

# Scrutinization and Management of Urological Complications Attributed to Obstetrics and Gynecological Surgery

Pritesh Jain<sup>1</sup>, Sandeep Gupta<sup>2</sup>, Dilip K Pal<sup>3</sup>

## ABSTRACT

**Aim:** To review iatrogenic urological injuries due to obstetric and gynecological surgeries treated in the urology and gynecology department analyzing urinary tract anatomy, etiologic factors, diagnosis, treatment, and outcomes.

**Materials and methods:** We reviewed all cases of urological injuries managed in our institution from January 2009 to December 2016 which were associated with obstetric and gynecological procedures.

**Results:** Eighty-one patients were treated in the department during our study period. The most commonly injured organ was the bladder in 64.7% followed by ureter in 31.8%. Intraoperative diagnosis was made in 11.1% (9) cases, whereas 88.89% (72) cases were diagnosed postoperatively. Out of 81 cases, 66.7% (54) patients succumbed to urologic injuries as a result of gynecological procedures, while 33.3% (27) cases were due to obstetrical procedures. Vesicovaginal fistula (VVF) was the most common sequel followed by ureterovaginal fistula (UVF) in 42 (51.8%) and 15 (18.5%) cases, respectively. VVF combined with UVF and rectovaginal fistula were seen in 2 cases each. Although rare among various urogenital fistulas, vesicouterine fistula was encountered in three (3.7%) cases. All cases were managed with open or laparoscopic surgery with success in all but two patients.

**Conclusion:** Complex gynecological procedures are gradually emerging as an important cause of urological injuries, second to obstetrical causes. Intraoperative detection and correction takes a vital part in determining structural integrity of the tissue and eliminating misery of the patient. Delayed diagnosis and improper treatment may result in severe complications.

**Clinical significance:** Thorough knowledge of pelvic anatomy, meticulous surgical technique, early diagnosis of injury, and collaboration with a urologists in complex cases is required to reduce urological complications in obstetrics and gynecological procedures.

**Keywords:** Fistula, Gynecologic Surgery, Iatrogenic injuries, Obstetrical Surgery, Postoperative complications.

*Journal of South Asian Federation of Obstetrics and Gynaecology (2020): 10.5005/jp-journals-10006-1764*

## INTRODUCTION

Injuries to urinary tract are ubiquitous in gynecological and obstetric surgeries pertaining to their anatomical association, with an incidence of 0.49% for bladder, 0.24% for ureter in gynecological surgery, 0.18% for bladder, and 0.01% for ureter in obstetric surgery.<sup>1</sup> These injuries can be curtailed by meticulous dissection with comprehensive knowledge of pelvic anatomy. Intraoperative diagnosis is arduous; however, if one is vigilant enough, immediate repair is feasible which can prevent morbidity. Undiagnosed injuries may lead to chronic complications ranging from various urogenital fistulas to stricture and loss of renal function. In developing countries, most of these fistulas are still due to obstetric causes; however, due to better obstetric care and proliferation of complex pelvic surgeries, gynecological surgeries are becoming an important cause nowadays. Our study is a segregation and retrospection of such data from past 7 years. We believe digging out its etiopathogenesis can help in intercepting further morbidity associated with such injuries.

## MATERIALS AND METHODS

From January 2009 to December 2016, eighty-one patients with genitourinary injuries following obstetric and gynecological surgery were treated in the Department of Urology and Gynecology at a tertiary-care hospital in Eastern India. Ethical clearance was taken from institutional review board. We scrutinized the available medical records of patients and analyzed parameters, including etiology, predisposing factors, whether injury was diagnosed

<sup>1-3</sup>Department of Urology, Institute of Postgraduate Medical Education and Research, Kolkata, West Bengal, India

**Corresponding Author:** Dilip K Pal, Department of Urology, Institute of Postgraduate Medical Education and Research, Kolkata, West Bengal, India, Phone: +91 9433132553, e-mail: urologyipgmer@gmail.com

**How to cite this article:** Jain P, Gupta S, Pal DK. Scrutinization and Management of Urological Complications Attributed to Obstetrics and Gynecological Surgery. *J South Asian Feder Obst Gynae* 2020;12(2): 68–72.

**Source of support:** Nil

**Conflict of interest:** None

intraoperative or postoperative, treatment undertaken, and outcome. Urological complications were defined as injury to urinary tract organs in any form leading to leakage of urine, urinoma formation, formation of various urogenital fistulas, or ureteral stricture formation compromising renal function. Patients who were diagnosed with urogenital fistula after failure of primary repair were excluded from our study. Successful treatment was defined as normalization of anatomy.

Intraoperative diagnosed injuries were repaired during same sitting, whereas postoperative diagnosed injuries were categorized and treated as early as possible to prevent associated morbidity. Among the three intraoperative diagnosed bladder lacerations, all three were repaired by open method. Ureteric injuries were diagnosed intraoperative in four patients, one had laceration that was corrected by open primary repair over Double J (DJ) stent,

while the other three patients who had complete transection were repaired by open and laparoscopic ureteroneocystostomy in one and two cases, respectively. Two patients had combined bladder and ureteric injuries that were successfully repaired by open primary bladder repair and ureteroneocystostomy.

Time of referral since the culpable surgeries, in which injuries were diagnosed in postoperative period, varied from 1 day to 8 weeks; however, some of the patients presented to us years later. Diagnoses of injuries were fabricated by repercussion of history, physical examination, vaginal speculum examination, cystoscopy, and radiologic imaging. Upper urinary tract examination was done in cases of Vesicovaginal fistula (VVF) to rule out associated ureteric injury. In all cases of ureteric injury identified post-surgery, preoperative retrograde pyelography (RGP) and retrograde DJ stenting were attempted first. In difficult cases, we used 4.5 to 6.5F semi-rigid ureteroscope (Richard Wolf®, Germany), with 3F lumen of working channel compatible with 0.018-inch hydrophilic guidewire. Initially, 3F double J stent was placed which was later replaced by 4.5F. After failure of the endourological procedure, surgery was undertaken as soon as possible. Open and laparoscopic surgical approaches were carried out with preference to the latter. VVF was repaired by open transabdominal O'Connor's repair, laparoscopic repair, and vaginal route according to fistula position and feasibility of surgery. In patients with vesicouterine fistula, laparoscopic uterus preserving surgery was done as patients wanted to preserve uterus. Patients of complicated VVF with rectovaginal fistula were managed by two-stage repair. VVF repair with diversion colostomy was carried out first followed by colostomy closure in second sitting. In patients with ureterovaginal fistula (UVF) and patients with ureteric stricture, modified Lich-Gregoir technique of extravesical ureteral reimplantation was executed, ureteric stent was embedded in all, and wherever required psoas hitch was performed to counterpoise the gap between ureter and bladder. In patients with concomitant VVF and ureterovaginal fistula, both VVF repair and ureteroneocystostomy were done in a single session. In patients of urethrovaginal fistula, transvaginal repair was done using labial fat pad.

Follow-up of patients was done according to the respective surgical procedure. Complications were recorded according to the Clavien-Dindo grading system for the classification of surgical complications.

## RESULTS

Mean age of our cohort of patients was 34 years (range: 18–62 years). Among 81 patients, intraoperative diagnosis was made in only nine cases (11.1%), while 72 (88.9%) patients manifested with urogenital fistulas, ureteric stricture, hydronephrosis, and loss of renal function postoperatively.

Gynecological surgery was reprehensible for urological injury in 54 (66.66%) patients, while injuries in 27 patients (33.34%) preceded obstetrical causes. Among 52 cases of hysterectomy, 21 (40.4%) were operated laparoscopically. Difficult Cesarean delivery was leading cause in 23 patients with urologic complication out of 27 cases due to obstetrical procedures. Figure 1 depicts overall causes of urological complications, and Table 1 depicts various causes along with site of injury in more detailed way.

Bladder injury was found to be the most common type of injury affecting 51 (62.97%) cases, while 23 (28.34%) patients experienced ureteric injury. Four (4.9%) patients had both bladder and ureteric involvement. Urethral injury was least prevalent affecting three

(3.7%) patients (Fig. 2). Table 2 depicts management of various types of urinary tract injuries. Mean follow-up period after management of urologic complication was 21 months (average 6–36 months).

### Bladder Injury

Out of 51 cases with isolated bladder injury, only 3 were diagnosed intraoperatively. Among postoperatively diagnosed 48 patients, 42 were cases of VVF, 3 had vesicouterine fistula, and 2 cases had combined VVF and rectovaginal fistula that were preceded by obstructed labor.

Out of 42 cases of isolated VVF, 21 were managed using laparoscopic transabdominal repair, 16 by open transabdominal O'Connor's repair, and 5 through vaginal route with Martius flap. In three patients with vesicouterine fistula, laparoscopic uterus-preserving repair was done. In two patients who were managed laparoscopically, there was recurrence of VVF during follow-up and were successfully managed by open technique of repair.

### Ureter Injury

Out of 23 cases of isolated ureteric injury, acute ureteric injury was identified in four patients. Three patients had ureteric injury in form of ligation, two had unilateral, and one had bilateral. UVF developed in 15 (69.23%) patients, and ureteric stricture was found in 2 (7.69%) patients. One patient with ureteric stricture post-cesarean section landed up in non-functioning symptomatic kidney for which laparoscopic nephrectomy was done. Out of 15 cases of isolated UVF, 6 were repaired by transabdominal laparoscopic ureteroneocystostomy, 6 by laparotomy, and in three cases DJ stenting alone resulted in fistula closure. One case of ureteric stricture was managed with primary ureteroneocystostomy with psoas hitch. Since in all patients lower ureter was involved, the gap between ureter and bladder was bridged via simple ureteroneocystostomy or with psoas hitch.

### Combined Ureter and Bladder Injury

Combined ureter and bladder injury were present in four cases: two preceded by Wertheim's hysterectomy and two by open abdominal hysterectomy. Two cases were diagnosed and repaired intraoperatively. Remaining two cases that were diagnosed postoperatively, presented with combined VVF and UVF, were repaired by open transabdominal O'Connor's bivalve repair and ureteroneocystostomy.

### Urethral Injury

Three patients had urethral injury: one anteceded sling surgery for urinary incontinence, one following cystourethrocele repair during vaginal hysterectomy, and one complicated by obstructed labor. All three cases were repaired successfully incorporating Martius flap.

## DISCUSSION

The anatomic proximity of the reproductive and lower urinary system predisposes it to iatrogenic injuries during obstetric and gynecological procedures. Injury to the urinary tract may involve injury to the ureter, bladder, and urethra and rarely to kidneys. Urinary tract injury complicates an estimated 0.2 to 1% of all gynecologic procedures and pelvic operations.<sup>2</sup> Since urological injuries may remain insidious and go unidentified, their actual incidence cannot be made from the literature.

In pelvic surgeries, most commonly injured urological organ is bladder followed by ureter.<sup>1,3</sup> Ureteral injuries are reported to

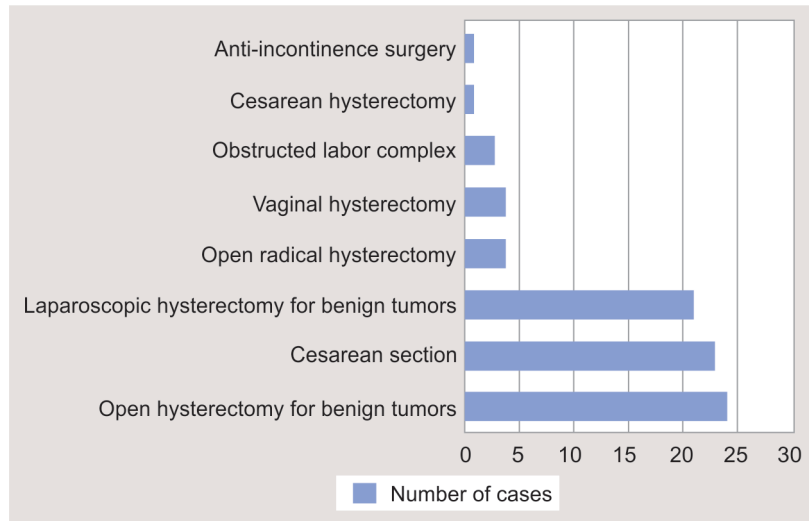


Fig. 1: Bar chart depicting various causes of urological complications

Table 1: Various cause of urologic injury with site of injury

Causative factors (total cases = 81) N (%),	Types of procedures	Organs injured (no. of cases)	No of cases (%)
Gynecological procedures, 54 (66.66%)	Open hysterectomy for benign tumors	Bladder (15)	24 (29.6%)
		Ureter (7)	
	Laparoscopic hysterectomy for benign tumors	Bladder and ureter (2)	21 (25.6%)
		Bladder (13)	
	Open hysterectomy for malignant tumors	Ureter (8)	4 (4.9%)
		Bladder and ureter (2)	
	Vaginal hysterectomy for benign tumors	Ureter (2)	4 (4.9%)
Bladder (2)			
Urethra (1)			
Obstetric procedures, 27 (33.34%)	Anti-incontinence surgery	Urethra (1)	1 (1.2%)
	Cesarean section	Bladder (19)	23 (28.4%)
		Ureter (4)	
	Obstructed labor complex	Bladder (2)	3 (3.7%)
		Urethra (1)	
Cesarean hysterectomy	Ureter (1)	1 (1.2%)	

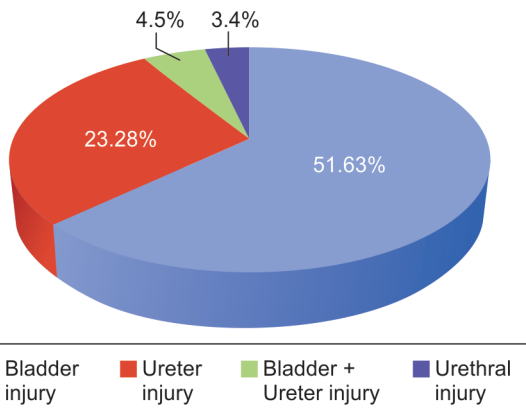


Fig. 2: Pie chart depicting various urological organs injured (no. of patients, percentage)

occur in approximately 0.1 to 2.5% of gynecologic surgeries.<sup>4-6</sup> It is becoming more prevalent as a result of the increasing numbers of laparoscopic pelvic procedures.<sup>7,8</sup> In our cohort of patients, bladder was the most common injured organ followed by ureter and urethra.

Urological injuries can be diagnosed intraoperatively or postoperatively. Most of the bladder injuries can be diagnosed intraoperatively in comparison to ureter injury. The literature reported that around 70 to 80% of ureteric injuries go undiagnosed intraoperatively.<sup>7,9</sup> Intraoperative diagnosis of urological injuries has advantages of successful repair, decreased morbidity, and fewer legal risks. Unfortunately, in our series, intraoperative diagnosis was made only in 11.1% cases with ours being a tertiary-care center, where most cases were referred from elsewhere after developing complications.

Intraoperative cystoscopy during major benign gynecological operations was successful in detecting urological injury in only 0.4%

**Table 2:** Surgical management of various urological complications associated with obstetrics and gynecological procedures

<i>Injury/sequel</i>	<i>Treatment<sup>d</sup></i>	<i>No. of cases (total = 81)</i>	<i>N (%)</i>
<b>Postoperative diagnosed 72 (88.9%)</b>			
Vesicovaginal fistula (VVF)	1. Open transabdominal O'Connor's repair	16	42 (51.8)
	2. Laparoscopic repair	21	
	3. Vaginal repair	5	
Ureterovaginal fistula (UVF)	1. Open ureteroneocystostomy	6	15 (18.5)
	2. Laparoscopic ureteroneocystostomy	6	
	3. Double J (DJ) stenting	3	
VVF and UVF	Open transabdominal repair	2	2 (2.5)
VVF and rectovaginal fistula	Open transabdominal repair with diversion colostomy <sup>b</sup>	2	2 (2.5)
Ureteric stricture	Laparoscopic ureteroneocystostomy	1	1 (1.2)
Ureteric stricture with loss of renal function	Laparoscopic simple nephrectomy	1	1 (1.2)
Unilateral ligation of ureter	Removal of ligature with ureteric stenting	2	2 (2.5)
Bilateral ligation of ureter	Removal of ligature with ureteric stenting	1	1 (1.2)
Urethrovaginal fistula	Vaginal repair	3	3 (3.7)
Vesicouterine fistula	Laparoscopic uterus preserving repair	3	3 (3.7)
<b>Intraoperative diagnosed 9 (11.1%)</b>			
Bladder and ureter injury	Open repair of bladder and ureter injury	2	2 (2.5)
Ureteric injury	Open repair over DJ stent	2	4 (5.0)
	Laparoscopic ureteroneocystostomy	2	
Bladder injury	Open repair	3	3 (3.7)

<sup>a</sup>In all cases of ureter repair Double J stent was placed

<sup>b</sup>Two-stage repair was done with closure of colostomy in second stage

cases of otherwise undetected injuries.<sup>10</sup> Thus, we recommend its use only during complex procedures or where there is high suspicion that injury has occurred.

Mechanism of injury includes laceration, transection, inadvertent ligation of ureters, incorporation of bladder tissue during suturing, or diathermy related injuries.<sup>11</sup> Predisposing factor includes careless surgery, lack of knowledge of anatomy, active infection, severe adhesions due to previous surgery, broad ligament and cervical fibroids, endometriosis, advanced malignancies, and so on.

The etiology of bladder injury and subsequent VVF differs among developing and developed world. In developing countries, obstetrical VVFs continue to be a major problem because of substandard antenatal and obstetric care. Obstetrical fistulas cause "field injury" to a larger area when compared to postsurgical patients, thus producing a larger fistula.<sup>12</sup> Out of 55 bladder injuries in our study, 21 cases (38%) preceded obstetrical procedures such as cesarean section, cesarean hysterectomy, and obstructed labor compared to 34 (61.8%) injuries caused by gynecological procedures. Among gynecological procedures for benign conditions, bladder injury occurred in 17 (50%) cases of abdominal hysterectomy, 13 (38%) cases of laparoscopic hysterectomy, and in 2 (5.9%) cases following vaginal hysterectomy. Radical hysterectomy was associated with bladder injury in two cases (5.9%).

The prevalence of iatrogenic ureteral injuries in laparoscopy is escalating attributed to fancying of laparoscopic approach over open procedures and also facing predicament associated with such surgeries and retroperitoneal dissection.<sup>8</sup> Gynecologic pelvic surgery has emerged as the most common cause of iatrogenic ureteral injury. Many studies evaluated the incidence of ureteral injuries in gynecologic procedures ranging from 0.1 to 2.5%.<sup>5,6</sup> According to the literature, more than 50% of all iatrogenic ureteric injuries anteceded gynecological surgeries.<sup>13</sup>

The most vulnerable site for injury of ureter is its lower segment, and meticulous attention is required while dealing with anatomical sites such as the tunnel of Wertheim's, the base of the infundibulo-pelvic ligament, and the lateral pelvic wall just above the uterosacral ligament. Types of intraoperative ureteric injuries may range from ligation, kinking by a ligature, to crushing by clamp, division, complete or partial transection, devascularization, or diathermy. In our study, out of 27 cases with ureteric injuries, 22 (81.4%) were ascribed to gynecological surgeries such as laparoscopic hysterectomy in 8 (36%) cases, open hysterectomy in 9 (41%), vaginal hysterectomy in 1 (4%), and open Wertheim's hysterectomy in 4 (18%) cases. Remaining 5 (18.5%) injuries were consequence of obstetrical procedures that encompassed cesarean section in four cases and cesarean hysterectomy in one case.

Postoperative symptoms of urologic injury tend to be variable. Flank pain and fever are the most common symptoms in early postoperative period followed by urinary leakage after removal of urethral catheter. Hematuria, a dramatic indicator of renal trauma, is absent in approximately 30% of ureteric injuries.<sup>14</sup> Women may occasionally present with a retroperitoneal urinoma, which can be confirmed by an ultrasound scan. Postoperative anuria, in cases of bilateral ureteric ligation though uncommon, should prompt urgent evaluation. Sequel to most of urological injury is involuntary loss of urine from site other than the urethra; this should prompt the search for an iatrogenic fistula. Vesicouterine fistula patients typically give history of cyclical hematuria. A late presentation is the development of hypertension secondary to obstructive uropathy. In suspected cases, investigations are done to evaluate renal function, to rule out hydronephrosis, and to assess continuity of the ureter. In our study, a post-hysterectomy patient developed anuria on second postoperative day as a result of bilateral ureteric ligation, for which she was operated upon the same day.

Assessment for patency of urinary tract can be done using various investigations such as intravenous urogram, abdominal and pelvic computerized tomography scan with intravenous contrast, retrograde pyelogram, cystoscopy, renal ultrasound, and contrast-dye tests.

In suspected cases of ureteric injury, we performed RGP and tried to negotiate DJ stent, as it is an invaluable procedure not only in relieving symptoms but also in ameliorating small fistulae. There is no definitive consensus about the timing or technique of fistula repair. The classical view is to delay the repair for 3 to 6 months to allow the inflammation to subside; however, repair can be done as early as 4 weeks in properly selected patients with same results, minimizing morbidity of the patients. Laparoscopic Lich-Gregoir extravesical ureteroneocystostomy for ureterovaginal fistula or lower ureteric stricture is the most common surgery performed with very good success rate. We treated six of our UVF patients laparoscopically with 100% success at minimum follow-up of 6 months. In all the patients, DJ stent was removed after 4 weeks. All the cases were successfully managed. When compared to open surgery, laparoscopic ureteric reimplantation has the advantage of less analgesic requirement, shorter hospital stay, and faster convalescence.

Vesicouterine fistula is rarest among urogenital fistula with only few cases reported. We encountered three cases of these fistulas post-cesarean. Such patients can be managed by prolonged indwelling bladder catheterization, fulguration of the fistula tract, or hormonal induction of menopause that will induce involution of the puerperal uterus; however, all these methods have high failure rate. Surgical treatment includes hysterectomy or repair based on patients reproductive wishes. As in our study, all the three patients were of young age and wanted to preserve uterus; hence, we performed laparoscopic uterus preserving repair in similar manner as in O'Connor's repair of VVF with 100% success rate.

As with all retrospective studies, our study too has its own limitations; thus, findings should be interpreted with circumspection. Another problem encountered was information available in medical records which might have been incomplete; also some cases are obscured when injuries are repaired intraoperatively without urologic reference. Thus, the magnitude of the problem is larger than what we are cringing upon. On the contrary, comforting prospect is extensiveness of data collection over.

## CONCLUSION

Apart from patient consent, counseling, and consolation, a surgeon requires a thorough insight of anatomy, anticipation of such injuries, and their prevention. A surgeon should not panic or get pushed inaction and end up toppling. Laparotomy might be

considered over laparoscopy in cases where injury to the ureter is contemplated. Early diagnosis and intervention not only prevent delayed sequel to injuries but also determine chances of successful outcome. Iatrogenic urological injuries result in bereavement of both the patient and the surgeon, thus requiring collaboration of urologists and gynecologists where such injuries are anticipated.

## REFERENCES

- Ozdemir E, Ozturk U, Celen S, et al. Urinary complications of gynecologic surgery: iatrogenic urinary tract system injuries in obstetrics and gynecology operations. *Clin Exp Obstet Gynecol* 2011;38(3):217–220.
- Gilmour DT, Dwyer PL, Carey MP. Lower urinary tract injury during gynecologic surgery and its detection by intraoperative cystoscopy. *Obstet Gynecol* 1999;94(Suppl):883–889. DOI: 10.1097/00006250-199911001-00045.
- Aronson MP, Bose TM. Urinary tract injury in pelvic surgery. *Clin Obstet Gynecol* 2002;45(2):428–438. DOI: 10.1097/00003081-200206000-00015.
- Yossepowitch O, Baniel J, Livne PM. Urological injuries during cesarean section: intraoperative diagnosis and management. *J Urol* 2004;172(1):196–199. DOI: 10.1097/01.ju.0000128632.29421.87.
- Liatsikos EN, Karnabatidis D, Katsanos K, et al. Ureteral injuries during gynecologic surgery: treatment with a minimally invasive approach. *J Endourol* 2006;20(12):1062–1067. DOI: 10.1089/end.2006.20.1062.
- Dorairajan G, Rani PR, Habeebullah S, et al. Urological injuries during hysterectomies: a 6-years review. *J Obstet Gynaecol Res* 2004;30(6):430–435. DOI: 10.1111/j.1447-0756.2004.00226.x.
- Wu HH, Yang PY, Yeh GP, et al. The detection of ureteral injuries after hysterectomy. *J Minim Invasive Gynecol* 2006;13(5):403–438. DOI: 10.1016/j.jmig.2006.04.018.
- Ostrzenski A, Radolinski B, Ostrzenska KM. A review of laparoscopic ureteral injury in pelvic surgery. *Obstet Gynecol Surv* 2003;58(12):794–799. DOI: 10.1097/01.OGX.0000097781.79401.0B.
- Mann WJ, Arato M, Patsner B, et al. Ureteral injuries in an obstetrics and gynecology training program: etiology and management. *Obstet Gynecol* 1988;72(1):82–85.
- Wiskind AK, Thompson JD. Should cystoscopy be performed at every gynecologic operation to diagnose unsuspected ureteral injury? *J Pelvic Surg* 1995;1:134–137.
- Likic IS, Kadija S, Ladjevic NG, et al. Analysis of urologic complications after radical hysterectomy. *Am J Obstet Gynecol* 2008;199(644):e1–e3.
- Arrowsmith S, Hamlin EC, Wall LL. Obstructed labor injury complex: obstetric fistula formation and the multifaceted morbidity of maternal birth trauma in the developing world. *Obstet Gynecol Surv* 1996;51:568–574.
- Elliott SP, McAninch JW. Ureteral injuries: external and iatrogenic. *Urol Clin North Am* 2006;33:55–66.
- Armenakas NA. Current methods of diagnosis and management of ureteral injuries. *World J Urol* 1999;17:78–83.