Access strategies for revision or explantation of the Charité lumbar artificial disc replacement

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Background: **Several lumbar disc prostheses are being developed with the goal of preserving mobility in patients with degenerative disc disease. The disadvantage of lumbar artificial disc replacement (ADR) compared with anterior interbody fusion (ALIF) is the increased potential for displacement or component failure. Revision or removal of the device is complicated by adherence of the aorta, iliac vessels, and the ureter to the operative site. Because of these risks of anterior lumbar procedures, vascular surgeons usually provide access to the spine. We report our experience with secondary exposure of the lumbar spine for revision or explantation of the Charité disc prosthesis.**

Methods: **Between January 2001 and May 2006, 19 patients with prior implantation of Charité Artificial Discs required 21 operations for repositioning or removal of the device. Two patients had staged removal of prostheses at two levels. One patient had simultaneous explantation at two levels. The mean age was 49 years (range, 31 to 69 years; 56% men, 42% women). The initial ADR was performed at our institution in 14 patients (74%). The mean time from implantation to reoperation was 7 months (range, 9 days to 4 years). The levels of failure were L3-4 in one, L4-5 in nine, and L5-S1 in 12.**

Results: **The ADR was successfully removed or revised in all patients that underwent reoperation. Three of the 12 procedures at L5-S1 were performed through the same retroperitoneal approach as the initial access. One of these three, performed after a 3-week interval, was converted to a transperitoneal approach because of adhesions. The rest of the L5-S1 prostheses were exposed from a contralateral retroperitoneal approach. Four of the L4-5 prostheses were accessed from the original approach and five from a lateral, transpsoas exposure (four left, one right). The only explantation at L3-4 was from a left lateral transpsoas approach. Nineteen of the 22 ADR were converted to ALIF. Two revisions at L5-S1 involved replacement of the entire prosthesis. One revision at L4-5 required only repositioning of an endplate. Access-related complications included, in one patient each, iliac vein injury, temporary retrograde ejaculation, small-bowel obstruction requiring lysis, and symptomatic, large retroperitoneal lymphocele. There were no permanent neurologic deficits, deep vein thromboses, or deaths.**

Conclusions: **Owing to vascular and ureteral fixation, anterior exposure of the lumbar spine for revision or explantation of the Charité disc replacement should be performed through an alternative approach unless the procedure is performed ≤2 weeks of the index procedure. The L5-S1 level can be accessed through the contralateral retroperitoneum. Reoperation at L3-4 and L4-5 usually requires explantation and fusion that is best accomplished by way of a lateral transpsoas exposure. (J Vasc Surg 2006;44:1266-72.)**

During the last 15 years, the number of anterior lumbar spinal reconstructions for degenerative disc disease has significantly increased. The evolution of spine technology has changed the occasional anterior procedure through a large flank incision to commonplace fusions through a direct anterior extraperitoneal exposure. Because of the proximity of the lumbar spine to the aorta, inferior vena cava, and the iliac vessels, anterior exposures are frequently performed by vascular surgeons.

Despite high rates of radiographic fusion using cages and allografts, long-term outcomes are limited by persistent back pain, loss of mobility, and the development of adjacent level degenerative disease. These complications have led to the development of prostheses designed to allow normal flexion, extension, and rotation.

The first device available in the United States is the Charité artificial disc replacement (ADR), which was developed in Berlin in the mid-1980s and has been implanted worldwide in >15,000 patients.[1] A randomized trial comparing Charité ADR with anterior lumbar interbody fusion (ALIF) was completed in December 2001, and US Food and Drug Administration (FDA) approval followed in October 2004.[2] In the first year after FDA approval, approximately 4000 devices were implanted.[3]

The Charité device consists of two metal alloy endplates with a sliding polyethylene core (Fig 1). Causes of removal or revision of the prosthesis are multifactorial and are related to technical errors at implantation, use of the prosthesis for non-FDA-approved indications such as multilevel disease, and persistence of symptoms. We report our experience with explantation and revision of the Charité ADR, focusing on lessons learned that may minimize vascular and ureteral injuries.

PATIENTS AND METHODS

Patients. Between January 2001 and May 2006, 19 patients with Charité ADR devices required 21 reopera-

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