

# Bullet removal from the infratemporal fossa

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Ahmed Maki Merza

Department of Maxillo-Facial, Al-Karkh General Hospital, Baghdad, Iraq

Address for correspondence:

Dr. Ahmed Maki Merza, Al-Karkh General Hospital, Baghdad, Iraq.

E-mail: makimaxfax@gmail.com

## ABSTRACT

War injuries are the cornerstone of maxillofacial surgery, and it led to the initiation and development of this specialty, and each case represents a challenge to the surgeon who deals with it. In this article, we present a 30-year-old male patient who was referred to our emergency department complaining of gunshot wound, severe pain, and limitation in mouth opening. Preoperative imaging showed a bullet with a very long path lodged in the infratemporal fossa. Three different approaches with the aid of C-arm imaging system were used for the removal of this bullet; the last approach was the successful one.

**Keywords:** C-arm scanning, gunshot wounds, infratemporal fossa approach, missile injuries

## INTRODUCTION

“War is the only proper school for a surgeon” - Hippocrates. Lessons from the past should be documented and learned, and the experience should be passed among surgeons who deal with war injuries.

Since 2003 and till now, there had been a huge number of missile injuries in Iraq due to the war against terrorism and that put us the surgeons to face all sorts of these injuries, which categorized in the literature as nonpenetrating, penetrating, perforating, or avulsive. Avulsive injuries have entrance and exit wounds, generally presenting with an acute loss of tissue associated with passage of the projectile out of the victim. Nonpenetrating injuries are grazing or blast wound. Penetrating wounds are caused by the projectile striking the victim but not exiting the body. Perforating injuries have entrance and exit wounds, classically described as being without appreciable tissue loss.<sup>[1,2]</sup> The removal of foreign bodies in penetrating type of missile injuries is usually recommended because they can move to a deeper position, and their presence may result in unexpected complications, especially when the foreign body is located in dangerous area such as infratemporal fossa, and a real risk is always exists to the neighboring nerves or vessels during the removal procedure. Preoperative routine radiographs and

computed tomography (CT) scans in the head and neck region yield limited information of the foreign body location to extract it. Hence, to remove it, an intraoperative portable imaging system (C-arm) is needed.<sup>[3,4]</sup>

This case discusses the problem related to head and neck missile injuries, their irregular path, diagnostic and therapeutic consequences, and the special approaches to the infratemporal fossa.

## CASE REPORT

This case concerns a retained bullet in the right side infratemporal fossa. Entry of the bullet was from the left side shoulder region making a small lacerated inverted inlet, crossing the left shoulder, passing obliquely through the pharynx, and in front of the spine

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then finally lodging in the right infratemporal fossa. The patient came walking to the emergency department and was fully conscious with a Glasgow Coma Scale (15); no active bleeding or expanding hematoma was noticed, but the patient complained of severe pain in the right side maxillary vestibule and tenderness over the right side zygomatic arch with limitation in the mouth opening (<20 mm).

The primary, secondary, and tertiary survey was done, and the patient observed during first 24 h; two plain radiographs at right angle to each other were taken for initial assessment as shown in Figures 1 and 2, and then, a computerized tomography scan was also done to show the location of the bullet which was lodged in the infratemporal fossa between the lateral pterygoid muscle and lower part of temporalis muscle below the level of the zygomatic arch and medially to it and that was causing the limitation in mouth opening; a very interesting finding was discovered that in spite of this long dangerous course, the bullet did not cause any injury to the major vessels, nerves, or hard tissue structures [Figure 3].

After the 24 h, a small swelling with tenderness on palpation was noticed in the left side suprascapular area of the neck near the site of the inlet which increased in size to extend from the inferior border of the mandible to the clavicle with fever, severe tenderness, and increased white blood count ( $>25 \times 10^9$ ); Doppler and angiography were done to check vascular tree of the neck before abscess drainage and they were negative, during that the patient begin to develop the signs of septic shock, so immediately, the patient was transferred to the operation theater, and under general anesthesia, a vertical incision about 5 cm in length at the region of anterior border of the sternocleidomastoid muscle was done; large amount of serosanguinous purulent discharge was evacuated from the neck, and two vacuum drains were inserted from remote area to the incision site; after 3 days, the swelling was subside, but the bullet was still inside.

Bullet removal was done in a second session under general anesthesia with the usage of a mobile image intensifier which generally consists of two units, the X-ray generator and image system on a portable imaging system (C-arm) and the workstation unit used to store and manipulate the images. In this session, three approaches to the infratemporal fossa to extract the bullet were used, first: intraoral maxillary vestibular approach; second: lateral one-third of the eyebrow, but unfortunately, they were unhelpful to extract the bullet, so third: preauricular approach with temporal extension (question mark incision) was ultimately used by making full fasciocutaneous flap then reflection of the temporalis muscle from the temporal bone to finally reach the infratemporal fossa and extracting the bullet with the benefit of the portable imaging system (C-arm).

Postoperative condition was very good, shows gradual increase in mouth opening, and without any neural deficit in facial nerve.

## DISCUSSION

In missile injuries, the type of injury whether it is nonpenetrating, penetrating, perforating, or avulsive;



Figure 1: Posterior-anterior radiograph

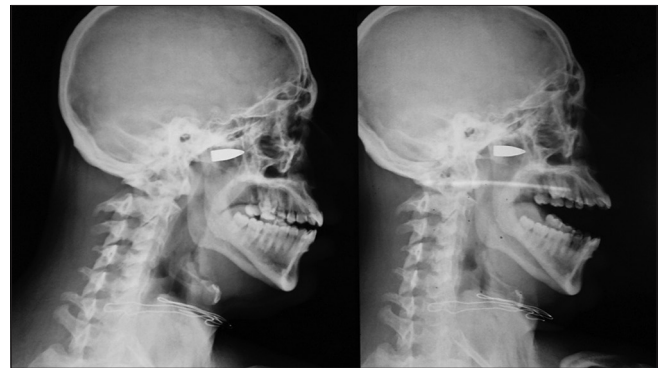


Figure 2: Open and closed mouth lateral radiograph



Figure 3: Computerized tomography

suspected path and type of the object should be considered in each case individually cause all these factors will complicate injuries which are usually diagnostically and therapeutically challenging<sup>[5]</sup> [Figures 4-6]. This case shows a penetrating missile injuries with a bullet (projectile) lodged in the right side infratemporal fossa and an inlet in the left side shoulder with an amazing long path crossing the three zones of the neck without causing any neural or vascular deficit which

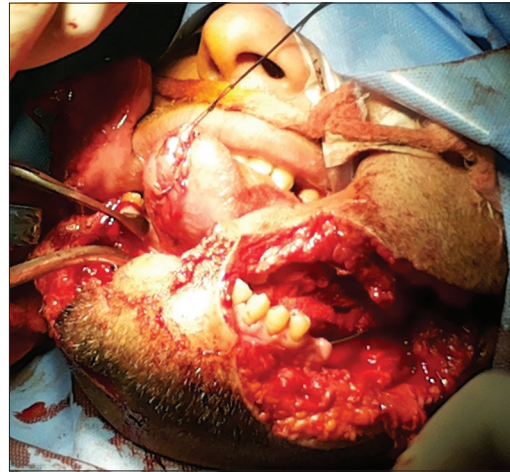
is may be attributed to the ability of low-velocity bullet to push away or stretched soft tissues including vessels or nerves<sup>51</sup> [Figure 7]. Furthermore, complete examination should be done, and appropriate imaging is necessary to define the magnitude and nature of head and neck injuries; CT scan

with three-dimensional reformatting is essential for obtaining this information.

Hard signs of vascular injuries, such as expanding hematoma, need urgent evaluation and intervention, so Doppler ultrasound



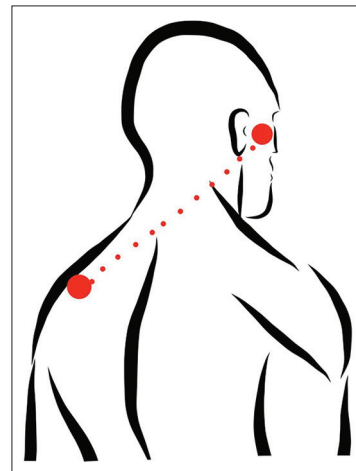
**Figure 4:** Missile injury, perforating type



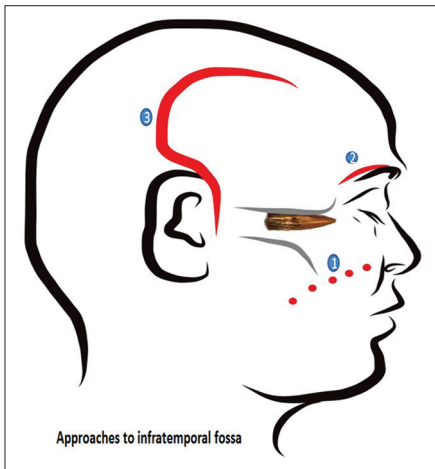
**Figure 5:** Missile injury, avulsive type



**Figure 6:** Missile injury, penetrating type



**Figure 7:** The path of the bullet



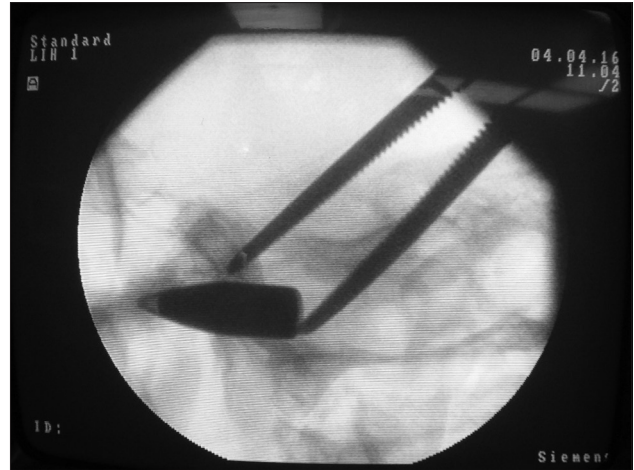
**Figure 8:** The approaches



**Figure 9:** Marking preauricular with temporal extension approach



**Figure 10:** Temporalis muscle reflection to expose temporal and infratemporal fossa, also the lateral eyebrow approach can be seen



**Figure 11:** Bullet localization intraoperatively by portable imaging system (C-arm)



**Figure 12:** Bullet removal



**Figure 13:** Wound closure and drain insertion

and helical computed tomographic angiography were done to exclude any vascular injury after that neck exploration expelled a serosanguinous purulent discharge, and this may be attributed to soft-tissue necrosis and small vessel damage resulted from the pressure wave, temporary, and permanent cavitation effects of the bullet; also, it may be attributed to the microthrombus formation, vascular endothelial loss, and necrosis as far as 3 cm from the wound margins.<sup>[6,7]</sup>

Although many approaches to the infratemporal fossa described in literatures, preauricular incision with temporal extension and temporalis muscle reflection from the temporal bone is the successful approach which was used to extract the bullet from the infratemporal fossa in this case, while the other two conservative approaches (intraoral and lateral eyebrow) which also had been used first in this case were unsuccessful [Figures 8-10].

Blind vigorous dissection around the area of bullet without imaging intraoperatively might cause foreign body to migrate to a deeper anatomical site, cause severe bleeding from major blood vessels such as maxillary artery, and/or neural damage to branches of the trigeminal nerve that founded in the

infratemporal fossa. Thus, the procedure done in conjunction with using portable imaging system (C-arm) which was very helpful in accurately localize foreign body in surgical field as shown in Figure 11 and 12.<sup>[7,8]</sup> Follow-up showed improvement in mouth opening without any weakness in facial nerve [Figure 13].

## CONCLUSION

We recommend early debridement with copious irrigation of the inlet and the accessible path of the bullet. Also to approach the infratemporal fossa through preauricular incision with temporal extension and using C-arm imaging system for exact localization of lost foreign bodies in the oral and maxillofacial area as a safe and readily available procedure, especially in cases, in which the object is embedded in soft tissue.

The postoperative physiotherapy is very useful in increasing the range of mouth opening.

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**Conflicts of interest**

There are no conflicts of interest.

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