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Case Report

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Near-fatal air gun injury in a child

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Abstract

Introduction: Air guns are widely used for recreation and to protect crops from animals. It is a pneumatic weapon capable of inflicting serious life-threatening injuries. The authors present a case of a child subjected to a life-threatening pellet injury to the head due to discharge of an air gun while playing.
Case report: A 3 ½ year old male child who was 95 cm in height presented with a circular perforated laceration 0.4 cm in diameter with surrounding abrasion collar on the right side of the face over the zygomatic arch, nasal bleeding and aspiration of blood. Imaging studies revealed a diabolo-shaped foreign body resembling a pellet of an air gun in the left pharyngeal space. The foreign body was removed under image guidance. Investigation revealed that the parents used an air gun on the farm to protect their crops from monkeys. Since examination of the weapon and child indicated that he could not have caused the injury himself, we concluded that another child had fired the weapon accidentally, during play.
Conclusions: The findings were compatible with those caused by discharge of an air gun. This case re-emphasizes the importance of keeping this type of weapons away from children. We recommend that air guns be governed by the same laws that apply to firearms.

Keywords: *air guns, firearms, forensic ballistics, head injuries, laws, wounds, gunshot*

INTRODUCTION

Even though the usage of air guns in Sri Lanka has been relatively rare in the past, they are now being increasingly used for sports events and to protect crops from animals [1,2].

Historically, air guns were not powerful weapons, but modern air guns are more powerful and capable of inflicting life-threatening injuries [3,4]. According to the firearm ordinance of Sri Lanka, "any weapon of whatever description, designed or adapted for the discharge of any noxious substance" is also considered as a firearm. However, an air gun is not considered as a firearm [5].

CASE PRESENTATION

A 3 ½ years old boy was admitted to the emergency department with a bleeding injury on the right side of the face (Fig. 1a). The mother of the child said she found the child in the front yard of the house, in a semi-conscious state with bleeding from the face. A 2 ½ year old child was with him at that time. During examination there was a 0.4 cm perforated laceration with active bleeding and an abrasion collar (Fig. 1b). There was no burning, blackening, or tattooing. The radiograph of the skull showed a diablo-shaped radio opaque object in the left side of the face (Fig. 2a and Fig. 2b). Computed tomography (CT) scan of the brain demonstrated

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radio opaque substance in the left pharyngeal space (Fig. 3).

An ENT team tried to remove the foreign body but failed. The next day, the same team successfully removed the foreign body under image-guidance. The foreign body was a pointed 0.177 (4.5mm) calibre air gun pellet (Fig. 4).

Further inquiry revealed that an air gun was kept on a ledge in the open verandah of the farmhouse to scare away monkeys which destroy their crops. This injury has apparently been sustained when the children had taken it out to play and the 2 ½ year old boy had accidentally fired the weapon.

Figure 1: Injury on the right side of the face of the victim (a) 0.4 cm penetrating laceration with surrounding abrasion collar (b)

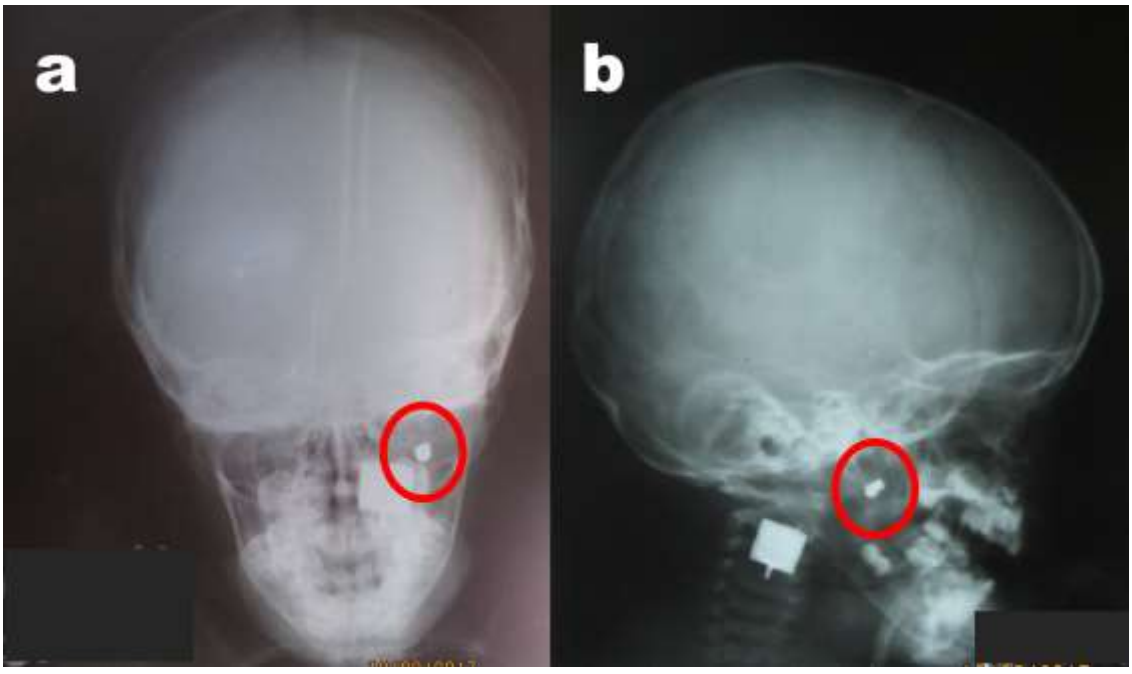

Figure 2: Plain radiograph of the skull showing a diablo-shaped radio-opaque object in the left side of the face (circle); coronal view (a) and sagittal view (b)

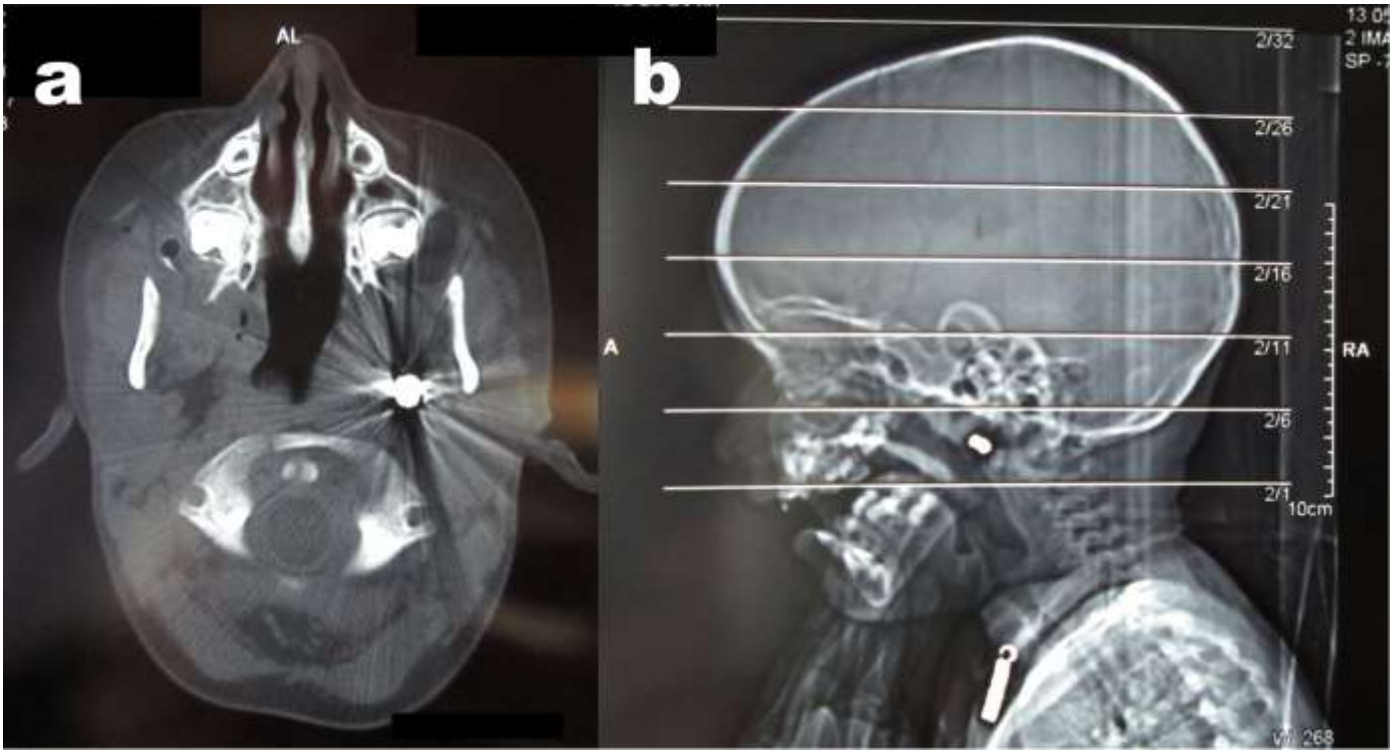

Figure 3: CT scan of the skull demonstrating a hyperdense object in the left pharyngeal space; transverse view (a) and sagittal view (b)

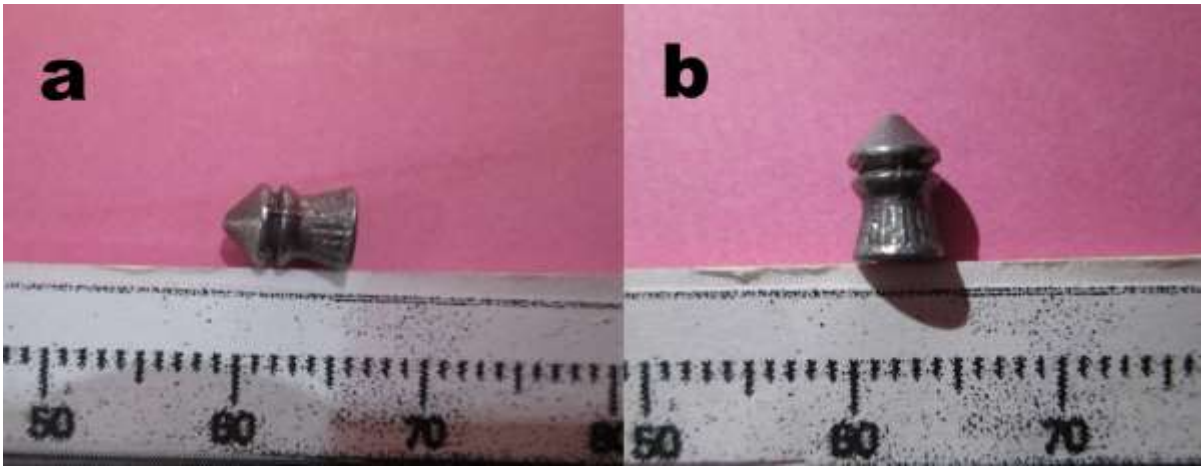

Figure 4: Slightly distorted air gun pellet removed by the ENT team

Figure 5: The air gun used in the incident (a) and markings on the barrel (b)

DISCUSSION

Sri Lanka is an agriculture-based country; agriculture is the sole income of the farmers. Destruction of crops by animals, especially monkeys and wild boars, is a huge problem [6]. So, farmers use many methods to scare animals away. Nowadays the use of air guns is becoming popular as a method of pest control. Air guns are now widely available in Sri Lanka in a number of varieties and models. These are affordable, cheap, and a permit is not needed for the use [1]. In our case, the gun was a Chinese made XISICO –XTB3, 0.177 type weapon (Fig. 5) having a muzzle velocity of 143 m/s according to the manufacturer.

Air guns are wind chamber weapons, using an air reservoir to propel the pellet, in contrast to firearms, which utilize the propulsive force generated by the oxidization of a propellant [2]. Air guns, of modern and traditional models, are powerful weapons that are capable of causing serious or life-threatening injuries [3]. There are three basic systems for discharging the projectile from an air gun. Pneumatic air guns have an air chamber into which air is pumped. The projectiles achieve a maximum speed of 235 m/s. The spring air compression system derives its energy from the cocking of the gun. The maximum speed of a 4.5 mm (0.177) caliber projectile is 305 m/s. Gas compression systems, which use carbon dioxide from a disposable cartridge, achieve muzzle velocities comparable to those of spring guns of the same caliber. Fatalities from pneumatic weapons are very rare. Most of them are accidents, but there are occasional homicides and suicides [7]. Modern air guns are divided into higher and lower power categories. High powered designs are becoming increasingly common and are used for hunting. These rifles can propel a pellet beyond 330 m/s which is approximately the speed of sound, and the noise produced is similar

to a 0.22 caliber rim fire rifle [8]. When comparing with powder firearm rifles, higher-powered air rifles do not require a license and cartridges and can be used for pest control [9].

Most air gun pellet injuries occur in children and adolescents. Di Maio had encountered only four lethal cases throughout his career [7]. The potential for lethal injuries depends on the ability of the discharged projectile to penetrate, which depends, in turn, on its kinetic energy (½ mass of projectile x velocity^2), shape of projectile, distance from which the shooting is done, and of course, the anatomical region hit by the projectile. The most common site of injury is the head and neck, while injuries to the eye have also been reported [10,11]. The airway and neurovascular structures make the neck a potentially life-threatening site of injury, as indicated by a review of the literature [12]. In Sri Lanka, one previous case of non-fatal air gun injury to the hand has been reported [1].

The projectile used in rifled air guns is the lead diablo pellet. This has a narrowing in the middle (waist) and has an open base. The flared tail of the pellet is designed to improve directional stability. (Fig. 4). Modern air gun pellets are capable of inflicting serious, life-threatening injuries. When a projectile strikes an object, energy from the projectile is transferred to its target [7].

The critical velocity required for penetration of human skin by an air rifle pellet is around 38–70 m/s, [13] which is within the muzzle velocities of many air rifles available for sale. High energy projectiles inflict damage by the processes of shock wave, temporary cavitation and permanent cavitation. High velocity wounds are dangerous because they carry the risk of airway obstruction due to direct or indirect laryngeal obstruction, particularly when wounds are closed [14,15]. However, in low velocity air guns, direct effects on tissues occur, such as laceration and crushing within the missile tract, rather than the effects of temporary cavitation. Patients may be unaware of being shot. In addition, the entry wound is often very small, thus serious injuries may be trivialized or missed completely. Plain radiographs are important in the evaluation of suspected cases of air gun pellet injuries [12]. Locating air gun pellets using ultrasound-guided techniques can minimize the need for blind exploration of wound tracts. Therefore, theses diagnostic modalities can limit complications such as swelling and hematoma caused by wound exploration [16]. Use of selective angiography, in addition to clinical examination has also been proposed by Van As et al [17]. Angiography is a necessity if a missile enters the base of the skull or neck.

A clinical forensic medical practitioner is required to document the type of injuries, type of weapon and categorize the degree of hurt caused, according to the penal code of Sri Lanka, in the medico legal examination form which is submitted to the police following examination of the patient. Since air guns do not fall under the definition of a firearm, it was not possible to identify the weapon as a firearm, nor, the injuries as caused by a firearm. Therefore, the injuries were classified as abrasion and laceration, while the weapon was mentioned as air gun. Since the projectile had penetrated the face, it was categorized as grievous hurt.

Air guns, which have a significant potential to cause injuries to human tissue, are freely available as there is no regulations or licensing required for the purchase, possession or use. Due to its increasing use against crop foragers in Sri Lanka, the number of accidental – and intentional – injuries caused are bound to increase. Therefore, it is recommended that the use of air guns to be regulated by the relevant authorities, before more injuries or deaths occur.

CONCLUSIONS

Air guns are used as a means of protecting crops from animals. But all air gun manufacturers, distributors and users should be registered by police or relevant authorities to monitor who are possessing such weapons. It should be governed by gun laws or any other relevant law, as some types of air guns can cause lethal injuries and they can be used for crimes. They can also be very hazardous in the hands of children, as in this incident, emphasizing the need for air guns to be kept away from children in a protective manner.

Key points

- Air guns are widely used for recreation and to protect crops from animals.
- These are pneumatic weapons capable of inflicting serious life-threatening injuries.
- They can also be very hazardous in the hands of children, emphasizing the need for air guns to be kept away from children.
- We recommend that air guns be governed by the same laws that apply to firearms.

Author declaration

Authors' contributions:

Mohamed Sadik Siddique: Methodology, Investigation, Data curation, Writing - Original Draft; Amal Nishantha Vadysinghe: Conceptualization; Kasun Bandara Ekanayake: Writing - Review & Editing; Dinesh Malcolm Gerard Fernando: Conceptualization, Writing - Review & Editing, Supervision.

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Conflicts of interest/competing interests: None

Ethics approval: All procedures performed in the study were in accordance with the ethical standards of the institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to participate: This case report was done for medicolegal purpose. All the details are available in public domain. However, we present these cases for academic purpose adhering to the ethical principles and guidelines of our institution. Informed consent was obtained from legal guardian.

Consent for publication: Informed consent for publication was obtained from legal guardian.

Availability of data and material: Not applicable

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