively, 3 cases were diagnosed in the early post-operative period (<48hrs) and 15 cases were diagnose after 48 hours (between3-28 days).

Table 1 – Cause for ureteric injuries and time of detection

S. No.	Type of surgery causing ureteral injury	Intra operative detection	Post operative detection		Total frequency	%
			Early <48hrs	Late >48hrs		
1	Gynaecological surgeries	1	3	14	18	75%
	Abdominal hysterectomy (AH)	1	2	8	11	61%
	Lap assisted vaginal hysterectomy(LAVH)	-	-	2	2	11.1%
	Lower segmental Cesarean section (LSCS)	-		1	1	5.5%
	Other pelvic surgeries like oophorectomy, pelvic floor repairs etc.	-	1	3	4	36.3%
2	Colorectal surgeries	3		1	4	16.6%
3	Retro peritoneal tumor resection	2			2	8.3%
	Total	6	3	15	24	100%

The injuries on the left side ureter were more common (62.5%) than right side ureter (37.5%). The site of ureteric injuries viz., upper, middle and lower thirds of the ureter, were 2 (8%), 3(13%), 19 (79%) cases respectively.

Post operative clinical presentation of ureteric injury in 18 cases, included flank pain in 10 cases (41.6%), genito urinary fistula with vaginal discharge in 7 cases (29%), fever in 6 cases (25%) and hematuria in 2 cases (8.3%). Injuries were evaluated with various imaging techniques and diagnosed with ureteric obstruction in 16 cases (66.6%) and urinoma /leak in 7 cases (29%). (TABLE.2)

Table 2 – Clinical presentation of ureteric injuries

Sl.No.	Clinical presentations	Frequency	Percentage
1.	Flank pain	10	41.60%
2.	Genito urinary fistula	7	29.10%
3.	Ureteric obstruction	16	66.60%
4.	Urinoma	7	29.10%
5.	Hematuria	2	8.30%
6.	Fever	6	25%

The type of ureteric injures in our study, irrespective whether diagnosed intra operatively or post operatively, mostly was partial ureteric injury like laceration in 11 cases (45.8%), while complete transection of ureter was found in 4 cases (17%). Other injuries like ligation of part of wall of ureter or whole lumen with ligatures were found in 5 cases (20.8%), devascularization with segmental ureteric loss in 2 cases (8.3%), and electro coagulation injury were found in 2 cases (8.3%). (TABLE.3)

Table 3 – Type of ureteric injuries

Sl.No.	Ureteral Injury	Intraoperative	Post operative	Total	Percen-tage
1.	Transection	4	0	4	17%
2.	Partial injury	0	11	11	45.80%
3.	Ligation	2	3	5	20.80%
4.	Devascularisation	0	2	2	8.30%
5.	Electro coagulation	0	2	2	8.30%
	Total	6	18	24	100%

Out of the 24 patients, 11(45.8%) were managed endoscopically by DJ stenting post operatively and the other 13 cases were intervened with open surgery both in the intra operative and the post operative period. The surgical procedures performed other than the endoscopic procedure were uretero-ureterostomy in 4 ureteric injuries (16.6%), and Boari flap procedure in 3 ureteric injuries (12.5%), and uretero-neocystostomy in 6 cases (25%). Intraoperatively, 4 cases were managed with uretero ureterostomy and 2 cases needed ureteric reimplantation (uretero neocystostomy). (TABLE 4).Out of 24 cases, 16 cases were followed up for one year duration. 1 case which was treated with endoscopic intervention earlier was diagnosed with ureteric stricture at 6 months post operatively with complaints of loin pain, and it was managed with ureteric reimplantation at later date. Another injury with lower ureteric stricture which was managed with endoscopic intervention, diagnosed with stricture ureter and it was managed with endoscopic dilatation.

Table 4 – Surgical management of ureteric injuries

Sl. No	Surgical intervention done	Intraoperative period	Post operative period	Total	Percen- tage
1.	Ureteroneocystostomy	2	4	6	25%
2.	Endoscopy DJ stenting	0	11	11	45.80%
3.	Boari flap	0	3	3	12.50%
4.	Uretero ureteric anastomosis	4	0	4	16.60%
	Total	6	18	24	100%

IV. Discussion

Iatrogenic ureteral injuries are a potential complication of any open or endoscopic abdominal or pelvic operation. Traditionally, gynecological procedures have accounted for greater than 50% of all iatrogenic ureteral injuries [4-10]. The ureter is injured during approximately 2.2% of all hysterectomies and routine gynecological pelvic operations [11-13]. In our series abdominal hysterectomy (75%) accounted for the majority of gynecological injuries. Other gynecological procedures causing ureteral injury include ovarian and pelvic mass resection, vaginal hysterectomy, laparoscopic surgery, bladder neck suspension and cesarean section [12,15,16]. The various reason interpreting the ureteric injuries in gynecological surgeries could have been due to lack of expertise by gynecological oncologists in managing the gynecological malignant neoplasms and also due to the difficult anatomical approach in the narrow pelvis.⁴ General and vascular surgery have accounted for 5 to 15% of all ureteral injuries in the literature [4, 12, 13]. In our series colorectal surgery (16.6%) accounted for the majority of general surgical injuries, most of which are transections and are identified during the initial procedure. Recognition and repair at the time of injury allow for better results with fewer complications [15,

17]. In our series the majority of injuries were detected postoperatively (gynecological in 17 cases and general surgery in 1 cases). Patients with injuries detected post-operatively had more complications than those with injuries detected and repaired at occurrence, which is consistent with findings in the literature. With technological advancement, endoscopic management has an important role [4]. Endoscopic intervention was successful in about 45.8% of cases in our study. Thus confirming the literature. Better outcomes are achieved when injuries are detected and treated at the original operation. Overall morbidity and mortality due to iatrogenic injuries have come down when compared with the past [4-6]. None of our patients required nephrectomy and there was no mortality among our patients. The complication in the post-operative period was ureteric stricture in 1 case which was managed with ureteric re-implantation and one another case requiring endoscopic dilatation.

Not included in our case series, during the study period, we had performed pre-operative ureteric stenting in 27 cases, which were done in cases with relatively high chances of ureteric injuries identified by pre-operative imaging and as per the decision by the treating surgeon, and we had not noticed any ureteric injuries in those 27 cases. Although those cases were not part of our study series and was out of scope of our objective of the study, we had though observed those, revealing there is a trend towards the decreased chances of ureteric injuries with preoperative ureteric stenting in high risk cases.

Table 5: Comparison of our study with other studies in the literature.

Name of study	Selzman et al	Parpalaspama et al	Berkmen F et al	KarmounTetal	Dowling RA	Present study
No.of Patients	165	72	29	30	27	24
Study period	20 Yrs	7 Yrs	7 Yrs	10Yrs	6Yrs	2½ Yrs
Male/Female		17%<83%				21%<79%
Mean age	55	52				
Non urological injury	58%					
Gynaecological surgery		64%	14%		52%	75%
Other surgeries		25%	83%			25%
Urological surgeries			3%			
Intra op/Post op detection	33%<67%	21%<79%	9.6%		15%<85%	25%<75%
Mean diagnostic delay		6 days	22days	13days		8days
Clinical Presentation						
Flank Pain	48%					41%
Stricture	37%					0%
Fistula	31%					29%
Ureteric Obstruction	--					66%
Urinoma	--					29%
Uremia	21%					0%
Hematuria	--					8.3%
Fever	--					25%
Site U/M/L	2%,7%,91%	--, --,89%	30%,19%, 51%			8%,13%, 79%
Type of Injury						
Transection			61%			17%
Laceration			3%			46%
Ligation			7%			21%
Devascularisation			29%			8.3%
Electrocoagulation						8.3%
Intervention Endourological (DJ stenting)	42%	60%		76%		46%
Open surgeries	58%	40%	100%	23%		54%

V. Conclusion

In our study group, we have observed gynecological injuries as the most common cause of iatrogenic ureteric injuries in non urological surgeries, although it was observed in other cases also. The most common location being lower ureter and three-fourth of the injuries were identified postoperatively. The management depends on site of the injury, nature of the injury, and time of identification of injury. Endoscopic intervention is effective management in the indicated ureteric injuries with good functional outcome nevertheless open surgeries are needed in many of the injuries. Better understanding of the pelvic anatomy, meticulous dissection, timely detection of ureteric injury, expertise availability and seek of their help, early recognition will help in better management of the ureteric injuries.

Reference

- [1] Assimos D, Patterson L, Taylor C. Changing incidence and etiology of iatrogenic ureteral injuries. *J Urol* 1994;152:2240-6.
- [2] Gill H, Broderick G. Urological complications of gynecological surgery. *American Urologists Association Update Series* 1994;13:lesson 32.
- [3] Neuman M, Eidelman A, Langer R, Golan A, Bukovsky I, Caspi E. Iatrogenic injuries to the ureter during gynecologic and obstetrical operations. *Surg Gynecol Obstet* 1991;173:268-71.
- [4] Iatrogenic ureteral injuries: a 20 year experience in treating 165 injuries. Selzman AA, Spirnak JP. *J Urol* 1996; 155:878–81
- [5] Higgins, C. C.: Ureteral injuries during surgery. A review of 87 cases. *J.A.M.A.*, 199: 82, 1967.
- [6] Smith, A. M.: Injuries of the pelvic ureter. *Surg., Gynec. & Obst.*, 140 761, 1975.
- [7] Gangai, M. P., Agee, R. E. and Spence, C. R.: Surgical injury to ureter. *Urology*, 8: 22, 1976.
- [8] Bright, T. C., III and Peters, P. C.: Ureteral injuries secondary to operative procedures: report of 24 cases. *J.Urology*, 9 22, 1977.
- [9] O'Brien, W. M., Mated, W. C. and Pahira, J. J.: Ureteral stricture: experience with 31 cases. *J. Urol.*, 140 737, 1988.
- [10] Neuman, M., Eidelman, A., Langer, R., Golan, A., Bukovsky, I. and Caspi, E.: Iatrogenic injuries to the ureter during gynecologic and obstetric operations. *Surg., Gynec. & Obst.*, 173: 268, 1991.
- [11] Zinman, L. M., Libertino, J. A. and Roth, R. A.: Management of operative ureteral injury. *J.Urology*, 12: 290, 1978.
- [12] Corriere, J. N., Jr.: Ureteral injuries. In: *Adult and Pediatric Urology*, 2nd ed. Edited by J. Y. Gillenwater, J. T. Grayhack, S. St. Lezin, M. A. and Stoller, M. L.: Surgical ureteral injuries. *Urology*, 38: 497, 1991.
- [14] Dowling, R. A., Corriere, J. N., Jr. and Sandler, C. M.: Iatrogenic ureteral injury. *J. Urol.*, 135: 912, 1986.
- [15] Eisenkop, S. M., Richman, R., Platt, L. D. and Paul, R. H.: Urinary tract injury during cesarean section. *Surg Gynecol Obstet* 60:591, 1982.
- [16] Grainger, D. A., Soderstrom, R. M., Schiff, S. F., Glickman, M. G., DeCherney, A. H. and Diamond, M. P.: Ureteral injuries at laparoscopy: insights into diagnosis, management, and prevention. *Surg Gynecol Obstet* 75 839, 1990.
- [17] Hoch, W. H., Kursh, E. D. and Persky, L.: Early, aggressive management of intraoperative ureteral injuries. *J. Urol.*, 114 530, 1975.