Posterior intraprosthetic dislocation of cervical arthroplasty: illustrative case

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BACKGROUND Cervical disc herniation is a common condition usually treated with anterior cervical discectomy and fusion (ACDF) or, more recently, with cervical disc arthroplasty (CDA). Both treatments offer similar clinical results. However, CDA has been found to offer fewer medium- to long-term complications as well as potential reduction of long-term adjacent disc degeneration.

OBSERVATIONS A 40-year-old man was treated with cervical discectomy and arthroplasty due to a C6–C7 disc herniation with left C7 radiculopathy. After the treatment, his postoperative follow-up appointments were uneventful for 9 months. However, after 9 months, he reported cervical pain and a right C7 radiculopathy after neck extension. Imaging confirmed a posterior intraprosthetic dislocation, the first case reported to date. The patient was received emergency surgery under neuromonitoring, and the prosthesis was replaced by an ACDF and anterior plate. The insert presented a rupture of the anterior horn. The patient presented no preoperative or postoperative neurological deficit, and his follow-up review revealed no issues.

LESSONS Posterior intraprosthetic dislocation is an extremely rare complication. It may occur with Mobi-C cervical arthroplasty in the case of rupture and oxidation of the polyethylene insert. Spine surgeons should be aware of this potential major complication.

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KEYWORDS cervical arthroplasty; Mobi-C; intraprosthetic dislocation; spinal cord compression

Cervical disc disease is a common condition that may lead to cervical disc herniation and radiculopathy of the upper extremities. Cervical disc herniation was long treated by anterior cervical discectomy and fusion (ACDF) with good results and long-term efficacy and safety. Over the last two decades, cervical disc arthroplasty (CDA) has become an alternative treatment of cervical disc disease. Some literature reviews found better medium- to long-term clinical results, reoperation rates, and adjacent segmental disease with CDA. Other reviews showed that CDA was not inferior to ACDF, and a Cochrane review concluded clinical results in favor of CDA. However, in the latter, the issues discussed were at such a low sample rate of studies with such small differences obtained, not blinded studies, that a bias potentially existed related to caregiver expectations.

Several trademarked products are available, such as Bryan (Spinal Dynamics Corp. and Medtronic Sofamor Danek), ProDisc-C (DePuy Synthes), Prestige (Medtronic), and Mobi-C (Zimmer-Biomet), with different settings and shapes and a common objective of disc motion preservation. The Mobi-C is a semiconstrained cervical prosthesis containing two chrome-cobalt plates and a mobile polyethylene insert in between.

Complications related to CDA are primarily linked to the anterior cervical approach, such as dysphagia (2–70%), recurrent laryngeal nerve compression (3–16.7%), hematoma (suffocating or epidural, incidence 0.2% and 0.9%, respectively), dural tear with pseudomeningocele (0.5–3%), esophageal lesion (0.4–1.15%), spinal cord compression (0.5%), vertebral artery injury (0.4%), and exceptional tracheal or thoracic duct lesion.

Postoperative neurological impairment is the most dreaded complication in cervical surgery for patients and surgeons. Some specific complications of CDA are well-known, including anterior bone loss (41.84%) and material subsidence (<3.7%), and heterotopic ossifications (7.7–94.1%).

Herein we describe a case of delayed posterior intraprosthetic dislocation of cervical arthroplasty.

ABBREVIATIONS ACDF = anterior cervical discectomy and fusion; CDA = cervical disc arthroplasty; MRI = magnetic resonance imaging; NRS = numerical rating scale.
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Illustrative Case

A 40-year-old male patient (smoker) received surgery by the team at Clinic La Source in Lausanne, Switzerland, because of a left C7 radiculopathy with motor deficit M4+/5 and pain-resisting medical treatment. Cervical magnetic resonance imaging (MRI) (Fig. 1) found a left C6–C7 disc herniation with C7 conflict and no sign of posterior facet or instability. The surgery consisted of a right cervicotomy, C6–C7 microdiscectomy, and CDA with a Mobi-C prosthesis (Zimmer-Biomet) (Fig. 2). The patient was discharged from the clinic after 24 hours. The follow-up review showed adequate wound healing, complete resolution of motor deficit, and radicular pain recovery without any complication.

After 9 months, the patient presented to the office after feeling neck pain for 5 days and right C7 radicular pain after neck extension. The pain was immediately unbearable (numerical rating scale [NRS] of 8/10), with transient right complete motor deficit of the lower limb in a few minutes, so he went to the emergency department in another location (Yverdon-les-Bains). Radiographs were obtained (Fig. 2) and were considered normal. The patient was discharged from the clinic after 24 hours. The follow-up review showed adequate wound healing, complete resolution of motor deficit, and radicular pain recovery without any complication.

Clinical examination showed a NRS 10/10, a Neck Disability Index of 82%, and a well-healed scar without any sign of inflammation. Cervical mobilization was painful and limited to 30° of rotation. The Spurling test was bilaterally positive, triggering a right C7 radicular pain. There was no motor or sensitive neurological deficit of the upper limbs. Lhermitte and Hoffmann signs were negative.

Discussion

Emergency cervical MRI showed a suspicion of intraprosthesis dislocation, so the imaging was completed by computed tomography (Fig. 3), which confirmed the diagnosis.

The patient received emergency surgery the same day under C3–T1 neuromonitoring (NIM Eclipse Surgeon Directed, Medtronic). A left cervicotomy was performed using microscopic magnification. The superior plate of the prosthesis was not adhesive and was easily removed. The mobile part of the prosthesis in polyethylene was posteriorly dislocated and retained by the posterior longitudinal ligament. The anterior horn of the polyethylene insert was ruptured and the global aspect was partially supple, allowing a hook to be inserted within (Fig. 4). The inferior plate of the prosthesis adhered well to the vertebral endplate and was removed using a bone osteotome. A sample of deep membrane was taken for microbiological analysis. A polyether-ether ketone cage was implanted with 1 cm³ of bone substitute in the interbody space. An anterior C6–C7 plate completed the instrumentation (Fig. 5).

Postoperatively, the patient showed no complications, and the radicular pain was relieved. The patient was discharged from the clinic after 2 days. The sample taken remained negative for microbial culture. The follow-up review was without issue, with adequate wound healing and normal cervical motion after 2 months. The NRS reached 4/10 and Neck Disability Index was 34%.

Observations

To our knowledge, this is the first case of posterior intraprosthesis dislocation of a CDA reported in the literature so far. Tsermoulas and Bhattathiri reported the first case of anterior dislocation of a C5–C6 Mobi-C arthroplasty. They found a fixed...
Pelletier et al. described a case of an early anterior intraprosthetic dislocation of a C4–C5 Mobi-C CDA related to excessive motion of the mobile segment adjacent to a two-level C5–C6 and C6–C7 ACDF. The dislocated CDA was removed and ACDF was performed with an anterior plate placed from C4 to C7. Several causes of CDA failure have been discussed, such as inappropriate patient selection, under- or oversized implants, and technical error. In the current case, the polyethylene insert showed signs of wear and partial rupture. The delay of occurrence and motion of the upper plate suggest a slow mechanism, with plate osteolysis and polyethylene oxidation, which might have been favored by tobacco exposure. In addition to the lack of restraint of the prosthesis, these mechanisms may have resulted in intraprosthetic dislocation.

Lessons
Posterior intraprosthetic dislocation is an extremely rare complication that may occur with Mobi-C cervical arthroplasty in cases of rupture and oxidation of the polyethylene insert. Spine surgeons should be aware of this potential major complication. Further studies and investigations are needed to understand the exact causes of CDA failure.

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Disclosures
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Conception and design: Prod’homme, Boschierini. Acquisition of data: Prod’homme, Grasset. Analysis and interpretation of data: Prod’homme. Drafting the article: Prod’homme. Critically revising the article: Prod’homme, Grasset. Reviewed submitted version of manuscript: Prod’homme, Grasset. Approved the final version of the manuscript on behalf of all authors: Prod’homme. Administrative/technical/material support: Grasset. Study supervision: Boschierini.

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