

Case Report: Air Gun Pellet Injury to the Cribriform Plate of a Young Male

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Abstract

Air guns and rifles are usually considered to be harmless. Even though these firearms are categorized as toys, injuries with these are quite common in children and adolescents. The most common reason for these types of injuries is accidents and negligence. In this case report we present a 17-year-old male, admitted to the emergency department with a 5 mm incision below his left eye. In the CT imaging a pellet was seen lodged in the cribriform plate. It pierced through the ethmoid sinus. The patient was admitted to the inpatient clinic and managed conservatively with antibiotic therapy. A review of literature was performed to find out the best strategy to reach an optimized outcome and evaluate probable complications.

Keywords

Air Gun, Pellet, Cribriform Plate

1. Introduction

Air guns and rifles are usually considered harmless as they fire low-velocity missiles (muzzle velocity: <1000 feet per second [fps]). Nevertheless, they are fast enough to penetrate the cranium and paranasal sinuses [1] [2]. 50% of these guns have velocities higher than 500 fps while only 200 fps is enough to fracture a bone [3]. Air gun pellet injury can cause serious damage in soft tissues and bone. At the same time some metals that are used in the manufacturing process of the bullet can have toxic effects, their specific mechanism of injury is not

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certain [4]. These guns are categorized as toys although they could lead to serious injuries in the children and teenage population. In this case report a young male who was shot with an air gun while playing with his friend is presented with a concise discussion on the management strategy and complications of air guns.

2. Case Report

A 17-year-old male patient admitted to the emergency department with a 5 mm incision below his left eye. He told that his friend shot him while they were playing with an air gun. The neurological examination was unremarkable. A metal object was detected in the dura mater at base of the cranium at x-ray and CT imaging. The object passed through the ethmoid sinus into the cribriform plate in the cranium. White blood cell count was 14000 while the other biochemical markers were found to be within the normal range. The patient was admitted to the inpatient clinic and conservative management was performed with 1 gram of ceftriaxone twice a day. On the second day of hospitalization WBC count was found to be within the normal range. In CT imaging, which was performed one week after the injury, there was no evidence of infection rather than the metallic artifact in the bony fragment.

3. Discussion

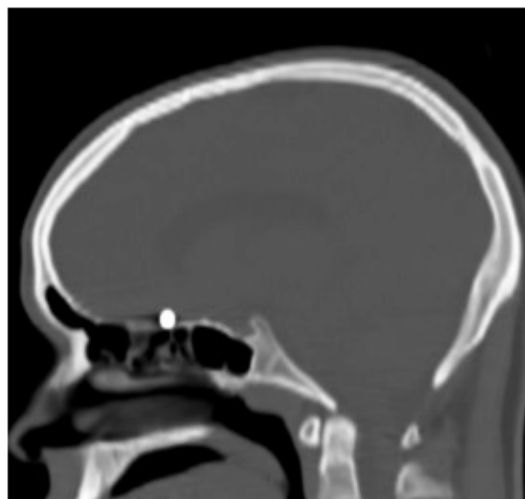
Most air gun injuries are caused by careless use [4] [5]. This case is a typical example of air gun injuries in which most of the injuries are caused by a friend in an accidental fashion. In 80% - 90% of the cases these injuries occur in people under 19 years of age [6] [7]. 60% - 75% of these injuries occur accidentally by self-harm or while playing with a friend. Between the years 1990-2000 CPSC reported 39 deaths caused by air gun accidents in United States. There are 21,000 - 37,000 air gun injuries annually. Out of these cases 4 is mortal [8].

Air guns are known to be causing low velocity injuries [9]. Low velocity is accepted to be less than 1000 fps, but these velocities still have risk for penetrating the eyes (130 fps), the human skin (290 fps) and the bone (350 fps) [10]-[12]. The risk of death increases with velocities higher than 350 fps in air gun injuries [13].

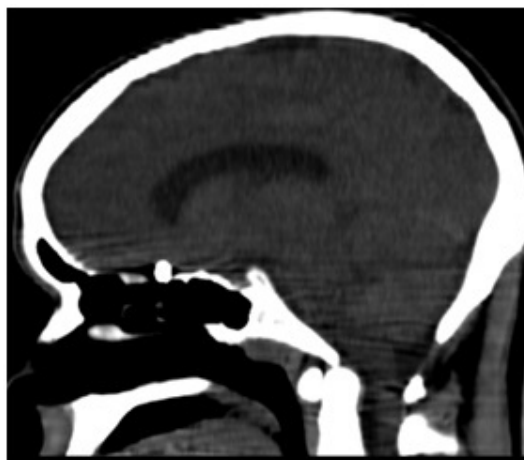
Plain X-rays are adequate to localize metallic fragments. CT is essential to assess soft tissue and bone damage. It is also useful in evaluating the course of the projectile [14] [15] (Figures 1(a)-(c)).

Angiography is needed in patients who have active bleeding, changes in neurological status, bruits, enlarging hematoma or the course of the projectile is adjacent to known vascular structures [16].

The management algorithm has become highly controversial, as there is a debate in benefits between the more aggressive intervention, the surgery and the more conservative approach, the use of antibiotics. Some authors advocate for early surgical intervention with removal of the bone fragments and the foreign body, the debridement of the wound, application of water-tight dural closure, with reconstruction if necessary [17] [18]. The surgery, which is the removal of the foreign body, may be avoided if there is a risk of aggravating the neurological damage. The principle of not removing the fragments from an otherwise healthy brain, as used in our case is



(a)



(b)



(c)

Figure 1. CT scan, sagittal (a, b) and axial (c) views, showing the pellet penetrated to cribriform plate.

currently the widely accepted approach [17] [19]. Conservative management consists of utilizing prophylactic antibiotics and in necessary cases the anticonvulsants [9]. The possibly complications of the conservative management are infection and epilepsy. After penetrant brain injury, intracranial infections occur within a relatively short period after injury (55% within 3 weeks; 90% within 6 weeks) [20]. Post traumatic epilepsy occurs in 30% - 50% of the cases. Therefore, the patient has to be carefully observed during hospitalization and close follow up is needed during the outpatient period.

In the presented case, conservative management was utilized, as there was no worsening in the neurological situation of the patient. The possible toxic effects of the metal and the risk of infection should always be kept in mind. During the follow-up of the patient frequent neurological examination and measurement of trace elements were done. After discharge the same procedure was performed in the first week and the first month.

4. Conclusion

Air guns have low fire velocity but can cause major injury. These injuries frequently occur in the teenage and children population while they are accidentally playing with air guns. Patients must be carefully observed and

examined even in trivial injuries. The etiology of the injury must be known; the neurological and clinical examination must be complete. The trajectory of the bullet and its proximity to adjacent structures such as vessels must be displayed with the help of radiological imaging. The treatment plan could be decided with the review of radiological imaging. Patients without neurological deficits that were administered prophylactic antibiotherapy were followed conservatively without the need for surgery.

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