

COMPLICATIONS AND MANAGEMENT OF URETERIC INJURY DURING LAPAROSCOPIC HYSTERECTOMY

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INTRODUCTION

Injury to pelvic ureter is one of the most serious operative complications of gynaecologic surgery. This type of injury is associated with high morbidity, ureterovaginal fistulas and the potential loss of kidney function. There is a greater risk of renal function impairment in ureteric injuries as compared to bladder injuries since less than half of all ureteric injuries are identified at the time of surgery.

World over, hysterectomy is one of the frequently performed gynaecological surgical procedures. It is performed for various benign conditions as well as for the cancer of uterus and adnexa. It is, however associated with a small but significant risk of surgical morbidity and between 2 to 10 patients per thousand suffer ureteric injury.(1)

Operative injuries to the urinary tract occur in the course of gynaecological procedures due to the close development (embryological) and proximity of the urogenital systems.

It has been reported that 52-82% of operative ureteric injuries occur during gynecologic surgery. Most of these injuries occur during the performance of hysterectomies. Ureteral injuries have been reported in 1.3-2.2% of abdominal hysterectomies and in 1.3% and 0.03% of laparoscopic and vaginal hysterectomies respectively(3,4,5,6,8,9,10,13,17,18). As the experience with operative laparoscopy has increased, the incidence of all major complications has declined but ureteric injuries have stayed constant at around 1%(5,17).

AIM

The aim of study was to review the management of ureteric injury occurring during the performance of laparoscopic hysterectomy.

Materials and Methods

Rapid review of literature was carried out. The keywords used were gynecological laparoscopic surgeries, ureteral trauma, urological injuries at laparoscopic hysterectomy, management of ureteric injuries.

Searches were conducted by the following data bases: Medline, Google, Pubmed, HighWirePress, RCOG and Nice guidelines and Online Springer facility available at Laparoscopy Hospital, New Delhi.

Anatomy and blood supply of pelvic ureter

During its passage from the renal pelvis to the bladder, the ureter is divided anatomically into two major components; abdominal and pelvic and they are approximately equal in length (12-

15cms) . The ureter enters the pelvis passing over the iliac vessels at the point where the common iliac artery divided into external and internal iliac arteries

The retroperitoneal position of the pelvic ureter at the pelvic inlet is used for its identification during surgical procedures .

Deep in the pelvis the ureter courses along the lateral side of the uterosacral ligament to enter the base of the broad ligament .Approximately 1.5 cm lateral to the cervix the ureter passes underneath the uterine artery (at the level of internal cervical os).It then passes medially over the anterior vaginal fornix before entering the trigone of the bladder .

Ureter derives its blood supply from multiple sources .The upper (abdominal) ureteral segment receives blood supply from renal and ovarian arteries ,the middle segment is supplied by branch from aorta and common iliac artery and the pelvic ureter receives multiple anastomosing vessels from the uterine, vaginal and vesical arteries .

The blood supply to the upper and mid portion of the ureter is from its medial side and the pelvic ureter receives its blood supply mainly from the lateral side .The internal vessels anastomose freely with each other in the surrounding adventitia.(4-7,8)

Factors which increase the chances of ureteral trauma (5,6,8)

- Previous pelvic surgery
- Endometriosis, pelvic adhesions
- Enlarged uterus
- Ovarian neoplasms
- Cervical fibroids ,broad ligaments fibroids
- Distorted pelvic anatomy and
- Intra operative hemorrhage.

Types of ureter injury

The ureter may be injured at laparoscopic hysterectomy due to

- Ligation or kinking by a ligature
- Electrosurgical dissection /diathermy
- Post operative avascular necrosis and by obstruction due to haematoma or lymphocele .
- Stapling devices for vascular pedicles .

Ureteral injuries usually occur in one of the four anatomical locations

- Cardinal ligament where the ureter passes under the uterine vessels
- At or below the infundibulopelvic ligament
- Along the lateral border of uterosacral ligament
- Where the ureter lies in close proximity to the anterior vaginal wall and enters the base of the bladder .(3,4,5,6,7,8)

Most commonly the ureter is injured in the lower third of its pelvic course .

It has been shown in various studies that around two thirds of ureteric injuries are not recognized intra operatively. However intraoperative recognition is critical so that it can be repaired and renal functional compromise can be avoided (7, 8, and 18).

Preoperative strategies to reduce the intraoperative injuries have included

- Risk assessment –this is based on underlying pathology .
- in patients deemed to be at risk of intra operative ureteric injury, ultrasound and intravenous urogram (IVU) should be performed to delineate ureteric position ,dilatation and to disclose the anatomic variation (5,6,7,18)

Intraoperative strategies to prevent the ureteral injury

According to Liu, “the best way to prevent ureteral injury during laparoscopic surgery is to be certain of its location at all times during the procedure. “ (8)

- It is recommended (8, 20) that routine identification and dissection of pelvic ureter be performed at the beginning of any difficult pelvic surgery.

Prophylactic ureteric catheterization has been advocated by some in difficult cases (21) though it has not been shown to reduce the risk of ureteral damage in routine cases (8, 20, 22). Ureteral mucosa can be damaged by the heat emitted from the lighted catheter and from the intraoperative manipulation of the catheter against the ureter (8,20,22)

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- RECOGNITION OF THE URETERAL INJURY
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- Intraoperative Diagnosis
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- Intraoperative Diagnosis and repair of ureteral injury leads to preservation of renal function and also reduces litigation risk for the gynecologist (5, 6). Ureteral integrity should be checked intraoperatively. In all cases of pelvic/ureteric dissection, it is recommended to routinely perform cystoscopy examination after intravenous injection of indigo carmine dye (6, 8, 23). Ureteral injury or obstruction is suspected if there is no dye efflux from the ureteral orifice 15 minutes after indigo carmine injection. In these cases a ureteral catheter can be used to pass up the ureter towards renal pelvis in a retrograde fashion (8). The passage of catheter should also be viewed laparoscopically. If catheter passes up to the renal pelvis and there is free drainage of urine, obstruction is ruled out.
- If resistance is met then a retrograde pyelogram (RPG) should be performed and an X-Ray should be taken to determine the exact location of the obstruction. In these situations help of a urological colleague should be sought.
- Postoperative Diagnosis of ureteric Injury
- Undetected iatrogenic ureteric injuries should be suspected in postoperative period if patient complains of flank pain, has fever with chills, abdominal distension with ileus and complains of watery discharge per vaginam. Haematuria or oliguria may or may not be present. (5, 6, 7, 8, 18). It should be noted that typical symptoms may be absent in up to 50 % of women (6).
- Investigation performed in suspected cases of ureteric injury include
- CBC, Blood urea, serum creatinine, urinalysis.
- Intravenous Urogram
- computed tomography
- renal ultrasound
- retrograde pyelogram
- cystoscopy
- contract-dye tests
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- Many urologists believe that IVU is the best imaging study to evaluate the ureteral integrity postoperatively. In addition, it also assesses the function of the ipsilateral kidney and any presence of hydronephrosis / hydroureter. The extravasation of dye can be seen readily by performing an IVU (18).
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- Renal Ultrasound, including postoperative ureteral jet ultrasonography is perhaps the best non invasive method to visualize the kidney and to assess the continuity of ureter (18, 24).
- Cystoscopy and Retrograde Pyelogram are needed when results of IVU and CT scan are inconclusive (6, 18). When the results of IVU and CT scan are inconclusive, a retrograde pyelogram may be necessary to evaluate the course of the ureter. This identifies the anatomic site of obstruction, even when missed on an IVU or CT scan, by delivering a higher density of contrast material to the injured site. A retrograde pyelogram is, however, more invasive than either an IVU or CT scan and requires cystoscopy.
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- Treatment of ureteral Injury
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- When the injury is recognized intraoperatively, management depends upon the type of injury. Ureteral laceration can at times be repaired and if ureter is kinked, simple removal of ligature may relieve the obstruction.
- The thermal injury or injury by stapling devices used in laparoscopic surgery is usually more serious. In these cases and in cases where complete ureteral transection has occurred, the damaged area should be excised and ureteral reanastomosis or reimplantation should be performed.
- The management of ureteral injury recognized postoperatively is guided by many factors. The interval from injury to recognition may guide management. If recognized within the first week of operation in patient without significant infection, a surgical exploration and repair may be performed. (5, 6, 7, 8, 18).
- Attempting repair after 7-10 days of injury may be difficult and many urologists recommend that in the presence of edema, inflammation and poor general condition of the patients, surgery for ureteral reconstruction should be postponed for 6 weeks. In these patients a percutaneous nephrostomy tube or retrograde ureteral catheter can be placed initially for urinary drainage and to stabilize the patient.
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- Surgery (intraoperative or postoperative) for ureteral reconstruction should adhere to the following principles to optimize treatment (6, 8).
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- have adequate debridement and use only healthy ureter for reanastomosis.
- Perform tension free anastomosis by adequate ureteric mobilization.
- Obtain complete hemostasis if possible.
- Minimal use of fine absorbable sutures to attain watertight closure.
- Insert indwelling ureteral catheter and place retroperitoneal drainage.
- Use peritoneum or omentum to surround the anastomosis.
- Management options for repair of ureteric injuries are
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- Ureteric stent placement in cases of partial transection of ureter.
- In cases of complete transection the options available are

End to end reanastomosis

Uretero neocystostomy

Transuretero uretrostomy

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- All transected ureters need stenting and a double J stent is used for this purpose (6, 8). A retroperitoneal drainage to limit urinoma formation and bladder decompression by Foley's catheter is recommended.
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- End to End reanastomosis of ureter
- If the site of injury is above midpelvis (>5 cm from vesico ureteric junction) and there is no loss of ureteric length (injury not extensive) then end to end anastomosis of the ureter may be performed.
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- Uretero neocystostomy
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- Most injuries to ureter are located deep in pelvis (< 5 cm from vesico ureteric junction) and if there is no loss of ureteric segment, these injuries are best managed by performing uretero neocystostomy (6,8,18)
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- To avoid tension on the anastomotic site, the bladder must be mobilized from back of the pubis. If mobilization of bladder is difficult , a bladder hitch (psoas hitch) is performed by displacing the bladder upwards and attaching it to the fascia of the iliopsoas muscle.
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- Transuretero ureterostomy
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- If complete transection of ureter with loss of a large segment of ureter has occurred then a transuretero ureterostomy is recommend by the urologists.
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- Complications following surgery for ureter injury are

Ureteric stricture formation

Stent and nephrostomy related problem

Urinary tract infection

Wound infection, leakage from anastomotic site and haematoma formation

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- **Summary**
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- The review of literature on ureteric injuries during laparoscopic hysterectomies lays emphasis on intraoperative steps to minimize the chance of ureteric damage and steps to increase the intraoperative detection rate of these injuries (should they occur).
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- Laparoscopic ureteric identification and dissection should be learnt by all surgeons performing operative laparoscopy. Steps to increase detection of intraoperative injuries like cystoscopy at the completion of the operative procedure should also be encouraged. Routine confirmation of ureteral integrity prior to conclusion of difficult pelvic surgery is crucial in recognizing ureteral injury.

- Early postoperative identification of ureteric injury by appropriate radiological investigation should be advocated in women who are not recovering satisfactorily in postoperative period. Repair of injury can then be performed as soon as possible and morbidity can be minimized.

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