

Case Report

Gunshot wound to the upper cervical spine leading to instability

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Received January 8, 2014; Accepted February 3, 2014; Epub March 15, 2014; Published March 30, 2014

Abstract: Gunshot wounds (GSW) to the cervical spine leading to instability are rare. Also, the presence of vital vascular and neurological structures in the surround area lead to death or severe disability in the vast majority of cases. In this brief report, we present a rare case of C1 fracture due to GSW leading to instability of the atlanto-occipital joint in a neurologically intact patient.

Keywords: Neck pain, trauma, atlanto occipital joint, gunshot wound

Introduction

The incidence of GSW to the spine account for 13-17% of all spine injuries [1]. However, cervical lesions are rarely seen due to the life-threatening conditions of such patients. The incidence of neurovascular lesions is high and, those who survive, may become severely disable. The inherent nature of GSW is generally associated with stable lesions and, rarely, is necessary surgical stabilization [1, 2]. To our knowledge, there is no published report of GSW causing fracture of both occipital condyle (OC) and C1 vertebrae leading to craniocervical instability in a neurologically intact patient.

Case report

A 32-year-old male patient sustained a single gunshot wound to the face. The bullet caused right occipital condyle and atlas fracture and lodged near to the anterior C1 arch (**Figure 1A** and **1B**). Angio-CT revealed no vascular injuries. Also, no intracranial injury was seen and, surprisingly, no neurological deficit was identified. He had only neck pain to flexion-extension movements. Initially, it was recommended Philadelphia collar for 12 weeks. He was discharged in stable neurological condition to other trauma center. After 1 month, he presented in the outpatient clinic with refractory and

severe neck pain, worsened with flexion and extension of the head. CT scans showed pseudoarthrosis of atlanto-occipital joint, with instability signs (**Figure 1C** and **1D**). Then, we performed an occipito-cervical fixation, with C1-C2 lateral process screws (**Figure 2**). The outcome was favorable and he had improvement of cervical pain.

Discussion

Patients with cervical spine gunshot injuries rarely sustain a fracture alone without neurologic deficit [1-3]. Our patient was victim of a GSW causing fractures of the skull base and of atlas, and, interesting, with no neurologic or life-threatening injury. This finding in spine is more common with non-missile penetrating injuries than with GSW [4, 5]. Bullet fragments could be seen next to the anterior C1 arch however, initially, no surgical treatment was recommended. GSW to the cervical spine are most stable in nature, therefore, rarely need to be operated. Generally, only when there's considerable comminution of the anterior and posterior elements of the spine, the patient is considered for surgical stabilization [1, 2]. Moreover, the assessment of the stability of the craniocervical junction is challenging in penetrating injuries, Due to the rarity of such lesions, no standardized treatment algorithm had been developed.

Gunshot wound with spine instability

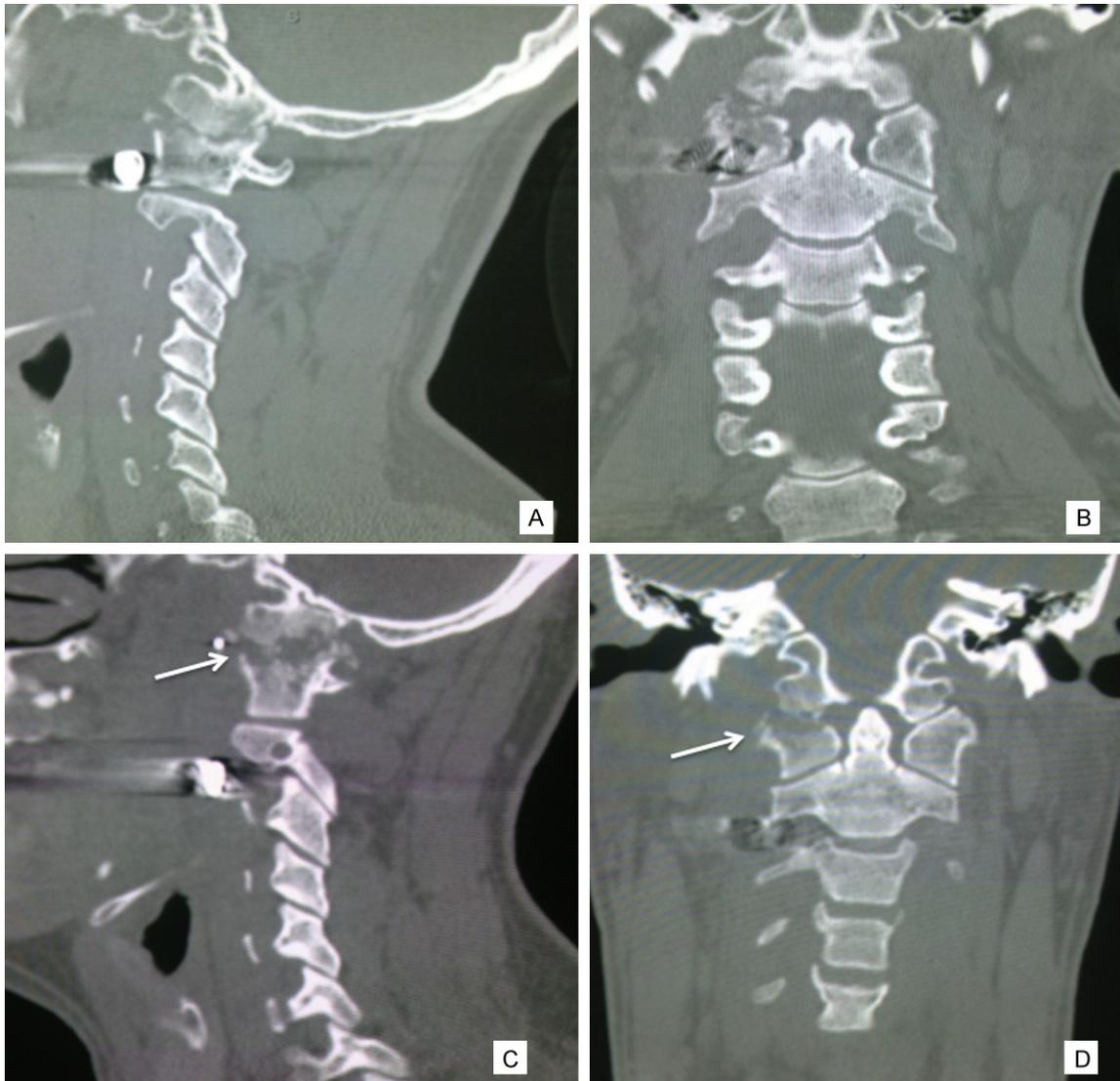


Figure 1. Admission and 1-month cervical spine CT scan (*upper and lower, respectively*). A and B: C2 fracture and occipital condyle fracture. The projectile was lodged near to C2. C and D: Note the progression of atlanto-occipital instability and signs suggesting pseudoarthrosis (white arrows).

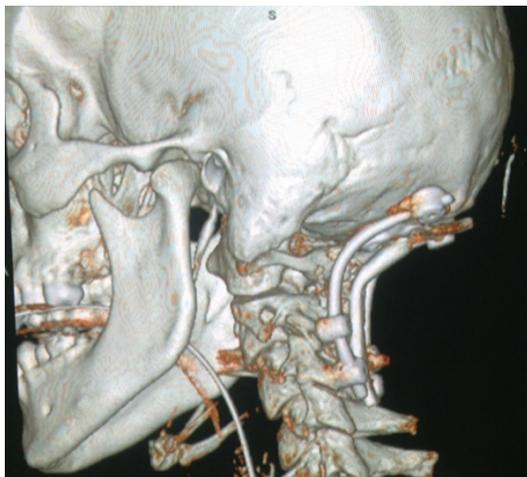


Figure 2. Post-operative 3D tomography with occipitocervical fixation. After this surgery, the pain rapidly improved. The bullet was not removed.

The complex regional anatomy and overlying structures make plain radiographic images difficult to interpret [6]. Probably, the absence of radiographic instability signs during the in-hospital care might be related to pain or spasm. So, most authors recommend further evaluation 2 weeks after injury to allow the symptoms subside [1]. Anyway, our patient had another radiographic evaluation with CT image 4 weeks after injury. The associated pain with pseudoarthrosis seen in cervical CT scan was sufficient to

determine surgical treatment to stabilize the atlanto-occipital junction.

Our patient had concomitant occipital condyle fracture and C1 fracture. In 2012, Mueller et al [7] reported a prospective investigation of incidence based on a total of 2,616 CT scans that had been performed during this period. None of these series found condyle fractures associated with injuries by firearm. According to Anderson e Montesano classification system, the fracture seen in our patient could be classified as type I fracture, a generally accepted stable lesion [8]. However, the integrity of this complex articulation is dependent on a number of supporting ligaments, of which the tectorial membrane and bilateral alar ligaments are the most important [7-9]. Probably, the thermal lesion of such ligaments caused by the GSW and the associated fracture of C1 made this injury unstable leading to later pseudoarthrosis.

Finally, although GSW to the upper cervical spine leading to instability is rare, clinicians should be aware of such possibility when there's suspicion of ligament lesion of the craniocervical junction.

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