Symptomatic C1–2 fusion failure due to a fracture of the lateral C-1 posterior arch in a patient with rheumatoid arthritis

Case report and review of the literature

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The authors report a case in which the lateral C-1 arch fractured in a patient with rheumatoid arthritis and an intact fusion mass; this patient had previously undergone a C1–2 Brooks-type fusion. This unique complication occurred secondary to continued resorption of the C1–2 rheumatoid pannus. Two years after occipitocervical fusion the patient has made a complete neurological recovery.

KEY WORDS • rheumatoid arthritis • atlantoaxial subluxation • arthrodesis • C-1 arch • fusion failure

Radiologically demonstrated evidence of cervical spine involvement is present in more than 80% of patients with rheumatoid arthritis.2 Atlantoaxial subluxation is the most common manifestation of disease.3,15 In the properly selected patient, posterior C1–2 arthrodesis followed by postoperative halo immobilization therapy is a highly successful treatment.5,9,14 Fusion rates range from 50 to 94% for the rheumatoid spine, because of the poor bone quality and ongoing disease.10,12 Late-onset fusion complication and disease progression contribute to failure with time. We report the case of a lateral C-1 posterior arch fracture that occurred 6 months after a C1–2 Brooks-type fusion was performed in a patient with rheumatoid arthritis, atlantoaxial instability, and an intact fusion mass.

Case Report

This 74-year-old right-handed woman with a 22-year history of rheumatoid arthritis developed intermittent suboccipital pain, mild ataxia of upper and lower extremities, gait difficulty, and an increase in atlantodens interval from 2 to 9 mm over an 18-month period. In September of 1995, a posterior C1–2 Brooks-type fusion with 18-gauge wire and autograft was performed. Postoperatively, the patient was placed in a halo orthosis. The C-1 arch was intact pre- and postoperatively (Fig. 1).

At 3-month follow up, the patient had some relief of pain but no gait improvement. By 6 months, the suboccipital and posterior auricular pain had increased and gait difficulty had worsened. Radiographic evaluation at this time demonstrated an intact fusion mass, a fracture of the posterior arch of C-1, and 5 to 6 mm of subluxation on flexion–extension views (Fig. 2 upper).

At this juncture, both revision of the C1–2 fusion and extension to the occiput were discussed as the most viable surgical solutions. Because there was significant rheumatoid lateral mass destruction, it was decided to proceed with an occipitoc-3 fusion (Fig. 2 lower). The patient tolerated the procedure well and was discharged on postoperative Day 3. A cervical orthosis was prescribed for 8 weeks. At 2-year follow up, she has only minor paraspinal neck pain, her ataxia has resolved, and her gait is normal.

Discussion

Many complications of posterior C1–2 wire fusion have been described: pseudarthrosis, wire breakage, slippage due to inadequate wire tightening or placement, infection, graft resorption, and transient or permanent neurological deficit.1–15 In their 1999 technical note Vaccaro, et al.,14 presented the only other reported case of a C-1 posterior arch fracture that occurred after atlantoaxial fusion. In their patient without rheumatoid arthritis, a Brooks-type fusion with cables was performed to treat a persistent nonunion of a Type II odontoid fracture. Their follow-up radiographs revealed a pseudarthrosis of the superior aspect of the iliac bone graft as the probable mechanism leading to the fracture.

Our case is the first report of a postoperative lateral C-1 fracture after a Brooks-type fusion has been perform-
ed. In this case, continued bone resorption from the C1–2 rheumatoid pannus resulted in fracture of the lateral aspect of the C-1 posterior arch. Both intra- and postoperatively, the rheumatoid spine presents challenges. Thompson and Meyer\(^{13}\) abandoned the use of 18-gauge wires for the more pliable 20- or 22-gauge wire after noting, “fractures of the dorsal C1 lamina and C2 spinous process when using 18-gauge wire for more rigid fixation.” It is unclear from their comments whether their complication occurred intra- or postoperatively. However, the poor bone quality in a patient with rheumatoid arthritis makes both intra- and postoperative periods complex.

Postoperative halo immobilization, transarticular screws, and cervical plates have all been reported to increase the fusion rate in patients with rheumatoid arthritis.\(^{3-8,14}\) Although a solid dorsal fusion mass was demonstrated in our patient at time of follow up, transarticular screws combined with posterior wiring could have provided three-point stability closer to the center of rotation of the C1–2 articulation. Once we were faced with the C-1 fracture, recurrence of symptoms, and vertebral instability, a number of therapies were available, including: halo immobilization, posterior placement of transarticular screws, occipitocervical fusion, or an anterior C1–2 fusion. Vaccaro, et al.,\(^{14}\) used an anterior approach for transarticular screw placement. They reported that at 6-week follow-up examination the patient was asymptomatic, but he was subsequently lost to follow up. In light of its reliability, concern regarding occiput–C1 arthritis, and our experience, we chose a posterior approach for performing an occipital–C3 fusion. At 2-year follow up, the patient is doing well and suffers only intermittent minor paraspinal pain.

**References**

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