CASE REPORT

Occipital condyle fracture in a patient with occipitalisation of the atlas

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SUMMARY

Occipital condyle fractures and occipitalisation of the atlas are rare entities of the craniocervical junction. To the best of our knowledge, a patient presenting with a traumatic occipital condyle fracture and pre-existing occipitalisation of the atlas has not been previously reported. We report the case of a 79-year-old man presenting with an Anderson and Montesano type III fracture through a fused occipital condyle and lateral mass. This fracture was noted to extend into the transverse foramen and the C1–C2 joint space. The transverse ligament and ligamentum flavum were calcified but not disrupted and the atlantodental interval was within normal limits. The neurological examination was unremarkable with the exception of neck pain. The patient was treated conservatively and placed in a rigid cervical collar for 10 weeks with serial CT studies to monitor healing of the fracture. At 4 months of follow-up, the patient was pain free with nearly complete resolution of his occipital condyle fracture.

BACKGROUND

Occipital condyle fractures occur in 0.4% of patients with trauma.¹ Guidelines for managing these fractures suggest that fracture type and integrity of the transverse ligament should dictate treatment.^{1–2} Instances in which the transverse ligament remains intact can be effectively treated with external cervical immobilisation devices, such as collars or halos, whereas transverse ligament disruption or displacement of fragments into the foramen magnum typically demand surgical stabilisation and fusion.¹

Occipitalisation of the atlas (also known as assimilation of the atlas, atlanto-occipital fusion or occipitocervical synostosis) is the term given to the osseous fusion of C1 to the base of the skull, often including the occipital condyle. It occurs in 0.08–3% of the population, making it the most common anomaly of the craniocervical junction.^{3–4} In addition, patients with atlanto-occipital fusion have a higher incidence of atlantoaxial instability at baseline.⁵

To the best of our knowledge, a report of acute occipitocervical fracture occurring in an individual with congenital atlanto-occipital fusion has never been reported. Given that the current practice regarding the treatment of occipital condyle fractures focuses heavily on the importance of transverse ligament stability—the same factor made unstable by congenital atlanto-occipital fusion—it is unclear whether the current guidelines apply to this anomalous scenario. Thus, we describe our management of such a case and consider the salient

features related to the clinical challenges experienced with such patients.

CASE PRESENTATION

A 79-year-old man presented to our emergency department after falling down a flight of stairs and striking his face. He denied any loss of consciousness during the event but reported residual neck pain with tenderness on examination. He denied radicular pain, paraesthesias and bowel or bladder incontinence. Cranial nerves, including the hypoglossal nerve, were functioning normally and muscle strength was 5/5 in all muscle groups bilaterally. Reflexes were 1+ throughout.

INVESTIGATIONS

An X-ray suggested occipitalisation of the atlas, but the fracture could not be seen (*figure 1*), thus CT of the cervical spine was carried out for further assessment. The CT of the cervical spine revealed developmental atlanto-occipital fusion of the occipital condyles to the lateral masses of C1. Basilar invagination was also present. An Anderson and Montesano type III fracture through the fused left occipital condyle and lateral mass was noted to extend into the transverse foramen and the C1–C2 joint space (*figure 2*). CT angiogram of the neck ruled out injury to the vertebral artery. The ligamentous complex at the craniovertebral junction confers significant stability and is therefore important to evaluate. In this case, the MRI, including short tau inversion recovery images, did not show ligamentous injury (*figure 3*). Although the transverse ligament and ligamentum flavum were

Figure 1 Craniocervical X-ray most clearly demonstrating fusion of the posterior arch of C1 to the occiput. A fracture was not evident, but clinical suspicion prompted a CT scan.

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Figure 2 Left, axial and right, sagittal CT scans of the craniocervical junction at presentation demonstrating fusion of the left occipital condyle with the lateral mass of C1 and a fracture involving both elements. The fracture is indicated by the arrowheads.

Figure 3 Sagittal short tau inversion recovery MRI demonstrating the absence of ligamentous injury to the craniocervical junction.

calcified, they were not disrupted and the atlantodental interval was within normal limits.

TREATMENT

The patient was treated conservatively and placed in a rigid cervical collar for 10 weeks with serial CT studies to monitor healing of the fracture.

OUTCOME AND FOLLOW-UP

At 4-month follow-up, the patient was pain-free with nearly complete resolution of his occipital condyle fracture ([figure 4](#)).

DISCUSSION

Occipitalisation of the atlas was first described by Rokitsansky in 1844 and was later roentgenographically demonstrated by

Schuller in 1911.⁶ Failure of normal segmentation of the cranio-vertebral region in the early embryological stages gives rise to atlanto-occipital fusion,⁷ which can range in severity from a fibrous band connecting C1 with the occiput to the complete bony fusion of the two structures.^{5 8} It sometimes presents clinically with cervical myelopathy but can be asymptomatic, as was true in this case.⁹ Occipitalisation of the atlas has also been associated with stenosis of the foramen magnum by the dens (basilar invagination).¹⁰ Despite radiographic evidence of slight basilar invagination in this case, the finding did not alter our clinical judgement because the patient lacked any symptoms of brainstem compression. Finally, it is especially important to evaluate hypoglossal nerve function in any patient with an occipital condyle fracture. Several reports of immediate as well as delayed hypoglossal nerve palsies have been reported in the literature as a fracture line involving the occipital condyle can easily spread to involve the hypoglossal canal.^{11–14}

Complete occipitalisation of the atlas expunges all movement between the atlas and occiput, thereby placing additional stress on the occipito-odontoid ligaments during maximal flexion. The abnormal amount of ligamentous laxity due to compensatory movements has been theorised to cause atlantoaxial subluxation (indicated by an atlantodental interval greater than 3 mm).¹⁵ This theory has been proposed to explain the atlantoaxial instability that occurs in approximately 50% of cases of developmental atlanto-occipital fusion.⁴

Given that the key recommendations for surgical fusion in acute occipital condyle fractures are based on atlantoaxial instability secondary to loosening of the transverse ligament, we felt that this patient's congenital fusion afforded sufficient stability to allow for conservative management, especially considering the normal atlantodental interval. Had this measurement been greater than 3 mm, we would have strongly considered surgical fusion because of the risk of progressive instability and neurological injury.

Figure 4 Left, axial and right, sagittal, CT scans of the cranio-cervical junction 4 months later showing the healed fracture.

The resolution of this patient's fracture with a collar alone indicates that conservative therapy was an acceptable decision. Thus, this case suggests that conservative therapy alone may be an acceptable choice for patients with the rare co-occurrence of assimilation of the atlas and occipital condyle fracture when the atlantodental interval is within normal limits.

Learning points

- ▶ Occipital condyle fractures and occipitalisation of the atlas are rare entities.
- ▶ The major criteria for surgical stabilisation include instability, malalignment and narrowing of the foramen magnum resulting in spinal cord compression.
- ▶ Conservative therapy involves external fixation with a rigid collar or halo.

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