

CASE REPORT

Ureteral Injury in an Oblique Lateral Approach at the L4–L5 Level: Case Series and Literature Review

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Abstract

Ureteral injury in lateral spinal approaches is an uncommon but severe complication, as it may lead to chronic impairment of renal function if not detected early. Due to the nonspecific nature of symptoms, early suspicion and appropriate management are essential for patient outcomes. Contrast-enhanced abdominal and pelvic computed tomography is the standard imaging modality for confirming ureteral injury. We present a case series of ureteral injuries associated with OLIF procedures at the L4–L5 level.

Level of evidence: IV

Keywords: Degenerative spine, Lumbar arthrodesis, OLIF, Ureteral injury

Introduction

Oblique Lateral Interbody Fusion (OLIF) is a minimally invasive lumbar arthrodesis procedure used to treat degenerative lumbar spine conditions. The surgical objective of this technique is to place an interbody graft to maximize segmental lordosis and provide indirect neural decompression through expansion of the bony neuroforamen and ligamentous distraction of the central canal, thereby reducing the risks of neurological injury and cerebrospinal fluid leakage, complications commonly associated with conventional posterior approaches.¹⁻³

The retroperitoneal space allows direct access to the intervertebral disc, avoiding injury to the paravertebral muscles, improving rehabilitation, and reducing postoperative pain.^{4,5} The most frequent complications reported with the pre-psoas approach include incisional pain in 2.2% of patients, lower-extremity neurological symptoms due to sympathetic chain injury, and vascular injuries reported in 1.7%.¹

Urinary tract injury is a highly uncommon complication in this approach; however, it is clinically significant, as associated sequelae may ultimately lead to chronic renal function impairment. We present a case series of left ureteral injuries following OLIF procedures at the L4–L5 level.

Case Presentation

CASE 1

A 71-year-old male patient with no significant medical history presented with chronic low back pain and gait claudication after walking a few meters, without requiring assistive devices. He reported axial low back pain radiating to both thighs, with symptoms improving at rest. Preoperative imaging demonstrated a full-spine radiograph with degenerative lumbar scoliosis and magnetic resonance imaging showing multilevel lumbar spinal stenosis [Figure 1].

In the first surgical stage, anterior arthrodesis was performed via an OLIF approach at L3–L4 and L4–L5, and via an Extreme Lateral Interbody Fusion (XLIF) approach at L1–L2 and L2–L3. The patient exhibited favorable early postoperative recovery with adequate pain control, ambulating in his room at 48 hours. Five days after the first stage, a second percutaneous posterior arthrodesis from L1 to L5 was performed [Figure 2].

Following the second procedure, the clinical course worsened, with severe left flank pain and poor pain control. Magnetic resonance imaging (MRI) revealed a heterogeneous fluid collection within the subcutaneous tissue at the lateral approach site at L4–L5. Due to suspicion of an acute infection, surgical debridement was performed,

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including removal of the L4–L5 interbody cage and placement of an iliac crest graft. Despite this, the patient continued to experience severe pain rated 9/10, predominantly in the left flank. A second surgical debridement revealed a serohematic collection; samples were obtained for bacteriological analysis, and two suction drains were placed.

The patient persisted with 9/10 pain, and the drainage output remained abundant and serous. Given the suspicion of urinary tract injury, a computed tomography (CT) urography was obtained, confirming ureteral injury with contrast extravasation [Figure 3].

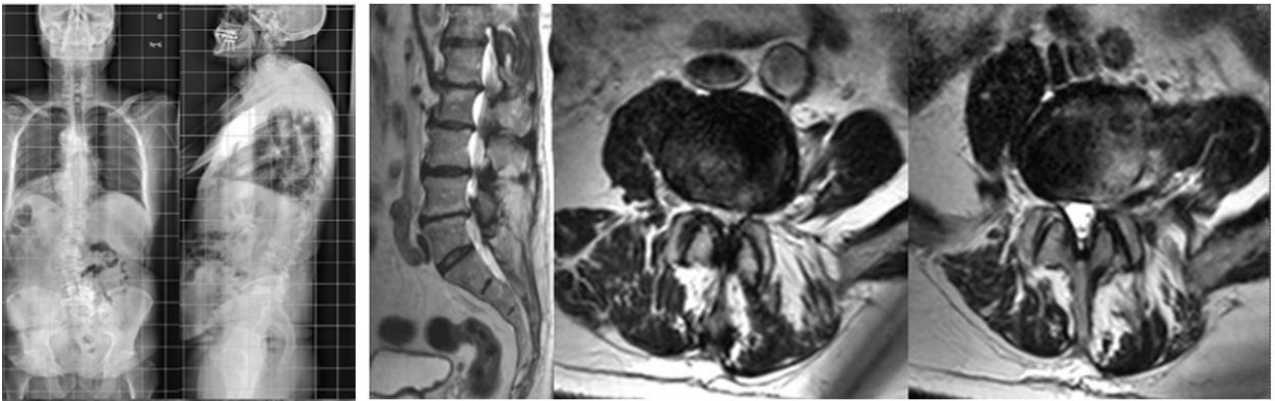


Figure 1. In the upper images, a full-spine radiograph demonstrates adult lumbar scoliosis. In the lower magnetic resonance imaging (MRI) images, multilevel lumbar spinal canal stenosis is observed at L3–L4 and L4–L5



Figure 2. Lumbar spine radiograph following L1–L5 anterior and posterior arthrodesis

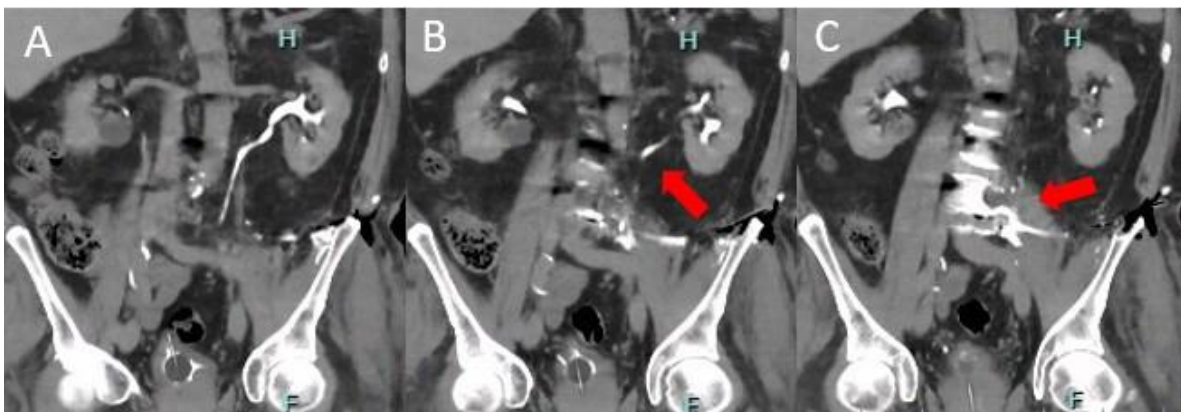


Figure 3. Contrast-enhanced abdominal and pelvic CT scan. In the coronal views, the red arrow indicates the location of the ureteral injury

An urgent consultation with the Urology Department was requested, and an exploratory lumbotomy was performed, which evidenced an incomplete ureteral lesion. End-catheterization with an open-end ureteral stent was performed, followed by open repair with a five-point anastomosis [Figure 4].

The postoperative course was favorable, and 10 days after repair, the open-end catheter was exchanged for a double-J stent. The patient subsequently initiated motor

rehabilitation and was discharged home a few days later. Of note, all bacteriological cultures obtained during the revision procedures were negative. At 45 days post-repair, the double-J stent was removed.

At one-year follow-up, the patient demonstrates good control of low back pain with occasional discomfort, performs swimming and walking activities, and shows no evidence of renal function impairment.

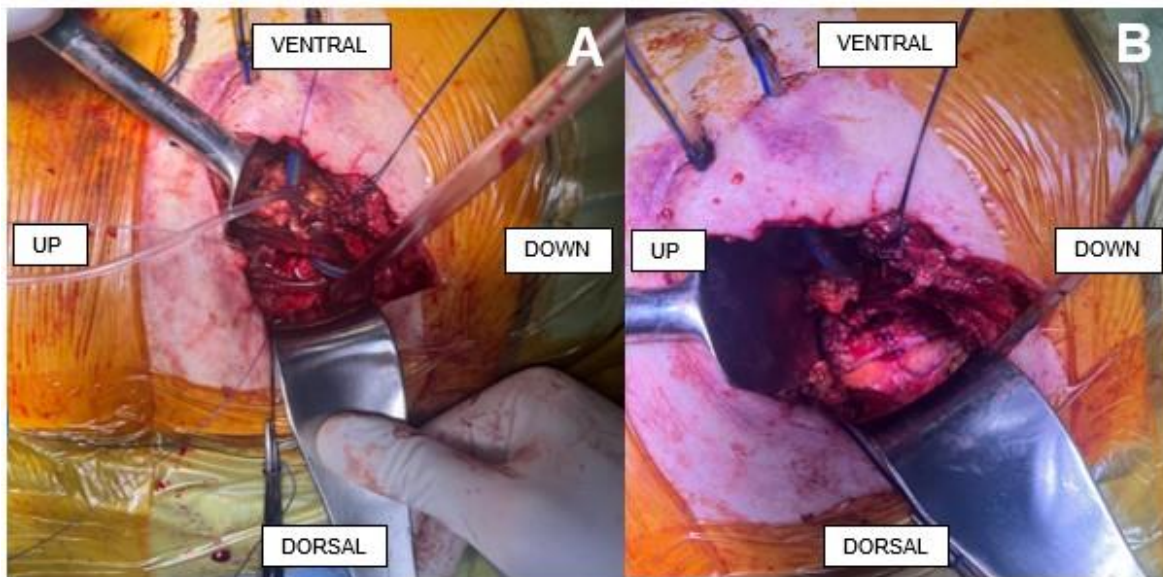


Figure 4. A: Preoperative image of the previously catheterized ureter. B: End-to-end ureteral anastomosis

CASE 2

A 66-year-old male patient with a history of bilateral total hip arthroplasty for coxarthrosis presented with a one-year history of left-sided non-deficit lumbar radiculopathy. He had undergone three nerve root blocks without significant improvement. He reported low back pain that improved with

rest, associated with radiating pain down the left lower limb to the calf. Preoperative imaging demonstrated multilevel lumbar stenosis with L3-L5 vacuum disc phenomenon [Figure 5]. For this reason, an anterior arthrodesis via OLIF at L3-L4 and L4-L5 was performed as the initial surgical stage.

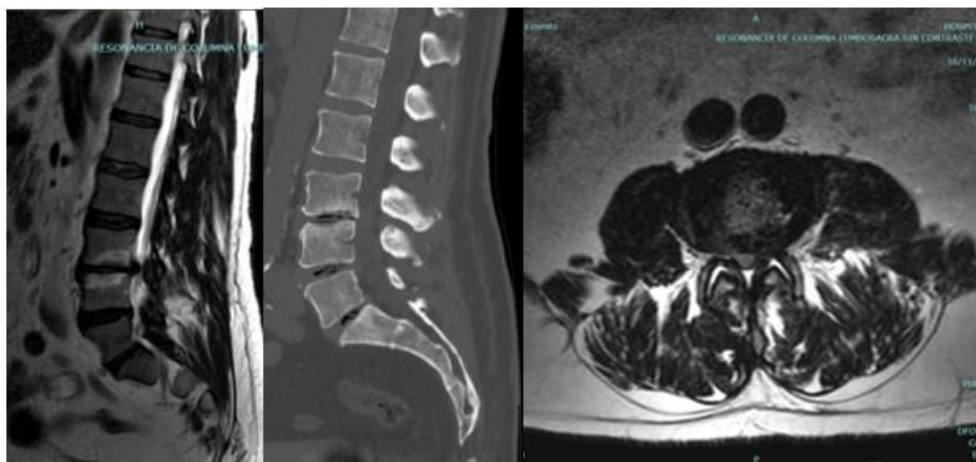


Figure 5. Preoperative images showing Modic changes at the L3-L4 level, with spinal canal stenosis and multilevel vacuum phenomenon

At 48 hours postoperatively, routine laboratory testing revealed an increase in serum creatinine to 2.07 mg/dL (from 1.18 mg/dL preoperatively). At 96 hours, erythema and tenderness developed over the lateral approach site. CT imaging revealed fluid collections between the muscular planes of the external and internal oblique muscles and a hematoma within the fibers of the left rectus abdominis. Due to persistent abdominal pain, a surgical debridement was performed, revealing a superficial serous collection extending toward the pre-psoas region at L4–L5.

On the following day, 1200 mL of clear fluid was drained. Suspecting urinary tract injury, CT urography was obtained, confirming a solution of continuity in the mid-third of the left ureter [Figure 6]. In coordination with the Urology Department, open ureteral repair was performed via end-to-end anastomosis [Figure 7].

During the subsequent days, the patient continued to drain large volumes of serous fluid, with daily output progressively increasing. Control MRI demonstrated distal migration of the ureteral catheter, prompting surgical

revision. The patient was discharged with outpatient follow-up, delaying the second-stage posterior arthrodesis.

Four days post-discharge, the patient presented with low-grade fever and left flank pain. CT urography demonstrated a urinoma at the ureteral anastomosis, with contrast leakage into the retroperitoneal space. Percutaneous nephrostomy under CT guidance was performed. Blood cultures were positive for *Candida albicans*, and antifungal treatment with caspofungin was initiated. The patient showed a favorable clinical course, later switched to oral fluconazole, and was subsequently discharged.

After removal of the double-J catheter and six months following the anterior arthrodesis, posterior arthrodesis via a percutaneous approach from L3 to L5 was completed [Figure 8]. At six months post posterior procedure, the patient continues physical activity, including swimming and stretching exercises, without sequelae related to the urological injury.

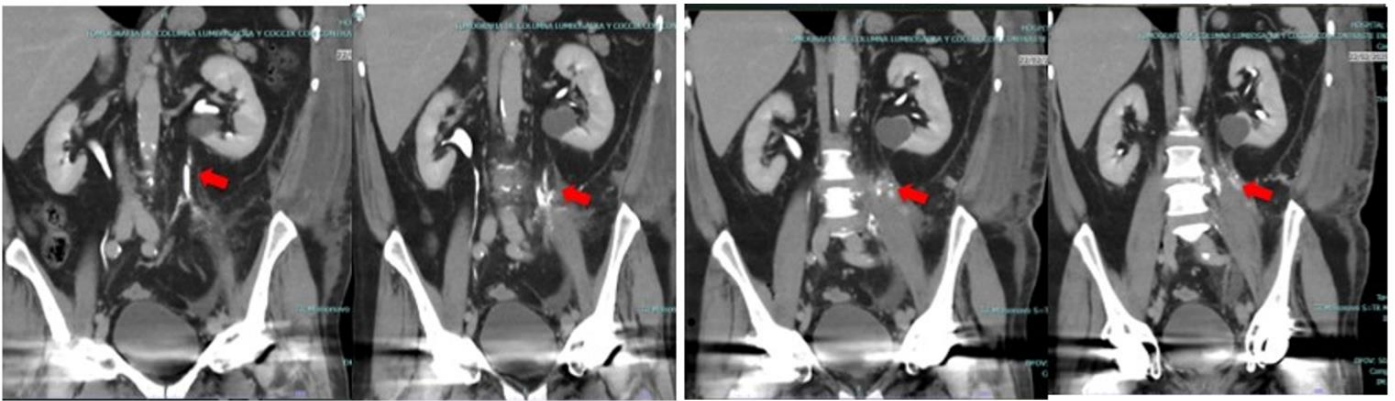


Figure 6. Contrast-enhanced abdominal and pelvic CT scan. In the coronal views, the red arrow indicates the location of the ureteral injury and the contrast extravasation



Figure 7. Intraoperative image showing open ureteral anastomosis



Figure 8. Lumbar spine radiograph following L3–L5 anterior and posterior arthrodesis

Discussion

The kidney and ureter are located anterior and lateral to the psoas muscle within the retroperitoneal space. At T12–L1, L1–2, and L2–3 levels, the kidney is particularly susceptible to injury since it is often positioned directly lateral to the psoas, in the same plane used for a transpsoas approach. At lower lumbar levels, ureteral injury is a possible complication in the pre-psoas approach, primarily due to insufficient blunt dissection during exposure.⁶ Although the incidence of ureteral injury is low, the surgeon must remain vigilant during the approach and dissection, especially in cases with rotational spinal deformity.⁷

In the present study, two cases of ureteral injury associated with the OLIF approach at the L4–L5 level were reported. In both cases, the laceration was not identified intraoperatively. Diagnosis was made postoperatively due to abdominal pain, and confirmed with CT urography demonstrating contrast extravasation from the urinary tract. One of the few reports in the literature is by Anand *et al.*, who described three urological injuries, including two ureteral and one renal injury.⁸ They concluded that in any patient presenting with abdominal pain after a lateral approach, urinary tract injury should be ruled out first. In their analysis, excessive mobilization of the retroperitoneal space prior to transpsoas fusion may have resulted in ureteral avulsion at the level of the renal pelvis. Of note, the ureteral injuries they reported occurred at higher levels compared with our series.

Detection is often challenging because symptoms are nonspecific and may manifest immediately after surgery or within several days. Common clinical presentations include abdominal or flank pain, fever, nausea or vomiting, vaginal urinary leakage, hematuria, and leukocytosis. When suspected, computed tomography of the abdomen and pelvis with and without contrast must be obtained.⁹ Delayed-phase imaging is considered optimal for detecting urine leakage; however, findings may be missed if insufficient time has passed for contrast excretion.¹⁰

Conclusion

Ureteral injury may occur following a pre-psoas approach to the lumbar spine, most commonly as an iatrogenic complication. Surgeons must exercise caution during exposure of the retroperitoneal space to prevent this injury, taking sufficient time to ensure proper dissection. When ureteral injury is suspected, delayed-phase contrast-enhanced computed tomography is a valuable imaging modality for diagnosis. Once confirmed, prompt management is essential to prevent long-term impairment of renal function.

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