

Case Report

Right Ear Trauma From Foreign Bodies By Firearm

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Abstract

Introduction

Ear injuries by firearms are rare in civilian and military practice. Treatment should be efficient to restore the hearing. The objective of this study was to describe and discuss the diagnostic and therapeutic management of ear trauma by bullets.

Observation

A 35 year old patient was referred for trauma of the right ear by bullets. He presented the following symptoms: earache, otorrhage, hearing loss and right tinnitus without peripheral facial palsy. The imagery showed multiple metallic foreign bodies in the external acoustic meatus, the middle ear and the right auditory tube. Surgical exploration objectified a perforated eardrum, three buckshot in the external acoustic meatus and one in the middle ear, below the promontory without leakage of labyrinthine liquid. The surgical removal of the metallic foreign bodies and the subcutaneous oedematofibrous sections of the external acoustic meatus were followed by a tympanoplasty type I and a good calibration of the external acoustic meatus. The outcome was marked by a lateralization of the eardrum without stenosis of the external auditory meatus.

Conclusion

The management of ballistic trauma by firearm must make an accurate inventory of injuries from bullets, but also look for lesions of acute acoustic trauma. Treatment of ballistic damage of the middle ear is surgical. It must restore the tympano-ossicular system and prevent stenosis of the external auditory meatus and tympanic cavity to restore hearing.

Keywords: ear; trauma; firearm; foreign body; tympanoplasty; calibration; external acoustic meatus; stenosis

Introduction

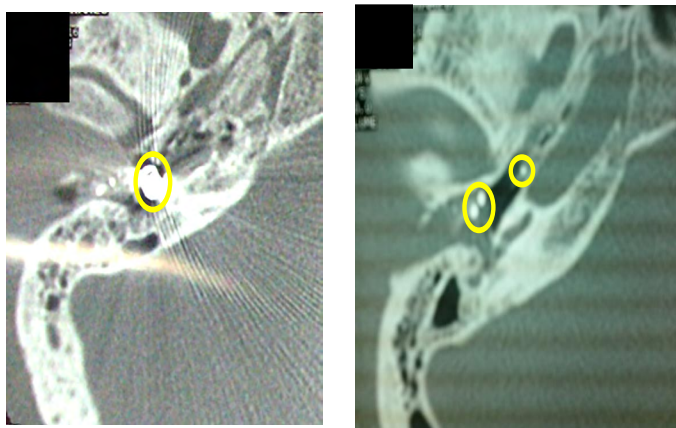
The lessons of the ear by firearm are rare in the civilian population. They are more frequent in military practice. They include injuries related to bullets and acute acoustic trauma. The later only injures the inner ear [1]. The first can cause damage not only on the three parts of the ear but also to all organs of the head and neck region [2, 3]. The efficient treatment to restore hearing should be done after careful surgical exploration of auricular lesions. The objective of this study was to describe and discuss the diagnostic and therapeutic management of ear trauma by firearm bullets.

Observation

A 35 year old patient, with no particular medical history, was admitted to the emergency room for trauma of the face and right ear by gunshot, fired from a distance of about 7 m. He presented the following symptoms: intense earache, otorrhage, hearing loss and right tinnitus without dizziness, visual impairment or initial loss of consciousness. The ENT examination revealed that on the right side of the face, he had punctate wounds on the tragus, cheek and angulo-mandibular, fronto-parietal areas. The otoscopy showed a wound at the entrance of the external acoustic meatus (EAM) and the reduction of his caliber that did not allow to examine the eardrum. There was no facial palsy or injury to other cranial nerves. The rest of the ENT examination was normal. The initial intravenous treatment included antibiotic therapy, corticosteroids, analgesics, which were all associated with non-ototoxic ear drops.

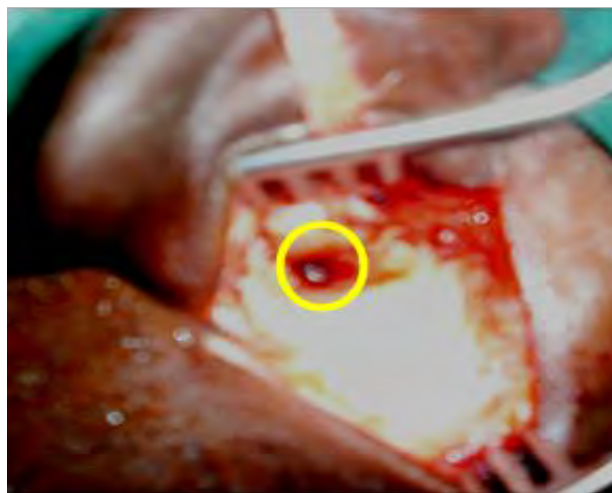
A CT scan of the temporal bone highlighted opacities with metal tone in favor of metallic foreign bodies (MFB) (ballistic projectiles) in the EAM, tympanic cavity and Eustachian tube duct. There was integrity of the ossicular chain. The tone audiometry was in favor of a conductive hearing loss with an average loss of 25 dB.

Figure1 (1a, 1b): Axial CT scan showing bullet in right tympanic cavity, external auditory meatus and Eustachian tube.



The treatment was surgical. Using a right postauricular incision, we approached the EAM and the middle ear where we noted a lower eardrum perforation with in his inner surface, fibrous bands adherent to the promontory, buckshot inside the EAM and the tympanic cavity (under Promontory). There was no labyrinthine fluid leakage or bleeding. We removed adherent fibrous bands of the eardrum, the edema and fibrous parts under the skin of the EAM, and the metallic foreign bodies in the EAM. We then expanded the EAM bone by milling the posterior and inferior walls. This allowed the extraction of the foreign body from the tympanic cavity. The impact of lead was visible, without labyrinthine fluid leakage or bleeding. We put a silastic blade on top of the promontory and filled the tympanic cavity with pieces of gelfoam. We made a type I Tympanoplasty using a graft cartilage from the conch which was placed on the handle of the malleus. Then we replaced the tympanomeatal flap. The thinner skin of the EAM, without subcutaneous fibrous tissue was placed on the bone of the EAM. The EAM calibration was done by 2 tabs silastic laid crosswise in the EAM and held in place by an expansive buffer (type pop earwick).

Figure 2: Intraoperative view of tympanic cavity with bullet



Immediately after the operation, we observed an improvement in his hearing. A month after the surgery, the patient reported decreased hearing which was confirmed with the audiogram (light conductive hearing loss). The CT scan highlighted a lateralization of the posterior part of the eardrum. The proposal of another tympanoplasty to correct the posterior tympanic membrane lateralization was refused by the patient. The hearing was stable after 5 months of follow-up.

Figure 3: Removed bullets

Discussion

Foreign bodies of the middle ear are frequent by gunshot but they can be exceptional in civilian workplace as reported by Eleftheriadou et al. [4] on a metallurgist using electric welding. When using firearms, many civilians as well as soldiers are exposed to acute acoustic trauma during shooting practice at a target [1,5,6] especially without ear protection [5,6]. The typical audiometric shape is a notch centered about 4 kHz [1] but hearing loss is especially most important in the high frequencies. [6]. during training practice on a target, the shooter, very close to the gun, has direct and significant exposure to the impact of the shot noise on the hearing. [6]. In civilian practice in our country, apart from hunting accidents, very few people train to shoot on a target; So these are voluntary gunshot victims (criminal) or accidental, like our patient, who are the most numerous. And those gunshots are fired at a sufficient distance of the victims; hence victims do not have much impact in their inner ear. Our patient had a conductive hearing loss therefore had no acute acoustic trauma which can be explained by the distance of 7 meters that separated him from the sound source of the firearm.

The various lesions found on clinical examination, the CT scan and during surgical exploration give an idea of the trajectory of the bullets. Eleftheriadou et al [4], in their clinical case with the metallurgist, describe well the trajectory of the foreign body and lesions caused by the foreign body. With their metallurgist, while using an electric welding, the warm glow of molten metal flew off, burnt the skin of the external auditory meatus, perforated the tympanic membrane and finally stopped around the ossicles as a foreign body. In accidents with firearms, Shido et al. [2] noted that lesions of the temporal bone by weapons are unusual but are seeing more frequently with increasing incidence of violent crime involving the use of firearms. They noted in the retrospective analysis of 43 patients with these lesions treated by their institution, hearing loss (29 cases), intracranial lesions (23 cases), facial nerve injury (22 cases), vascular lesions (14 cases) and a mandibular fracture (6 cases). Ocular trauma and cranial nerve palsies V, IX, X, XI and XII

are rare. [2]. Govorun et al. [7] In the results of treatment of 8 people suffering of trauma by non-lethal weapons, found that such weapons can cause serious penetrating wounds, fractures of facial bones, hematoma and contusions, a formation of foreign bodies and middle ear barotrauma. Judd and all [3] in a clinical trauma case by bullets from air gun in his left ear, presented the following symptoms: "pain, otorrhage, hearing loss and tinnitus. Imaging and surgical exploration led to the discovery of a metallic bullet in the left middle ear and rupture of the anterior wall of the external auditory meatus with impaction of tiny metal fragment and a secondary sequestrum. Bessho et al. [8] in a man of 64 years old found dead in his home with a 38-caliber revolver between his legs, well describe the lesions and the trajectory of the bullet and the resulting bone fragments. In fact, the bullet had created a separate canal of the second canal himself, created by a bone fragment.

Despite the multiple puncture wounds on the right side of the face, our patient had no significant neck injury, temporal bone or adjacent organs; that makes us think that the bullet penetrated directly into the ear by the EAM.

The treatment of these lesions is Surgical. For Gaetti-Jardim et al. [9], the approach of the temporomandibular region has been the subject of much controversy in the literature. In one reported case, he favors the endaural approach compared to the Postauricular approach for a pre-auricular gunshot wound with at the radiological examination a foreign body compatible with a shot gun observed in the right post-auricular region. They believe the endaural incision is more aesthetic and less dangerous for the branches and anastomosis of the facial nerve. Judd et al. [3] in a similar case to ours have done a surgical exploration which allowed to discover and extract the metallic ball. Eleftheriadou et al. [4] used the transcanal approach to remove the foreign body.

For our patient, to remove the foreign body and repair the eardrum, we have chosen the postauricular approach because we're used to it. We put on top of the promontory a silastic blade to protect the lining of the middle ear and prevent the formation of stenosis of the middle ear. Indeed, manipulations for resect the flanges which are connecting the interior of the tympanic membrane and the promontory will cause swelling in the middle ear. This edema can put in contact the lining of the tympanic cavity and the interior side of the graft and lead to stenosis of the middle ear. According to Reineke et al. [10] in the post-inflammatory stenosis acquired of ear canal, the chronic inflammatory process of the ear canal, the tympanic membrane or middle ear may lead to replacement of the original epithelium by fibrous tissue and eventually a total occlusion of the ear canal. To prevent the occurrence of EAM postoperative stenosis for our patient, we removed all the fibro-edematous tissue under the skin to leave a very thin skin. We have adopted this therapeutic approach following failure

of prevention of stenosis on left external auditory conduit in a patient in the treatment of a landlocked foreign body (piece of wood) and infected. In 1999, we received a lady in consultation for a foreign body in the left outer ear following the fall of a dead branch of a tree in his plantation. The foreign body, a piece of wood, after crossing the auricular retro soft tissues, stopped in the EAM surrounded by skin edema of EAM with a purulent otorrhea. We did the extraction of the foreign body by endaural approach and successive packing and calibration (with an expansive buffer type earwick pop) of the EAM every two days for a month. This treatment was associated with a local treatment (ear drops) and intravenous (antibiotic and anti-inflammatory drug). At day 16 after we stopped the EAM packing, stenosis of the duct had settled again. Gyo et al. [11] in their study noted that the lateralization of the tympanic membrane occurs when the tympanic ring is torn. According to other authors, lateralization of the eardrum usually occurs when the fibrous ring is fully released; it is frequently anterior. For our patient, we freed the entire fibrous ring with posterior lateralization of the tympanic membrane.

Conclusion

Surgical removal of ear projectiles must be minutieuse. Injury repair of EAM and tympanic membrane must be adequate to prevent stenosis of the external auditory canal which aims to reduce hearing loss.

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