Treatment of Adjacent Level Disease with the Stand-Alone VariLift®-L Expandable Interbody Fusion Device: A Case Report

Abstract: The treatment of adjacent level disease subsequent to lumbar fusion often involves a particularly complex and invasive surgical procedure. This case report demonstrates that the stand-alone VariLift-L Expandable Interbody Fusion Device can provide a straight-forward and clinically successful solution for these patients.

Introduction
Surgical fusion of the lumbar spine is a widely-accepted treatment for patients with failed conservative treatment of intractable lower-back pain. However, a noted complication after this procedure is adjacent level disease (ALD), with rates reported in the literature in the range of up to 20-40%.1,2,3,4 There is no consensus regarding the precise sequelae of ALD: whether caused by the fusion, the natural progression of previously existing degenerative disease, or by some combination.3,5 Treating these cases often involves particularly difficult and invasive surgical procedures. For instance, existing posterior instrumentation might be removed and replaced with a new construct that bridges the additional level. Here we report on using the VariLift-L Expandable Interbody Fusion Device for treatment of a patient with ALD.

Case Summary
A 63-year-old female retiree presented with significant low back, left hip, and leg pain. Her past history included a previous failed L4-5 and L5-S1 posterior fusion, followed one year later by an anterior interbody and posterior pedicle screw fusion at L4-5 and L5-S1, both done in another city. Her recurrent symptoms began several years following her anterior/posterior fusion. MRI scans and plain radiographs revealed a solid L4-S1 fusion, with significant degenerative disc disease and disc protrusion at L3-4 with chronic instability. This produced a tight stenosis at L3-4 with resultant cauda equina compression. (Figure 1)
After failure of conservative treatment measures, the patient underwent bilateral L3-L4 decompression, disc removal, and posterior interbody fusion using a pair of VariLift-L Expandable Interbody Fusion Devices (Figure 2) in a stand-alone capacity. This titanium-alloy (Ti6Al4V) device includes a novel expansion feature which provides a secure anatomic fit within the disc space. The device is cylindrical in shape, with flattened sides, a grooved surface, a hollow inner chamber, and wide fenestrations on each of the four sides. After implantation, an inner locking expansion washer is advanced anteriorly, opening the device into a wedge shape and creating a 12° angle of lordosis in the anterior end of the disc space. This expansion securely locks the grooves of each device into the vertebral endplates, stabilizing the interspace and reducing the incidence of device migration. (Figure 3)

After decompressing the L3-L4 interspace via a minimally invasive midline approach, the disc was removed in a standard bi-lateral fashion. A ring curette was used to remove the cartilaginous plates, preparing the bone for direct graft-to-endplate contact. Care was taken to preserve the weight-bearing structural integrity of the vertebral endplates, as this is key to avoiding subsidence of the devices.

Next, a bullet spacer was placed into one side of the disc space to slightly distract the vertebrae. On the contralateral side of the disc space, a sizing drill was used to size the implant and prepare the posterior opening of the disc space. In this patient, a 13-mm VariLift-L device was selected and screwed into proper position in the disc space. The inner locking expansion washer was then advanced anteriorly with the expansion wrench, expanding the VariLift-L device and locking it into position in the disc space. The bullet spacer was removed from the contralateral side of the disc space. The second 13-mm VariLift-L device was then inserted into the contralateral side of the disc space, parallel to and at the same depth as the first device. The second device was then expanded and locked into position in the disc space.

After bi-lateral placement and expansion of the VariLift-L devices, the disc space was copiously flushed with an antibiotic solution. The devices and disc space were then packed with morselized locally-acquired bone graft, obtained from the spinous processes and lamina. The endcaps were then threaded into place, compacting the bone graft securely inside the VariLift-L devices. Surgical blood loss of 500 ml was noted. Post-operative imaging showed excellent position of the VariLift-L devices, with stability, lordosis, and foraminal patency restored. The patient was discharged from the hospital 4 days post-operatively.

Clinical follow-up was conducted over a 2 year period, with no complications noted. Radiographic studies continually revealed a stable interbody fusion at L3-L4, with no significant (more than 3mm) device subsidence or migration. (Figure 4)

Discussion

The devices and procedure employed in this case have been used clinically for over 15 years. In 2002, Dr. David Attia, the inventor of the VariLift-L device, reported his 5-year results, noting a greater than 90% fusion rate with minimal complications, 79% of patients had pain reduce from high to low/moderate, and early recovery. After bi-lateral placement and expansion of the VariLift-L devices, the disc space was copiously flushed with an antibiotic solution. The devices and disc space were then packed with morselized locally-acquired bone graft, obtained from the spinous processes and lamina. The endcaps were then threaded into place, compacting the bone graft securely inside the VariLift-L devices. Surgical blood loss of 500 ml was noted. Post-operative imaging showed excellent position of the VariLift-L devices, with stability, lordosis, and foraminal patency restored. The patient was discharged from the hospital 4 days post-operatively.

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Furthermore, destruction of the micro-motion at facet joints has been shown to transfer additional loads to the adjacent discs, possibly accelerating ALD.\(^{12,13}\) The VariLift-L PLIF procedure preserves much of the posterior anatomy, including the micro-motion at the facet joints.

**Conclusion**

ALD following spinal fusion is a frequent complication that can pose many technical challenges in its surgical treatment. This case report demonstrates that the stand-alone VariLift-L Expandable Interbody Fusion Device can provide a straightforward solution in these cases. Moreover, this procedure preserves some of the micro-motion at the facets. Thus, we propose that the VariLift-L device is useful in both the treatment and avoidance of ALD associated with lumbar fusions.
References