

# Management of Ureteral Injuries due to Gynecological Surgical Procedures

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This prospective study examined the ureteral injuries due to gynecological operations from January 1995 to December 1999. Each patient was reviewed for pre-disposing factors, location, type of injury, time and methods of recognition. Ten patients of ureteral injuries were admitted and treated. Three injuries occurred at pelvic brim and seven other occurred elsewhere in the pelvis. Risk factors included endometriosis, ovarian neoplasm, pelvic adhesions and hemorrhage during gynecologic operations. Seven patients were managed by ureteroneocystostomies with psoas hitch procedure. Two had ureteroneocystostomies with Boair's flaps and one patient had Uretero-Ureteral anastomosis. All the ten patients had indwelling ureteral stents for two weeks for splintage. Wound infection was seen in one patient (10%) and urinary tract infection was documented in one patient (10%).

**Key Words** Ureteral Injury, Gynecological Operation.

The subject of ureteral injury and repair has stimulated the concern and inventive genius of surgeons for a century or more. Injury to the ureter is one of the most serious complications of gynecologic surgery. It is constant threat and sword of damocles hanging over every major operative procedure. True incidence of ureteral injury is unknown, however results from various studies suggest a rate of 0.4% to 2.5%<sup>1,2</sup>.

Most of the ureteric injuries (91%) involve the lower one-third of ureter<sup>3</sup>, where it is damaged by accidental ligature with uterine artery, crushed, transected or caught up in the suture used to close the peritoneum of pelvic floor.

Patients who had ureteral injuries during gynecologic operation were admitted in our unit bringing this complication to our attention. To study the problem, detail review of all ureteral injuries during five years period were undertaken and to learn if they could be avoided. Risk factors associated with ureteral injuries, mode of presentation and management options are discussed in this report.

## Patients and methods

Ten cases of ureteral injuries due to gynecologic operation were managed from January, 1995 to December, 1999, in Department of Surgery Services Hospital and Jinnah Hospital attached with Allama Iqbal Medical College, Lahore.

Ages of patients ranged from 38 years to 59 years. All the patients were referred from peripheral hospitals except one who was from same hospital in which ureteral injury was recognized intra-operatively and repair was done under same anesthesia. Each patient was reviewed for past medical and surgical history, type of procedure, anesthesia, incision and operative complication. In nine patients in whom ureteral injuries were recognized in post operative period, we performed Intravenous Urography (IVU) followed by cystoscopy and bulb

ureterography to see the side and site of injuries. All the patients were operated upon by consultant surgeon after pre-operative preparations. Two patients had ureteroneocystostomies (with sub-mucosal tunnel) with Boair's flap. Seven patients had ureteroneocystostomies (with submucosal tunnel) with psoas hitch and one patient had uretero-ureteral anastomosis. All the ureteral repairs were stented with 6F silastic double J ureteral stents for two weeks.

## Results

There were ten injuries to ureter. One injury was recognized immediately and repair was performed during the same anesthesia. Nine injuries were un-noticed and were recognized from fifth to 14<sup>th</sup> postoperative day. The patients' ages ranged from 38 years to 59 years. One of the ten patients had undergone previous hysterectomy, rest of nine did not have any operation prior to ureteral injuries. All patients underwent general anesthesia. Three patients had vertical incision and seven had pfannenstiell incision. The surgeon was gynecologist in 8 instances, a general surgeon in one instance and a general practitioner in one instance.

Three of the ureteric injuries occurred at the pelvic brim and seven occurred elsewhere in the pelvis. Of the seven five occurred where ureter crosses under the uterine artery during elective hysterectomies, one occurred near the anterior fornix of vagina and one occurred at the lateral pelvic wall.

Of the three injuries that occurred at the pelvic brim, one patient had undergone previous hysterectomy. That patient had a large benign ovarian tumor removed during which ureter was injured. The other two had adnexia removed for non neoplastic reasons. Each of these was associated with dense adhesion that made dissection of the adnexial structure difficult.

Of the seven injuries that occurred in deep pelvis, three patients had severe endometriosis, one had

endometrial carcinoma, and three had hemorrhage from uterine vessels which resulted in ureteric injuries.

Four ureters were transected and six were ligated. One of the nine patients presented with urinary discharge from pfannenstiell incision. Three of nine patients presented with continuous dribbling of urine from vagina and wetting of undergarments. Five patients presented with complaints of flank pain and fever. Fever was more than 100F° in all patients. All patients were studied with Intravenous Urography (IVU) followed by cystoscopy and retrograde bulb-ureterography to delineate the exact location of ureteral damage.

To repair the 3 ureteral injuries at pelvic brim, two ureteroneocystostomies (with sub-mucosal tunnel) with Boari's flap and one ureteroneo-cystostomy with psoas hitch were used. To repair seven injuries in the pelvis, one end to end uretero-ureteric anastomosis and six ureteroneocystostomies (with sub-mucosal tunnel) with psoas hitch were used. All the ureteral repairs were stented with 6F silistic double J ureteric stents for two weeks. One patient (10%) had wound infection and one patient (10%) had urinary tract infection which were treated successfully with antibiotics. Eight out of ten patients (80%) had good recovery and went home on tenth post operative day. Each patient was followed up with Intravenous Urography (IVU) at 3 months post operatively which showed normal urinary tract.

### Discussion

The ureter, which transports the urine from kidneys to urinary bladder, is most vulnerable to iatrogenic injury due to urological, gynecological, vascular, and general surgical procedures. According to Selzman AA and Spirnak-JP 34% of iatrogenic ureteral injuries are due to gynecological surgical procedures<sup>3</sup>. The close embryologic development of the ureter and female genital tract predisposes the ureter to injury during surgical procedure in the female pelvis<sup>4</sup>. In the adults the ureter is generally 24-30cm in total length but varies with body habitus. The ureter is often arbitrarily divided into segments for purposes of surgical or radiographic description. The abdominal ureter extends from renal pelvis to the iliac vessels, and the pelvic ureter extends from the iliac vessels to the bladder. The ureter can also be divided into upper, middle, and lower segments usually for purposes of radiographic description. The upper ureter extends from renal pelvis to upper border of sacrum, the mid ureter then extends to lower border of the sacrum, which roughly corresponds with iliac vessels and the lower (distal or pelvic) ureter extends from lower border of sacrum to the bladder. With knowledge of the ureteral anatomy, the common site of ureteral injuries during gynecological surgical treatment are easily deduced. (1). The distal ureter just lateral to vagina where the uterine artery crosses ventrally over the ureter to enter the uterus. (2) Over the pelvic brim where the ovarian vessels cross the ureters in

the infundibulo-pelvic ligament and (3) at the angle of vaginal fornix<sup>5</sup>. Findings from other studies indicated the incidence of ureteral injury to be 0.67%–2.5%<sup>6-7</sup>.

However the incidence is rising as more ambitious operations are undertaken laproscopically. The risk of ureteral injury is higher after laproscopic hysterectomy compared with traditional hysterectomy<sup>8-9</sup>.

In the present study majority of recognized ureteral injuries occurred deep in the pelvis (7 out of 10) than that (3 out of 10) at the pelvic brim as published in other studies<sup>10</sup>.

The risk factors are identified in this report (1) Cancer (2) Hemorrhage (3) Endometriosis and (4) Dense adhesions.

To prevent ureteral injury, pre-operative Intravenous Urography (IVU) or placement of ureteral stents or both have been suggested in difficult cases only and need not be a routine<sup>11</sup>. The most accurate way of following the ureter is by direct visualizing during the operative procedure and is the method we prefer. Retroperitoneal identification of ureter at the reference point where it crosses anteriorly at the bifurcation of iliac vessels and following its course through the pelvis into bladder visually and palpably is safe and best way to prevent injury to ureter. Bleeding is a common problem in surgical procedures in the pelvis and can lead to ureteral injuries. Three instances were identified retrospectively in which bleeding from uterine vessels was controlled by suture ligation, clamps or cautery that led to ureteral damage. To avoid such damage proper identification of uterine vessels and ureter before suturing or cauterising is mandatory.

Nine patients with ureteral injuries who presented late in post operative period, we performed Intravenous Urography (IVU) to see the site of injury followed by cystoscopy to exclude the possibility of associated vesical injury and retrograde bulb ureterography to see the site and nature of injury. WU-K and Associate<sup>12</sup>, Sharfi-AR and Associate<sup>13</sup> have recommended the same.

In this report we performed one uretero-ureteric anastomosis, two ureteroneocystostomies with Boari's flaps and seven ureteroneocystostomies with psoas hitch with good results. None of the patients required re-do operation which is comparable with other studies<sup>14</sup>. We found that for resolution of lower ureteric defect, psoas hitch procedure has many advantages over the classic Boari's flap technique, not only it is simpler to achieve but facilitates reflux preventing re-implantation of ureter. Psoas hitch is the simplest procedure for substitution of the lower one third of the ureter<sup>15,16</sup>.

In all the ten cases, we splinted the ureteric repairs with 6F double J silicon ureteric stents for two weeks. There was no urinary leakage noted. Ureteric stents prevent postoperative urinary leakage and are helpful in reducing the postoperative morbidity<sup>17</sup>. Controversy about their use in certain situation is bound to continue particularly with reference to the uncomplicated cases<sup>18</sup>. In

a survey of 1453 members of American Urological Association, approximately 75% used splints for ureteric repairs, pyeloplasties and ureteric reimplantations<sup>19</sup>. The justification of this policy was diminished likelihood of, urinary extravasations, infections and many other complications that contrive to disrupt the unsplinted anastomosis. The consensus view of their use must be that they are most unlikely to do any harm and may well do a lot of good to the overall benefit of the patient.

In 9 out of 10 patient who presented late, we performed the operative repair of ureteral injuries soon after the diagnosis was established and preoperative preparations were made. Recently acquired ureteral injuries may be repaired soon after the diagnosis of the problems with good result as supported in this series of patients. This shortens the length of hospital stay of patient and alleviates much of the morbidity endured<sup>20, 21</sup>.

Two patients had infections; one had wound infection (10%) and other had urinary tract infections (10%) which were treated successfully which is comparable to other studies<sup>22</sup>.

### Conclusion

Knowledge of pelvic anatomy including retroperitoneal course of ureters is essential for all pelvic surgeons. Liberal use of retroperitoneal dissection to identify the ureter can decrease the incidence of ureteral injuries. We recommend early repair of ureteric injury, splinting the repair with double J ureteric stents.

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