Objective: To report the difficulties in managing a case of os odontoideum. Methods: Female patient, 12 years old who developed a quadriaparesis after minor cervical trauma in October 2005. In the emergency department a congenital cervical anomaly was identified. The patient was placed in a Stryker® frame and, few days later, in a halo bracing. After 3 months, an infection around the pins emerged and the halo vest had to be removed. A severe C1-2 instability persisted and a C1-C2 Gallie procedure was attempted. In the following weeks the bone disappeared and another procedure was attempted in June 2006 - C1 laminectomy and occiput-C3 fusion. In the following months the neurological status of the patient improved and a complete mass of occiput-C3 fusion was observed. Results: We choose a posterior cervical arthrodesis of C1-C2 using the Gallie technique. Since the condition was not resolved we performed a second surgery, C1 laminectomy (determined by SAC of 8, 3 mm in MRI) followed by posterior occiput-C3 fusion. In our case, until now, there is no evidence of axial decompensation, but a more prolonged follow-up is needed. Conclusions: The treatment of os odontoideum has many considerations but the essential that in the presence of instability and neurological deficit a solid fusion is achieved. In case of failure of posterior atlantoaxial wiring, the occiput-C2 or C3 fusion with rods seems to be an excellent option with a high rate of success, avoiding the need for additional support.

Keywords: Odontoid process/surgery; Odontoid process/radiography; Cervical vertebrae; Spinal injuries.
INTRODUCTION

In 1863, separation of the odontoid process from the body of the axis was described in a postmortem specimen. In 1886, Giacomini coined the term os odontoideum\(^1,2\).

Os odontoideum is rare, but the exact frequency is unknown. Known cases are either incidentally detected or are diagnosed when patients become symptomatic. No large-scale screening studies have been performed\(^1\).

Based on the position of the dens tip os odontoideum is described as orthotopic or dystopic. In an orthotopic os odontoideum, the dens is in anatomic position. A dystopic os odontoideum is present when the dens is in any other position\(^2,3\) (Figure 1).

CASE REPORT

The authors report a case of a twelve year old female that developed a tetraparesia after a minor cervical trauma in October of 2005. In the emergency department a congenital cervical anomaly was identified. The patient was placed in a Stryker\(^6\) frame and, few days later, in a halo bracing. After 3 months an infection around the pins emerged and the halo had to be removed. A severe C1-2 instability persisted and a C1-C2 Gallie procedure was attempted in January of 2006, 3 months after trauma. In the following weeks the graft disapeared and a severe C1-C2 instability persisted with the space available for the spinal cord was 10.8 mm in the X-ray and 8.3 in the MRI (Figures 2 and 3). Another procedure was attempted, in June 2006, that was a C1 laminectomy and fusion Occipital-C3 with Vertex System\(^\text{TM}\) (Medtronic) five months after the first procedure (Figure 4 e 5). In the following months the patient neurological status improved, allowing her to walk without assistance and to make her normal daily life activities. In July, 2 months after Occipital – C3 fusion, the fusion was evident in the X-ray. In the next one and half year of follow up she gained a good function – with only a functional grade 3 of 5 in intrinsic muscle of the left hand (C7/C8) as residual deficit - and a complete mass fusion Occipital – C3 was visible in July 2007 (Figure 6).

DISCUSSION

The primary factor that causes post-traumatic tetraparesia, frequently secondary to a slight trauma, is atlantoaxial instability. The stability of the atlantoaxial articulation depends fundamentally upon integrity of the odontoid process and the ligaments. When the odontoid process is disrupted, from traumatic or nontraumatic causes, the atlas will displace along the odontoid process, leading to instability\(^2\). The differential diagnosis of injuries of the upper cervical spine in children includes fractures through the base of the
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Os odontoideum appears as a round or oval ossicle with a smooth uniform cortex separated from the base of the axis by a wide gap. The ossicle border does not directly match up with the axis body. The wide gap separating the os odontoideum and the axis should lie above the level of the superior articular facets. The critical space available for the spinal cord (SAC) was proposed as 13 mm. At the level of atlantoaxial joint, the spinal cord has a diameter of 8 – 11 mm, and the transverse ligament has a diameter of 4 mm. In this case remains a 10, 8 mm space in Rx and 8,3 mm in MRI. A SAC of 11 mm is related with clinical improvement after a solid arthrodesis. It is important to check instability index since patient with more than 40 % have a high risk of myelopathy. Another factor of high risk is sagittal plane rotation angle with more than 20 degrees associated with a high risk of developing myelopathy.

Patients with posttraumatic progressive neurological deficit should be treated surgically. Different treatment methods have been advocated by different authors. The standard surgical technique is posterior atlantoaxial wiring with either a Gallie or a Brooks fusion. The Magerlike procedure was not an option because of the patient age. We have chosen a posterior cervical arthrodesis of C1 – C2 using a Gallie technique. In patients with os odontoideum, posterior subluxation can occur with the Gallie procedure. This problem is related with over-tightening of wiring that causes posterior translation of the C1 ring and brings the ossicle into the canal and against the spinal cord. It is important that radiographs are obtained intraoperatively assuring that the patient is fused in a neutral position.

Another major complication is nonunion, reaching 30 % when a fusion C1 – C2 with posterior atlantoaxial wiring is attempted. Postoperative management is important to avoid this complication. This includes a cervical bracing, as in our patient, or even a halo-bracing. Serial radiographs should be obtained to ensure progression to fusion and maintenance of stability. Nakagawa has presented a series of occipitocervical fusion in children, using rectangular rods that eliminated the complications associated with the halo and wire techniques for C1 – C2 fusion. Wudbhav reported a series of 15 patients that were fused C1-2 or C0-C2 with or without wiring, with 4 non unions. They were placed in a halo jacket until the follow up. The cases with compensatory sub axial changes were found in patients whose fusion angle exceeded 30°. In our case, until now, it is not evident sub axial decompensation but a more prolonged follow-up is needed.

Conclusion

The treatment of os odontoideum has many considerations but the essential in the presence of instability and neurological deficit is to obtain a solid fusion. The halo bracing is the key factor of the treatment. It should be used to achieve a more anatomical position before and during surgery and, after surgery, to ensure good immobilization until a solid fusion is achieved. In the case of a failure of a posterior atlantoaxial wiring a C0 – C2 or C3 fusion with rods appear to be an excellent option with a high rate of success, avoiding the need of a supplementary support.

REFERENCES