Expert's comment concerning Grand Rounds case entitled “Transarticular fusion for treatment of cystic lesion arising from an odontoid fracture” (by Ruth M. Parks, Matthias A. König, Bronek Boszczyk and Masood Shafafy)

Michael J. Goytan

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Introduction

The authors submit a case of a 39-year-old female who presented with an 18-month history of progressive numbness in all four limbs with concomitant episodes of bowel and bladder incontinence [1].

Her physical exam findings confirmed a cervical myelopathy with absent sensation in the upper extremities and reduced lower extremity sensation with a wide-based gait, poor tandem gait and increased extremity tone. There is a remote history of neck trauma 2 years ago and a history of congenital acetabular dysplasia. There were neither further details as to the history of neck trauma nor any history suggestive of a spondyloepiphyseal dysplasia to account for the defect in the dens [2].

Radiographs revealed; a reduction of the posterior Atlanto dens interval in the neutral position, a well-corticated cephalad and caudal margins of the odontoid fragment on a reformatted coronal CT, and the T2 sagittal MRI demonstrated circumferential attenuation of the CSF and cord compression from the level of the arch of C1 to the C3/4 disc space with severe compression at the level of the lamina of C2 posterior to the dens. The compression at C2 is a fluid filled lesion contiguous with the defect seen in the odontoid.

The authors surgical treatment consisted of a laminectomy from C1 to C3 with a transarticular fusion of C1–2, an occipital plate was placed in anticipation of extension to the occiput should the need for a revision arise.

At 1-year follow-up the cyst had resolved on MRI with a residual increased signal in the cord at C2.

The entrance complaints coupled with the radiographic findings exemplify the need for a direct and indirect decompression of the upper cervical spine. Relying on the principle of dorsal migration of the spinal cord secondary to a posterior-based decompression versus a direct decompression via transoral technique to decompress the cystic mass is debatable. The former is predicated by the severity of the myelopathy (Nurick Grade, JOA scale) and tempered by the somatotype of the patient and risk of wound complications in a transoral approach [3].

The underlying pathology of the odontoid is either from a pseudoarthrosis related to prior trauma or an os odontoideum, less likely is ossiculum terminale. The presence of hypertrophy of the anterior arch of C1 may be helpful to distinguish the two pathologies [4]. The resultant atlantoaxial instability is compounded by pseudocyst formation created by pathologic movement within the odontoid process and compression of the upper cervical spine in flexion. There are case reports of a retro-odontoid cyst in the non-rheumatoid patient population with an intact odontoid and atlantoaxial instability [5, 6].

M. J. Goytan (✉)
Sections of Orthopedics and Neurosurgery,
Department of Surgery, University of Manitoba,
AD4-820 Sherbrook Street, Winnipeg, MB R3A 1R9, Canada
e-mail: mgoytan@exchange.hsc.mb.ca; goytan@mymts.net

This retro-odontoid cyst does not arise from a zygapophyseal joint as seen in the lumbar spine, which are protrusions of the synovial membrane through defects in the joint capsule [7].

Reduction of posterior odontoid intraspinal masses after C1–2 arthrodesis is documented in the literature [8, 9]. The correct and nondebateable point is the transarticular C1–2 fusion to maintain reduction of C1 and C2 and indirectly reduce the spinal cord compression at C1–2. When the tip of the odontoid is fused to the clivus, an occipitocervical (oc) fusion must occur, as persistent oc movement will still compress the brain stem [10]. Unless the C1–2 articulation is packed with allograft or autograft bone, it is difficult to conceive that mere immobilization of the facet joint will cause it to arthrodese, and particularly, when the posterior arches of C1, C2 and C3 have been removed and an oc is the better surgical solution [11, 12].

This is further complicated and compromised by the patient's smoking history.

Expert's personal preference

I congratulate the authors on an excellent clinical outcome at 1 year, but I would remain cautious. The preoperative coronal occipital C1 articulation reveals accessory ossicles of C1 which will serve to stiffen the O-C1 joint and with the weight of the cranium act as significant lever arm at the attempted C1–2 fusion. I would have fused posteriorly with a polyaxial screw (no bias to plane) and rod (3.0 or 4.0 mm) from the occiput to C4. The implant selection and placement is as follows: a combination of one- and two-hole occipital plates per side with a C2 pars screw or C1–2 transarticular screw and lateral mass screws in C3 and C4. I would avoid the use of a “T” or “Y” occipital plate, as the surface area of the occiput for the craniocervical fusion is limited.

My preferred grafting material is an allograft unicortical iliac crest augmented with iliac crest cancellous autograft or cancellous bone from the procured posterior elements of the decompression.

With a single 3.5 mm cancellous screw placed through the allograft into the midline of the occiput, compression of the graft into the occiput is achieved (Figs. 1, 2). Caudal fixation is facilitated by a nonabsorbable heavy suture to the spinous process of C4. Meticulous attention must be undertaken to this part of the operation, as graft incorporation is paramount to the long-term success.

Conclusion

Atlantoaxial instability without neurologic deficit is often successfully treated by posterior C1–2 arthrodesis. In the

Fig. 1 Lateral radiograph of an occipitocervical fusion utilizing a poly axial screw-rod construct with occipital plates. The single cancellous screw securing the iliac crest allograft to the occiput

Fig. 2 AP radiograph, immediately postoperative film. The single midline cancellous screw securing the iliac crest allograft to the occiput

case of a retro-odontoid mass and C1–2 instability, our authors show that this can be treated successfully by instrumentation of the C1–2 joint and decompressive laminectomy. I would remain vigilant of this construct

representing the definitive treatment of this case and would have preferred an oc fusion. Although there is a reduction in cervical range of motion in flexion with extending the construct to the occiput, there is less risk of failure related to nonunion.

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