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Case report

Facial foreign body caused by air gun injury: Key considerations in case management

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Abstract: Facial injuries caused by air gun projectiles, although classified as low-energy traumas, can lead to infectious and inflammatory complications when the foreign body remains embedded in soft tissues. This study reports the case of a 28-year-old melanodermic female patient in whom a routine panoramic radiograph revealed a metallic image compatible with a lead pellet in the region of tooth 46. The patient complained of recurrent pain and episodes of purulent drainage for six months, with a history of facial impact caused by an air gun about 10 months earlier. The treatment consisted of surgical removal under local anesthesia, with careful dissection and complete extraction of the projectile. The postoperative period was uneventful, with satisfactory healing and no recurrence after two years of clinical follow-up.

Keywords: facial trauma; air guns; non-lethal weapon

1. Introduction

Facial injuries caused by air guns (BB guns, airsoft rifles, and compressed-air weapons) have been increasingly reported in the international literature, reflecting both the growing recreational use

of such devices and the widespread misconception of their harmlessness. Although these weapons are classified as low-energy devices, several studies have demonstrated that lead pellets can penetrate soft tissues, paranasal sinuses, and even bony and orbital structures, producing complex lesions with potential severe complications [1–3].

Oh et al. [1] demonstrated in a cadaveric study that the projectile could traverse the medial orbital wall and reach the intracranial space, even at short-range firing distances. Recent case reports highlight that patients may remain asymptomatic for long periods, with the foreign body incidentally discovered on dental or otorhinolaryngological imaging [4,5].

In addition to mechanical damage, the lead composition of the projectile represents a potential risk for local inflammation, chronic infection, and systemic toxicity, especially in young individuals or those with multiple retained fragments [6,7]. These findings emphasize the importance of dentists' awareness regarding diagnosis, management, and adequate treatment of this type of facial trauma.

2. Case report

The patient C.R.F., a 28-year-old melanodermic female, was referred to the Dental Clinic of Iguaçu University for elective dental care. During a routine panoramic radiographic examination, a high-density radiopaque image compatible with a metallic foreign body was observed, measuring approximately 0.5 cm at its greatest diameter, located apically to right mandibular first molar (Figure 1). The patient reported spontaneous pain and tenderness to deep palpation in the area for about six months, associated with intermittent purulent discharge through a cutaneous fistulous tract that had been active on two distinct occasions. She denied any dental trauma or previous surgical procedures in the region.

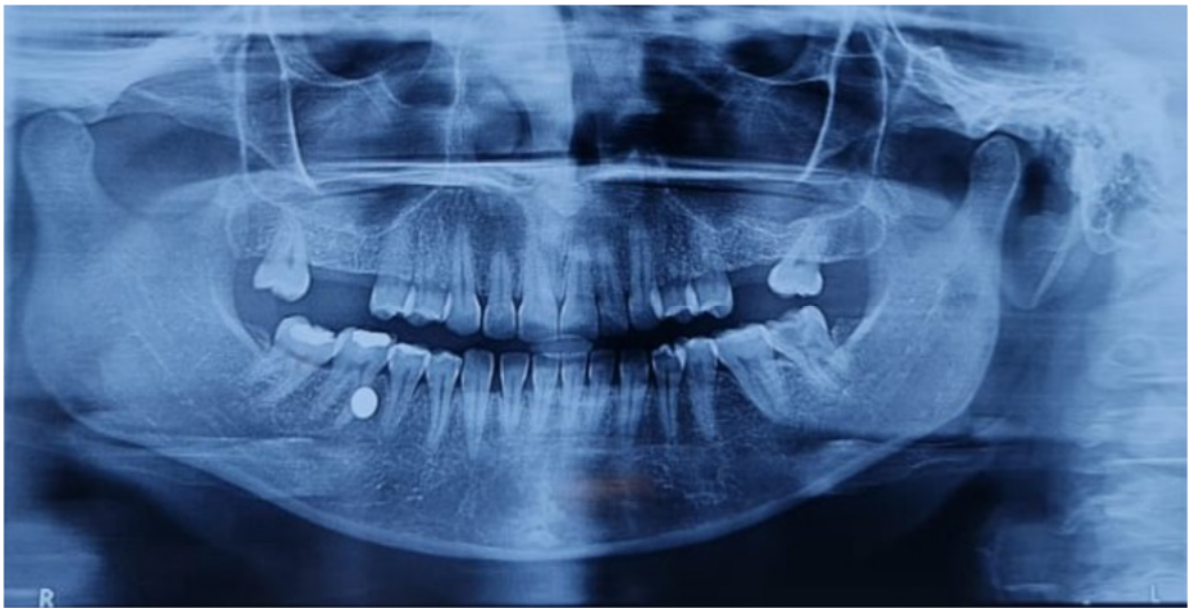

Figure 1. Initial panoramic radiograph demonstrating a high-density radiopaque image corresponding to a lead pellet located in the region of the right mandibular first molar.

Upon questioning about possible traumatic events, the patient reported that approximately 10 months earlier, while riding a bicycle near her residence, she felt a sudden impact on the right side of

her face accompanied by mild superficial bleeding, during a situation where local children were playing with air guns. The episode was not initially considered significant, and she remained asymptomatic for several months until the onset of pain and purulent drainage.

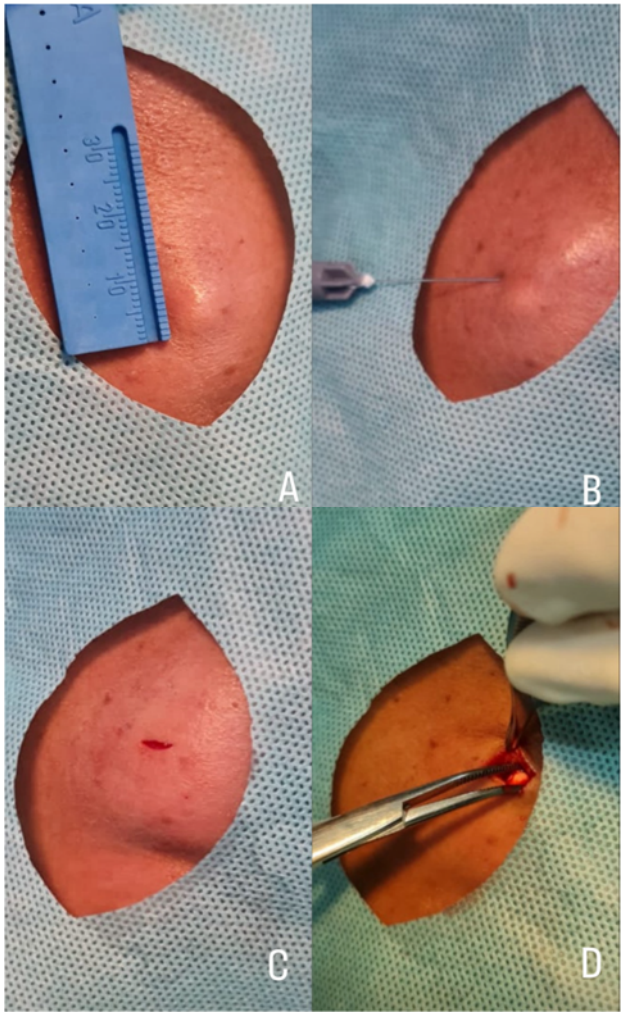

Figure 2. A. Clinical appearance showing a subcutaneous bulge caused by the retained lead pellet; B. Local deposition of anesthetic solution prior to surgical incision; C. Linear surgical incision performed using a No. 15 scalpel blade; and D. Anatomical dissection of the soft tissues until complete exposure of the lead pellet.

Clinical examination revealed a discrete, firm swelling of the right genian region, with well-defined borders and no erythema, local heat, or fluctuation. Palpation identified a rigid subcutaneous structure compatible with a metallic foreign body. Based on the clinical and radiographic findings, the presumptive diagnosis was that of a retained metallic foreign body (air gun projectile) in the facial soft tissues, associated with chronic infection (Figure 2A).

Surgical removal was planned under local anesthesia, following strict aseptic, biosafety, and anatomical preservation principles. Terminal infiltrative anesthesia was performed using 1.8 mL of 2% lidocaine with 1:100,000 epinephrine (DFL®, Rio de Janeiro, RJ, Brazil), administered with a dental syringe with reflux system (Rhosse®, Ribeirão Preto, SP, Brazil) and a 27G long needle (DFL®). A

latency period of approximately 10 minutes was observed to ensure adequate anesthesia and vasoconstriction (Figure 2B).

A linear incision of approximately 1 cm was made over the palpable prominence using a no. 15 surgical blade (Descarpack®, São Paulo, SP, Brazil) (Figure 2C). Blunt dissection was carefully performed with straight hemostatic forceps (Rhosse®, Ribeirão Preto, SP, Brazil) through the subcutaneous planes, allowing identification and direct exposure of the metallic fragment (Figures 2D and 3A). The projectile was removed entirely and atraumatically. The surgical cavity was thoroughly irrigated with 0.9% sterile saline solution and closed with simple interrupted sutures using 5-0 monofilament nylon (Ethicon®, Johnson & Johnson, São Paulo, SP, Brazil) (Figure 3B).

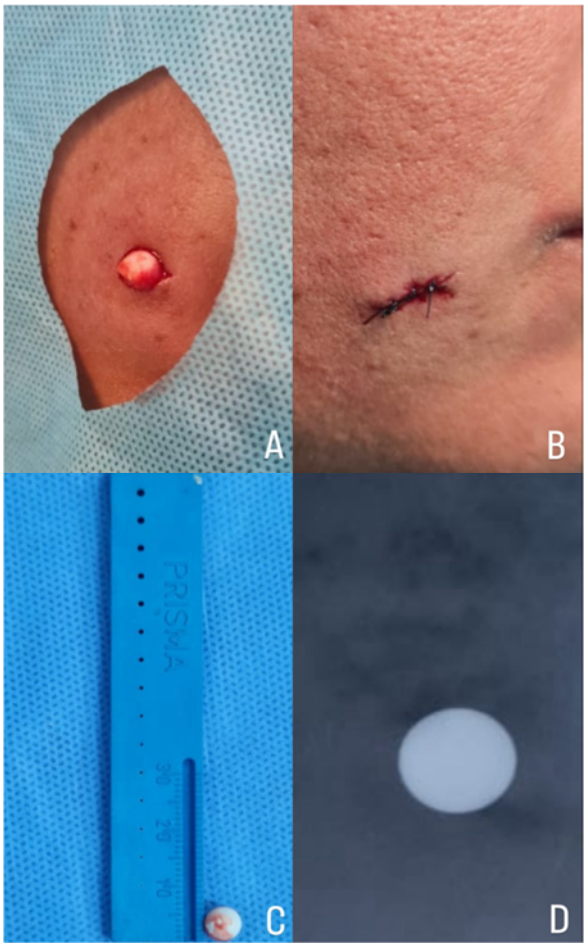

Figure 3. A. Complete exposure of the retained lead pellet; B. Wound closure with simple interrupted sutures using 5-0 nylon monofilament; C. Measurement of the extracted lead pellet; and D. Postoperative radiograph confirming the integrity of the lead pellet immediately after removal.

The extracted material was subjected to a control radiograph, confirming it to be a metallic projectile compatible with a lead air gun pellet (Figure 3C,D). Postoperative instructions were given, including analgesic prescription (Dipyrone 1 g every 6 hours for 2 days), anti-inflammatory medication (Nimesulide 100 mg every 12 hours for 2 days), and antibiotic therapy (Amoxicillin 500 mg every 8 hours for 7 days).

Follow-up appointments were performed at 7, 14, and 21 days, showing adequate primary healing, with no signs of inflammation, dehiscence, or recurrence of swelling. At the 24-month follow-up, the patient remained asymptomatic, with no evidence of infection, fistula formation, or functional and esthetic alterations, confirming therapeutic success and stable scarring.

3. Discussion

Facial injuries caused by air gun projectiles, although considered low-energy traumas, represent a significant diagnostic and therapeutic challenge. The allegedly non-lethal nature of such devices often leads to underestimation of the trauma, delaying recognition of both local and systemic complications. Recent studies have demonstrated that lead projectiles fired from air rifles or pistols can reach velocities exceeding 120 m/s, sufficient energy to penetrate facial or orbital bones, particularly in children and adolescents with thinner cortical structures [1–3].

The presence of retained projectiles in the facial region may result in a broad range of clinical manifestations. The most frequent symptoms include persistent pain, recurrent infections, and purulent discharge of sinonasal origin [3,7], as in the case reported in this scientific article. Direct contact between the metallic fragment and mucosal or osseous tissues stimulates chronic inflammatory response, which can progress to persistent bacterial sinusitis and localized osteitis. In such circumstances, surgical removal is generally indicated not only to alleviate symptoms but also to prevent chronic infection and soft tissue abscess formation [8,9].

Conversely, asymptomatic and stable foreign bodies, particularly those located in superficial or extra-sinusal planes, may be managed conservatively through clinical and tomographic follow-up [10]. This decision should consider not only the absence of symptoms but also the proximity to vital structures, such as the lacrimal ducts, facial artery, and orbital contents and the potential contraindication for future magnetic resonance imaging, which becomes unsafe when metallic fragments are retained.

Advances in endoscopic endonasal techniques have transformed the management of such cases. Minimally invasive access is now regarded as the gold standard for the removal of air gun pellets retained within the maxillary, frontal, or ethmoidal sinuses, providing enhanced visualization, precise hemostasis, and minimal morbidity [8,9]. Complex cases may benefit from image-guided navigation or intraoperative fluoroscopy, enabling millimetric localization of fragments and reducing the risk of iatrogenic injury [11]. More recently, the literature has described the use of 3D-printed patient-specific guides to facilitate the surgical removal of metallic foreign bodies in the facial soft tissues, reducing operative time while optimizing both esthetic and functional outcomes [12].

Another relevant consideration is the systemic toxicity of lead. Although the risk of plumbism associated with a single fragment is low, systematic reviews have shown measurable increases in serum lead levels among patients harboring multiple retained fragments, particularly in highly vascularized areas [6]. Therefore, laboratory monitoring is recommended especially for young individuals, pregnant women, and those with renal impairment and surgical removal should be performed whenever technically feasible and without functional compromise.

Orbital and orbitocranial injuries constitute the most severe end of the clinical spectrum. There are reports of intravascular migration of air gun pellets into the middle cerebral artery, requiring urgent endovascular intervention [2]. Such situations highlight the need for a multidisciplinary approach, involving oral and maxillofacial surgery, otorhinolaryngology, ophthalmology, neuroradiology, and

neurosurgery. Beyond vascular risks, orbital trauma caused by air gun projectiles can result in traumatic optic neuropathy and permanent blindness, even when the external wounds appear superficial [7].

Finally, management of these cases must observe infection control and prophylactic principles. Antibiotic coverage is recommended for contaminated wounds. Tetanus immunization must be updated routinely, and postoperative imaging control is essential to confirm complete removal of the foreign body. Procedures that were also performed in this reported case.

In summary, a retained air gun projectile in the facial region should not be regarded as a benign finding but as a potential source of infection, pain, and systemic toxicity. The contemporary literature consistently supports early endoscopic removal as a safe and effective approach for symptomatic cases, while structured clinical and radiological monitoring is acceptable for asymptomatic and anatomically stable lesions. The integration of advanced imaging, minimally invasive planning, and multidisciplinary collaboration forms the cornerstone of modern management of this type of trauma.

4. Conclusions

The literature highlights the potential dangers of non-powder firearms, emphasizing that these weapons can cause serious injuries or even death. Injuries associated with air guns should receive immediate medical and dental management comparable to that applied to firearm-related trauma. It is noteworthy that, although these weapons are often perceived as toys, they remain loosely regulated and can be legally purchased by young adolescents in most jurisdictions. Therefore, their use must always be accompanied by strict adherence to safety measures and public awareness regarding the associated risks.

Authors' contributions

The list of Authors should accurately reflect who carried out the research and who wrote the article. All multi-authored papers should include an Authors' Contributions' section at the end of the paper. When the corresponding author submits an article, this implies that all authors and responsible authorities where the work was carried out have approved its publication. The corresponding author has to declare the contributions of individual authors when submitting the article. Please follow the ICMJE definitions when defining authorship.

Patient-informed consent statement

The patient signed the informed consent before any procedure.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

The authors declare no conflict of interest.

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