

Hand-assisted laparoscopic ureteroureterostomy with renal mobilization for delayed recognition of a proximal ureteral injury after lumbar disk surgery

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Abstract

We present hand-assisted laparoscopic ureteroureterostomy (HALUU) with renal mobilization as a novel approach to the management of proximal ureteral injury after lumbar disk surgery. A 63-year-old female underwent L4-L5 discectomy and facetectomy with cage placement for back and leg pain. Postoperatively, she developed fever, nausea, abdominal pain, ileus and leukocytosis. A computed tomography scan of the abdomen and pelvis with intravenous contrast and delayed imaging demonstrated a left proximal ureteral injury with contrast extravasation. Retrograde and antegrade ureteral stent placement was unsuccessful; a nephrostomy tube was placed. Antegrade and retrograde ureterograms revealed a 3-cm proximal ureteral defect. All treatment options were discussed, and the patient chose to undergo hand-assisted laparoscopic renal mobilization with ureteroureterostomy, which was completed successfully without complications. Operative time was 381 minutes; estimated blood loss was 50 mL. The patient was discharged after 2 days, her ureteral stent was removed in 8 weeks, and follow-up with furosemide-mercaptoacetyltriglycine (MAG-3) renal scan demonstrated 30% function without evidence of obstruction. Hand-assisted laparoscopic ureteroureterostomy with renal mobilization can be performed as definitive management of a medium-length proximal ureteral injury. This is the first case describing this management technique after lumbar disk surgery.

Can Urol Assoc J 2010;4(3):E82-E85

Introduction

Ureteral injury is a rare but serious complication of lumbar disk surgery, and only 15 cases have been reported since 1961.¹⁻⁵ Reported management options include ureteral stent placement, open ureteroureterostomy and renal autotransplantation. Other management options involve nephrostomy tube changes, transureteroureterostomy, renal mobilization, bowel interposition and nephrectomy. We present hand-assisted laparoscopic ureteroureterostomy (HALUU) with renal mobilization as a novel approach to the successful management of a proximal ureteral injury after lumbar disk surgery.

Case presentation and management

A 63-year-old female with a history of spondylolisthesis underwent L4-L5 discectomy and facetectomy with cage placement for back and leg pain. On postoperative day 2, she developed fever (38.2°C), nausea, abdominal pain with distention, ileus and leukocytosis (13,200/mm³). A computed tomography (CT) scan of the abdomen and pelvis with intravenous contrast and delayed imaging demonstrated a left proximal ureteral injury with contrast extravasation (Fig. 1). A left retrograde pyelogram confirmed contrast extravasation at L4, but a left retrograde ureteral stent placement was unsuccessful. A left antegrade nephrostogram also showed contrast extravasation at L4 (Fig. 2), and antegrade ureteral stent placement was unsuccessful; therefore, a nephrostomy tube was placed. Treatment options were discussed, which included immediate surgical repair (open vs. laparoscopic) or follow-up in 1 week with attempted antegrade ureteral stent placement. The patient did not want to undergo surgical repair at this time because she was overwhelmed and wanted to recover from her lumbar surgery. She was discharged with follow-up in 1 week.

The antegrade ureteral stent placement was unsuccessful, and the patient was managed with a nephrostomy tube. Treatment options were discussed, and the patient would now require delayed surgical repair (open vs. laparoscopic). Three weeks later, the patient was re-admitted for a urinary tract infection. A repeat CT scan of the abdomen and pelvis revealed resolution of the urinoma.

Three months after the injury, an antegrade nephrostogram and a retrograde ureterogram were performed. A 3-cm proximal ureteral defect without active contrast extravasation was seen at L4-L5 (Fig. 3). All treatment options were discussed, and the patient chose to undergo HALUU with renal mobilization, which was completed successfully 6 weeks later without complications. Preoperatively, a shortened antegrade ureteral stent and an external ureteral stent were placed near the area of injury. Operative time was 381 minutes and the estimated blood loss was 50 mL. The patient was discharged after 2 days. Her ureteral stent was removed in 8 weeks, and an abdominal CT scan obtained 3



Fig. 1. Delayed abdominal computed tomography images obtained following the administration of intravenous contrast demonstrate complete left proximal ureteral injury with contrast extravasation and retroperitoneal urinoma.

months after surgery demonstrated complete renal drainage of contrast and no hydronephrosis (Fig. 4). Follow-up with furosemide-mercaptoacetyl triglycine (MAG-3) renal scan performed 3 months postoperatively demonstrated 30% function without evidence of obstruction (Fig. 5).

Discussion

The ureter is at risk of injury during lumbar discectomy given its close anatomical relationship with the vertebral body and the intervertebral disk. Most cases of ureteral injury occur during posterior lumbar disk surgery because the prone position presses the ureter against the vertebral body and intervertebral disk.¹ Only a few cases of ureteral injury during anterior lumbar approach have been reported; all were recognized after 48 hours and managed using endoscopic and percutaneous techniques.⁶⁻⁹ Other predisposing factors for ureteral injury after lumbar disk surgery include thin patients, patients with defects in or absence of the anterior annulus, retroperitoneal scars or adhesions or accidental perforation of the anterior longitudinal ligament.¹ Ureteral injury most often occurs when a rongeur-type instrument is used to clear the disk space and injuries are most often on the contralateral side of the discectomy.¹

Ureteral injury is an infrequently encountered complication following lumbar disk surgery. As in our case, patients with occult ureteral injuries typically present with abdominal pain, fever, leukocytosis and ileus. Abdominal and pelvic



Fig. 2. Left antegrade nephrostogram reveals contrast extravasation at vertebral level L4.

CT scans with delayed excretory images and retrograde ureterography are the most accurate diagnostic tests to detect ureteral injury, and can also be used to guide ureteral stent placement.¹⁰ Low-grade injuries can be sufficiently treated with ureteral stent placement, while the treatment of high-



Fig. 3. Simultaneous antegrade nephrostogram and retrograde ureterogram reveal a 3-cm ureteral defect at L4-L5 with no active contrast extravasation.

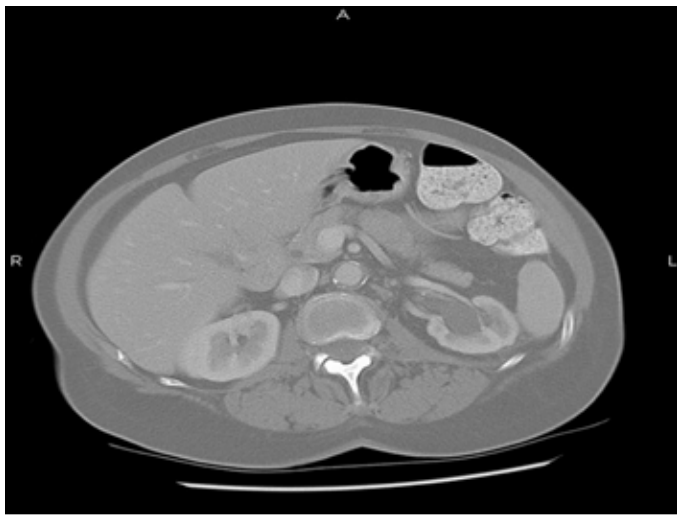


Fig. 4. Representative image from an intravenous contrast enhanced abdominal computed tomography scan obtained 3-months following left hand-assisted laparoscopic ureteroureterostomy demonstrates complete renal drainage of contrast bilaterally on delayed images.

grade injuries depends on the localization and extent of the damage.¹⁰⁻¹² Attempts at retrograde and antegrade stent placement were not successful in our patient, which is not entirely unexpected given reported failure rates of 50% to 80% in patients with high-grade ureteral injuries.¹³⁻¹⁵

Ureteral injuries are classified as immediate if they are recognized within 24 hours, and classified as delayed if the injuries are recognized after 24 hours. The management of patients with delayed recognition, such as our patient (discovered after about 30 hours), is controversial. Some authors endorse immediate operative repair of all iatrogenic ureteral injuries, regardless of the postoperative interval, to lessen the incidence of ureteral stricture, fistula and urinoma formation.^{15,16} Others believe that for delayed recognition injuries, initial urinary diversion can protect the kidney and allow resolution of any local hematoma, urinoma or inflammatory reaction.^{14,17,18} Ghali and colleagues compared 24 primary open repairs versus 7 staged procedures (urinary decompression with subsequent definitive surgical reconstruction) for iatrogenic ureteral injury and found similar overall complication rates of 25% and 29%, respectively.^{14,18} Complications included stricture, urinary fistulae and urinoma formation. Some authors recommend that delayed diagnosis of iatrogenic injuries be treated by percutaneous drainage and retrograde or antegrade placement of a ureteral stent, provided that the ureter is at least partially intact.^{14,19,20} If successful, stenting can be used as the sole management. Ureteric injuries, for which endoscopic stenting fails, can be treated by primary open repair, primary nephrectomy or staged procedures, which consist of initial nephrostomy drainage followed 6 to 8 weeks later by secondary open ureterovesical reimplantations.^{14,19} Delayed diagnosis of

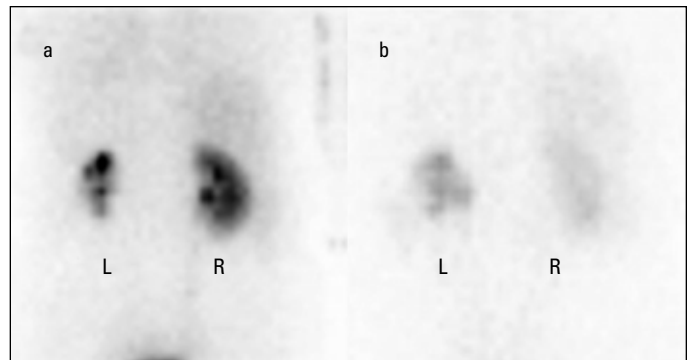


Fig. 5. MAG-3 lasix renal scan performed 3-months following left hand-assisted laparoscopic ureteroureterostomy reveals mildly decreased perfusion of the left kidney at 8 minutes following MAG-3 administration (a), and good clearance of the renal collecting system activity bilaterally after lasix administration (b).

traumatic ureteral injuries is managed similarly.¹⁷ For select grade I and grade II injuries, minimally invasive techniques may be therapeutic, but most high-grade injuries eventually require reconstruction, which should be deferred until the patient has healed from any associated injuries and the acute periureteral inflammatory response has resolved.¹⁷

Conclusion

In our case, an antegrade nephrostogram revealed a 3 cm proximal ureteral defect which was successfully repaired by HALUU with renal mobilization. Other management options discussed with our patient included nephrostomy tube changes, open ureteroureterostomy with renal mobilization, ileal ureter replacement, radical nephrectomy or autotransplantation. Our patient wanted HALUU with renal mobilization, and we feel that by delaying her repair, intraoperative visualization and manipulation were improved. The placement of a shortened antegrade ureteral stent and a retrograde external ureteral catheter to the area of injury, in addition to the insertion of a hand into the abdomen allowed for safer ureteral dissection and better anastomosis approximation. A significant amount of inflammation was seen and felt around the area of injury, which would have made the purely laparoscopic approach more difficult. Although a pure laparoscopic or open approach would be preferred in many situations, as was the case with our patient, pure laparoscopic repair was unachievable in the face of significant scar tissue. The hand-assisted approach allowed us to spare the patient the morbidity of an open incision, while completing a safe operation. It deserves mention that the hand-assisted approach may only be applicable in select situations, and many urologists do not perform this approach. Despite these limitations, HALUU with renal mobilization can be performed as definitive management of a medium-length proximal ureteral injury. This is the first case describing iatrogenic ureteral injury secondary to lum-

bar disk surgery managed successfully with delayed hand-assisted laparoscopic repair.

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Competing interests: None declared.

This paper has been peer-reviewed.

References

1. Cho KT, Im SH, Hong SK. Ureteral injury after inadvertent violation of the intertransverse space during posterior lumbar discectomy: a case report. *Surg Neurol* 2008;69:135-7.
2. Demirkesen O, Tunc B, Ozkan B. A rare complication of lumbar disk surgery: ureteral avulsion. *Int Urol Nephrol* 2006;38:459-61.
3. Hekal IA, Mohsen T, Nabeeh A. Ureteric injury after lumbosacral discectomy: a case report and review of the literature. *J Trauma* 2008;64:1387-91.
4. Heller V, Osterhage HR, Heckl W, et al. Ureteral injuries in intervertebral lumbar disk surgery [in German]. *Urologe A* 1986;25:347-50.
5. Trinchieri A, Montanari E, Salvini P, et al. Renal autotransplantation for complete ureteral avulsion following lumbar disk surgery. *J Urol* 2001;165:1210-1.
6. Gayer G, Caspi I, Garniek A, et al. Perirectal urinoma from ureteral injury incurred during spinal surgery mimicking rectal perforation on computed tomography scan. *Spine* 2002;27:E451-3.
7. Guingrich JA, McDermott JC. Ureteral injury during laparoscopy-assisted anterior lumbar fusion. *Spine* 2000;25:1586-8.
8. Isiklar ZU, Lindsey RW, Coburn M. Ureteral injury after anterior lumbar interbody fusion. A case report. *Spine* 1996;21:2379-82.
9. Wymenga LF, Buijs GA, Ypma AF, et al. Ureteral injury associated with anterior lumbosacral arthrodesis in a patient who had crossed renal ectopia, malrotation, and fusion of the kidneys. A case report. *J Bone Joint Surg Am* 1996;78:772-4.
10. Teber D, Egey A, Gozen AS, et al. Ureteral injuries. Diagnostic and treatment algorithm [in German]. *Urologe A*. 2005;44:870-7.
11. Dowling RA, Corriere JN Jr, Sandler CM. Iatrogenic ureteral injury. *J Urol* 1986;135:912-5.
12. Ortega SJ, Netto FS, Hamilton P, et al. CT scanning for diagnosing blunt ureteral and ureteropelvic junction injuries. *BMC Urol* 2008;8:3.
13. Cormio L, Battaglia M, Traficante A, et al. Endourological treatment of ureteric injuries. *Br J Urol* 1993;72:165-8.
14. Ghali AM, El Malik EM, Ibrahim AI, et al. Ureteric injuries: diagnosis, management, and outcome. *J Trauma* 1999;46:150-8.
15. Oh BR, Kwon DD, Park KS, et al. Late presentation of ureteral injury after laparoscopic surgery. *Obstet Gynecol* 2000;95:337-9.
16. Blandy JP, Badenoch DF, Fowler CG, et al. Early repair of iatrogenic injury to the ureter or bladder after gynecological surgery. *J Urol* 1991;146:761-5.
17. Armenakas NA. Current methods of diagnosis and management of ureteral injuries. *World J Urol* 1993;17:78-83.
18. Selzman AA, Spirnak JP. Iatrogenic ureteral injuries: a 20-year experience in treating 165 injuries. *J Urol* 1996;155:878-81.
19. al-Ali M, Haddad LF. The late treatment of 63 overlooked or complicated ureteral missile injuries: the promise of nephrostomy and role of autotransplantation. *J Urol* 1996;156:1918-21.
20. Liu CH, Wang PH, Liu WM, et al. Ureteral injury after laparoscopic surgery. *J Am Assoc Gynecol Laparosc* 1997;4:503-6.

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