Case Report

Disc herniation caused by a viscoelastic nucleus after total lumbar disc replacement—a case report

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Abstract: Degenerative disc disease (DDD) is highly prevalent. If conservative treatment fails, spinal fusion procedures are commonly performed. Total disc replacement (TDR) might be a surgical option for a distinct subset of patients with DDD. Several prostheses have been or are still available. Despite some promising initial clinical results, there is still limited experience with hardware-related adverse events. This report highlights an unreported complication after TDR with a viscoelastic device. Literature about long-term outcome and safety of this particular TDR is scarce. Hence, there exists limited experience with TDR-related complications with such a failure mode. We report a 34-year-old male presented to us with an acute S1 radiculopathy on the right. His past medical history was significant for prior TDR at the level L5/S1 at another hospital 2 years prior to this acute episode. Imaging studies revealed an intraspinal mass compromising the right S1 nerve root. This mass mimicked a disc herniation and sequestrectomy was performed. Intraoperatively, the prolapsed sequester turned out to be part of the viscoelastic nucleus of the disc prosthesis. Interbody fusion combined with posterior instrumentation was ultimately performed. The patient did well afterwards, but is currently (2 years later) developing adjacent segment disease with facet syndromes. Since TDR might be beneficial for certain patients, spine surgeons should be aware of potential device-related complications.

Keywords: Spine surgery; complication; total disc replacement (TDR); fusion; outcome

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Introduction

Degenerative disc disease (DDD) is highly prevalent and is progressing over time (1). DDD alters biomechanical characteristics of intervertebral discs (IVD) and hence the motion segment is affected (2,3). Degenerated discs that cause back pain may be treated surgically if conservative treatment fails. Traditionally, fusion procedures are performed (4). Total disc replacement (TDR) is an alternative for a specific subset of patients—namely those with discogenic back pain without clinical signs of a facet syndrome. The clinical outcome of TDR may be superior to conservative treatment or fusion in patients with DDD (5,6). Furthermore, TDR should decrease the risk of adjacent segment disease (7). In a recent study, TDR was associated with a significantly decreased risk for complications in the early phase after surgery (8). According to a survey, spine surgeons raised concerns about revision procedures and long-term outcome after TDR (9). Here we describe an unreported complication of an artificial lumbar disc herniation caused by a viscoelastic nucleus after TDR.

Case presentation

An otherwise healthy 34-year-old male presented to our department with an acute S1-syndrome on the right side.

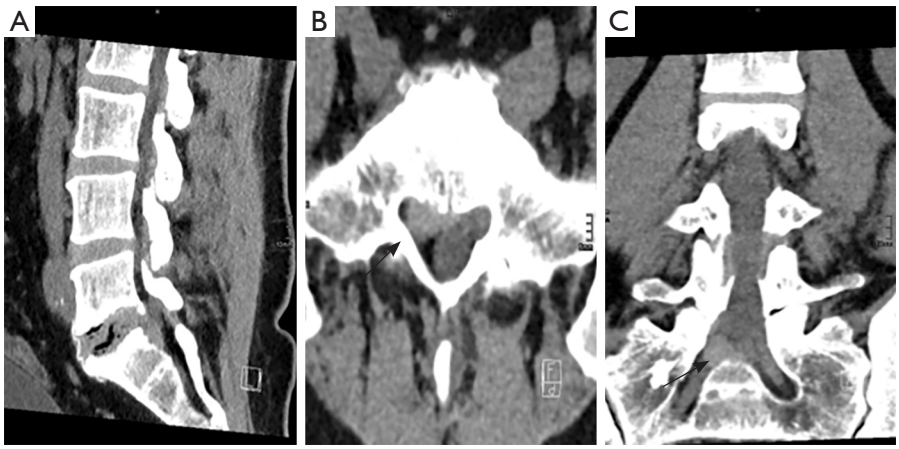

Figure 1 Sagittal (A), axial (B) and coronary (C) CT examination upon first admission showing a hyperdense intraspinal mass compromising the S1 root on the right (arrows).

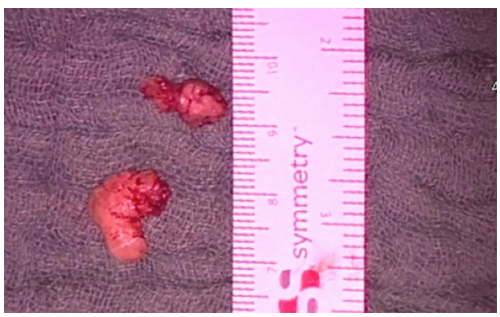

Figure 2 Obtained tissue during the first intervention at our institution showing viscoelastic properties.

He had undergone TDR (Cadisc-L; Ranier Technology Ltd.; Cambridge, UK) at the level L5/S1 more than 2 years prior to this episode at another hospital. Computer tomography of the lumbar spine revealed an intraspinal mass at the prior TDR level (*Figure 1*). The patient underwent microscopic sequestrectomy. Intraoperatively, a viscoelastic structure mimicking a regular disc herniation was found to compromise the S1 root and was subsequently removed (*Figure 2*). Postoperatively, the radiculopathy resolved completely.

However, 3 weeks later he presented again with similar symptoms. Imaging studies showed again an intraspinal mass (*Figure 3*). Another surgery was performed. Further, TDR was removed and replaced by an interbody fusion cage via a transperitoneal approach. Additionally, dorsal lumbar instrumentation was performed (*Figure 4*). The patient's condition is currently routinely followed-up. The radiculopathy has resolved, but the patient is now (2 years after fusion) experiencing adjacent segment disease with facet syndromes cranially to the instrumentation.

Discussion

DDD affects up to 40% of all patients with low back pain (4). Altered biomechanical properties eventually lead to spinal instability (2-4). TDR might be a valuable alternative to fusion procedures for some patients (10). Theoretically, TDR should decrease the risk of adjacent segment disease by maintaining range of motion (4,11). First clinical results have demonstrated this risk reduction in the clinical setting (12). Additionally, the effect on adjacent facet joints is minimal according to biomechanical investigations (13). Today numerous devices are available.

The Cadisc-L device is an elastomeric, monobloc disc prosthesis. It derives from a polyurethane-polycarbonate polymer with hard end plates and an internal structure consisting of a soft nucleus surrounded by a harder annulus (14). The design aims to mimic biomechanical and motion properties of IVD more physiologically (14,15). In a biomechanical study, this device caused a reduction in axial stiffness, but was able to maintain disc height and flexion stiffness within a physiological range (15). We are not aware of a published clinical outcome study. Clinical experience with a similar device has been published recently with a 2-year follow-up after cervical TDR (16).

In general, appropriate patient selection remains crucial, as several predictors favoring surgical or conservative treatment options have been identified (17). TDR might be statistically

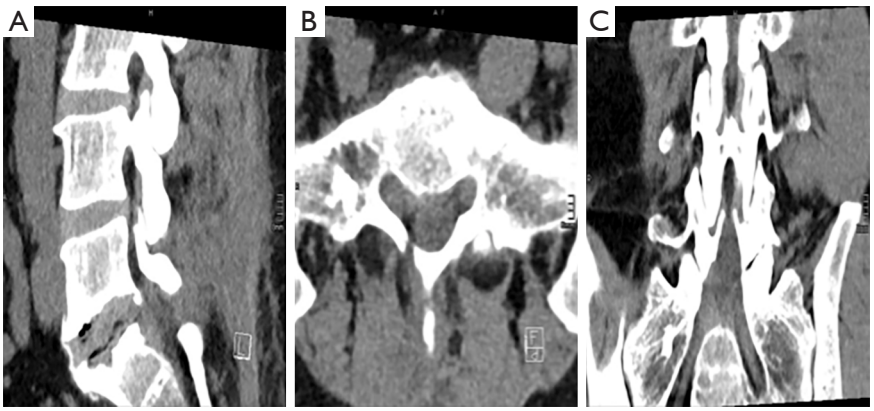

Figure 3 Sagittal (A), axial (B) and coronary (C) CT examination 3 weeks later than imaging studies shown in *Figure 1*, when the patient developed similar symptoms as before the first surgery at our institution.

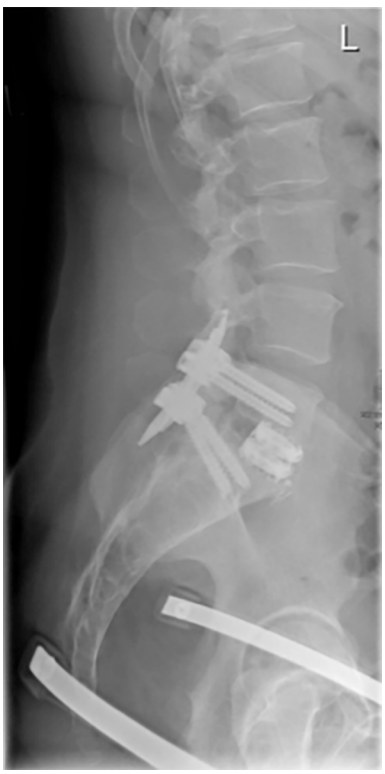

Figure 4 Lateral X-ray image 1 year after the fusion procedure.

superior to fusion in some aspects (6). The reduction or prevention of adjacent segment disease needs to be studied appropriately as there is still weak evidence available (7,10,18). Concerns about revisions and long-term outcome after TDR remain among spine surgeons (9,19). So far, TDR has not been implemented at a large scale (10,18).

At the lumbar level, microdiscectomy or microscopic sequestrectomy may be performed routinely, if conservative treatment fails in patients with herniated discs. Both treatment options are comparable, with some studies favoring sequestrectomy in the mid-term clinical follow-up (20). In the clinical management of this patient, lumbar sequestrectomy alone was obviously insufficient. Hence, as advocated by others interbody fusion should be considered as the primary option for failure of TDR (6). Noteworthy fusion tends to increase intradiscal pressure in adjacent segments and range of motion in non-fused segments (21). These biomechanical observations may contribute to the adjacent segment disease and facet syndromes in this case.

We agree with previous reports that delayed development or reoccurrence of pain with or without neurologic impairment should lead to early imaging studies in order to rule out a mass effect compromising neural structures (22). Although anterior dislocation after TDR has been described (23), we are not aware of previously reported posterior dislocation of the viscoelastic nucleus after TDR as seen in our patient. Despite the fact that the device has been removed from the market, we strongly believe that this report is relevant for spine surgeons as multiple devices have been implanted and similar devices are still available.

Conclusions

In summary, we present a to the best of our knowledge unreported complication after TDR with a very distinct failure mode due to the device design. Since there are only a few long-term outcome studies available (24), spine

surgeons should be able to recognize and respond to similar complications appropriately.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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