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CASE REPORT

Case Report: Facial injury due to a firearm projectile in a Brazilian adolescent [version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: Deaths and injuries from firearms are significant public health problems. This article presents a case of face injury caused by a firearm projectile with atrial involvement.

Case report: A 13-year-old male Black patient was admitted as an emergency victim of an accident caused by a firearm projectile. On physical examination, a hemorrhage was diagnosed in the right ear pinna region from the wound, and an increase of volume, of hardened consistency, in the right genic region, suggestive of local infection. On radiographic examination, a radiopaque, dense, foreign body was identified in the right zygomatic process region. The patient underwent surgery to remove the projectile.

Conclusion: The care provided to the victim of a firearm injury depends on the systemic conditions, the available professional staff, the resources and the infrastructure of the environment. Prior to initiating therapy, it is important to stabilize the patient to ensure survival.

Keywords

violence, firearms, facial injuries, maxillofacial injuries.

Open Peer Review

Approval Status

	1	2
version 1
09 Oct 2019	view	view

1. **Diah Ayu Maharani** , University of Indonesia, Jakarta, Indonesia

2. **Carisa Parrish**, Johns Hopkins University School of Medicine, Baltimore, USA

Any reports and responses or comments on the article can be found at the end of the article.

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Author roles: **Leite Cavalcanti A:** Supervision, Writing – Review & Editing; **Farias L:** Investigation, Writing – Original Draft Preparation; **Camilla Carvalho Laureano I:** Investigation, Writing – Original Draft Preparation; **Edgleys Porto D:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration; **Raimundo Cavalcante J:** Investigation, Supervision, Validation, Visualization; **da Silva Barbirato D:** Supervision, Validation, Writing – Review & Editing; **Cabral Cavalcanti AF:** Validation, Visualization, Writing – Review & Editing

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Introduction

Firearms are one of the leading causes of injury and death in children and adolescents in the world^{1,2}, constituting a public health problem that affects mainly large urban centers³. Costly treatment, long length of hospital stay, and considerable decreased productivity are significant factors related to this health issue^{4,5}.

The lesions can range from small lesions to large tissue avulsions, depending on the amount of energy released at the moment of impact³. The characteristics and severity of the lesions are determined by several factors such as load power, number and shape of the projectiles, distance and path of the shot, as well as elasticity and vascularization of the affected tissue³. Reduced distances, high-velocity projectile wounds, and gunshot wounds can result in devastating aesthetic and functional consequences^{6,7}.

Traumas produce irreversible damages, which can incapacitate individuals, leaving them unable to work, and generates demands for care to the health sector in services of various levels of complexity, from prehospital to physical and mental rehabilitation^{8,9}. Thus, they increase costs for the Brazilian Unified Health System and other sectors, the national social security system and for the families themselves^{8,9}. This article presents a case of face injury caused by a firearm projectile with atrial involvement.

Case report

A 13-year-old male Black patient, was taken to emergency department in April 2014 to a local hospital of Picuí, Paraíba, Brazil. He was victim of an intentional firearm injury and suffered one gunshot wound. At admission, he was cooperative and fully conscious. His vital signs and neurological examination were normal when he arrived at the hospital.

On physical examination, a hemorrhage was diagnosed in the right ear pinna region from the wound (Figure 1), and an increase of volume, of hardened consistency, in the right genic region. On radiographic examination (Figure 2), a radio-

Figure 1. Image of facial injury caused by the firearm projectile on initial presentation.

Figure 2. Facial radiological image showing the firearm projectile lodged in the right zygomatic process region.

paque, dense, foreign body image was identified in the right zygomatic process region. The patient was diagnosed with a face lesion caused by penetration of a firearm projectile through the skin requiring urgent surgical intervention.

The surgical procedure was performed under general anesthesia with orotracheal intubation and local infiltration of 2% lidocaine (Xylestesin 2.0% with vasoconstrictor, (Cristália Prod. Quím. Farm. Ltda., São Paulo, Brazil). Then, a linear incision was made immediately at the entry wound of the projectile, followed by divulsion of the fascial planes, exposure and subsequent removal of the projectile. Surgical cleaning of the area was performed using irrigation with 0.9% sodium chloride. The wounds were sutured (Ethicon™, Johnson & Johnson, São José dos Campos, Brazil) a penrose drain no.1 installed and skin sutured (Shalon™, Goiânia, Brazil) with single interrupted stitches.

After the surgery (immediately postoperative), the patient was treated with anti-tetanus serum 1000 UI/mL (Butantan Institute, São Paulo, Brazil).

Cephalothin (Keflin) 1 gram intravenously every 6 hours and after discharge 500 mg every 6 hours orally for 10 (ten) days) and an analgesic (Tylenol, 500 mg orally every 6 hours for three days) were prescribed. On the second postoperative day, the patient was discharged from the hospital and was advised about the medication prescription and the care related to hygiene and antiseptic treatment of the wounds, as well as when to return for follow-up (after seven days) for removal of the sutures and drain. The region around the wound's appearance has significantly improved at follow up.

Discussion

This work is important because it provides guidance on how to proceed with emergency care in patients with firearms, as there are no specific treatment protocols. For the treatment of

gunshot wounds, it is essential to know the ballistics of the wound in order to establish the prognosis and the treatment. Ballistics studies the movement of firearm projectiles and the trauma caused by the impact such projectiles on the human body. This knowledge results in better treatment and reduces the occurrence of complications related to the trajectory of the projectile⁹.

The first objective of the trauma team is to stabilize the patient maintaining free airways through intraoral aspiration, positioning and tongue trapping¹⁰. When necessary, orotracheal or nasotracheal intubation should be performed and, when indicated, a cricothyrotomy or tracheostomy performed¹¹.

In the case reported, accurate medical care was given to the victim at admission to the hospital, which reduced potential risks to life and enabled immediate medical treatment. The availability of qualified and experienced professionals in this setting and, the access to imaging equipment, allowed the detection of the agent firearm projectile quickly. The patient was immediately referred for surgery after diagnosis.

Surgical removal of the projectile should be considered when it is superficial or compromises the function of affected structures. However, when it is close to vital structures or is difficult access, the surgeon can choose to maintain it and follow-up (using radiographs, CT scans or digital arteriography's)⁷. Computed tomography (CT) is the gold standard for determining the nature of complex head and neck injury¹².

In this case, complete removal of the firearm projectile was performed because it was superficially housed in the auricular region. A drain was placed due to the wound being infected and the presence of edema.

Postoperative antibiotic therapy was imperative to assist in the elimination of the existing infection and to prevent further infection. The use of anti-tetanus serum was necessary due to the contaminated nature of the wound due to the projectile and its secondary remnants, such as lead, gunpowder, tissue

fragments and cartridge⁷. Prophylactic antibiotics with broad coverage specific for oral and skin flora should be administered at this time¹².

Injuries to the face should not be seen only as a medical problem, but also social and economic^{13,14}. The costs incurred in providing care to the victims by the health teams and the losses to the patient (loss of wages, permanent or transitory disabilities) can limit the social reintegration of the victims and their return to the labor market¹³. In addition, psychological issues should also be considered.

The limitations of the study are that although we have been following the patient for a short time, and have employed this treatment protocol on all firearm patients who reach the maxillofacial complex, this is only a report of a clinical experience in which this protocol was used. Therefore, further study is required to evaluate the effectiveness of this protocol.

Conclusion

The care provided to the victim of a firearm depends on the systemic condition of the patient, available professional staff, resources and infrastructure of the healthcare center. Prior to initiating therapy, it is important to stabilize the patient to ensure survival. In cases involving head and neck injuries, it is important that a oral and maxillofacial surgeon be part of the team. In addition, surgical cleansing, antibiotic therapy and anti-tetanus serum protocols should be followed in order to prevent postoperative complications.

Consent

Written informed consent for publication of the patients' clinical details and clinical images was obtained from the parents of the patient.

Data availability

Underlying data

All data underlying the results are available as part of the article and no additional source data are required.

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Open Peer Review

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Reviewer Report 28 June 2021

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Carisa Parrish

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The authors provided a good background to introduce the specific case of a 13yo patient with a single gunshot wound. This introduction very concisely summarized multiple clinical variables to consider in medical treatment of gunshot wounds, as well as contextualizing the medical, functional, cosmetic, and economic factors that make effective medical intervention so crucial. Given the location of the injury and the quantity of discussion appropriately dedicated to proactive management of potential infections, perhaps the authors could consider adding 1-2 citations regarding infection control strategy used, likelihood of infections after GSWs. I provided 2 example articles; I defer to the authors regarding whether these versus other articles would be most appropriate based on similarity to the specific GSW under discussion:

- Simpson *et al.* (2003¹).
- von See *et al.* (2011²).

The authors stated in the discussion that there are no specific treatment protocols regarding how to proceed with emergency care in patients with firearm injuries. Could the authors provide any citation of studies regarding common elements in effective management of GSWs based on other case report(s) or small series of case studies? Likewise, could the authors reference general trauma management protocols that should be referenced in effective intervention, including aspects that may vary in the case of firearm injuries?

As a psychologist, I sincerely appreciate the authors referencing the burden of mental rehabilitation and risk for developing psychological issues. I would respectfully request that the authors use this forum to briefly highlight importance of proactive emotional "injury" risk, just as they do with the proactive infection risk. Clearly medical stabilization is of top priority to establish; however, once patients are stable, trauma teams would do well to consider the long-term implications of GSW to mental health. In the discussion, the authors stated, "psychological issues should be considered." I would strongly urge the authors to briefly elaborate here. Trauma

surgery and emergency medicine advocates have the opportunity to highlight the critical need for effective longer term emotional/behavioral supports to complement the establishment of effective medical interventions. The long term negative impact on quality of life warrants more discussion, particularly given the age of the patient under discussion. Adolescents are at increased risk for development of a number of negative mental health outcomes, and suffering a firearm injury is not a neutral variable in that risk accumulation. Here are a few articles for authors to consider citing to assist in the suggested elaboration of psychological issues to consider:

- Greenspan *et al.* (2002³).
- Joseph *et al.* (2019⁴).
- Vella *et al.* (2020⁵).

Thank you for the opportunity to review this manuscript! Best wishes to the authors for highlighting the case of an adolescent victim of a firearm injury.

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Is the background of the case's history and progression described in sufficient detail?

Yes

Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?

Yes

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

Yes

Is the case presented with sufficient detail to be useful for other practitioners?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: child and parent distress and coping after pediatric physical injuries

(psychologist)

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 06 February 2020

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Diah Ayu Maharani

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Thank you for your efforts in preparing the manuscript. The paper is elegantly written on an important topic it should be indexed. However, there are some remarks the authors should consider to improve the manuscript:

- Please make sure to present the case using the CARE (CAse REport) as guidelines.
- "case report" should be added in keywords.
- Patient information should be added such as possible primary concerns and symptoms of the patients or from the parents. As well as medical, family and psycho social history.
- Were patient asked to share their perspective on the treatment received? Please address in the text.

Is the background of the case's history and progression described in sufficient detail?

Yes

Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?

Partly

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

Yes

Is the case presented with sufficient detail to be useful for other practitioners?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Dentistry

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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