CASE REPORTS

Iatrogenic Ureteral Injury Following Radical Hysterectomy - Case Presentation

Dragos Radu Marcu[1], Ovidiu Gabriel Bratu[1,2], Dan Arsenie Spinu[1,2], Ioana Sorina Oprea[3], Ileana Adela Vacaroiu[2,4], Bogdan Florin Geavlete[2,5], Camelia Diaconu[6,7], Dan Mischianu[1,2]

Abstract

Iatrogenic ureteral injuries account for over 75% of all ureteral injuries and according to literature the incidence of iatrogenic ureteral lesions during abdomino-pelvic surgery ranges from 0.5% to 10%. Undiagnosed and untreated on time, this pathology could lead to severe complications, possible fatal. Gynecological surgeries are responsible for more than 50% of all ureteral iatrogenic injuries, followed by colo-rectal surgery, vascular surgery and urological procedures. The risk of ureteral injury is enhanced by previous surgery, radiotherapy, abdomino-pelvic neoplasia that infiltrates and deforms the pelvic structures, disrupting the normal pelvic anatomy, retroperitoneal fibrosis, and endometriosis. Imaging investigations such as ultrasonography, intravenous urography, contrast CT and ureteropyeloghraphy are essential in the diagnostic process of ureteral injuries and as well as in establishing a proper therapeutic management. We present the management applied in the case of a female patient with an iatrogenic ureteral injury after radical hysterectomy for cervical cancer, for whom we have performed ureteroneocystostomy using the *Politano-Leadbetter* approach, after failing inserting a ureteral double J catheter. The gold-standard treatment for this type of pathology is represented by minimally invasive endoscopic procedures due to excellent results, fewer complications and lower morbidity and mortality rates when compared to open surgery. When endoscopic approach fails, classic surgery or the laparoscopic approach remain the viable solution. Several studies have presented good results in the cases where ureteral catheters were inserted before surgery, suggesting that the identification, isolation and dissection of the ureters is easier and that risk of iatrogenic ureteral injury is significantly reduced.

Keywords: iatrogenic ureteral injury, abdomino-pelvic surgery, complications, management, hysterectomy.

Rezumat

Leziunile ureterale iatrogene reprezintă peste 75% din totalul leziunile ureterale. Conform datelor publicate în literatura de specialitate incidența leziunilor ureterale în cadrul chirurgiei abdomino-pelvine variază între 0,5% şi 10%. În absența unui diagnostic pus la timp, precum şi a unui tratament adecvat, această patologie poate duce la complicații severe, posibil fatale (abces, urosepsis). Intervențiile chirurgicale din sfera ginecologică sunt responsabile pentru mai mult de 50% din totalul leziunilor ureterale iatrogene, fiind urmate de chirurgia colo-rectală, vasculară şi urologică, atât cea clasică, cât şi cea endoscopică (în special ureteroscopiile). Investigații imagistice precum ecografia abdominopelvină, urografia intravenoasă, examinarea CT cu substanță de constrast şi ureteropielografia

[1] Clinic of Urology, „Dr. Carol Davila" University Emergency Central Military Hospital, Bucharest, Romania
[2] Clinical Departament 3, „Carol Davila" University of Medicine and Farmacy, Bucharest, Romania
[3] Intensive Care Unit, „Dr. Carol Davila" University Emergency Central Military Hospital, Bucharest, Romania
[4] Department of Nephrology, „Sf. Ioan" Emergency Clinical Hospital, Bucharest, Romania
[5] Department of Urology, „Sf. Ioan" Emergency Clinical Hospital, Bucharest, Romania
[6] Clinical Departament 5, „Carol Davila" University of Medicine and Farmacy, Bucharest, Romania
[7] Department of Internal Medicine, Clinical Emergency Hospital, Bucharest, Romania

Corresponding author:
Ovidiu Gabriel Bratu
Department of Urology, „Dr. Carol Davila" University Emergency Central Military Hospital, Bucharest, Romania.
E-mail: ovi78doc@yahoo.com

au un rol important în stabilirea diagnosticului, precum şi în elaborarea managementului terapeutic, ținând cont de localizarea leziunii, de dimensiunea defectului, de gradul ureterohidronefrozei. Vă prezentăm abordul terapeutic adoptat în cazul unei paciente cu fistulă ureterală dreaptă post-histerectomie radicală pentru cancer de col uterin, diagnosticul fiind suspicionat în urma drenajului pelvin persistent şi ulterior confirmat în urma examinării CT cu substanță de contrast. Inițial s-a tentat montarea endoscopică a unui stent ureteral JJ, dar nu s-a reuşit identificarea orificiului ureteral drept, acesta fiind înglobat într-o zonă de edem important, motiv pentru care s-a abandonat abordul endoscopic şi s-a efectuat ureterocistoneostomie dreaptă tip *Politano-Leadbetter*. Endourologia reprezintă prima linie terapeutică în cazul acestei patologii, datorită riscului mai redus de complicații, precum şi a morbidității şi mortalității mai scăzute comparativ cu abordul clasic, dar atunci când tehnicile endoscopice eşuează abordul clasic rămâne soluția salvatoare. Numeroase studii au evaluat eficacitatea montării stenturilor ureterale înaintea intervențiilor abdomino-pelvine şi au relatat că stenturile pot reduce semnificativ riscul de leziune ureterală intraoperatorie, datorită identificării mai uşoare a ureterului şi a disecției acestuia.

Cuvinte cheie: leziuni ureterale iatrogene, chirurgie abdomino-pelvina, complicatii, management, histerectomie

INTRODUCTION

Iatrogenic ureteral injuries represent an important complication of abdomino-pelvic surgery with serious consequences in the absence of a prompt diagnostic and adequate treatment.

According to literature it has been estimated that over 75% of all ureteral injuries are iatrogenic and that the incidence of ureteral lesions during an abdomino-pelvic surgery ranges from 0.5% to 10%[1-5].

Studies concerning this pathology have shown that obstetric and gynecological surgery accounts for approximately 50-60% or even more, followed by colorectal surgery 10-25%, vascular surgery (aortoiliac and aorto-femural bypass) and urological surgery 15-30% (classic, laparoscopic and endoscopic approach)[5-11].

With the constant development of new endourological tools (flexible ureteroscope, lasers and grasping instruments), the rate of ureteral injuries secondary to endoscopic procedures has decreased, but despite this, abrasion of the ureteral mucosa (0.3-4%) and ureteral perforation (0.6-1%) are not uncommon[5,7,12]. The are several studies that contradict the previous information, stating that the incidence of ureteral injury has shown a significant increase, this being related to a more aggressive endourologic surgery[1,13]. Regarding urologic interventions, the ureteroscopy has proven to be responsible for the majority of the ureteral injuries (10-30%), but the open and laparoscopic approaches have their own rate of lesions[7,9-11].

An increase of the iatrogenic ureteral injuries rate has also been observed in laparoscopic and robot-assisted abdomino-pelvic surgery, especially in gynecologic surgeries.

The mechanisms responsible for ureteral lesions during surgery are: ligature, clamping, partial or complete transection, thermal injuries secondary to electrocoagulation, ureteral angulation, crush, devascularization, postoperative edema and ischemia which may lead to necrosis[5,6].

The are several risk factors associated with difficult abdomino-pelvic surgery which may lead to ureteral injuries such as: previous pelvic surgery, radiotherapy, pelvic adhesion, advanced tumors which may infiltrate and modify the surrounding structures, Ormond's disease, urinary malformation such as ectopic kidney, horseshoe kidney, ureteral duplication, endometriosis, retroperitoneal tumors, intraoperative bleeding which may force blind clamping for hemostasis and any other pathologies or anatomical changes that would disrupt the normal pelvic anatomy making difficult the identification of the ureters[1,6].

The extensive and difficult dissection during radical hysterectomy or any other major oncologic pelvic surgery may lead to the devascularization of the ureter with ischemia, necrosis and perforation of the ureter.

The ureter is a retroperitoneal organ, but despite its location the distal third is more susceptible to injury during pelvic surgery such as hysterectomy, pelvic lymph node dissection, colorectal surgery, due to its proximity to important vascular structures, to the ovaries, to the broad ligaments and uterine vessels. Numerous studies have emphasized that the distal third of the ureter is involved in approximately 80% of all ureteral iatrogenic injuries, this being related to its location and that the lesions are more likely to be produced when ligating the ovarian and uterine vessels, when trying to control a bleeding which may impose blind clamping, when dissecting and mobilizing the ureter[7,14-17].

The diagnosis of ureteral injury depends on the mechanism which has produced it and on the extent of the lesion. The ideal situation is intraoperatory discovery of the injury with immediate repair, but in the majority of the cases the diagnosis is made several days or even weeks after the surgery. Undiagnosed, depending on the type of injury, it may lead to ureterohydro-

nephrosis, chronic renal failure and even to the loss of the kidney, hematuria, ureteric fistula, ureteral stricture, abscess formation, uroperitoneum and urosepsis which may lead to death. Patients may present fever, chills, lower back pain or flank pain, hematuria, symptoms that in the context of recent abdomino-pelvic surgery may raise the suspicion of a ureteral lesion[1,5,6].

Imagistics has a major role in rising the suspicion and in the confirmation of the ureteral lesion. Investigations such as ultrasonography can reveal ureterohydronephrosis, intravenous urography, contrast intravenous tomography examination, anterograde or retrograde pyelography can confirm the diagnostic, revealing the location and the extent of the ureteral injury.

The management of the ureteral injuries depends on the type of injury, location, extension and as well as on the moment of its discovery. Due to the advances that have been made in recent decades regarding minimally endoscopic urologic procedures and tools, the endourological approach has become the first line treatment, being preferred to open surgery due to lower morbidity and mortality rates, that are higher in the classic surgery[6,13,14].

The type of treatment applied in this pathology depends on several factors such as the period of time elapsed from the moment of the injury until discovery, the extent of the injury, patients' comorbidities and clinical status. As we previously have mentioned the optimal treatment is represented by minimal invasive endoscopic procedures such as ureteral double J stent insertion or percutaneous nephrostomy, if the stent insertion is not possible due to technical reasons. There are situations when the endourological approach fails and the open approach remains the viable solution.

The moment of the ureteral lesion discovery has an essential role in the patients' outcome. If the ureteral injury is diagnosed after several days, even weeks after surgery, the patient associates a higher risk of infection, renal impairment and higher morbidity and mortality. The ideal case is intraoperative diagnosis and immediate repair[1].

We present the case of a female patient with a pelvic iatrogenic ureteral injury after total lymphadeno-colpo-hysterectomy with bilateral adnexectomy *Wertheim-Meigs,* for whom we have practiced ureteroneocystostomy using the *Politano-Leadbetter* approach.

CASE PRESENTATION

A 52 years old female patient admitted in our Clinic for right iliac ureteral injury after radical hysterectomy for cervical cancer.

The patient was diagnosed with cervical cancer in August 2016 and she underwent 26 sessions of radiotherapy.

In November 2016 she was admitted in an onco-gynecological specialized unit where total lymphadeno-colpo-hysterectomy with bilateral adnexectomy was performed. The postoperative evolution was favorable, without any major complications, the patient being discharged with a pelvic drainage tube, due to persistent lymphatic drainage which was normal considering the extent of the lympho-dissection.

At approximately three weeks after being discharged, she presented at the same medical unit for malaise, increased abdominal volume with diffuse abdominal pain and for bowel disorders. The patient has related that the quantity of the pelvic liquid drainage has progressively decreased and that for several days it was absent. Additionally, she has mentioned that her abdominal volume has increased in this period of time.

CT examination was performed and it showed a large liquid abdominal collection that resembled to ascites. The contrast CT scans highlighted extravasation of the contrast substance in the pelvic area, in the proximity of the drainage tube and as well as its complete opacification, suggesting a pelvic ureteral breach. After the drainage tube was changed approximately 8 liters of serous citrine fluid were evacuated (Figure 1).

Figure 1. CT examination – A. drainage tube in Douglas space without contrast substance; B. and C. drainage tube with contrast substance.

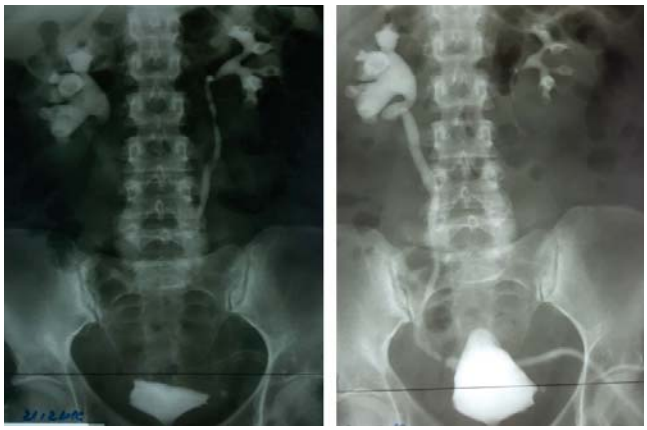

Figure 2. Preoperative intravenous urography – right ureterohynephrosis and pelvic drainage tube without contrast substance (urography at 15 minutes) and with contrast (urography at 60 minutes).

Having established the diagnosis of pelvic ureteral breach, the patient was transferred to our Clinic for specialized treatment (Figure 2).

Initially, we have tried to insert a ureteral double J catheter, but we could not identify the right ureteral orifice during cystoscopy, which was embedded in an area of important edema.

We have decided to abandon the endoscopic approach and we have performed exploratory laparotomy. After difficult pelvic dissection we have managed to identify and to isolate the pelvic ureter which was embedded in an area of fibrotic tissue. We have noticed that the pelvic right ureter was transected, presenting a breach of nearly 1 cm in length, in the immediate proximity of the drainage tube, at 3-4 cm from the vesico-ureteral junction, in the area of the uterine vessels. We have ligated the distal juxtavesical ureter and have managed to perform ureterocystostomy using the *Politano-Leadbetter* approach (Figure 3). We have inserted a ureteral double J catheter during the open approach, a drainage tube in pelvis near the new uretero-vesical anastomosis and an urethrovesical *Foley* catheter.

The postoperative evolution was favorable, without complications, the patient being discharged two weeks after the surgery.

At 45 days after the surgery the double J catheter was suppressed and we have performed intravenous urography. This investigation has revealed delayed secretion and excretion of the right kidney, with right ureterohydronephrosis, but no contrast substance extravasation was noted, sign that the ureterovesical anastomosis is competent (Figure 4).

The patient remains under our observation and she will be periodically evaluated to see if the ureterohydronephrosis persists or not.

DISCUSSIONS

Radical hysterectomy represents the elective method for treating cervical cancer. The development of the new surgical equipment has led to progress in laparoscopic surgery, laparoscopic radical hysterectomy becoming more popular with physicians and patients, due to faster recovery, less bleeding, a smaller postoperative scar and trauma. Nevertheless open radical hysterectomy has preserved an important percentage of all radical hysterectomies[5,6].

With the increase of the laparoscopic approach it has been observed that the rate of ureteral injuries during laparoscopic radical hysterectomies, pelvic lymph node dissection or any other pelvic surgery has increased when compared to the open approach. According to several studies the risk of ureteral injury during laparoscopic hysterectomy ranges from 0.2% to 6% while in the open approach the risk is smaller and it ranges from 0-2%[18-21].

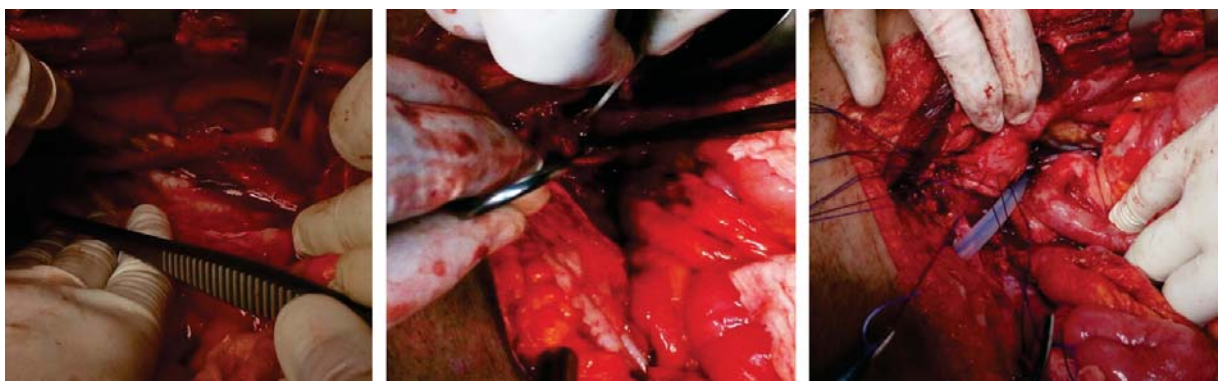

Figure 3. Intraoperative images – dissection and isolation of the pelvic right ureter; ureteral double J catheter insertion after the vesico-ureteral anastomosis was done; cystography.

Figure 4. Urography after ureteral double J catheter removal – delayed right secretion and excretion with right ureterohydronephrosis (at 7, 15 and 60 minutes).

Similar to the results found when evaluating the classical approach it has been observed that the incidence of the ureteral lesions during hysterectomy for benign lesions is smaller when compared to the laparoscopic approach for neoplasic pathologies[22,23]. This is perhaps secondary to the anatomical changes of the pelvic structures that occur in malignant pathologies, which may infiltrate the surrounding tissues leading to the deformation of the normal pelvic anatomy or due to fibrotic changes secondary to previous radiotherapy or surgeries.

According to current literature data regarding iatrogenic ureteral injuries gynecological surgeries are responsible for more than 50% of the injuries, some studies emphasizing that this values are even higher (approximately 75%)[1,24,25]. In more than two thirds of the cases the distal ureter is involved, being related to the proximity with the female reproductive organs, from the pelvic brim to the insertion of the ureters in the bladder, region where the ureters are crossed by the uterine artery and where the lesion is more likely to be produced[1,8,16,17].

It has been reported that the left ureter is more susceptible to being injured during pelvic surgery, especially during hysterectomy, because the left ureter is closer to the cervix than the right ureter[1].

There are several aspects that could significantly decrease the risk of ureteral lesions during pelvic surgery such as: knowing the pelvic anatomy, surgical experience, ureteral identification during surgery, being able to recognize a ureteral injury and having the basic skills to repair it or having specialized help who can manage such a pathology.

The efficacy of ureteral catheterization before abdomino-pelvic surgery has been evaluated for several years. The principle behind this procedure is that the presence of the ureteral catheters makes it easier for the surgeon to identify the ureter during dissection and to avoid its injury, and as well as recognizing a ureteral lesion during the intervention[7,26].

There are several studies that are in favor of preventively ureteral catheter insertion before gynecological pelvic surgery[27-29].

Tanaka in a study regarding the effectiveness of the ureteral catheters in the prevention of the ureteral lesions in gynecological laparoscopic hysterectomies stated that the catheter insertion has significantly reduced the risk of the ureteral injury, due to an easier identification during dissection, but he also stated that catheter insertion could not prevent ureteral injuries[21].

Other studies did not agree with this idea. *Wood* has evaluated the benefits of ureteral catheter insertion prior to laparoscopic hysterectomies and observed that this procedure could lead to unwanted complications such as hematuria, urinary infection, fever or to ureteral injuries[30,31]. Similar conclusions were reported by *Kuno* in study regarding the efficacy of double J catheter insertion in order to avoid ureteral injuries during pelvic surgery[32].

In the absence of prompt diagnosis and a proper treatment the risk for severe complications is high. Imagistic investigations have a crucial role when suspecting a ureteral injury. Ultrasonography can reveal ureterohydronephrosis if the ureter has been ligated or it can raise the suspicion of an abdominal collection. Intravenous urography and contrast tomography are more accurate investigations, especially the CT, because they can reveal contrast extravasation, the location and the size of the ureteral injury.

The advantage of intravenous urography is that it is a reliable investigation with good results and a more accessible investigation when compared to tomography,

considering the financial aspect. Intravenous urography has been the first line investigation used when suspecting a ureteral injury for approximately 50 years, since its introduction in the 1930s and until the introduction of computer tomography in the 1980s[6]. Another valuable and important investigation that we should not forget is retrograde pyelography.

Over 75% of the ureteral injuries are discovered several days, even weeks after surgery due to complications. According to literature, minimal invasive endoscopic procedures should be applied in this pathology. Ureteral catheter insertion or percutaneous nephrostomy (if the insertion of the ureteral catheter is not possible) should be the first line treatment, but this also depends on the period of time elapsed from the moment of the surgery until the diagnosis is made, and as well as on the type of injury and on the length of the ureteral defect[5-7].

Many researchers have reported good results after ureteral double J insertion. In a 2015 study regarding the non-surgical iatrogenic ureteral injuries management, *Zilberman* reported a 78.5% spontaneous ureteral healing after double J stent insertion[33]. Similar results were reported by *Karmouni* in 2001 study where he encountered a rate of spontaneous healing of 71% after double J stent insertion[34].

For the cases where endourological techniques have poor results or have no indication, laparoscopic or open surgery remains the solution. There are several surgical techniques that can be used in order to manage a ureteral injury, depending on the location and on the length of the ureteral lesion.

The ideal case when dealing with a ureteral injury is recognizing it during surgery and intraoperative ureteral repair. If intraoperative ureteral transection is suspected, intravenous blue methylene can be administered and it will appear in the operative field if the ureter has been injured[5].

For the proximal and middle ureteral injuries ureteroureterostomy and transureteroureterostomy represent the solution. The distal third ureteral lesions can be managed with direct reimplantation, ureteroneocystostomy, the vesico-psoas hitch approach or *Boari* flap, renal auto-transplantation, transureteroureterostomy, ureteral substitution with gastrointestinal segments if the length of the viable ureter is too short for a proper urinary anastomosis[1,5-7].

CONCLUSIONS

Iatrogenic ureteral injuries represent an unwanted complication of abdomino-pelvic surgery and as well as of endourological procedures, with a poor prognosis if not diagnosed on time and properly treated. According to literature the highest incidence rate has been observed in gynecological surgeries.

Imagistic investigations have an essential role in the discovery of this type of pathology and in its management.

Minimally invasive endoscopic procedures represent the gold standard in the management of iatrogenic ureteral injuries, due to fewer complications, lower mortality and morbidity rates, but it depends on the period of time elapsed since the moment of the injury until the diagnosis is made, on the type of injury, on the mechanism responsible for its appearance and on the length of the ureteral defect. For the cases where the endoscopic approach fails, classic surgery and even the laparoscopic approach represent the viable solution.

Preoperative ureteral double J catheter insertion should be taken into consideration before a major pelvic surgery, especially before gynecological surgeries, because it can significantly reduce the risk of iatrogenic ureteral injuries, due to an easier identification, isolation and dissection of the ureter.

No matter what the etiology of the ureteral lesion, the patients should be guided to a urological medical unit where specialized treatment should be applied. All surgeons and especially those who practice abdomino-pelvic surgery (gynecologists, urologists and general surgeons specialized in colo-rectal surgery) should maintain a high grade of attention during surgery due to the risk of injuring the ureters.

References

1. Chalya PL, Massinde AN, Kihunrwa A, Simbila S. Iatrogenic ureteric injuries following abdomino-pelvic operations: a 10-year tertiary care hospital experience in Tanzania. World J Emerg Surg. 2015; 10:17.
2. Carver BS, Bozeman CB, Venable DD. Ureteral injury due to penetrating trauma. South Med J. 2004; 97(5):462-464.
3. Al-Awadi K, Kehinde EO, Al-Hunayan A, Al-Khayat A. Iatrogenic ureteric injuries: incidence, aetiological factors and the effect of early management on subsequent outcome. Int Urol Nephrol. 2005; 37(2):235-241.
4. Pal DK, Wats V, Ghosh B. Urologic complications following obstetrics and gynecologicai surgery: Our experience in a tertiary care hospital. Urol Ann. 2016; 8(1):26-30.
5. Burks FN, Santucci RA. Management of iatrogenic ureteral injury. Ther Adv Urol. 2014; 6(3):115-124.
6. Esparaz AM, Pearl JA, Herts BR, LeBlanc J, Kapoor B. Iatrogenic urinary tract injuries: etiology, diagnosis, and management. Semin Intervent Radiol. 2015; 32(2):195-208.
7. Bašić D, Ignjatović I, Potić M. Iatrogenic ureteral trauma: a 16-year single tertiary centre experience. Srp Arh Celok Lek. 2015; 143(3-4):162-168.

8. 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(2):108-115.
9. Assimos DG, Patterson LC, Taylor CL. Changing incidence and etiology of iatrogenic ureteric injuries. J Urol. 1994; 152(6 Pt 2):2240-2246.
10. Stoller ML, Wolf JS Jr. Endoscopic ureteral injuries. In: McAninch JW (editor). Traumatic and Reconstructive Urology. Philadelphia, USA: WB Saunders Co, 1996, p. 199-212.
11. Schuster TG, Hollenbeck BK, Faerber GJ, Wolf JS Jr. Complications of ureteroscopy: analysis of predictive factors. J Urol. 2001; 166(2):538-540.
12. Romero V, Akpinar H, MD, Smith JJ 3rd, Assimos DG. Changing patterns in iatrogenic ureteral injuries. Rev Urol. 2011; 13(4):e179-e183.
13. McGeady JB, Breyer BN. Current epidemiology of genitourinary trauma. Urol Clin North Am. 2013; 40(3):323-334.
14. Klap J, Phé V, Chartier-Kastler E, Mozer P, Bitker MO, Rouprêt M. [Aetiology and management of iatrogenic injury of the ureter: a review]. Prog Urol. 2012; 22(15):913-919.
15. Dobrowolski Z, Kusionowicz J, Drewniak T, Habrat W, Lipczyñski W, Jakubik P, Wêglarz W. Renal and ureteric trauma: diagnosis and management in Poland. BJU Int. 2002; 89(7):748-751.
16. Brandes S, Coburn M, Armenakas N, McAninch J. Diagnosis and management of ureteric injury: an evidence-based analysis. BJU Int. 2004; 94(3):277-289.
17. Chong GO, Park NY, Hong DG, Cho YL, Park IS, Lee YS. Learning curve of laparoscopic radical hysterectomy with pelvic and/or para-aortic lymphadenectomy in the early and locally advanced cervical cancer: comparison of the first 50 and second 50 cases. Int J Gynecol Cancer. 2009; 19(8):1459-1464.
18. Uccella S, Laterza R, Ciravolo G, Volpi E, Franchi M, Zefiro F, Donadello N, Ghezzi F. A comparison of urinary complications following total laparoscopic radical hysterectomy and laparoscopic pelvic lymphadenectomy to open abdominal surgery. Gynecol Oncol. 2007; 107(1 Suppl 1):S147-S149.
19. Cholkeri-Singh A, Narepalem N, Miller CE. Laparoscopic ureteral injury and repair: case reviews and clinical update. J Minim Invasive Gynecol. 2007; 14(3):356-361.
20. Tanaka Y, Asada H, Kuji N, Yoshimura Y. Ureteral catheter placement for prevention of ureteral injury during laparoscopic hysterectomy. J Obstet Gynaecol Res. 2008; 34(1):67-72.
21. Forsgren C, Altman D. Risk of pelvic organ fistula in patients undergoing hysterectomy. Curr Opin Obstet Gynecol. 2010; 22(5): 404-407.
22. Frankman EA, Wang L, Bunker CH, Lowder JL. Lower urinary tract injury in women in the United States, 1979-2006. Am J Obstet Gynecol. 2010; 202(5):495.e1-495.e5.
23. Liapis A, Bakas P, Giannopoulos V, Creatsas G. Ureteral injuries during gynecological surgery. Int Urogynecol J. 2001; 12(6): 391-394.
24. Tijani KH, Onwuzurigbo KI, Ojewola RW, Afolabi BB, Akanmu NO. Iatrogenic ureteric injuries in a Nigerian teaching hospital - experience in the last decade. East Afr Med J. 2011; 88(9):304-309.
25. Schimpf M, Gottenger E, Wagner J. Universal ureteral stent placement at hysterectomy to identify ureteral injury: a decision analysis. BJOG. 2008; 115(9):1151-1158.
26. Basiri A, Mohammad Ali BF, Abdi H, Mahmoudnejad N. Laparoscopic reimplantation for single-system ectopic ureter. Urol J. 2007; 4(3):174-176.
27. Rassweiler JJ, Gozen AS, Erdogru T, Sugiono M, Teber D. Ureteral reimplantation for management of ureteral strictures: a retrospective comparison of laparoscopic and open techniques. Eur Urol. 2007; 51(2):512-522.
28. Siow A, Nikam YA, Ng C, Su MC. Urological complications of laparoscopic hysterectomy: a four-year review at KK Women's and Children's Hospital, Singapore. Singapore Med J. 2007; 48(3):217-221.
29. Wood EC, Maher P, Pelosi MA. Routine use of ureteric catheters at laparoscopic hysterectomy may cause unnecessary complications. J Am Assoc Gynecol Laparosc. 1996; 3(3):393-397.
30. Borkowski T, Judycki J, Borkowski A, Czaplicki M, Radziszewski P. Evolution in the approach to overlooked ureteral injuries after gynecological surgery. Ginekologia Polska. 2016; 87(10):690-696.
31. Kuno K, Menzin A, Kauder HH, Sison C, Gal D. Prophylactic ureteral catheterization in gynecologic surgery. Urology. 1998; 52(6):1004-1008.
32. Zilberman DE, Rimon U, Morag R, Winkler HZ, Ramon J, Mor Y. Non-surgical treatment of latrogenic postoperatively diagnosed ureteral injuries. Isr Med Assoc J. 2015; 17(4):227-230.
33. Karmouni T, Patard JJ, Bensalah K. [Urologic management of ureteral iatrogenic lesions]. Prog Urol. 2001. 11(4):642-646.