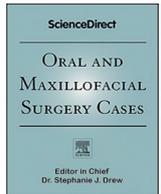




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Os odontoideum anomaly mimicking cervical fracture in a patient with maxillofacial trauma

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ABSTRACT

A rare anatomic anomaly of the second cervical vertebra involving the odontoid process was first described in 1863 in a post-mortem specimen and then was called “Os Odontoideum” (OO) by Giacomini that coined this term in 1886. The etiology of the OO is still controversial and it focuses mainly on two theories: acquired and congenital. In this scientific paper, we present the case of a patient admitted to our ward following a displaced fracture of the jaw and with a radiological diagnosis of a cervical spine fracture. Only a careful clinical and instrumental evaluation allowed us to detect the presence of OO anomaly, thus modifying prognosis and treatment protocol.

In our opinion, this rare clinical condition can be of interest to any medical professional who deals with traumatology, as it may be found in association with other post-traumatic pathologies, posing differential diagnosis problems or leading to possible misdiagnosis.

1. Introduction

The occurrence of trauma to the cervical vertebrae is a potentially serious and prognostically unfavorable event. Odontoid fractures represent the most common fractures involving the second cervical vertebra (C2) and the most common cervical spine fractures in patients older than 65 years [1]. A cervical fracture following a traumatic event that also involves the maxillofacial district can complicate the patient's postoperative course [2,3]. Therefore, in maxillofacial wards activity, it is important to avoid diagnostic errors that can prolong the patient's average hospital stay by subjecting him to unnecessary immobilization of the neck and psychophysical stress. OO is an idiopathic or not, anatomic variation of the odontoid process (OP) of C2. It consists of an independent ossicle of variable size and shapes with smooth circumferential cortical margins, separated from the base of a shortened OP by a gap, with no osseous continuity with the body of C2. Diagnosis of OO can be difficult because patients are generally asymptomatic or may have various nonspecific symptoms. We report the case of a 53 years old male, who was referred to our hospital for a jaw fracture due to a road traffic accident. Computed tomography (CT) scan revealed a bifocal fracture of the jaw and simultaneously revealed a suspected C2 fracture. Only an accurate clinical and instrumental evaluation with magnetic resonance imaging (MRI) led us to the correct diagnosis of OO anomaly, thus excluding the presence of the previously hypothesized cervical fracture.

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2. Case report

A 53-years-old male M.M. was referred in 2018 to our Maxillofacial Surgery Unit of Magna Graecia University, Catanzaro, Italy, for a severe double fracture of the jaw and C2 fracture following a motorcycle accident. On admission, the patient wore a Schanz collar. He complained of pain in the mandibular region and he was unable to open his mouth. Initial physical examination showed bruising of the jaw region, excoriations and lacerations of the facial skin and a lacerated wound already sutured under the lower lip. Alteration of the eurythmy of the face and the jaw function was noticed with analgesic trismus. Intraoral examination revealed partial edentulism of the mandible and the posterior maxilla sectors, dentoalveolar fracture of the upper left region of the maxilla, modified occlusion with crossbite and post-traumatic right dental pre-contact. CT examination performed at the hospital of origin revealed a displaced fracture of the right mandibular body and a compound left sub-condylar fracture (Figs. 1 and 2). Another finding that caught our attention was a suspected fracture of the C2 OP (Figs. 3 and 4).

A neurosurgical evaluation was requested. No significant signs or symptoms of cervical myelopathy were reported at the neurological examination. The patient only complained of neck and shoulder pain, probably due to the traumatic impact at the time of the accident. On the head and neck CT scans, a regular bordered ossicle was observed in the posterior of the atlas anterior arch, separate from the hypoplastic odontoid process. Neurosurgeons suggested performing MRI scans for the assessment of the spinal cord tract, to evaluate any possible compression. No findings of compression of the spinal cord, edema in the bone or trauma to the surrounding soft tissues, and no damage to the ligamentous structures or narrowing in the canal, were found (Fig. 5).

Based on the asymptomatic clinical picture and the characteristics of the CT scans, like the smooth uniform cortex of the small odontoid ossicle separated by a wide gap, especially considering essential MRI evidence, an OO anomaly was diagnosed. The Schanz collar was promptly removed avoiding prolonged immobilization and unnecessary psychophysical stress. The patient underwent open reduction and internal fixation with plates and screws of the right mandibular body fracture by transoral approach and intermaxillary locking with IMF screws for 20 days to obtain left sub-condylar composed fracture consolidation. The hospital patient course was uneventful. The patient underwent a followed up with clinical and radiographic exams for 3 years and has not developed any neurological symptoms.

3. Discussion

OO prevalence of 0.7% has been highlighted on MRI in a study of 133 asymptomatic patients with cervical vertebrae abnormalities [4], while in another study in the pediatric population with cervical abnormalities, an OO incidence of 3.1% was observed [5]. OO can have a traumatic or embryologic etiology. It can cause considerable instability with possible subluxation of C1 relative to the C2 axis and at its worst, it can have serious implications due to compression of the craniovertebral junction. According to the congenital hypothesis, it may be a segmental defect, which represents a failed fusion of the dens with the axis vertebral body of C2 during embryonic development or as a consequence of the secondary ossification center at the apex of dens fusing with its main part [6]. However, some authors believe that it is a result of remote trauma leading to a chronic non-united fracture of the OP with increased instability and injuries to the soft tissue [7]. Another difference regards the location of the OO: in traumatic cases, OO occurs is commonly located at the base of the dens, while in congenital cases, it is located at synchondrosis where occurs a fusion failure [8]. A combined etiology is sometimes supported. The local symptoms may include neck stiffness, shoulder pain, torticollis, respiratory dysfunction, weakness, numbness in the occipito-cervical region, pain, headache and neurovascular trap signs. Atypical symptoms have also been reported. Based on the asymptomatic clinical picture and the characteristics of the radiographic images, we suspected a



Fig. 1. Preoperative volume-rendered image of the right mandibular fracture.



Fig. 2. Preoperative CT coronal slice image showed a left sub-condylar compound fracture.



Fig. 3. CT Coronal slice image of cervical spine showed the OO (black arrow).

dystrophic variant of congenital OO in our patient. In our case, we excluded the evidence of the OP traumatic fracture with careful analysis of CT scans and 3D reconstructions, subsequently supported by MRI that showed no other signs of fracture. The study of MRI scans was important for the differential diagnosis between C2 fracture and OO anomaly [9]. On MRI, spinal cord integrity was assessed showing no signal change in the spinal cord, no edema in the bone or trauma to the surrounding tissues, no damage to the ligamentous structures or narrowing in the spinal canal. Therefore, in our patient, OO diagnosis was confirmed by comparing these instrumental findings with the patient's clinical state. OO management is still controversial, probably because in some cases the etiology is uncertain and clinical manifestations are not specific. Asymptomatic and stable cases must certainly be well evaluated and it should be considered not necessary to give indications for surgery immediately. The conservative approach with close follow-up is recommended in asymptomatic patients with OO mimicking a cervical trauma [10]. A suspected cervical fracture was diagnosed in our patient on the occasion of a maxillofacial trauma, which misled the radiologist in the emergency ward, but the nature of the suspected cervical fracture was diagnosed as a C2 anomaly based on adequate clinical and instrumental investigations with TC and MRI scans. In this way it was possible to proceed with maxillofacial surgery more quickly, also reducing the patient's anxiety due to possible neurological consequences of the cervical trauma. The patient's prognosis improved and hospital stays were significantly reduced.



Fig. 4. CT Sagittal slice image of cervical spine showed the OO (black arrow).



Fig. 5. Sagittal T2 weighted MRI of the cervical spine showed the OO with no direct or indirect sign of cervical trauma (no spinal cord compression, edema or hematoma of surrounding tissues.).

4. Conclusions

It is common evidence that cervical fractures can be found in association with maxillofacial injuries. It has also been hypothesized that the majority of OO cases have a traumatic etiology. The remaining part probably has a congenital origin. These rare C2 abnormalities can be mistaken for cervical fractures. We want to highlight the importance of recognizing and knowing how to diagnose this rare anomaly, even in maxillofacial traumatology departments, to avoid misdiagnosis and unnecessary treatments also reducing hospitalization times.

Credit author statement

Colangeli Walter: Conceptualization, Methodology, Writing original draft preparation. Cordaro Raffaella: Data curation, Investigation, Writing and Editing. Sorrentino Alfonso: Visualization, Software. Kallaverja Elvis: Software, Formal analysis. Facchini Valerio: Validation, Conceptualization. Becelli Roberto: Methodology, Supervision. Della Torre Attilio: Conceptualization, Review and Editing. Cristofaro Maria Giulia: Supervision, Review and Editing.

Declaration of competing interest

None of the authors has any potential conflict of interest.

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