Case – Ureteric entrapment following oblique lateral interbody fusion

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INTRODUCTION

Urologic complications during spinal surgery, although rare, require prompt evaluation and management. Complications can arise from the close proximity of the lumbosacral spine to the ureter, potentially leading to ureteral obstruction, urinary extravasation, and hydronephrosis, which may result in renal impairment, pain, and infection. Ureteral injuries during spinal surgery occur due to direct trauma, compression, or entrapment by surgical hardware.[1-3]

The oblique lateral interbody fusion (OLIF) procedure is a minimally invasive technique accessing the lumbar spine via a lateral approach, avoiding major posterior muscles. A cage implant is inserted between the vertebrae to provide structural support and promote fusion; however, the retroperitoneal approach potentially increases the risk of ureteral injury.

This case report details the diagnosis and management of ureteric entrapment following an OLIF procedure with cage implant for degenerative disc disease.

CASE REPORT

A 76-year-old male presented with progressive lower back pain and left thigh paresthesia unresponsive to conservative management. Imaging revealed severe L3–4 degenerative disc disease, and he underwent OLIF with cage implant and posterior pedicle screw fixation at L3–L4 level. The surgical approach involves an oblique flank incision, 5 cm anterior to the disc midpoint. The external oblique fascia is sharply opened, followed by blunt dissection through muscle layers to access the retroperitoneal space, developing a plane anterior to the psoas and lateral to the vasculature.

Following surgery, he complained of persistent left-sided incisional/flank pain and developed a fever (39.2°C) on postoperative day 7. A computed tomography (CT) scan showed new left hydroureteronephrosis down to the level of the L3–4 disc prosthesis with a delayed nephrogram, suggesting obstruction; there was associated perinephric fluid around the kidney, which tracked into the retroperitoneum and anterior to the psoas suggestive for urinary extravasation from a likely forniceal rupture (Figure 1). Urology was consulted and a nephrostomy tube was inserted, relieving the pain and draining 1.2 L of urine.

Nine days postoperatively, he underwent cystoscopy, left retrograde pyelogram, and nephrostogram, which revealed medial deviation of the proximal and distal ureter with an abrupt cutoff at the L3–L4 disc space, corresponding to the location of the OLIF cage (Figure 2). A hydrophilic guidewire was unable to be advanced proximally. The findings were reviewed with the spine surgery team and urgent surgery was scheduled the next day to attempt to loosen the cage implant and release the ureter.

The patient was positioned in the right lateral decubitus position with the table flexed. The previous left flank incision was opened and extended laterally towards the 11th rib and medially towards the rectus. The lumbodorsal fascia was opened and the retroperitoneum entered. The peritoneum was swept off of the overlying abdominal wall and Gerota's fascia dissected off of the psoas in order to expose the L3–L4 disc space.

With lateral retraction of the psoas muscle, the lateral aspect of the cage implant was identified. Both the proximal and distal portions of the ureter were identified and could be seen tracking into the cage (Figure 3). The posterior L3 and L4 pedicles were opened to expose the rods and screws on each side. The L4 set screws were loosened with a distractor applied to try and create adequate space to dislodge the ureter. After maximal posterior distraction and anterior discectomy, the tethered ureter was not able to be released, and it was decided to proceed with a ureteroureterostomy.

The ureter was transected at the level of the cage proximally and distally. Both ends of the ureter were spatulated on opposite sides and the mucosa appeared healthy and well-vascularized. A uretero-ureteric anastomosis was performed in a tension-free

KEY MESSAGES

- Ureteric entrapment following OLIF is rare but can lead to significant renal impairment.
- Fever, abdominal/flank pain, or hematuria after OLIF should be investigated, as they may necessitate urgent intervention.
- Contrast-enhanced CT with urographic phase is essential for timely diagnosis.
- In cases where ureteral dislodgement from the spinal implant is not possible, a uretero-ureterostomy with stenting is a viable option.

manner over a 6 French multilength double-J stent. The peritoneum was sharply opened to access the omentum and a pedicled omental flap was created and based off the left gastroepiploic artery. The flap was wrapped around the anastomosis and secured.

The peritoneal opening was then loosely reapproximated around the flap. A Jackson-Pratt drain was placed and the left nephrostomy tube left open along with a Foley catheter. On postoperative day 5, the nephrostomy tube was clamped, Foley catheter removed, and the drain monitored. The drain output remained minimal, and it was removed. The nephrostomy tube was removed via fluoroscopy nine days postoperatively and the patient was discharged from hospital three days later. The stent was removed six weeks postoperatively and a followup CT confirmed resolution of the injury and perinephric fluid.

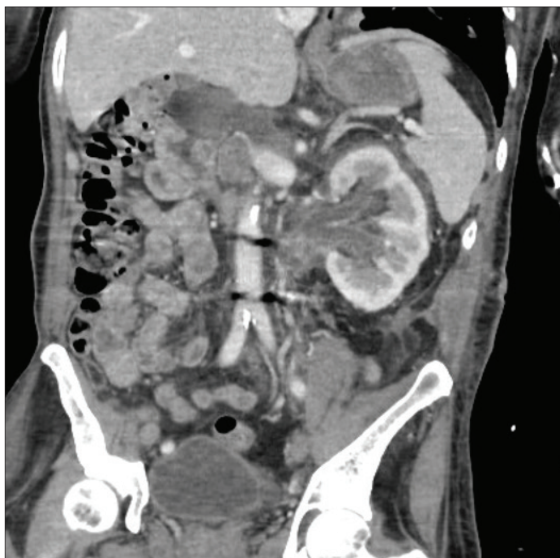

Figure 1. Coronal view of left kidney demonstrating moderate hydronephrosis, uroepithelial thickening, and perinephric fluid.

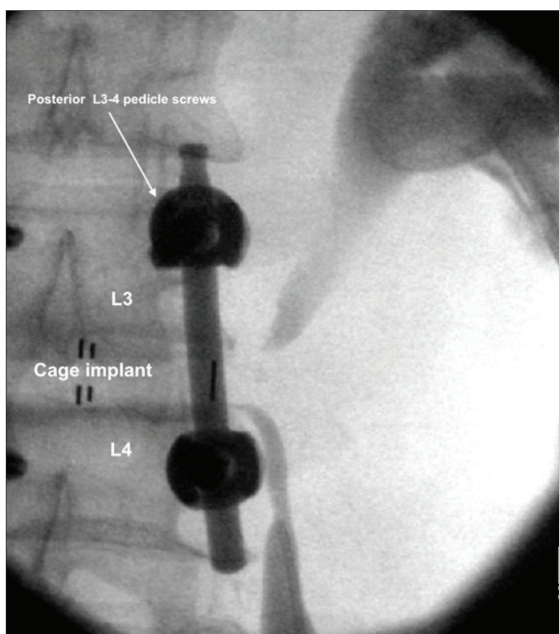

Figure 2. Fluoroscopic image demonstrating combined left retrograde and nephrostogram with an abrupt proximal and distal cutoff at the level of the intervertebral cage implant.

DISCUSSION

This report explores a rare case of ureteric entrapment following an OLIF procedure and cage implant insertion. In this patient, the ureter could not be dislodged from the implant, necessitating transection and re-anastomosis.

OLIF has been introduced as a technique for minimally invasive lumbar fusion, with a 1.7% risk of major surgical complications.[4] There are two main circumstances in which ureteric injury can occur during OLIF. First, during psoas retraction, the ureter can be compressed or displaced as it runs along the anterior surface of the psoas. The improper handling or excessive retraction of the psoas can lead to injury of the overlying ureter.[5] Second, during the placement of the interbody cage, the ureter may become vulnerable to injury. If the cage is positioned too anterior to the disc space or is angled incorrectly, it could compress or trap the ureter against nearby structures, potentially causing obstruction or other forms of damage.[5] Careful attention to cage placement and angulation is crucial to avoid such complications. There have been minimal reports of ureteral injury following OLIF.

In 2017, Kubota et al reported a partial ureteral injury on postoperative day 2. As the ureter wasn't tethered

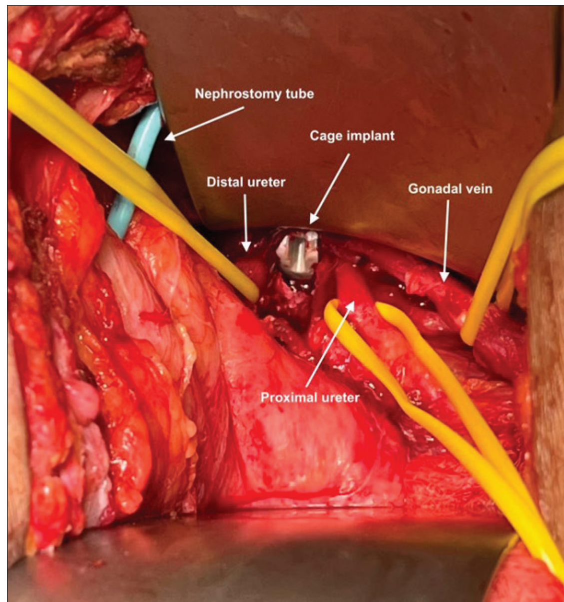

Figure 3. Intraoperative image demonstrating the lateral aspect of the intervertebral cage implant with associated ureteric entrapment.

under the implant, they were able to address the injury through stenting.[6] A similar case occurred in 2022, as reported by Wang et al. This patient also suffered accidental ureteral transection in which a uretero-ureteric anastomosis was performed with stent insertion.[7] Another report by Lee et al identified a ureteric injury during an OLIF procedure, indicated by intraoperative hematuria. A urologist was consulted, and a ureteroureterostomy with stent insertion was performed at the time of surgery.[8] Anterior, posterior, and lateral lumbar surgeries have also reported ureteral injury, with the incidence rate being higher in OLIF procedures when compared to lateral interbody fusion procedures.[9]

Ureteric injuries are likely to be diagnosed in the postoperative period because of the limited exposure provided by the relatively small OLIF incision, which potentially limits intraoperative recognition. The delayed diagnosis of ureteric injuries can result in pain, fever, and sepsis. Post-OLIF symptoms of fever, abdominal/flank pain, and hematuria should be thoroughly investigated to rule out urologic injuries.[10]

During an OLIF procedure, patients should be catheterized, and the color of urine should be closely monitored. Once ureteric injury is suspected, a urologist should be consulted to assist with the diagnosis and treatment. In the postoperative period, timely CT with urographic phase should be performed when a urologic injury is suspected. Incomplete ureteric transections can be managed endoscopically with ureteric stenting and maximal drainage. Complete transections or ureteric entrapment/obstruction require open repair and are amendable to ureteroureterostomy.

CONCLUSIONS

Although rare, ureteric injury can occur during OLIF surgery due to the anatomical position of the ureter relative to the spinal column and the surgical approach. Surgeons should carefully monitor patient symptoms post-surgery for any signs of sepsis, kidney injury, or abdominal/flank discomfort that could indicate ureteric injury. Postoperative diagnosis of a ureteric injury can be aided by cross-sectional imaging with contrast-enhanced CT, including the urographic phase. Prompt intervention is crucial to reduce long-term sequelae.

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This paper has been peer reviewed.

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