Case Study

EXTERNAL AUDITORY CANAL FRACTURE AFTER POSTERIOR DISLOCATION OF AN INTACT CONDYLAR HEAD.

ABSTRACT

Aims: The aim of this article is the applied treatment of fracture of the external auditory canal following traumatic facial injuries.

Presentation of Case: The case report of the patient described in this article, is corresponded with posterior dislocation of an intact mandibular condyle after facial injuries she had due to a road accident. The physical and x-ray examination revealed facial fractures, TMJ dysfunctional symptoms with severe disk displacement , as well as fracture of the anterior wall of the EAC. Atraumatical reduction of the fracture was accomplished during the TMJ disc reduction and joint exploration, resulting in a satisfactory outcome with no complications and improvement of hearing impairment.

Discussion: The anterior osseous wall of the external auditory canal, which represents part of the tympanic portion of the temporal bone, defines the posterior limit of the glenoid fossa, and is situated close to the condyle of the mandible. Due to this intimate anatomical relationship, herniation of the TMJ apparatus into the external auditory canal (EAC) occurs spontaneously or secondary to neoplasia, inflammation, developmental problems and especially trauma. Direct high-energy impact into the chin displaces the condyle posteriorly and the result may be a fracture of the condyle or posterior dislocation of intact condyle without fracture, a dislocation of condyle into middle cranial fossa or temporal fossa, or a fracture on the anterior wall of the EAC.

Conclusion: In summary, a direct blow to the mandible can result in a TMJ apparatus injury. Due to the close relationship between TMJ and EAC, an atypical injury such as a fracture on the anterior wall of EAC can occur. Oral & maxillofacial surgeon, when called to examine and diagnose TMJ injury disorders, owns the challenging responsibility to take account of potential concomitant temporal bone fractures or intracranial complications in cooperation with radiologists, ENT doctors and neurosurgeons.

Keywords: fracture , auditory , canal, condylar dislocation.

INTRODUCTION

Temporal bone fractures are, by definition, fractures of the skull base, and are often associated with injuries to other areas of the craniomaxillofacial skeleton[1]. They represent roughly 20% of all skull fractures, while up to 75% of patients with a skull base fracture have a temporal bone fracture as a component of the injury[1]. The most common causes and risk factors include younger age, male gender, motor vehicle accidents, falls, bicycle accidents, athletic injuries, assaults and penetrating trauma[2].

The temporal bone includes the squamous, petrous, mastoid, and tympanic portions, as well as the styloid process[1]. Classically, petrous temporal bone fractures are classified as longitudinal (parallel to the long axis of the petrous bone) or transverse (perpendicular to the late axis) depending on the orientation of the fracture line, or mixed when the fracture line extends in any direction across the basal portion of the skull[1].

Longitudinal fractures begin at the squamous portion of the temporal bone, run through the external auditory canal (EAC), and turn anteriorly toward the foramen lacerum. They account for about 80% of cases, whereas transverse fractures are far less common than longitudinal fractures and frequently are caused by a severe blow to the occipital portion of the calvaria or by a direct frontal blow[1]. Transverse fractures course directly across the petrous pyramid , fracturing the otic capsule, and then extend anteriorly along the eustachian tube and geniculate ganglion.

The EAC is divided into an outer cartilaginous one-third and an inner osseous two-thirds, which represents the tympanic portion of the temporal bone[3]. The canal extends from the conchal cartilage to the tympanic membrane and is approximately 25mm long and slightly S shaped. Within the anterior and inferior portions of the cartilaginous ear canal, there are small fenestrations through the cartilage called the “fissures of Santorini”. The anterior and inferior walls and lower portion of the posterior walls of the osseous canal are developed from the tympanic ring. The posterior wall is

closed to the mastoid cells and the descending portion of the facial canal. The inferior wall is composed of dense bone and the anterior wall, which defines the posterior limit of the glenoid fossa, is close to the condyle of the mandible. The blood supply of the EAC originates from the external carotid artery (posterior auricular and superficial temporal branches) and from the maxillary artery (deep auricular branch and arterior tympanic artery)[3, 4].This rich blood supply explains bleeding from the EAC in patients with maxillofacial fractures.
In this article we present a case of a patient with a fracture of left external auditory canal due to a force applied in the right side of the face.

PRESENTATION OF CASE

A 29 year-old female arrived to our clinic with injuries in the left side of face, that were caused by road accident thirty days before. After the accident the woman referred to the Emergency Department of local Hospital.
After the primary care, the physical and x-ray examination revealed facial injuries, hearing discomfort from the left ear, as well as TMJ dysfunctional symptoms such as restricted mouth opening, deviation and “locking” of mandible, especially in the morning session due to disk derangements following the accident. She also complained of preauricular pain in the left side. There were no signs of brain injury or neurological deficit. From the history of the accident, she reported a severe blow to the chin and lateral craniofacial region, which caused external auditory canal bleeding.
When the patient came to our clinic, panoramic radiograph and computed tomography (CT) showed an incomplete right parasymphyseal fracture, a left zygoma fracture and a breadth reduction of external auditory canal due to fracture of the anterior wall of EAC. Also the left condyle showed to be in an anterior place during centric occlusion. (Fig. 1, Fig. 2)
With the patient under general anaesthesia the parasymphysis and zygoma fractures were reduced and left TMJ was exposed. After the disk reduction and during the exploration of the joint, a gap was revealed in the posterior wall, which corresponded in the fracture of the anterior wall of EAC. With careful entry of a blunt elevator inside the EAC and following the canal outline, the reduction of the fracture was achieved, with release of characteristic sound.
The postoperative course was uneventful. Examination of the patient by an ENT specialist in the next days , showed a considerable improvement of hearing impairment. Two years after the operation a computed tomograph showed an EAC breadth within normal limits. (Fig. 3a,b,c)

DISCUSSION

The longitudinal fractures result from direct lateral blunt trauma to the skull in the parietal region of the head. These fractures involve the squamous portion of the temporal bone, follow the axis of the external auditory canal, frequently near the roof, to the middle ear space and then course anteriorly along the geniculate ganglion and eustachian tube , ending near the foramen lacerum.
Hearing loss or impairment, nausea , vomiting and vertigo, TMJ discomfort or dysfunction (TMJ trismus, inability to chew, and localized pain) are symptoms of patients with temporal bone fractures. Clinical signs may include ecchymosis, particularly in the periorbital region (‘’raccoon eyes’’ sign)[1] or in the postauricular region due to the bleeding from the mastoids veins (Battle’s sign)[5]. Physical examination reveals an external auditory canal laceration[6] or hemorrhage[9-10], an hemotympanum and a cerebrospinal fluid (CSF) otorrhea or rhinorrhea, which occurs in 20% of temporal bone fractures[1]. Particularly, concerning the association of craniofacial fractures with external auditory canal bleeding (EACB), Lu et al[4] found EACB with an overall frequency of 7.5% (43 of 573 craniofacial fractures) and investigated the presence of EACB between 4 fracture types (skull base, midface, mandibular with and without involvement of the condyle). Statistical analysis showed that skull base and mandibular intracapsular condylar fractures are the two main causes of EABC, while midface and mandibular fracture cases not involving the condyle are quite rare.
Facial nerve paralysis exists in most cases, it is noted immediately and remain permanent unless corrected surgically[9].
Hearing loss, as a result of injury to the tympanic membrane, the middle ear ossicles or the presence of a haematoma, is also a common finding, and can be sensorineural or conductive[3, 10].
The TMJ apparatus is located anterior to the external auditory canal and has two articulating bony components : the mandibular condyle and the articular eminence and glenoid fossa of the temporal bone. The glenoid fossa is limited posteriorly by the petrotympanic fissure. The posterior part of the glenoid fossa is formed by the anterior tympanic plate, which is thin and weak.

Due to this intimate anatomical relationship, herniation of the TMJ into the EAC occurs spontaneously[11] or secondary to neoplasia, inflammation, developmental problems and especially trauma [11-14]. Direct impact into the chin displaces the condyle posteriorly until the movement is stopped by the articular fossa and the ligaments. The result is a fracture of the condyle or posterior dislocation of intact condyle without fracture[15], a dislocation of condyle into middle cranial fossa[16, 17] or temporal fossa[16] or an injury on the anterior wall of the EAC [5]. By contrast, longitudinal temporal bone fractures are usually associated with posterosuperior quadrant of the EAC near the tympanosquamous suture[3].

The direction, degree, magnitude and precise point of application on the face and the state of dentition and the occlusal position of the mandible, determine the type of the injury in the temporomandibular region. Also, whether the mouth is open, abnormalities of condylar morphology or the presence of a particularly thin roof of the glenoid fossa affect the condylar dislocation. In our patient, the high-energy nature of the causative force applied in the right parasymphysis region caused a fracture in the anterior wall of the left EAC, without a condylar fracture. The result was hearing loss from left ear due to EAC obstruction.

Computed tomography is the diagnostic modality of choice for mandibular condylar fractures and injuries in temporal region[11, 18]. It is important to recognize potential association between mandibular condylar trauma and temporal bone fractures. In our patient a CT examination showed a fracture in the anterior wall of left EAC and a decrease in EAC breadth. This case report emphasizes the need to scrutinize the temporal bone particularly the petrous portion of EAC on CT for fractures in a patient with TMJ injury.

Approaches to the joint include preauricular, postauricular, endaural, rhytidectomal, submandibular and intraoral. We chose preauricular approach for TMJ reconstruction of internal derangement and easier exploration and confirmation of the EAC fracture.

The reduction of the fracture was atraumatical and simple by the use of an elevator which was inserted inside EAC. Primary stability was achieved by wedging of adjacent fracture sites. The postoperative period was uneventful. In the next days after the operation, the hearing loss was restored.

Treatment modalities for EAC, tympanic plate and temporal bone fractures from TMJ herniation, in general include either open or closed reduction of the associated mandibular fractures[8, 19], reconstruction of the anterior canal wall, pain control, management of occlusal discrepancies, and physiotherapy to prevent decreased mandibular range of motion.

In contrast to above mentioned interventional surgical method of treatment, in our case report atraumatical reconstruction of the anterior wall of the EAC and fracture reduction was achieved during TMJ disc reduction and joint exploration, with careful entry of a blunt elevator inside the EAC following the canal outline.

CONCLUSION

In summary, a direct blow to the mandible can result in a TMJ apparatus injury. Due to the close relationship between TMJ and EAC, an atypical injury such as a fracture on the anterior wall of EAC can occur. Oral & maxillofacial surgeon, when called to examine and diagnose TMJ injury disorders, owns the challenging responsibility to take account of potential concomitant temporal bone fractures or intracranial complications in cooperation with radiologists, ENT doctors, and neurosurgeons[20].

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FIGURES

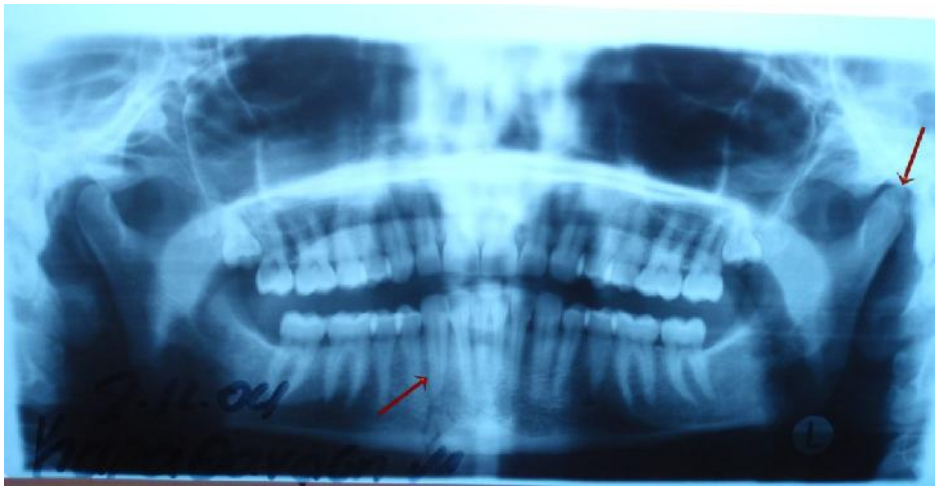

Figure 1: Conventional panoramic view. Note the parasymphyseal fracture on the right and the condylar position on the left (arrows).

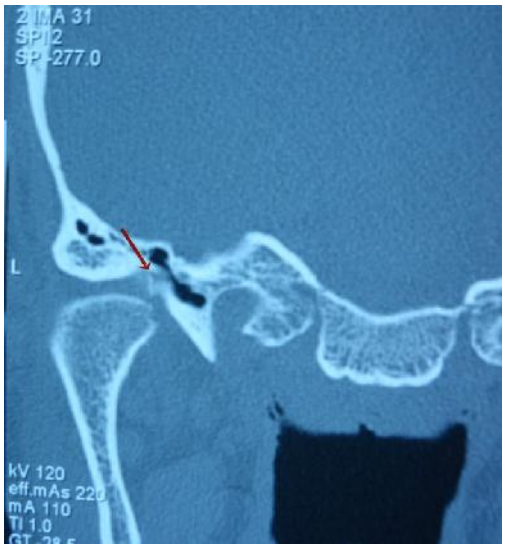

Figure 2: The fracture of left EAC

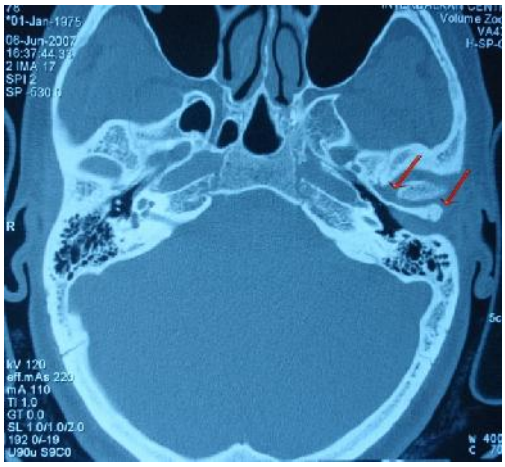

Figure 3a : Postoperative view, 2 years after reduction (arrows)

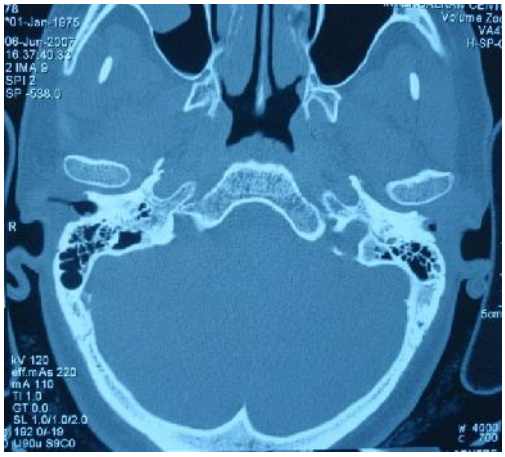

Figure 3b : Bilateral symmetrical appearance of the condylar head

Figure 3c : The final condylar position following the surgical intervention in the left TMJ (MRI, sagittal incision)