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CASE REPORT

Mandibular access osteotomy to retrieve a bullet lodged in infratemporal fossa: a case report

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ABSTRACT

Gunshot injuries to facial region are challenging due to complex anatomy of facial skeleton and presence of vital structures. The bullet or projectile can get lodged in an area of limited access and close to neurovascular structures. Here, we present a case of 20 years male who presented with an accidental gunshot injury to his face with penetrating entry wound over right malar region and no exit wound. CT scan of face revealed communited fractures of bones of right midface and a single bullet lodged in right infratemporal fossa. To gain access to the bullet, mandibular right subcondylar osteotomy was done. Mandibular access surgery via right subcondylar osteotomy provided the shortest route of access to the bullet with reduced need of soft tissue dissection and preservation of vital neurovascular structures.

INTRODUCTION

Firearm related injuries in civilian settings is an issue of public health concern globally. Most common scenarios of injuries are homicides and suicide attempts; however, unintentional firearm discharges are also reported.[1] In Nepal, firearms possession for illegal hunting of wild animals is a common practice, occasionally leading to self-inflicted accidental injuries.[2] Gunshot injuries to maxillofacial regions present multiple challenges primarily due to presence of numerous vital structures. The high velocity projectile causes extensive tissue damage in its pathway and can even get lodged in complex facial spaces. Removal of bullet is surgically challenging in such cases. The primary aim is removal of bullet while preserving the vital structures.[3] Access surgeries have been regularly used in craniomaxillofacial surgeries in removal of inaccessible tumors of head and neck region. This case uses the principle of access surgery to gain the shortest and safest route for removal of a bullet lodged in infratemporal fossa.

CASE REPORT

A 20-year-old male presented to Emergency Department with alleged history of self-inflicted accidental gunshot injury with impact over right side of his face 9 hours back. Patient had assembled a homemade rifle to practice hunting in remote areas of Ruby valley, Nepal. The gun backfired with wooden and metallic contents of the gun hitting the patient on his right cheek. There was no history of loss of consciousness, nausea or vomiting ruling out any neurological injury. Patient gave history of right nasal bleeding suggesting injury to nasomaxillary region.

Physical examination revealed charred skin appearance over right midface, right periorbital edema and ecchymosis, right subconjunctival hemorrhage. Vision was blurred with intact eye

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movements in the right eye. There was penetrating laceration injury over the right malar region with irregular margins. There was no exit wound. Mouth opening was reduced with pain in the right temporomandibular joint. Occlusion was intact. Neurological examinations of trigeminal and facial nerve revealed no deficit.

CT scan images revealed fracture of right zygomaticosphenoid suture, right zygomaticomaxillary buttress, lateral wall and floor of right orbit, comminuted fracture of anterolateral wall of right maxillary sinus with hemosinus. A hyperdense foreign body, round of about 2cm was noted to be lodged medial to right condyle neck in the infratemporal fossa (Fig. 1).

Figure 1: Initial clinical and radiographic presentation of the patient

In view of above findings, surgical intervention was planned focusing on extraction of lodged bullet, open reduction and fixation of midface fracture, and soft tissue repair. Given the complex location of the bullet, mandibular access surgery was planned. Right retromandibular incision was given to access mandibular ramus. Subcondylar osteotomy was completed using peizosurgical tips (Fig. 2). The bullet was retrieved under direct vision (Fig. 3). The proximal and distal segments were reduced and fixed using a Delta miniplate incorporating four monocortical screws (Fig. 4). Closure was completed in layers. Midface fracture segments were reduced and fixed using routine principles.

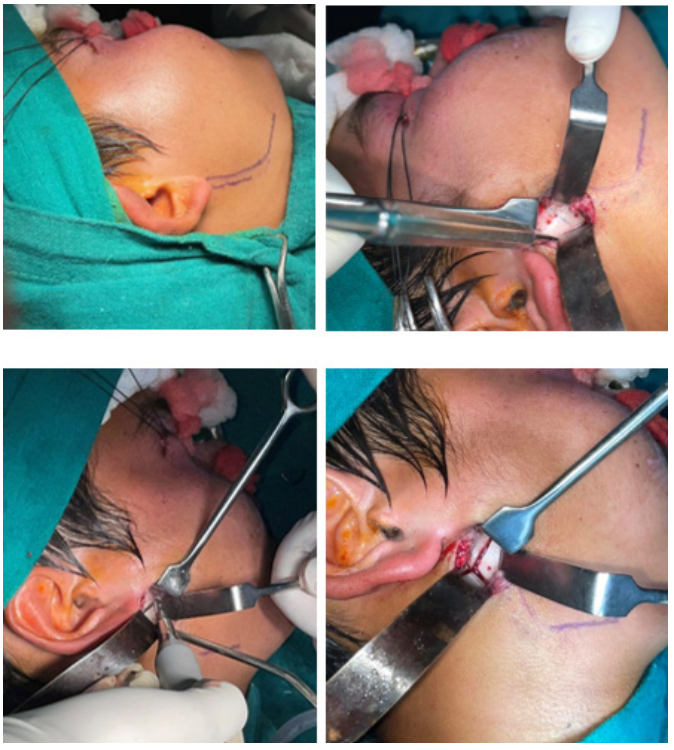

Figure 2: Right Subcondylar osteotomy

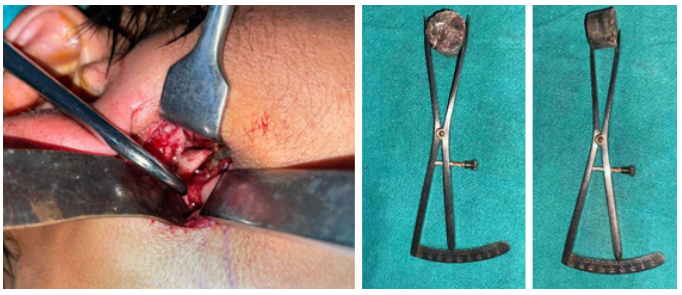

Figure 3: Direct Visual access to bullet and extracted bullet

Figure 4: Subcondyle fixation and closure

Postoperatively, patient was kept on intravenous antibiotics and discharged after one week of uneventful hospital stay. Follow up visits of the patient revealed satisfactory healing.

DISCUSSION

Based on Global Burden of Disease study reports, firearm

related injuries have caused more than 2.75 million deaths in civilian settings in the past decade.[1] Secondary to its prevalence, economic and social loss, firearm violence is regarded as an issue of public health concern globally.

Adolescents and young adults are most affected and highest number of cases are recorded in western countries like Brazil, United States, Colombia. Although, homicides makeup most of the burden, self-harm and unintentional firearm discharges are also common.[2] In Nepal, Arms and Ammunition Act prohibits possession of a firearm without a valid license. Possession and use of firearms is a cognizable offence.[4,5] However, significant number of people, especially in rural Nepal possess firearms in their homes. Use of guns for illegal hunting for wild animals, is common in these areas resulting in unintentional injuries.[6] Injured individuals often report late to hospital and provide misleading histories to avoid legal complications. In this case, the patient initially gave a fabricated story about accidental fall injury from a tree while harvesting medicinal leaves. However, later through physical examinations and imaging, it was determined to be a gunshot wound.

Maxillofacial region is made up of a rigid skeletal framework made up of multiple bones enveloped by a thin, delicate but highly vascular soft tissue envelope. It houses numerous vital structures that include nerves, blood vessels, muscles, special organs and glands that are essential for breathing, speaking, eating and facial expressions.[7] Gunshot injuries to craniofacial regions present with myriads of challenges to treating surgeons. The high kinetic injury of projectile often results in extensive soft tissue lacerations, comminuted fractures of bones, cavitation injuries and disruption of vital structures. Treatment goals include airway management and basic life support measures, hemorrhage control, prevention of infection, bone and soft tissue reconstruction among others.[3]

The projectile or bullet can get lodged in tissue spaces in what is called a penetrating type of gunshot injury.[8] This case presented with a bullet lodged in infratemporal fossa, an area between mandibular ramus and lateral plate of the pterygoid process just behind maxilla. Major structures present in infratemporal fossa are the lateral and medial pterygoid muscles, the mandibular division of the trigeminal nerve, the chorda tympani branch of the facial nerve, the otic parasympathetic ganglion, the maxillary artery and the pterygoid venous plexus.[7] Surgical objectives in this case were removal of bullet followed by reduction and fixation of fractured bone and soft tissue repair for functional and cosmetic restoration of midface. Proximity to base of skull and presence of key vital structures makes surgical access to infratemporal fossa extremely challenging requiring meticulous planning, advanced imaging and surgical techniques.

Entry wound of the bullet offered minimal help in surgical access as it provided a longer approach complicated by posttraumatic edematous tissue and comminuted bone pieces. Other approaches to infratemporal fossa include Transzygomatic approach, Transmaxillary approach, Retromaxillary approach, endoscopic approach each with their unique advantages and disadvantages. Transmaxillary and Retromaxillary approaches were disregarded as comminuted fracture of maxilla in this case would not provide stable reference for dissection. Transzygomatic approach involved increased risk of injury to facial and trigeminal nerve branches. Access surgery in the form of right subcondylar osteotomy was used in this case. It provided a shorter route, clean dissection through unaffected tissues and preservation of vital structures, resulting in minimal postoperative morbidity. This technique, however, requires meticulous surgical skills, careful handling of surrounding tissues and close postoperative follow up.

CONCLUSION

Infratemporal fossa is a deeply situated complex tissue space containing major neurovascular and other vital structures which makes it inherently difficult to access surgically. Access osteotomy surgeries have been frequently utilized in maxillofacial tumor cases. This case presented with a great example of utilizing principles of access surgeries in complex ballistic trauma cases resulting in desired outcome with minimal morbidity, while also saving precious time and preserving vital maxillofacial structures.

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