Urological Injuries during Obstetric and Gynecological Surgical Procedures: Two Centers Experience

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Abstract

Objective: To retrospectively analyze the frequency and outcome of urological injuries in obstetric and gynecological surgical procedures in two medical centers.

Patients and Methods: This retrospective study done for a total of 4710 patients, who underwent cesarean section (3870) and hysterectomy (840) operations in two centers (Al-Hussein University Hospital and Assiut University Hospital during time interval from January 2006 - March 2010. Detailed history and physical examination, and the investigations of the patients were carried out. Patients were operated by a senior surgeon, and those that suffered urological injury were analyzed. The nature of injury, the timing of diagnosis and methods of repair all were recorded.

Results: During the study period 840 patients had underwent hysterectomy and 3870 patients underwent cesarean section (total 4710 patients). Urological injuries recorded in 46 (0.98%) patients. Sustained bladder injury was reported in 14 (1.7%) and 16 (0.41%) cases who underwent hysterectomy and caesarean section, respectively. All bladder injuries except one case diagnosed intraoperatively.

Ureteric injury was seen in ten (1.19%) hysterectomy and six (0.15%) caesarean section patients; the injuries included ligation in 8 (0.16%) cases, transaction in 4 (0.08%), ligation and transaction in 3 (0.06%), and ureterovaginal fistula in 1 (0.02%) case. Intraoperative diagnosis of injuries was made in 5 (31.2%) and postoperative in 11 (68.8%) patients. Cases of bladder injury were treated by formal surgical repair and bladder drainage, while patients with ureteric injury were treated by surgical repair and/or ureteral stenting.

Conclusion: Urological injuries though uncommon, yet add significant contribution to morbidity. To reduce the morbidity from urological injuries in obstetric and gynecological procedures, careful preoperative workup, and in difficult cases anticipation and suspicion of the injury is essential.

Key Words: Hysterectomy – Caesarean section – Bladder injury – Ureteric injury.

Introduction

UROLOGICAL injuries to lower ureter and urinary bladder are uncommon but important surgical hazards especially during hysterectomy and cesarean section. Nearly two thirds of all ureteric and bladder injuries occur during gynecological surgery, and most of these complications occur during surgeries via abdominal route compared to vaginal route [1,2].

Many risk factors contribute to urological injuries in gynecological surgeries especially difficult and/or lengthy surgery are associated with active infection, endometriosis, enlarged uterus, previous pelvic surgery, pelvic adhesions, ovarian neoplasms, distorted pelvic anatomy, and uterine fibroids [2-4]. The reported incidence of bladder and ureter injuries range as 0.5% and 0.36% for abdominal hysterectomy, 0.1% and 1.8% for vaginal hysterectomy and 1.7%-5.13% for obstetric hysterectomy [3-5]. The incidence of bladder injury increases with previous caesarean deliveries [4]. Women with urological injuries during gynecological or obstetric procedures were found to have greater blood loss, longer operative time, more frequent blood transfusions, more febrile morbidity and longer hospital stay [3,4].

Moreover, the establishment of laparoscopic hysterectomy in many centers resulted in an increased incidence of urological injuries, particularly ureteric injury [6].

The aim of our study to determine the incidence of urinary tract injuries during gynecological and obstetric procedures, identify possible risk factors and outcome of their management.
Patients and Methods

This retrospective study done for total 4710 patients, 840 patients who underwent hysterectomy and 3870 patients underwent cesarean section, in two medical centers (Al-Hussein University Hospital, Cairo and Assiut University Hospital, Assiut) from January 2006 to March 2010.

The record of all the patients who suffered urological injury during these procedures was studied and analyzed including the following:

**History:**
- Full clinical history.
- Previous pelvic surgery especially previous cesarean section.
- History of pelvic inflammatory disease.

**Examination and investigations:**
All data of physical examination findings and investigations especially the pelvic and abdominal ultrasound.

**Operative data:**
- All operative details like: Distorted anatomy, hemorrhage or poor visualization.
- The time of recognition of injury either intra-operative or post-operative, surgical repair and outcomes were also recorded.

**Follow-up:**
Postoperative follow-up, including physical examination, investigations and interventions all were reported.

The study complied with the ethical regulations of our universities.

**Results**

From January 2006-March 2010, total 4170 patients who underwent hysterectomy or caesarean section were retrospectively reviewed for associated iatrogenic urological injuries. During this period, a total 46 lower urinary tract injuries occurred of which 30 (65%) involving urinary bladder and 16 (35%) involving lower ureters.

Out of 840 patients who underwent hysterectomy, 570 (67.9%) had abdominal hysterectomy and 270 (32.1%) had vaginal hysterectomy. The frequency of bladder injury was higher in abdominal hysterectomy being 2.3% (13) as compared to 0.37% (1) in vaginal hysterectomy. The incidence of ureteric injury was 1.7% (10) in abdominal hysterectomy whereas no such injury occurred in the vaginal hysterectomy group. Amongst the 3870 cesarean sections, bladder injury occurred in 16 (0.41%) patients and ureteric injury in six (0.15%) patients (Table 1).

Thirteen bladder injuries during abdominal hysterectomy, ten were due to pelvic adhesion from previous cesarean sections (CS) and pelvic surgery, while two resulted from unsafe diathermy dissection and one case with long obstructed labour. They were diagnosed intra-operatively and repaired in two layers with 2/0 vicryl with Foley's catheter drainage for 10 days. One bladder injury was diagnosed in the postoperative period due to persistent urinary leakage from the drain; re-operation with repair of the perforation was uneventful. The only bladder injury that occurred in vaginal hysterectomy was due to accidental entrapment of the bladder. It was recognized post-operatively due to the leakage of urine per-vagina and was confirmed on cystography; re-exploration and 3-layer repair using 2-0 Vicryl was successfully performed together with drain. The site of injury of bladder was involving dome of bladder in the majority of cases.

Sixteen cases of bladder injury among caesarean sections (CS) had a previous history of CS; one of the patients had four and another seven previous CS. The posterior wall of the bladder was densely adherent to the lower uterine segment; their separation resulted in tear in nine cases and small cystotomy in five cases. In two cases profuse bleeding obscured the operative field and blind dissection resulted in bladder tears. All cases were repaired successfully with 2-0 vicryl double-layer repair together with bladder drainage. Close proximity of the bladder injury to trigone and ureteral orifice in 2 cases necessitate insertion of DJ stents by attending urologist intraoperatively in 2 cases.

Ureteric injuries were recorded in 16 patients. The distribution of ureteric injuries is shown in Table (2). Injuries during hysterectomy involved lower third of ureter (at or below pelvic brim) whereas injuries during the cesarean section involved lower ureter in 4 cases and middle (above pelvic brim) ureter in the remaining 2 cases. No ureteric injury recorded during or after vaginal hysterectomy. Amongst the ten cases of ureteric injury during abdominal hysterectomy, two patients had carcinoma cervix, another 2 cases with marked pelvic adhesions from previous pelvic surgery where the anatomy was obscure, while six cases resulted from bleeding and attempts to secure hemostasis blindly. Six injuries were left-sided and three rights sided, while one was bilateral. All (6) ureteric injuries during CS resulted from blind
sutures to secure hemostasis, and were equally distributed on each side. All ureteric injuries were managed by senior urologist either intraoperatively or in postoperative period.

Intraoperative diagnosis of ureteral injuries was made in 5 (31.2%) and postoperatively in 11 (68.8%) patients. Out of the eight patients with ligation injury, three were diagnosed during surgery; the ligature was identified, removed and DJ stenting performed. The remaining five cases were diagnosed in the post-operative period due to persistent lumbar pain and fever. Ultrasound examination revealed hydronephrosis while intravenous urography confirmed hydronephrosis with dilatation of ureter up to the level of ligation; suture removal and DJ stenting was successful in 4 cases while end-to-end ureteral anastomosis with DJ stent done in the remaining patient. Among the five cases of transaction, two cases were recognized at the time of surgery and three in the postoperative period due to persistent leakage of urine from the drain. All five were managed successfully by primary repair and DJ stenting. Two cases of ligation and transection were diagnosed in the early post-operative period. One patient presented with anuria due to ligation and transection of both the ureters, while the other patient presented with fever and loin pain. Ultrasound and multislice CT scan made the diagnosis clear. In the patient with anuria, one ureter required re-implantation (ureteroneocystostomy); in the other one anastomosis with DJ stenting was successful. The other patient managed with end-to-end anastomosis and DJ stent for 6 weeks.

The last patient with ureteral injury had partial injury to the ureter presented post-operatively with leakage of urine from the vagina; CT scan done and confirmed ureterovaginal fistula. The patient managed successfully with excision of fistulous tract, ureteral Boari flap on DJ stent 3 months later.

Table (1): Distribution of urological injuries.

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>No. of surgeries</th>
<th>Bladder injury</th>
<th>Ureteric injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal hysterectomy</td>
<td>570</td>
<td>13 (2.3%)</td>
<td>10 (1.7%)</td>
</tr>
<tr>
<td>Vaginal hysterectomy</td>
<td>270</td>
<td>1 (0.37%)</td>
<td></td>
</tr>
<tr>
<td>Cesarean section</td>
<td>3870</td>
<td>16 (0.41%)</td>
<td>6 (0.15%)</td>
</tr>
</tbody>
</table>

Table (2): Distribution of ureteric injuries.

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. of Intraoperative diagnosis</th>
<th>Postoperative diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligation</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Transaction</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Ligation &amp; transaction</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Fistula</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Discussion

Both urinary and female genital tracts are anatomically closely related which increase the potential injury of them during surgical procedures. Iatrogenic urological injuries represent nearly 1% of complications secondary to gynecological and obstetrical surgeries [1,4,7]. Proper diagnosis of these urological injuries and early management is very essential to avoid and decrease associated morbidity [2,5].

In our study, we aim to detect the prevalence of urological injuries during the most common obstetrical and gynaecological procedures done at our centers, namely caesarian section and hysterectomy. In our study, the rate of bladder injury was 0.64% and that of ureteric injury 0.34%, which is comparable to other series where bladder injuries ranged from 0.7% to 0.82% and ureteric injuries 0.2%-0.4% [2,4-8,10]. Montz and associates [9] reported bladder injuries between 0.5-1%. Raut and associates [10] in their study described the incidence of bladder and ureteric injuries in gynecological surgery as 1.23% and 0.11% respectively, whereas in obstetrical surgery the incidence of bladder and ureteric injury was 0.67% and 0.33% respectively. Nawaz et al. [2] reported a large series of nearly 18,500 gynecological and obstetrical procedures and recorded bladder injury incidence 0.25-0.7% and ureteric injury incidence 0.02-0.6%.

Bladder injuries were most common urologic injuries in our study. They occurred mostly during separation of bladder from lower segment of uterus in patients with previous cesarean sections. Scarring from previous surgery obliterates the safe surgical plane, thus making the dissection difficult. In this situation, application of upward traction on the vesico-cervical fascia will make the dissection between bladder and uterus safe. Bladder injury can be suspected by the presence of urine leakage or hematuria; large cystotomy is easily detected while smaller tears can be detected by filling the bladder with normal saline or methylene blue [3,11]. There is no doubt that primary repair during the operation has excellent results. In our study, the majority of bladder injuries were easily detected by the operating gynaecologist and obstetrician which can be explained by the easier accessibility of the urinary bladder for assessment intraoperatively.

The ureteric injuries are difficult to diagnose intra-operatively but can be suspected by observing leakage of urine during operation. This suspicion should be especially in difficult cases of scaring,
carcinoma cervix, large pelvic masses and hemorrhage. Furthermore, confirmation of ureteric integrity should be accomplished by careful exploration of ureter along its pelvic course together with injection of diuretics and looking for urinary leakage, ureteric dilatation and peristalsis [1,3,5,11]. In anticipated difficult cases bilateral ureteric catheterization helps in the better exploration of ureters during surgery. Unfortunately, about two thirds of ureteric injuries are detected post-operatively with variable clinical pictures as fever, hematuria, flank pain, oliguria or anuria, or persistent urine leakage [5,7,10,11]. Urinary injuries can be minimized by avoiding blind clamping of blood vessels, operating close to the pathology, identification of the ureter in its course before dissection, careful mobilization from the operative site and short diathermy applications or use of bipolar diathermy and identification of risk factors which induce distorted anatomy e.g. previous pelvic surgery, malignancy, fibroids, endometriosis [1,2,5,9].

The general principles of ureteric repair are ureteric dissection preserving adventitial sheath and its blood supply, tension free anastomosis, watertight closure with fine absorbable sutures, use of peritoneum or omentum to surround the anastomosis, drainage of the anastomosis site with a passive drain to prevent urine accumulation and stenting with a ureteric catheter [5-7].

Intraoperative identification of urological injuries enables proper early repair and is associated with decreased morbidity and negligible legal risks [11,12].

The use of intraoperative cystoscopy during urogynecological operations has shown the incidence of urological injury between 2.6-8% [2,13,14], whereas another study had shown cystoscopy to miss certain bladder and ureteral injuries [16]. There still no general consensus on whether intraoperative cystoscopy should be performed routinely during every major gynecological procedure [15]. Cystoscopy should be considered in complex cases, as it is cost effective. A high index of suspicion must be considered in patients with unexplained hematuria, fever, abdominal or flank pain and oliguria or anuria.

Regardless of the etiology of urological damage, prompt radiological investigation in the form of intravenous urography or contrast-enhanced computed tomography is ultimately required for diagnosis to prevent delay in treatment and subsequent comorbidity.

None of the recorded urological injuries was due to laparoscopic procedure because few laparoscopic gynaecological procedures had been done in our centers during the period of our study. This is in contrast with other series that reported an increased incidence of urological injuries during laparoscopic interventions at least in its initial application [6,17].

Although lower urinary tract injuries are uncommon during gynaecological and obstetric procedures, yet had significant morbidity when improperly diagnosed and managed. The vast majority of bladder injuries are easily identified intraoperatively by obstetricians and gynaecologists, thus properly repaired. On the other hand, ureteric injuries are commonly missed intraoperatively and diagnosed postoperatively, hence a high index of suspicion is required intraoperatively especially in difficult and high risk cases.

**Conclusion**

Urological injuries though uncommon, yet add significant contribution to morbidity and medical litigation. Knowledge of pelvic anatomy, careful dissection and keeping high index of suspicion in difficult and risky cases are the key factors to anticipate and prevent injury.

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**References**


