

## Early and Late Diagnosis of Iatrogenic Urinary Tract Injuries During Obstetric and Gynecological Operations

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**Received:** 11 July 2016,

**Accepted:** 21 September 2016

**DOI:** 10.5799/ahinjs.01.2016.03.0606

### ABSTRACT

**Objective:** We aimed to present urinary tract injuries occurring during obstetric and gynecological operations and their clinical consequences.

**Methods:** Twenty-three patients who had urological organ injury during obstetric and gynecological operations that have been conducted in Fatih University School of Medicine Sema Hospital Department of Obstetrics and Gynecology between January 2010 and June 2016 were retrospectively analyzed. Etiology, type of injury, diagnostic process, treatment methods and complications of urologic injuries and success rate have been investigated. Injuries were categorized into two groups as intra-operative early injuries and post-op late injuries. Early injuries were laceration, rupture, ligation and late injuries were hydronephrosis, contrast material leakage or fistula.

**Results:** Eight patients diagnosed in our clinic at intraoperative or post-op early period and 15 patients who were referred to our clinic after having operation in an external clinic were assessed. Thirteen of the injuries were gynecologic and 10 of them were obstetric. Mean age of operated patients was 34.2±9.4 (23-65) years. Ureteral injury and bladder injury was detected respectively in 6 and 2 patients getting early diagnosis. Fistula (5/15), hydronephrosis secondary to urethral stricture (3/15) and vaginal erosion (3/15) were detected as late diagnosed injuries. In a patient whom ureter was ligated non-functioning kidney has developed.

**Conclusion:** To reduce rate of urinary system injuries a sound knowledge of anatomy is required and also correct surgical techniques should be used. Early diagnosis and therapy may prevent complications and loss of organs that may lead to morbidity.

**Key words:** Bladder injury, ureteral injury, obstetric and gynecologic surgery, iatrogenic diseases

### INTRODUCTION

In females, due to anatomic proximity of genital and urinary systems, surgical interventions always pose potential risk on these systems. Despite advancement in gynecologic and obstetric techniques ureteral and bladder injuries occurring due to overlooked conditions may cause complications with high morbidity such as excessive blood loss, prolonged operation time, more frequent blood transfusions, fever and longer hospitalization (1-3). There are various risk factors increasing risk of urologic injury

in gynecologic operations such as prolonged surgery, presence of active infection during operation, endometriosis, large uterus, previous pelvic operation, pelvic adhesions, gynecologic malignancies and myoma uteri (4). Incidence of bladder and ureteral injuries is 0.36-0.5% in abdominal hysterectomies, 0.1-1.8% in vaginal hysterectomies and in radical surgeries particularly ureteral injury risk reaches up to 30% (5,6). In practice of obstetrics, bladder and ureter injury risk increases as the number of caesarean section and in hysterectomies done with obstetric indications injury rate varies between 1.71-5.13 % (7). Urinary tract injuries

occurring due to obstetric and gynecologic surgery is categorized into two groups. Acute complications; diagnosed and treated intraoperatively, namely ureter ligation, bladder and ureter lacerations. Chronic complications are ureterovaginal and vesicovaginal fistula occurring days or months after primary surgery.

In this study, we aimed to present urinary system injuries occurring during and/or after obstetric and gynecological operations and their clinical consequences.

## METHODS

In this study, twenty-three patients who had urological organ injury during obstetric and gynecological operations that have been conducted in a tertiary centers' Obstetrics and Gynecology Department between January 2010–June 2016 were retrospectively analyzed. Clinical assessments, demographic datas, referral symptoms and conducted surgical procedures were derived from patient charts and from electronic records. First surgical intervention was considered as a success criteria. During assessment of urologic injuries etiology, type of injury, diagnostic process, treatment methods, complications and success rate have been investigated. Injuries were categorized into two groups as intra-operative early injuries and post-operative late injuries. Early injuries were laceration, rupture, ligation and late injuries were hydronephrosis, contrast material leakage or fistulas. Diagnosis was established in each patient by physical examination, gynecologic examination, radiological imaging methods (cystography, intravenous urography-IVP, urinary computerized tomography – CT) and cystoscopy. Acknowledgment approval of the hospital administration was obtained before the study.

## RESULTS

Eight patients diagnosed in our clinic at intraoperative or post-op early period and 15 patients who were referred to our clinic after having operation in an external clinic were analyzed. Thirteen of the injuries were gynecologic and 10 of them were obstetric. Mean age of operated patients was 34.2±9.4 (23-65) years. In 8 patients the diagnosis was established at intraoperative or early post-op period but in 15 patients diagnosis was late. Ureteral injury and bladder injury was detected respectively in 6 and 2 patients getting early diagnosis. Clinical findings and applied treatments of these patients were shown in Table 1. In two patients who experienced bladder injury during caesarean section primary repair was done and the patients were catheterized.

Foley catheters were in place for 10 days of follow up and due to lack of any pathology they were removed and the patients called for routine controls. In ureter ligation cases sutures were removed to check for any damage. Since motility was observed D&J catheter was inserted and the patients were followed. In two patients with full thickness cutting ureter primary repair was done by the help of catheter. In a patient operated for cervical cancer and developing bilateral ureteral ischemia during the post-op period ureteroneocystostomy (UNS) was done by using boary flap technique. Minimum 90 days later D&J catheters were removed and no urinary flow abnormality was observed. Late stage injury findings of 15 patients who were operated in external clinics and referred to our clinic were shown in Table 2. Most frequently fistula (5/15), hydronephrosis secondary to urethral stricture (3/15) and vaginal erosion (3/15) were detected as late diagnosed injuries. In a patient whom ureter ligation was observed non-functioning kidney has developed.

**Table 1.** Clinical findings of iatrogenic injury detected early diagnosis

Etiology (n)	Diagnosis	Treatment
Cesarean section (2)	Bladder injury (2)	Primary bladder repair
TAH+BSO (5)	ureteral ligation (3)	Suture opening + DJ catheter insertion
	Ureteral full-thickness cut (2)	Primary ureteral repair + D&J catheter insertion
Wertheim operation (1)	Bilateral ureteral ischemia>bilateral urethral stricture>hydronephrosis	Ureteroneocystostomy (UNS)

TAH+BSO: total abdominal hysterectomy+bilateral salpingo-oophorectomy

## DISCUSSION

Iatrogenic urinary tract injuries are the most common complications of pelvic surgery. Its incidence varies between 0.5-1.5% and bladder injuries are more frequent than ureter injuries (8,9). Raut et al. have reported ureter injury rate as 0.11% in gynecologic operations and 0.33% in obstetric operations

(10). In a series of 18,500 operations Nawaz et al. have reported ureter injury rate as 0.02-0.6% (4). In our study, 9 (39.1%) of patients included bladder injury, 10 (43.5%) of them ureter injury and 4 (17.4%) of them urethral injury have occurred. Ureters enter into the pelvis at the level where common iliac artery branches as internal and external branch and to the bladder after traversing from posterior of uterine artery.

**Table 2.** Clinical findings of iatrogenic injury detected later diagnosis

Etiology (n)	Diagnosis	Treatment
<b>Incontinence surgery (3)</b>	Vaginal erosion (2)	Partial excision of the mesh
	Vaginal erosion (1)	Total excision of the mesh
<b>Operative delivery (3)</b>	Vesicovaginal fistula (3)	Vaginal fistula repair
<b>Cesarean section (5)</b>	Vesicouterine fistula (2)	Abdominal fistula repair
	Vesicovaginal fistula (2)	Vaginal fistula repair
	Bladder injury> Primary repair> Bladder catheterization> Urethral stricture (1)	Buccal urethroplasty
<b>Ovarian cysts surgery (1)</b>	Urethral stricture (1)	D&J catheter insertion
<b>TAH+BSO (2)</b>	Ligation of the ureter> Non-functioning kidney (1)	Laparoscopic nephrectomy
	Urethral stricture (1)	D&J catheter insertion
<b>TAH (1)</b>	Urethral stricture (1)	D&J catheter insertion

TAH: total abdominal hysterectomy

TAH+BSO: total abdominal hysterectomy+ bilateral salpingo-oophorectomy

In pelvic surgery 85% of ureter injuries occur at distal ureter (11). Since location of ureters are retroperitoneal it's normally expected that injury risk may be present only in complicated surgeries; however, injuries are observed during simple surgical procedures (12). Pelvic adhesions, radiotherapy, large uterus, gynecologic malignancies, endometriosis, anatomic anomalies and inexperienced surgeons are risk factors that may lead to ureter injuries (13,14). The most important factor determining prognosis in ureter injuries is time from diagnosis to treatment. Intraoperative diagnosis reduces morbidity and mortality but delayed diagnosis may manifest itself as negative clinical signs (15). Unfortunately, currently most of the ureter injuries are diagnosed at a late stage (16,17).

Anatomic location and difficulty in exploring of ureter have pivotal role in delayed diagnosis. In our study 6 of early injuries and 4 of later stage were diagnosed. Ureter injuries occur as clamp crush, diathermic injuries, ligation, segmental resection of ureter, kinking of ureter, devascularization of ureter during wide dissection (18). Chronic complications are ureter stricture, ureterovaginal fistula or fistulizing into other organs (19). Symptoms of patients are variable but may be manifested as flank pain, fever, prolonging ileus, ascites, urinary incontinence, anuria, hydronephrosis with accompanying uremia and non-functioning kidney (20). In follow up of 5 patients treated with proper interventions in the early period no pathology has been observed. In patients operated due to cervical cancer ureter ischemia and clinical signs such as decrease in urinary output and uremia have occurred and thus ureteroneocystostomy (UNS) was done. There was no abnormality in the post-op follow up for 4 months. D&J catheter was placed to 3 patients referring at a late stage and they were followed up for 3 months. There was no abnormality in the follow up visits. After various tests it was determined that in one patient non-functioning kidney has developed and nephrectomy was carried out. It's reported that ureter injuries most frequently

occur during gynecologic operations and among them during total abdominal hysterectomy (TAH) (21,22). In our study 9 of the patients (90%) have undergone hysterectomy and only one patient (10%) has undergone ovarian cyst surgery. Hysterectomy was determined as the most frequent cause of ureteral injuries and there was no ureteral injury secondary to obstetric causes.

Conventionally, the most frequently injured organ during gynecologic operations is bladder and the rate of injury was reported as 0.14-3.17% (23). Bladder injuries may occur during pelvic, abdominal or vaginal operations. Anatomic variations, inefficient exploration, adhesions, scar secondary to previous surgery, radiotherapy, presence of urinary infection, malignancy, endometriosis, pelvic inflammatory diseases and incomplete emptying of bladder are the risk factors for bladder injuries (7). The most frequent iatrogenic injuries are bladder laceration and vesicovaginal fistula. Incidence of bladder injury during caesarean section varies between 0.08-0.94% and this rate increases as the number of caesarean section increases. Some risk factors that may lead to bladder injury during caesarean section were reported. Previous caesarean section, urgent caesarean section, caesarean section performed during the second stage of labor and intraabdominal adhesions may play a role in acute injuries. Prolonged operation time, active urinary tract infection, using of prolonged indwelling catheter are seem to be potential risk factors for late stage injuries such as vesicouterine or vesicovaginal fistula (24,25). Fistula after caesarean section may be observed in various locations. Dissection of inferior segment of uterus is the most frequent cause of vesicouterine fistula formation observed after caesarean section (26). Among genitourinary fistula the most frequent one is vesicovaginal fistula. Blamed factors in its etiology are caesarean section, using of vacuum or forceps, episiotomy and prolonged labor (27, 28). In our study, vesicovaginal fistula has formed after normal delivery in 3 patients and history of prolonged labor and operative delivery was determined in

these patients. Efficient exploration during caesarean section may facilitate detection and repair of urinary leakage or hematuria. In our study primary repair was done in two patients with early diagnosed bladder injury. In average 10 days of bladder catheterization was done. Follow up visits revealed no pathology and the patient was then called for routine control visits. Late stage complications of following bladder injuries were vesicourinary fistula in 2 patients, vesicovaginal fistula in 2 patients and urethral stricture secondary to catheterization after intraoperative bladder repair in one patient. Secondary repair of fistula was accomplished in 4 patients and there was no recurrence. In the patient with urethral stricture urethroplasty by using buccal mucosa flap was performed.

Currently mid-urethral slings are the most frequently used method in surgical treatment of stress urinary incontinence (SUI) since they are easily applicable, reliable and their long term results are successful (29). Literature search reveals numerous studies reporting success and complications of the surgical operations. Intraoperative complications are bladder injury, urethral injury, vaginal perforation, hematoma, hemorrhage and obturator nerve injury (30,31). Complications at later stage are most frequently encountered as vaginal mesh erosion and also as urinary tract infection, de novo urgency, dyspareunia or abscess. Incidence of vaginal erosion after incontinence surgery varies between 0.7-13.8% (32,33). Vaginal erosion is the late complication of sling surgery and manifests its clinical signs within 9 months in average. The primary factor effecting vaginal erosion formation is the sling material among others. In addition to this, menopause, chronic diseases, use of corticosteroids, infections and inelaborate surgery have their part in etiology of vaginal erosion. Different therapeutic approaches are present. Some authors recommend conservative approach on the other hand some authors recommend partial or total excision of the mesh (34-36). In our study, partial excision of mesh was performed in 2 of the patients with vaginal erosion after mesh application and total excision was performed in one patient. In the 3 months follow-up there was no SUI recurrence or another complication.

In conclusion, to reduce rate of urinary tract injuries during gynecologic and obstetric operations a sound knowledge of anatomy and use of correct surgical techniques are required. Overlooked injuries may lead to organ losses with high morbidity. Complications secondary to urinary tract injuries may be totally eliminated by early diagnosis and treatment.

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