Ureteral Injury during Lumbar Laminectomy: A rare occurrence

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ABSTRACT

During spinal surgery injury to ureters is a rare complication with only few cases has been reported in literature. We come across a case of un-recognized iatrogenic during lumbar laminectomy. The injury went unrecognized initially and was discovered fifteen days later when the patient presented in surgery ER with atypical symptoms of severe right iliac fossa and flank pain. The symptoms were not attributable to any disease pertaining to the respective specialty. In this case report we have highlighted a rare complication which encountered during lumber spine laminectomy, with literature review to give comprehensive information's to the surgeons and patients regarding this complication and its management approaches.

Keywords: Ureter, Injury, Lumber laminectomy, Clinical presentation, Diagnosis, Management

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INTRODUCTION

Iatrogenic injuries to ureters are most frequent and account for approximately 75% of all ureteral injuries and are commonly encountered during urology procedures, gynecological surgery, general surgery, and vascular surgical procedures[1]. Iatrogenic ureteric injuries are rarely reported after spinal surgeries. In spine surgery, lumbar laminectomy is a surgical procedure in which part or whole of the vertebral bone (lamina) is removed in order to relieve compression over the nerve roots or the spinal cord that may be caused by trauma, herniated disk, spinal stenosis or tumors or some other reason[1,2]. Retroperitoneal organ injury is an extremely rare complication of lumbar laminectomy reported in literature. So far only about 15 cases of ureteral injuries following lumbar disk surgery have been reported in the literature[1]. The frequency of complications following posterior lumbar surgery ranges between 1.9% and 10.8%. Among these complications, injury to retroperitoneal structures is an uncommon but a potentially serious complication[3].

Unlike pelvic or retroperitoneal surgical procedures, where a surgeon is highly aware of the proximity of the ureter and consequently its potential for injury[4], spinal surgery has its limitations in terms of exposure patient positioning. Usually, the prone or semi-prone position during surgical procedure is normally associated with ureteral injury. Although rare, being knowledgeable of this potential complication helps a surgeon to be vigilant in his/her surgical approach[5]. Moreover, the scarcity of early signs and symptoms occurring because of this complication mandate a high index of suspicion for its prompt and appropriate management[2,3]. In this case report we present a rare case of complication of lumbar laminectomy operation, its clinical presentation, diagnosis and give an overview to the surgeons regarding this complication and its different management options.

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CASE REPORT

A 43-year-old female patient reported to the emergency room with complaints of intractable pain in the right iliac fossa for ten days. She had undergone lumbar laminectomy at LV4-LV5 level in a tertiary care hospital fifteen days back. The surgery was uneventful, and patient was sent home on third post-operative day. After 2-3 days of discharge from hospital, the patient has noticed a dull shooting pain which was getting worse gradually over a period. Her pain was mainly over the right lower abdominal quadrant and radiated towards the right thigh. It was similar in nature to preoperative right-sided thigh pain and was progressively getting worse in the last three days when it became so severe that she presented to the emergency department late in the night. She opened her bowels regularly and these were no GI symptoms.

On examination, she was hemodynamically stable and had a diffuse tender swelling in the right hemiabdomen. Bowel sounds were audible. Her blood results were normal and urinalysis was negative for leukocytes, blood and nitrites. Ultrasonography of the abdomen and pelvis showed a well-defined hypo-echoeic fluid collection extending from the pelvis to the right upper quadrant along with dilated gut loops and mild right sided hydronephrosis. A contrast enhanced CT scan of the abdomen and pelvis was carried out which showed a well-defined lobulated fluid collection in right retroperitoneum of size 9.7 X 7.8 X 15.8 cm (TR*AP*CC) with thick enhancing wall and internal septae. Perilesional fat stranding was noted with strand reaction that was reaching up to ascending colon. It was compressing the mid ureter and pushing the right kidney upwards and anteriorly. Mild to moderate hydronephroureter was also observed. Mild pelvic ascites was also present (Fig-1). Keeping in view the history and radiological features, suspicion of right sided psoas abscess was provided by the radiologist.

Fig – 1: Large retroperitoneal fluid collection pushing the right kidney upwards

The patient was planned for exploration and subsequent drainage of the fluid collection. Prior to proceeding with surgery, the operating surgeon aspirated the swelling with a syringe under ultrasonographic guidance. The aspirated fluid was clear in appearance which raised the possibility of CSF leak. It was sent for Routine examination and creatinine level estimation- which was reported to be markedly elevated. A diagnosis of urinoma due to an iatrogenic right ureteric injury was made which had probably occurred during the laminectomy procedure that the patient had underwent recently.

Urinoma was drained by placing a percutaneous nephrostomy tube initially. Cystoscopy and bilateral ureterogram was carried out. Contrast injected through the right ureter was observed to be spilling into the retroperitoneum above the sacroiliac joint. The ureteric continuity was disrupted, and no contrast was passing into the proximal right ureter or kidney.

A guidewire was then introduced through the right ureteric orifice, but it was also lost in the retroperitoneum. Ureteroscopy was performed and right ureter was found to be transected just above the sacroiliac joint. It was planned to place a Double J ureteric stent endoscopically to facilitate the identification of the distal end of the transected ureter during subsequent exploration (Fig - 2). The patient improved symptomatically after

drainage of urinoma via nephrostomy tube.

Fig – 2: a) Percutaneous nephrostomy tube placed in the retroperitoneum.

b) DJ stent placed in the distal segment of the transected ureter.

Management options were discussed with the patient and her family which included end to end ureteric anastomosis, renal auto-transplant or a possible right nephrectomy as a last option. For exploration, right Rutherford Morrison incision was made, and the ureter was searched through dense fibrosis in the retro-peritoneum. Free upper end of the ureteric stent placed earlier could be seen easily and the distal end of the severed ureter was thus traced. The distal ureter was dissected free from the surrounding fibrosis and dense adhesions. Identification of the proximal ureteric segment was a tedious task because it was buried in dense fibrosis. Right kidney was mobilized and starting from the dilated right renal pelvis careful dissection was performed downwards and proximal ureter was freed from the surrounding fibrosis and traced to its lower severed end. Both the ureteric ends were spatulated and a tension-free wide end to end anastomosis was fashioned over a Double J stent (Fig - 3).

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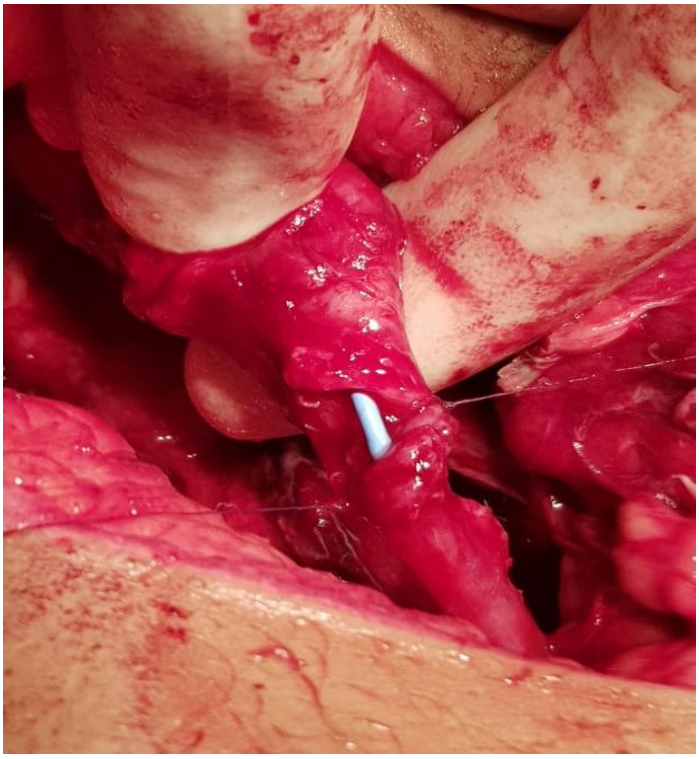

Fig – 3: Fashioning end to end ureteric anastomosis over a JJ stent.

During dissection in the retroperitoneum, it was also noticed that the iliac vessels were buried in dense fibrosis which precluded the possibility of vascular anastomosis for auto-transplant. The patient made an uneventful recovery. Her drain was withdrawn after 48 hours, and Foley catheter was removed on the 5th post-operative day. DJ stent was retrieved after 6 weeks on follow up. An ultrasound KUB performed six months following surgery revealed normal kidneys and ureter.

DISCUSSION

Iatrogenic ureter injury is potentially a devastating complication encountered during surgical procedures. The ureters are most frequently injured during colo-rectal, vascular and gynecological procedures[6,7]. During endoscopic procedures for ureteric pathologies such as removal of tumor or stone, there is a potential for ureteric injuries[8,9]. Peri-operative stenting to minimize iatrogenic ureteral trauma during surgery has been advocated in literature, but this has not been adopted universally due to different reasons and available literature has also been unable to make a case for the routine use of this technique globally[10,11]. Anatomically, the ureter is located retroperitoneally, which courses from the Pelvi-ureteric junction to the urinary bladder. It courses down and lies just lateral to the tip of the transverse processes of the lumber vertebra and anterior to Psoas muscle. Lower down, the ureter on both side crosses over the ventral surface of transverse process of the 3rd to 5th lumbar vertebrae, it then enters the pelvis and crosses anterior to the bifurcation of common iliac vessels on both sides. Due to the ureter's proximity at the level of 3rd to 5th lumbar vertebras and their inter-vertebral disk, both the ureters are liable to iatrogenic injury during posterior approach lumbar discectomy[12.13].

Injury to the ureter is an uncommonly reported iatrogenic complication during laminectomy. Unlike other retroperitoneal structures, the ureter, is surrounded by peri-ureteral fat that gives it a certain mobility and makes its injury unlikely, that explains the limited number of documented cases to date[3].

Etiologically, different patient related factors which increases the risk of iatrogenic ureter trauma during posterior lumber discectomy comprises of lean body habitus, absence of the anterior annulus in spine – which is commonly considered to provide extra layer of protection to the ureter and local scarring due to previous retro-peritoneal surgery. Similarly, other surgical factors leads to the increase chances of ureteral injury are prone positioning during surgery, supporting pelvic bolsters which push the ureter towards posterior more closer to the lumber vertebrae and surgery at the level of distal lumbar vertebrae where both ureter are placed more medially[8.9.12]. In addition, inadvertent use of Ronger type of surgical instruments during lumbar disc procedure may perforate the pre-vertebral ligaments and can cause damage to the retro-peritoneal organs including ureters[13].

Most commonly, flank and abdominal pain, macroscopic hematuria and fever should raise the suspicion of ureteric injury in the patients who had undergone such surgical procedures. However, usually the neurosurgeons and orthopedic surgeons commonly fail to recognize this complication, since it is quite a rare occurence[1]. The scarcity of early signs and symptoms in ureteral injury, necessitates a high index of suspicion by the operating surgeon to reach an early diagnosis. This may also lead to an appropriate management of the complication. As reported in the literature, the average time to reach the diagnosis, which is crucial to salvage the affected renal unit is ranges from 3 to 6 weeks post-operatively[2,8,9].

During spine surgery, through knowledge of applied anatomy of the area, careful use of discectomy instruments and avoidance of inadvertent use of other instruments are the critical precautions to prevent the per-operative ureteral injury[5,8]. During surgery, the operative surgeon should keep themselves aware that the presence of clear fluid around the spine during or following surgery, could be intra-operative irrigated saline, chyle from injured thoracic duct, cerebrospinal fluid or a urine from a ureter[2,13].

The principles of ureteric injury management comprise of an establishment of urinary drainage and a possible of realignment of ureter with a ureteral stent endoscopically or with open surgery. Before any definitive surgical procedure, per-cutaneously under ultrasound drainage of large urinoma if present, is strongly advocated because this will alleviate the patient's symptoms and allows the surgeon in more clear and precise assessment of the site and severity of the ureter injury. As a part of assessment, contrast enhanced CT scan of the urinary tract is considered very helpful in outlining the anatomical details of the injured ureter[8,9,12]. Different management options can be considered depending upon the nature and extent of injury. These include Ureteric stenting, Uretero-ureterostomy, Trans-uretero-ureterostomy, Boari tabularized bladder flap, Ileal-neo-ureter, Renal auto-transplantation and Nephrectomy. All of these treatment

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modalities have been reported in the literature previously [9-12]. The Uretero—ureterostomy is more appropriate option in managing mid ureter or proximal ureter injuries[9,10]. The distal ureteral injuries are best managed by uretero-neo-cystostomy with or without Vesico-psoas hitch procedure. If distal segment is not appropriate for end-to-end anastomosis, a number of other techniques are available for reconstruction of the ureter. The commonly recommended are Boari flap, Trans-uretero-ureterostomy and Renal auto-transplantation[4]. Rarely, the renal auto-transplantation or ureteral defect substituted with a segment of small gut is considered in selected cases. Minimally invasive or laparoscopic techniques has also been recommended to manage ureteral iatrogenic injuries if expertise is available or in specialized centers[8,9].

The literature review shows that in mid ureteric injury while performing uretero-renoscopy, the Pillai et al[2] has managed it with indwelling ureteral stent initially for two months followed by definitive repair. They use 8 cm Boari anterior bladder tubularised flap which was anastomosed to the healthy ureter over a 6Fr ureteral stent. Similarly, Demirkesen et al[1] and de Quintana-Schmidt et al[3] has reported a successful ureter repair by uretero-ureterostomy of a completely transected ureter after an inadvertent iatrogenic ureter injury during lumber disk operation. Hijiha and colleagues[12] reported that after encountering urinoma, percutaneous drainage of urinoma and nephrostomy over same side, an antegrade nephrostogram was performed which showed proximal ureter with blind end. The cystoscopy and retrograde ureterogram of same side showed a retrograde left ureter injury at the level of Lumber 3- 4. This has confirmed the complete ureteral disruption with a defect of 5 cm. They have not considered repair by end-to-end uretero-ureterostomy technique or repair by distal uretero-vesicostomy with psoas hitch/Boari flap because of the long defect and proximal location of defect. They offered any one option among permanent nephrostomy tube, ileal neo-ureter, renal auto-transplant, or nephrectomy to the patient. The patient consented for nephrectomy due to his advanced age, normal opposite kidney function (creatinine 57 µmol/L), and anatomically normal opposite kidney. In another case of iatrogenic injury during laminectomy, the Omidi-Kashani and colleagues[5] has detected a 25 cm of irreparable ureteral loss. The ureter was abraded and avulsed from both the pelvi-ureteric and vesico-ureteric junctions. They planed nephrectomy based on their personal experience, previous status of affected side kidney and intraoperative patient's situation. After nephrostomy, the patient was discharged on 5th post-operative day.

CONCLUSION

Ureteral injury following spinal surgery is a rare surgical complication with significant morbidity and mortality. Although the initial symptomatology can be nonspecific, an early diagnosis is essential to avoid complications such as sepsis or the grave consequence of loss of renal unit. A high index of suspicion is therefore essential for early appropriate management and renal salvage.

AUTHOR'S CONTRIBUTION

Farouk K: Literature search, Operating surgeon, Final approval
Samiullah: Literature search, Operating surgeon, Critical review
Ishtiaq S: Manuscript writing, Literature review
Masood A: Literature search
Ahmed I: Literature search

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