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Short report of an unusual ballistic trauma

Francesco Inchingolo^{a,c,*}, Marco Tatullo^{b,c}, Massimo Marrelli^c, Alessio D. Inchingolo^a,
Giorgia Pinto^d, Angelo M. Inchingolo^e, Gianna Dipalma^c

^a Department of Dental Sciences and Surgery, University of Bari, Bari, Italy

^b Department of Basic Medical Sciences, University of Bari, Bari, Italy

^c Department of Maxillofacial Surgery, Calabro dental, Crotona, Italy

^d Department of Forensic Medicine, University of Bari, Bari, Italy

^e Department of Surgical, Reconstructive and Diagnostic Sciences, University of Milano, Milano, Italy

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ABSTRACT

INTRODUCTION: Portable firearms have a relevant medico-legal interest, being a major cause of injury. Bullet entry wounds generally have a particular appearance, including contusion, skin introflexion, and simple or excoriated ecchymosis. The skin wound is typically a hole with frayed margins, whose diameter is smaller than that of the bullet.

PRESENTATION OF CASE: We report the case of a 19-year-old man with ballistic trauma. Examination of the patient's lesions indicated that the bullet had entered from the left mandibular parasymphysis, creating a small hole without the typical bullet wipe and blackening. Subsequently, the bullet seemed to have fractured the left chin region immediately below the lower alveolar process, and it finally stopped in the submandibular area in the suprahyoid region of the neck.

DISCUSSION: This case is peculiar because the distinctive features of a firearm injury were absent; the lack of bleeding and edema made the case difficult to interpret without additional diagnostic investigations.

CONCLUSION: Ballistic trauma can manifest in different ways; therefore, internal trauma should be suspected even in the absence of clear external signs. This case report shows how an unusual bullet entry hole can mask quite serious injuries.

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1. Introduction

Ballistic traumas vary according to the weapon used, the velocity of the bullet, the direction of the energy transferred from the bullet, density and size of the tissue, and form and hardness of the bullet. On the basis of the initial velocity of the bullet, firearms can be categorized into infrasonic and supersonic types. Infrasonic firearms have a bullet velocity less than 660 meters per second (m/s), whereas that of supersonic firearms is above 660 m/s.^{1,2}

The extent of the injury depends on the degree of absorption of kinetic energy produced by the bullet on impact, as well as on the resistance offered by the tissue/body. Once the bullet reaches the body, it causes contusion, skin introflexion, and simple or excoriated ecchymosis before it penetrates the tissues.² The skin wound is typically a hole with frayed margins, whose diameter is smaller than that of the bullet, owing to elastic retraction of the skin. The

injury that results from contact with the fired bullet is a solution of continuity, which can be a perforating or penetrating wound (e.g., if the bullet is trapped in the tissues) or a grazing wound (when the bullet grazes the skin surface).

2. Presentation of case

We report the case of a 19-year-old man who came to our attention 2 h after a ballistic trauma. The investigation conducted by the ballistic expert reported the dynamics of the shot, indicating that it was fired at close range, probably from a distance of less than 1 m, with a trajectory from above to below; the 45° angle of inclination suggested that the bullet hit the patient while he was on his knees.

Investigations of the patient's lesions suggested that the bullet entered from the left mandibular parasymphysis, making a small hole; subsequently, the left chin region immediately below the lower alveolar process appeared to have been fractured by the bullet. The bullet finally stopped in the submandibular area in the suprahyoid region of the neck.

Extraoral examination did not reveal hematic diathesis or edema, and typical signs of a firearm injury were absent. The bullet entry hole was only identified as such at a later stage; it was very small and without the typical bullet wipe and blackening, suggesting that some object had been put between the weapon and the point of impact (Fig. 1). The hole measured 0.7 cm in diameter, with

* Corresponding author at: Piazza Giulio Cesare, Policlinico, 70124 Bari, Italy.
Tel.: +39 0805593343.

E-mail addresses: f.inchingolo@doc.uniba.it (F. Inchingolo),
marco.tatullo@libero.it (M. Tatullo), studiomarrelli@calabrodental.it
(M. Marrelli), f.inchingolo@tin.it (A.D. Inchingolo), giannadipalma@tiscali.it
(G. Pinto), a.inchingolo@email.it (A.M. Inchingolo), giannadipalma@tiscali.it
(G. Dipalma).



Fig. 1. The bullet entry hole.

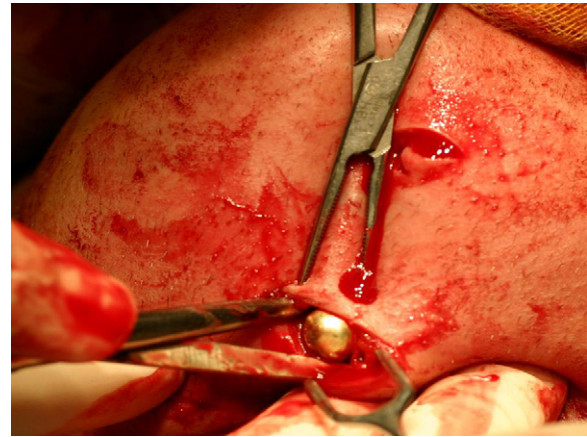


Fig. 2. The bullet.

irregular circular margins, an erythematous area burned into the centre, and surrounded by softer tissue. The extraoral examination showed a coronal fracture of tooth 31 and increased mobility of the frontal dental group and the whole inferior alveolar process, as observed by 2-handed palpation. Digital inspection also revealed the presence of a bone fragment within the sublingual floor; this fragment was probably displaced after the bullet impact.

The authors opted for emergency surgical treatment (1 h after arrival at the hospital, 3 h after the shooting) under general anesthesia to restore the anatomy of the comminuted fractured bone. Bullet removal and structural repair were prioritized. The neurovascular complexity of the area adjacent to the bullet required the careful work of a full team of doctors, including a plastic surgeon to control the aesthetic impact of the treatment. No relevant vascular damage was observed.

The first phase of the operation involved removal of bone fragments displaced into the sublingual floor. After making a submarginal incision to create a flap on the lingual side, the flap was separated and the displaced bone fragments removed using surgical forceps. Thereafter, the incision was closed using a horizontal mattress suture.

In the second, delicate, phase of the operation, the structure of the shattered bone was restored by applying titanium osteosynthesis plates, which were fixed with intraosseous screws in the chin region. To ensure greater stability in the traumatized area, a ferula ligature of the lower frontal group was also performed at the same time.

The third phase of the operation, involving removal of the bullet, was the most critical because of the extreme mobility of the foreign body within the soft tissues. This required the use of a dynamic luminance intensifier to guide the surgeon's hand towards the bullet. The region in which the bullet had lodged was identified by skull radiographs, obtained in several projections, along with ultrasound investigations before and after surgery. After extraoral incision of the submandibular area, diastasis of the subcutaneous areas, and separation of the muscular-fascial planes, the bullet (diameter, approximately 9 mm) was removed (Fig. 2). Thereafter, hemostasis of the involved tissues was achieved, and intradermic sutures (using reabsorbable material) and cutaneous sutures (using non-reabsorbable material) were inserted.

The course of the bullet did not affect either the major vessels or the major nerve trunks; therefore, the postoperative course was shorter than expected, in view of the type of injury and the area of the body involved. As a consequence of the combined orthopedic–orthodontic rehabilitation, the patient was able to regain full functionality in mastication, phonation, and deglutition.

3. Discussion

In this case report, we describe a very unusual gunshot wound, compared to typical ballistic trauma, which initially misled the doctors at the Emergency Ward about the actual traumatic noxa.² Bullet entry holes are typically characterized by a stellate entrance wound caused by gas expansion (for a shot fired at close range) or by an entrance wound with bullet wipe and an abrasion ring (for a shot fired from >50 cm).^{1,2} In the present case, the distinctive features of a firearm injury were absent, and the lack of bleeding and edema made the case difficult to interpret without additional diagnostic investigations.

Although the area pierced by the bullet was rich in neurovascular structures, many of which are extremely important, the patient did not suffer any severe injury of the neurovascular structures. Instead, he presented only with the fracture of the chin region, along with compromised stability of the lower alveolar process.

4. Conclusion

Our case report shows that ballistic trauma can occur with extremely variable characteristics, making diagnosis difficult. Experience and an open-minded approach when assessing trauma patients may facilitate diagnosis without the requirement of further investigation. However, if there are no injuries to internal organs or neurovascular structures and if surgeons and dentists work together to plan treatment, complete aesthetic and functional rehabilitation can be rapidly achieved.

Conflict of interest

The authors declare that they have no competing interests.

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Ethical approval

Written informed consent was obtained from the patient for publication of this case report and the accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Authors' contributions

FI and GD participated in the surgical treatment and in the follow-up examinations. MT drafted the manuscript and revised the literature sources. MM and GP participated in the follow-up examinations. ADI and AMI revised the literature sources. All authors read and approved the final manuscript.

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