Case report

Intraspinal canal migration of distal occipitocervical instrumentation rods causing incomplete tetraplegia

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Introduction

Occipitocervical fusion is a gold standard surgical technique for stabilizing the craniocervical junction and cervical spine in patients with rheumatoid arthritis (RA). We describe herein a rare occurrence of cervical fracture-subluxation and intraspinal canal migration of the distal ends of instrumented rods after occipitocervical fusion, resulting in incomplete tetraplegia in an elderly woman with RA. The management of this case is discussed, as the patient recovered without revision and extension of the instrumentation. To our knowledge, no similar cases have been previously reported in the English-language literature.

Case report

A 69-year-old woman with a history of RA for more than 30 years, for which the patient had required prednisolone 2.5–7.5 mg daily for 18 years, underwent C1 laminectomy and occipitocervical fusion using a rod and hook system (CCD Cervical System; Medtronic Sofamor Danek, Memphis, TN, USA) and posterior iliac crest bone grafting for the treatment of cervical pain and numbness of bilateral hands due to atlantoaxial subluxation with upward migration of the odontoid process. Short occipitocervical fusion (O-C4) was performed because her subaxial lesions were asymptomatic and not severe based on X-ray examination. The severity of RA at surgery was ranked as a more erosive subset according to the “disease subset” proposed by Ochi et al., with Steinbrocker’s radiological stage IV and functional class III.2,3

During surgery, as a double-hook claw construct, down-going laminar hooks were placed bilaterally at C2, and up-going laminar hooks were placed bilaterally at C4. The distal ends of the rods were left more than 2.0 cm below the distal hook. This extra length was believed to be sufficient to connect with the additional rod using a rod connector in the case that subsequent spinal fusions downward for subaxial lesions were required. Intraoperatively, the distal ends of the rods were more than 5 mm from the laminae. However, on postoperative radiography the rods were seen to come into contact with the laminae (Fig. 1). The patient’s symptoms resolved after surgery.

Four years after surgery, at age 73 years, the patient experienced severe neck pain and numbness in the upper and lower extremities when neck hyperextension was required during treatment of tooth cavities at a dental clinic. The patient suffered progressive weakness of her bilateral upper and lower extremities and showed incomplete tetraplegia by the next day when she was referred to our hospital. Radiographic examinations showed severe osteoporosis and anterior fracture-subluxation of the cervical spine at the C6/7 level, with intraspinal canal migration of the distal ends of the rods (Fig. 2).

Removal of the instrument and occipitothoracic reconstruction was initially planned. However, long and invasive surgery was impossible for the patient owing to symptomatic and unstable cardiac failure. We thus decided to perform less-invasive surgery to remove the migrated distal ends of the rods. After laminectomies of C6 and C7, the migrated distal ends of the rods were seen severely compressing the spinal cord and were therefore cut and removed. Electrocautery was avoided as much as possible to prevent unnecessary electrical stimulation to the spinal cord through the rods. A high-speed diamond burr proved useful for cutting the titanium rods safely. Posterior bone grafting using resectioned laminae was also applied.

Immediately after surgery, the patient experienced improved strength in the upper and lower extremities,
and she resumed waking with aid within 4 weeks after surgery. The patient was managed in a Philadelphia collar for 12 months after surgery, and with application of a soft cervical collar thereafter. Solid bone union was obtained within 15 months after surgery (Fig. 3). The patient was informed that data from the case would be submitted for publication and gave her consent.

**Discussion**

Vertical translocation at the level of the upper cervical spine (cranial settling, basilar invagination, or superior migration of the odontoid process) is observed in 4%–35% of patients with RA. Subsequent compression of the spinal cord and medulla oblongata by vertical translocation can cause severe neurological deficits and even sudden death. Prophylactic posterior occipitocervical fusion is recommended for vertical translocation, even in the absence of neurological compromise, as this surgery offers superior long-term results and decreased mortality compared to conservative treatment. However, patients who have undergone occipitocervical fusion sometimes require further spinal fusion downward when there are complaints of subaxial lesions. Subaxial lesions are less common than upper cervical lesions but occur later in the course of the disease and manifest as multilevel anterior dislocation in RA (7%–29%).

Considerable stress on the level adjacent to the fusion is a well-known problem with all instrumented spinal surgeries. Patients with RA may be at particular risk for further cervical instability following initial fusion surgery due to laxity in the cervical spine caused by rheumatoid erosive facet synovitis. After occipitocervical fusion in patients with RA, the incidence of subaxial subluxation requiring further surgery is reportedly as high as 36%. We also speculated that the present patient might require further instrumented arthrodesis surgery, showing fracture-subluxation at the C6/7 level and rod migration into the intraspinal canal.