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Unilateral Biportal Endoscopic Discectomy: Technical Note

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Abstract

Lumbar radiculopathy was a common clinical pathology with a lifetime incidence ranging from 13% to 40% and was associated with significant morbidity and socioeconomic burden. In cases where conservative therapy fails, discectomy was the standard surgical care for prolapsed intervertebral disc. There are various methods to remove the disc materials viz open discectomy, microscopic discectomy, transforaminal, PLED or Unilateral Biportal Endoscopic discectomy. Surgical techniques of most of these methods are abundant in literature. However, there are few technical details on UBE. In this paper, we outline key technical steps to guide surgeons in performing UBE effectively. The techniques described here represent one possible method among many, rather than a definitive protocol.

Introduction

Unilateral Biportal Endoscopic (UBE) Discectomy was an advanced minimally invasive spinal surgery that adapts arthroscopic techniques for treating disc herniation. Compared to traditional open surgery, UBE provides benefits such as faster postoperative recovery and better preservation of natural spinal anatomy.[1] This technique has recently been popularized. The implementation of this technique remains novel in resource-limited settings such as Nepal. Surgical techniques for UBE vary widely, and there is currently no standardized methodology documented in the literature in the context of Nepal. This documentation of technical nuances is intended to guide future endoscopic spine surgeons toward faster skill acquisition and better clinical outcomes

First lumbar discectomy was described in 1909 by Krause and Oppenheim.[2] Later Caspar et al. introduced microscopic discectomy, a less invasive method compared to conventional technique discectomy and it can be considered the beginning of endoscopic discectomy.[3] Technological advancements, including the operative microscope, enhanced retractors, and improved lighting, have contributed to reduced blood loss and postoperative pain, ultimately leading to shorter surgery durations and hospital stays.[4] Interest in endoscopic spine surgery began in 1973 when Parviz Kambin first introduced the percutaneous posterolateral discectomy, utilizing access through what was now known as the Kambin triangle.[5] Despite this, it was not until Yeung who introduced the first endoscopic spine system in 1993 to perform discectomies under direct visualization.[6] Use and technique of standard arthroscopic instrumentation for spinal surgery were first reported in 1996 by De Antoni et al.[7] Soliman reported surgical management of lumbar disc prolapse and spinal stenosis using two separate portals in 2013. Unilateral biportal endoscopic discectomy (UBED), which was similar to MD, was recently introduced.[8,9] The technique combines the advantages of standard open surgery and endoscopic spinal surgery.

In this paper, we have outlined key technical steps to guide surgeons in performing UBE effectively. It should be noted that no comparative studies yet exist to evaluate the effectiveness of different UBE approaches. The techniques described here represent one possible method among many, rather than a definitive protocol.

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Surgical Steps

1. Anesthesia and Patient Positioning

For the treatment of lumbar disc herniation surgically, patients are selected according to the result of their radiological investigations such as magnetic resonance imaging (MRI), computed tomography (CT), physical examination, failure of conservative treatment. The Unilateral Biportal Endoscopic (UBE) procedure was performed under general anesthesiaThe patient was kept in a prone position on a standard radiologically compatible spine table on a Wilson frame with hip and knee flexion and well-padded at the pressure points . All the instruments are kept ready along with C-arm image intensifier

2. Localization and Portal Creation

The operating table was adjusted to ensure horizontal alignment of the target intervertebral disc space, maintaining a perpendicular orientation to the ground on lateral fluoroscopic imaging. Fluoroscopic verification of midline, medial perpendicular line and intervertebral space was made with the help of K wire. (Figure 1:A&B) A 10 mL syringe needle was then positioned to define the triangulation target at the spinolaminar junction, located 1.5 cm superior and inferior to the intervertebral space along the ipsilateral medial pedicular line (Figure 1C). Local anesthetic was administered through one needle, with egress confirmed through the other needle (Figure 2). Two skin incisions spaced 2–3 cm apart, were made to facilitate sequential dilatation using tubular dilators, which were advanced until their tips converged at the junction of the spinous process (SP) base and lamina under AP fluoroscopy (Figure 1D). The endoscopic portal measured ≥7 mm, while the working portal was 9-10 mm or larger to accommodate instrument passage and maintain continuous saline irrigation. The multifidus muscles were carefully dissected from the SP and lamina to establish working space serving as the primary operative field.

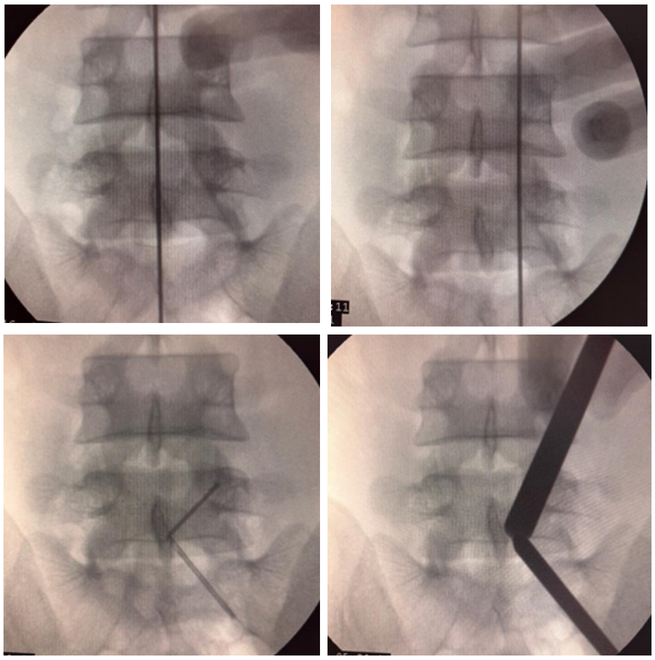

Figure 1: X- Ray Localization: A: A K-wire guided localization of the midline. B: A K-wire guided localization of the medial perpendicular line. C: Check X-ray to confirm triangulation at the spinolaminar junction with the help of a 10 ml syringe. D: Tubular dilators triangulated at the junction of the spinous process (SP) base and lamina.

3. Endoscopic Visualization

The endoscope was introduced through the designated endoscopic portal, while the radiofrequency (RF) probe was advanced via the working channel. The discectomy commenced at the inferior margin of the upper lamina, serving as the primary anatomical landmark for docking. Soft tissue ablation was meticulously performed using the RF probe, with the endoscope and surgical instruments arranged in a triangular configuration to enhance spatial orientation and exposure of critical bony structures. A 3,000-mL saline bag was suspended 80-100 cm above the surgical site. To minimize tissue edema, the water pressure was maintained below 30 mmHg whenever feasible.10 The fluid medium facilitated optimal endoscopic visualization by effectively flushing blood from the operative field, thereby preserving a clear surgical view throughout the procedure.

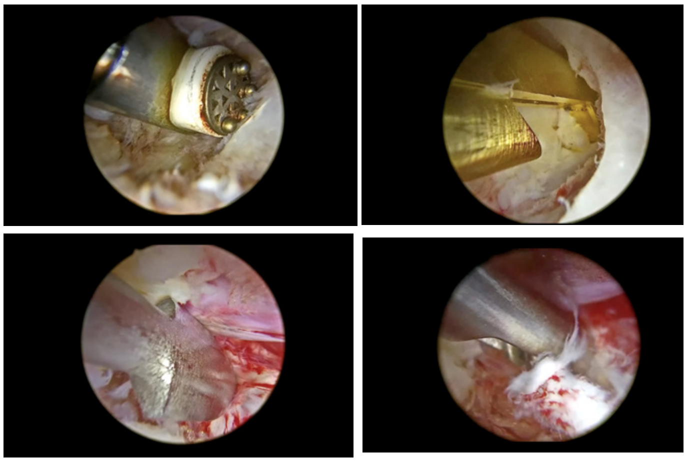

Figure 2: Endoscopic Visualisation and discectomy: A: Triangulation of endoscope and RF probe at the inferior margin of superior lamina. B: Bone work was extended with the help of drill and Kerrison's punch until the cranial, lateral, and caudal attachments of the LF was released. C: Annulotome being carried out. D: Endoscopic view of disc removal with the help of Pituitary rongeur.

4. Bone work

Bony resection was initiated at the inferior margin of superior lamina. Use a burr to thin the lamina. Bone work was extended until the cranial, lateral, and caudal attachments of the Ligamentum Flavum (LF) were fully released. With the 45 degree Kerrison punch and use of drill, extend the laminotomy laterally to the medial edge of the facet joint complex. Particular caution was warranted during LF mobilization due to its frequent adherence to the meningo-vertebral ligament - a delicate, web-like connective structure anchoring the dura mater to the dorsal lamina and LF dorsally.11 Excessive traction should be avoided, as is anatomical relationship predisposes to dural tears. Adequate bone removal and precise LF detachment are critical to minimize traction force and reduce the risk of complications.

5. Discectomy

Following clear visualization of the thecal sac and the nerve root, the annulus fibrosus was meticulously cleared of overlying tissue. The disc space access was achieved via annulotome, and herniated disc material was carefully extracted with a pituitary rongeur. Hook may be used to remove remaining disc fragments. Adequate decompression was confirmed by observing free pulsation of the nerve root and thecal sac. In cases presenting with a substantial annular defect, the margins of the annulus were coagulated and sealed with a radiofrequency probe to facilitate closure and reduce the risk of recurrence

6. Closure and Post operative care

Upon successful completion of the procedure, muscular layers are approximated, and fascial closure was performed using a 2-0 absorbable suture. The skin was secured with staples, followed by the application of sterile dressing., The patient was then transferred to the recovery unit for immediate postoperative monitoring. After an appropriate period of observation, hemodynamically stable patients are transitioned to a general ward. Postoperative pain was managed with analgesics as needed, and early ambulation was encouraged to facilitate recovery and reduce the risk of complications associated with prolonged immobilization.

Pearls & Pitfalls

In our experience, optimal patient selection is key to improving treatment outcomes. Clinicians should cultivate their own proficiency in MRI interpretation rather than depending exclusively on radiologists reports. Direct patient assessment allows for better correlation between pain patterns, neurological symptoms, clinical signs, and imaging findings.[12,13] Plain X-rays must be meticulously examined to detect transitional vertebrae, high iliac crest, assess medial facet anatomy and evaluate disc height.[14,15]

During endoscopic procedures, proper triangulation is essential for smooth surgery.[16] Too narrow an interportal distance leads to instrument crowding, while excessive width hinders smooth tissue dissection and disc access.[17] To ensure safety, radiofrequency ablation settings should be carefully adjusted at different tissue depths to avoid thermal injury. Recommended energy setting is to not use RF in ablation mode around thecal sac and if needed use coagulation mode at lowest setting.18 Saline irrigation height and pressure must be optimised to maintain clear visualization and pressures. Low pressure will obscure good vision while high pressure will increase internal pressures causing irritation, which may cause the patient to suffer from headache and other symptoms after awakening from the anesthesia.[19]

Managing bleeding requires a multimodal approach, including blood pressure control, increasing irrigation height, saline flushing, or targeted radiofrequency coagulation of bleeding vessels.Drills should be used with extreme care and caution. Sudden slippage of the drill off the bone may cause injury to the theca or nerve root. Entanglement of peridural fibrous bands and vascular bundles in the neck of the drill can cause damage.[20] Prolapsed or sequestrated disc should be precisely evaluated for its location and migration as the risk of recurrence is high since the prolapsed pulposus has several fragments. In cases of large disc herniations, complete removal must be confirmed; settling for partial extraction may compromise outcomes if less vigilant to search for residual disc. Switching the endoscope to view the root from different angles may reveal the residual disc compressing nerve. In our experience, restoration of root and thecal sac pulsation, along with visible vascularity on the nerve root and thecal sac indicates successful decompression. Sometimes discs may be calcified, demanding drilling.

Conclusion

In this paper, We have outlined technical guidelines for performing unilateral biportal endoscopic discectomy. While discussions on the effectiveness and clinical value of UBE continue in the literature, our goal was to contribute to its standardization by detailing a systematic technical aspect practised in my centre. These technical notes may help new spine surgeons learn faster and improve outcomes. We encourage the aspiring endoscopic spine surgeons to critically evaluate its technique and refine them as further clinical evidence emerges.

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