Non Urological Iatrogenic Ureteric Injuries: Management and Outcome

Muhammad Mansoor [1*]

ABSTRACT

Objective *To analyze presentation and outcome of the management of iatrogenic ureteric injuries caused by different non-urological procedures.*

Study design *Descriptive case series.*

Place & Duration of study *Department of Urology, Jinnah Postgraduate Medical Centre (JPMC) Karachi, from January 2013 to December 2019.*

Methodology *All cases of ureteric injuries referred to urology section from other departments of the hospital were included. All pertinent details for diagnosis, operative procedures and postoperative complications were recorded. A regular follow up was done of all patients. Descriptive statistics were used to present data.*

Results *A total of 48 iatrogenic ureteric injuries in 45 patients were managed during the study period. Mean age of the patients was 34.55±8.74 year. There were 40 females (88.9%) and 05 males (11.1%). Out of the total ureteric injuries, 28 (58.3%) were on left side, 20 (41.7%) on right side inclusive of three bilateral trauma. Distal ureteric injuries were most commonly encountered (n=43 - 89.5%), followed by mid-ureteric (n=3 - 6.2%) and 2 (4.2%) in proximal ureter.*

Gynecological and obstetrical procedures resulted in most of the injuries (n=36 - 80.0%), followed by general surgical procedures (n=9 - 20.0%). Abdominal hysterectomy was the most common gynecological procedure where ureter was injured while laparoscopic colectomy was the most common general surgical procedure resulting in similar trauma. Majority (71.1%) of the patients were diagnosed in early postoperative period. Percutaneous nephrostomy was the most common (44.31%) palliative operative procedure performed. Uretero-neocystostomy was the most common definitive operative procedure performed in 22 (48.8%) patients. Nephrectomy was necessary in 8.8% of patients. The success rate was 91.1%.

Conclusion *Total abdominal hysterectomy was the most common surgical procedure resulting in ureteric injury. During the operation good surgical technique with identification of course of the ureter is important step to decrease the risk of injury.*

Key words *Iatrogenic, Non-urological, Ureteric injuries, Abdominal hysterectomy.*

[1] Department of Urology JPMC, Karachi

Correspondence:
Dr. Muhammad Mansoor [1*]
Department of Urology
Jinnah Postgraduate Medical Centre
Karachi
E mail: mansuryaqub@hotmail.com

INTRODUCTION:

Iatrogenic ureteric injury is defined as any inadvertent injury to the ureter during any surgical procedure in or around the ureter which necessitates an additional period of observation or intervention either endoscopic or open surgery.[1] Ureter may be injured during any difficult abdomino-pelvic surgical procedure which may be gynecological, obstetrical, urological or general surgical. Gynecological

surgeries especially hysterectomies, are still the most common causes of iatrogenic ureteric injury. The close proximity of the ureter to the uterus and cervix increase the chances of injury specially if the uterus is enlarged or the dissection is difficult due to malignancy and adhesions.[2] The incidence of ureteric trauma during gynecological surgeries ranges from 0.1% to 1.5% for benign cases and < 5% for oncological procedures.[3] Recent trends of minimal invasive gynecological surgeries had shifted the predominant cause of iatrogenic ureteric injuries from urology to gynecological surgeries.[4] Laparoscopic gynecological surgery is now responsible for the highest rate of ureteric injuries (64%) compared with 26% for general surgery and 10% for urological procedures.[5]

Literature suggests that prognosis is better when injury is detected intraoperatively and immediate repair is performed.[6] The method of repair depends upon the level of injury and length of normal proximal ureter. Injuries of proximal third ureter are repaired usually by end to end ureteric anastomosis, while middle third injuries are preferably repaired by either end to end anastomosis or a Boari's flap with ureteric re-implantation. The injuries to distal third are usually repaired with uretero-neocystostomy with psoas hitch.[7]

The purpose of this study was to present our experience in the management of iatrogenic ureter injuries caused by non-urological procedures mainly from gynecological and general surgical departments, its various clinical presentation, timing of presentation, type of injury, site of ureteric injury and methods of repair, its success rate and overall outcome.

METHODOLOGY:

This was a retrospective descriptive case series conducted in the Urology Department of Jinnah Postgraduate Medical Centre Karachi. Records of all patients with ureteric injuries managed between January 2013 to December 2019, with minimum follow up of one year were analyzed.

The data of 45 patients with 48 iatrogenic ureteric injuries including three bilateral ureteric ligation were reviewed. All patients of ureteric injuries were referred from the different departments including gynecology & obstetrics and general surgery. Injuries caused by urological procedures were excluded from this study. The recognition time of injury was arbitrarily divided into intraoperative, early and late.[1] An intraoperative recognition was defined as injury noticed during surgery, while an early recognition was labeled when diagnosed during initial postoperative hospital stay within a week and manifested as increased urinary drain output, prolonged ileus, urinoma etc. This was diagnosed on the basis of clinical presentation and confirmed by ultrasonography, intravenous urography or CT-urogram. Late presentation was defined as patients coming after months to year and present as having hydronephrosis, ureteric stricture formation and non-functional kidney.

Pertinent details like indication for surgery, type of surgery, location of injury, laterality, method of repair, time of recognition of injury, surgery performed and its outcome were recorded. A repair was defined successful when there was no anastomosis related complications noted with preservation of ipsilateral renal function. Follow up was made in the outpatient department with ultrasound KUB done at two month interval. If there was any finding of hydronephrosis, then intravenous urography (IVU) or CT urogram were advised. The statistical analysis was done using Statistical Package for the Social Sciences (SPSS, Version 20.0). For categorical variables, frequency (percentage) was used, and for continuous variables mean + SD calculated.

RESULTS:

There were 48 iatrogenic ureteric injuries in 45 patients. This included 40 females (88.9%) and 05 males (11.1%). The mean age of the patients was 34.55+ 8.74 (from 26 year – 70 year) year. Of the total injuries, 28 (58.3%) were on left side and 20 (41.7%) on right side. This included three bilateral injuries. Two (4.2%) injuries were in proximal ureter, 3 (6.2%) in mid ureter and 43 (89.6%) in distal ureter.

The causes of ureteric injuries according to specialty are mentioned in table I. Gynecological and obstetrical cases accounted for majority of cases (n=36 - 80.0%), followed by general surgical procedures (n=9 - 20.0%). Abdominal hysterectomy was the most common surgical procedure resulting in ureteric injury, while laparoscopic colectomy was the most common general surgical procedure. The types of various ureteric injuries are given in table II.

Regarding time of clinical presentations, only 11 patients (24.4%) were diagnosed during surgery. Of these nine were from gynecological department, while two from general surgical department. They were mostly managed with uretero-ureterostomy and ureteric re-implantation either directly or with Boari's flap and DJ stenting with good result. Thirty-two (71.1%) patients were identified in early postoperative period (1 day -7 days with the average of 3 days). Out of all early presenters, 25 were

Table I: Causes of Non Urological Iatrogenic Ureteric Injuries (n=45)

Surgical Procedures	Number	Percentage (%)
Gynecology and Obstetrics	**36**	**80.0%**
Abdominal Hysterectomy	23	
Ovarian Cystectomy	05	
Cesarean Section	08	
General Surgery	**09**	**20.0%**
Colectomy	05	
- Open	02	
- Laparoscopic	03	
Retroperitoneal Tumor	02	
Laparoscopic Sigmoid Mesh Fixation	01	
Colostomy Closure	01	
Total	45	

gynecological cases, and seven general surgery patients. Their usual mode of presentations were no urine output in urine bag in bilateral ureteric involvement, increased urinary output from abdominal drain, abdominal urine collection (urinoma) that presented as tender swelling and continuous urinary discharge from vagina (uretero-vaginal fistula). Out of 25 gynecological patients three were anuric because of bilateral ureteric ligation, 16 presented with increased urinary output from the drain (urinoma) while remaining 6 presented as uretero-vaginal fistulae.

These patients were managed with percutaneous nephrostomy as proximal diversion to salvage kidney, minimize urine leakage and promote healing if it was a small injury. After 2-weeks interval endo-evaluation was performed with ante and retro-grade ureterogram to assess the exact site and size of ureteric injury and a gentle attempt of ureteroscopy and DJ stenting was also made. This was successful in five patients. A second delayed attempt of ureteroscopy and DJ stenting was tried after two months which was successful in another six patients. Remaining patients needed definite open operative treatment (delayed uretero-ureterostomy in four patients and ureteric re-implantation in 18 patients with or without Boari's flap). Six of these patients had uretero-vaginal fistula. Late presentation was observed in 2 (4.4%) patients who presented after one year of hysterectomy as unilateral asymptomatic massive hydronephrosis and non- functioning kidney. These were the missed injuries and needed nephrectomies. The details of operative procedures are shown in table III.

In nine general surgery patients ureteric injury occurred. Left sided colectomy was the most common cause of ureteric injury noted in five patients (two were open while three due to laparoscopy). Two patients underwent excision of large retroperitoneal tumors of whom one was diagnosed as chordoma where the big segment of ureter was excised inadvertently, resulting in loss of proximal segment of ureter. They were managed with open nephrostomy with ureteric ligation. One of these patients died due to early surgical complication not related to renal issue, while second needed nephrectomy after two weeks. One more case with prolapsed rectum was managed with laparoscopic sigmoid sacropexy using prolene mesh resulting in left ureteric ligation, ultimately needed ureteric implantation. Another patient underwent Hartmann's procedure due to diverticulosis with end-colostomy one year back. He sustained ureteric injury during reversal of colostomy resulting in urinoma formation. He was managed with percutaneous nephrostomy. DJ stenting was attempted but not successful. Later open uretero-ureterostomy was performed after six months with smooth recovery and preservation of ipsilateral renal unit. Total of four (8.8%) nephrectomies were performed, in one because of large retroperitoneal tumor, second due to leakage of an emergency uretero-ureterostomy, two due to severe hydronephrosis and non-functioning kidney. The success rate was 91.1%.

DISCUSSION:

The overall incidence of iatrogenic ureteric injury is 0.3-1.5 % and more than half is attributed to gynecological procedures.[8,9] Nine percent of all ureteric injuries occur during colorectal resection especially during operation on rectal cancer cases.[10]

Table II: Types of Ureteric Injuries (n=48)		
Types of Ureteric Injury	**Number**	**Percentage (%)**
Ureteric Transections	27	35.41%
Ureteric Ligations	13	16.66%
Loss of Ureteric Segment	02	4.16%
Uretero-vaginal fistula	06	12.50%
Total	48	100%

Table III: Operative Procedures Performed (n=88)		
Treatment	**Number**	**Percentage (%)**
Immediate(intraoperative) ureteric repair with Double J stent (End to end anastomosis)	08	9.09%
Percutaneous nephrostomy/ Open nephrostomy	39	44.31%
Early ureteroscopy with DJ stenting	05	05.68%
Delayed ureteric repair (End to end anastomosis)	04	04.54%
Ureteric re-implantation with psoas hitch	15	17.04%
Ureteric reimplantation with Boari's flap	07	07.95%
Delayed ureteroscopy with DJ stent	06	06.81%
Nephrectomy	04	8.8%
Total	88	100%

In developing countries, open gynecological and obstetrics surgical induced iatrogenic ureteric injuries account for 50-70% of the cases.[11] However, in developed countries due to reduction in number open gynecological procedures in last two decades a marked increase in iatrogenic ureteric injuries are reported due to laparoscopic procedures.[12]

In our study, female were affected much more than males due to gynecological and obstetric procedures. The similar results were reported in other studies with female preponderance.[1,11] This is opposite in urological injuries where male patients are affected more frequently.[13] The mean age of the patients in our study was 34.55 + 8.74 year, which is similar to other studies. This indicates that majority of female patients are affected in the middle of their reproductive age.

In our study 80% of the patients had gynecological procedures of which open total abdominal hysterectomy (TAH) accounted for 51.1% of all cases. Chianakwana GU et al in his review of urological injuries also mentioned TAH representing 87.5% of all causes of iatrogenic ureteric injuries.[14] In studies from sub-saharan Africa, cesarean section was reported as the most common cause for ureteric injuries surpassing hysterectomies.[15] Transection of ureter was the most common type of injury in 35.4% followed by ligation (16.6%) in our study. Oboro et al also reported the similar results though ureteral ligation is most common injury in many studies.[16] In laparoscopic gynecological surgeries a different pattern is observed where complete transaction is the commonest injury noted in 61% of patients.[17]

Regarding location the literature showed that the lower one third of ureter is the most common site of injury. Our study also showed a similar pattern with 89.6% patients sustained injury at distal ureter. A study by Hasanali reported 79.0% injuries in distal ureter.[18] Al-Awaidi K et al also mentioned 64.6% injuries of distal ureter.[19] This is because of the close relation of ureter to uterine vessels and located just 12mm away from vagina at the base of cardinal ligaments which is the most common site of injury.[20] Left ureter is closer to the cervix than right one and most of the general surgical procedures in our study were left sided like left hemi-colectomy, sigmoid diverticulosis and mesh placement in prolapsed rectum resulting in frequent left ureteric injuries as reported in other studies.[20]

The rate of intraoperative diagnosis is best in endo-urological procedures (62.5%) followed by open

procedures (43.5%) but minimal in laparoscopic procedures (12.5%).[21] This can be explained by lack of haptic feedback in laparoscopy along with the fact that thermal injury during laparoscopic diathermy takes few days to manifest clinically. In non-urological ureteric injuries only one third of ureteric injuries were diagnosed intraoperatively and 50-70% injuries were discovered late.[22] Controversy exists in the management of these patients. Some urologists recommend immediate repair while others advise a delayed repair in patients with sepsis, extensive hematoma etc.[23] They need a period of upper tract drainage either by internal drainage (double J stent) or external drainage (percutaneous nephrostomy) prior to definite surgery. Nephrostomy worked by redirection of urine flow, and in combination with double J stent, it may allow for complete healing of partial ureteric injury in 8-12 weeks.[24] It also preserves renal function, control sepsis, allow ante-grade contrast study to localize site and type of ureteric injury and may permit ante-grade ureteric catheterization.[25]

CONCLUSION:

Total abdominal hysterectomy is still the most cause in our setup. Early diagnosis and treatment may result in better outcome. Close clinical vigilance in early postoperative period with a low threshold for using IVU and CT scan will minimize the chance of delayed diagnosis.

REFERENCES:

1. Chalya PL, Massinde AT, Kihunrwa A, Simbila S. Iatrogenic ureteric injuries following abdomino-pelvic operation: A 10-year tertiary care hospital experience in Tanzania. World J Em Surg. 2015 10:17 Dol 10. 1186/s 13017-015-0011-z.

2. Gemer O, Simonovsky A, Huerta M, Kapustian V, Anteby E, Linov L. A radiological study on the anatomical proximity of the ureters and the cervix. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18:991-5. doi: 10.1007/s00192-006-0269-5.

3. De Cicco C, Ret Davalos ML, Van Cleynenbreugel B, Verguts J, Koninckx PR. Iatrogenic ureteral lesions and repair: a review for gynecologists. J Minim Invasive Gynecol. 2007;14;428-35.

4. Abboudi H, Ahmed K, Royle J, Khan MS, Dasgupta P, N'Dow J. Ureteric injury: a challenging condition to diagnose and manage. Nat Rev Urol. 2013;10:108-15. doi: 10.1038/nrurol.2012.254.

5. Parpala-Sparman T, Paananen I, Santala M, Ohtonen P, Hellstrom P. Increasing numbers of ureteric injuries after the introduction of laparoscopic surgery. Scand J Urol Nephrol. 2008;42;422-27

6. Rafique M, Arif H. Management of iatrogenic ureteric injuries associated with gynecological surgery. Int Urol Nephrol. 2002;34:31-5.

7. Lynch TH, Martinez-Pinerio L, Plas E, Serafetinides E, Turkeri L, Richard-A et al. EAU Guidelines on Urological Trauma. Eur Urol. 2005;47:1-15.

8. Palaniappa NC, Telem DA, Ranasinghe NE, Divino CM. Incidence of iatrogenic ureteral injury after laparoscopic colectomy. Arch Surg. 2012;147:267-71. doi: 10.1001/archsurg.2011.2029.

9. Nachiappan S, Currie A, Askar A, Faiz O. Intraoperative ureteric injuries and litigation in the NHS. J Clin Urol. 2015;8:9-13. doi: 10.1177/2051415814537822.

10. Elliott SP, McAninch JW. Ureteral injuries: external and iatrogenic. Urol Clin North Am. 2006;33:55-66. doi: 10.1016/j.ucl.2005.11.005.

11. Kingsley OC. Pattern of iatrogenic ureteral injuries in a tertiary health center in Nigeria. Trop J Med Res. 2016;19:47-51.

12. Romero V, Akpinar H, Smith JJ 3rd, Assimos DG. Changing patterns of iatrogenic ureteric injuries. Rev Urol. 2011;13:179-83.

13. Mansoor M. Iatrogenic ureteric injuries in urological surgeries- a tertiary hospital experience. Professional Med J. 2020;27:2558-63. https://doi.org/10.29309/TPMJ/2020.27.1.5378.

14 Chianakwana GU, Okafor PI, Ikechebelu JI, Mbonu OO. Urological injuries following gynecological operations- our experience in a teaching hospital in Nigeria. West Afr J Med. 2006;25:153-6. doi: 10.4314/wajm.v25i2.28267.

15 Willium G, Broughton S, worker H, Tekle H five years experience of uterovaginal fistula following obstetrics and gynecological intervention in Ethiopia Afric J Urol. 2010;16:17-9.

16 Oboro V, Dare FO, florida SO, Aderounmu AO, Adeoti M, Ajati AM. Ureteric injury following pelvic operation. East Afr Med J. 2002;79:611-3.

17 Berkmen F,Peker AE, Alagol H, Ayyildiz A, Arik Al, Basay S. Treatment of iatrogenic urethral injuries during various operation for malignant conditions J Exp Clin Cancer Res. 2000;19:441-5.

18 Durmaz H. External-internal ureteral catheterization technique in treatment of ureteral injuries Turk J Med Sci. 2019;49:1132-7. doi:10.3906/sag-1902-3

19 Al-Awadi K, Kehinde EO, Al-Hunayan A, Al-Khyat A. Iatrogenic ureteric injuries: incidence, aetiological factors and the effect of early management on subsequent outcome. Int Urol Nephrol. 2005;37:235-41. https://doi.org/10.1007/s11255-004-7970-4.

20 Fröber R. Surgical anatomy of the ureter. BJU Int. 2007;100:949-65. doi: 10.1111/j.1464-410X.2007.07207.x.

21 Selzman AA, Spirnak JP. Iatrogenic ureteral injuries: A 20-year experience in treating 165 injuries. J Urol. 1996;155:878-81.

22 Burks FN, Santucci RA. Management of iatrogenic ureteral injury. Therap Adv Urol. 2014;6:115-24.

23 Nerli RB, Ghagane SC, Kadeli V, Hiremath MB. Ureteric injuries during laparoscopic gynecologic surgeries. J Sci Soc. 2019;46:3-7.

24 Mani NB, Kim L. The role of interventional radiology in urologic tract trauma. Semin Interven Radiol. 2011;28:415-23.

25 Mteka KA, Mbwambo J, Mvungi M. Iatrogenic ureteric and bladder injuries in obstetrics and gyneocological surgeries. East Afr Med J. 2006;83:79-85.

Received for publication: 22-05-2021

Accepted after revision: 11-08-2021

Author's Contributions:
Muhammad Mansoor: Concept, data collection, statistical analysis and manuscript writing.

Ethical statement: Institution review board permission was obtained and informad consent taken.

Competing interest:
The authors declare that they have no competing interest.

Source of Funding: None

How to cite this article:
Mansoor M. Non urological iatrogenic ureteric injuries: Management and outcome. J Surg Pakistan. 2021;26 (3):97-102. Doi:10.21699/jsp.26.3.4.