

# Endoscopic Management of Accidentally Lodged Airgun Pellet in Paranasal Sinus

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## ABSTRACT

Although Air gun is categorized as a toy and seemingly harmless injuries with these are quite common in children and adolescents. Injury due to air gun is mostly accidental and in-fact due to negligence. A 17 year old female was admitted in the ENT department with history of air gun injury just below right eye accidentally by the hands of her brother. Diagnostic Nasal Endoscopy revealed no foreign Body. In the Computed Tomography imaging, a pellet was seen lodged in the anterior ethmoid, in close proximity to cribriform plate with a trajectory of pellet tract through the retro-orbital fat. Pellet was found to have been migrated to posterior ethmoid. Its removal was done by endoscopic approach without complications.

**KEY WORDS:** air gun injury, endoscopic sinus surgery, paranasal sinuses

## INTRODUCTION:

Airgun injuries to the paranasal sinuses are relatively uncommon. Airgun fires low velocity projectile by means of compressed air or gas. In contrast to this, a firearm, burns the gun powder or a similar propellant to fire its projectile device which has high velocity. The muzzle velocity of air gun is <1000 feet per second (fps) which is fast enough to penetrate the cranium and paranasal sinuses.<sup>[1]</sup>

Air gun injury is common in children and teenaged. Most of the times it is accidental but can also be the result of assaults. Injuries due air gun may be trivial but it may sometimes cause severe morbidity or even death. The depth of penetration in tissues depends on the physical and ballistic properties of the bullet such as the distance of shooting, the mass, size, shape, speed, and kinetic energy of the bullet.<sup>[2]</sup> Some metals that are used in the manufacturing process of

the bullet can also have toxic effects. Depending on the course and trajectory of the missile track, sino-orbital gunshot injuries can involve paranasal sinuses, orbit, cranial nerves, or brain. Surgical approach for the management depends on the damage occurred in the orbital content, vascular structures and other vital structures.

## CASE REPORT:

A young girl of age 17 years visited to ENT Out Patient Department with a complaint that she had been hit by Air Gun 24 hours back while her brother was playing with Air Gun and fired it accidentally. She had bleeding from the wound just below the right eye and right nasal bleed followed by pain and swelling around the right eye. On examination, she had right infraorbital oedema with sub-conjunctival haemorrhage. The entrance wound of the pellet was seen in the right infra orbital region 1 cm below the lateral canthus of right eye with no visible exit wound (Figure 1). Anterior rhinoscopy revealed small blood clots in right nasal cavity. On Nasal endoscopy, no pellet was visible with minimal nasal mucosal oedema. She had normal visual acuity and fundus examination on ophthalmic check up. Her Central Nervous System examination was unremarkable.

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Figure 1: Arrow showing Entry wound of Air-Gun Injury.

and the trajectory of pellet was through the right retro-orbital fat.

Ophthalmologist's opinion was taken. According to them as trajectory was through the retro-orbital fat, not damaging the orbit and optic nerve, they advised for conservative management for orbit and regular ophthalmic check up. Endoscopic exploration under general anaesthesia was planned to remove the pellet in right ethmoid sinus to avoid complications like chronic sinusitis, headache, lead poisoning and migration of pellet to brain because of its proximity to cribriform plate. After right Anterior Ethmoidectomy, we found that there was injured lamina papyracea with prolapsed orbital pad of fat. Small fragment of the pellet was removed from anterior ethmoid but we couldn't find out the main pellet there as indicated in CT scan. To our surprise, the pellet was found to be migrated in the posterior ethmoid just below the

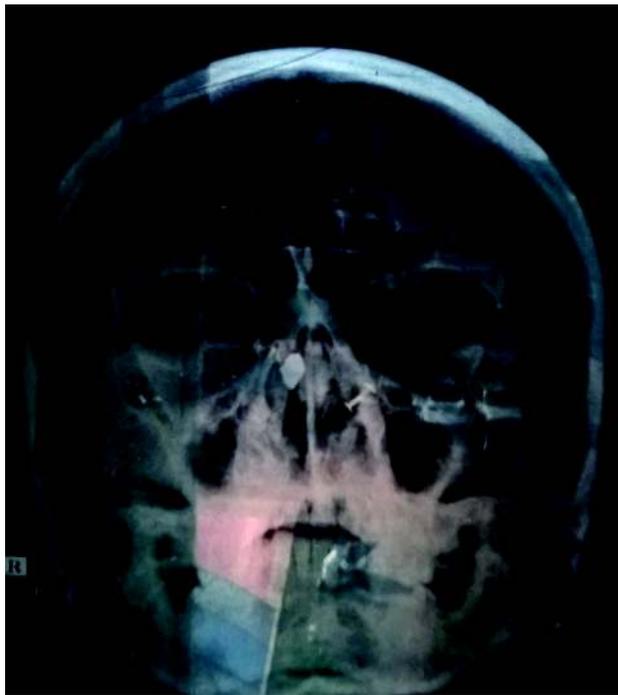


Figure 2: Plain X-ray PNS Water's View showing Radio-opaque Foreign body in Right nasal Cavity.

Plane X-ray Skull lateral view and Paranasal Sinus Water's view showed radio-opaque foreign body in the right nasal cavity towards the roof of nose (Figure 2). Computed Tomography (CT) of Paranasal sinus and Orbit revealed, a pellet of size  $9.6 \times 5.5 \times 9.3$  mm in right anterior ethmoid sinus in close proximity to anterior ethmoidal artery (Figure 3) and anterior skull base (Figure 4). There was another small fragment of metallic foreign body in right anterior ethmoid sinus



Figure 3: Plain CT Scan Coronal View showing Pellet in Anterior Ethmoid sinus just near the beak of Anterior Ethmoid artery.



Figure 4: Plain CT Scan Saggittal section showing pellet in Anterior ethmoid sinus.

cribriform plate which was then removed carefully without CSF leak. Patient recovered well. In last 1 year's clinical and radiological follow up, she has no signs of lead poisoning or orbital complications.

## DISCUSSION:

Most air gun injuries are caused accidentally out of negligence. In 80% - 90% of the cases, these injuries occur in people under 19 years of age.<sup>[3]</sup>

High Energy Missiles travel at speed more than 2000 feet per sec (fps). These cause damage to the human tissues by the processes of shock wave, temporary cavitation and permanent cavitation. It results in comminute fractures or a hole formation due to perforation of the bone by the bullet. Bone fragments can act as secondary missiles causing much more damage than the original projectile.

Low Energy Missile travels at velocities below 1000 fps and cause injury by mechanisms different than High Energy Missiles. These mechanisms include direct injury to tissues, such as laceration and crushing within the missile tract, rather than the effects of temporary cavitation.<sup>[4]</sup> Air guns are known to be causing low velocity injuries.<sup>[5]</sup> These velocities still have risk for penetrating the eyes (130 fps), the human skin (290 fps) and the bone (350 fps).<sup>[6-7]</sup> The risk of death increases with velocities higher than 350 fps in air gun injuries.<sup>[8]</sup>

Air gun injuries in children are generally more severe than adults because of thin skeleton.<sup>[9]</sup> Distance between the weapon and the penetrated tissue and the anatomic site of pellet entry are also equally important to determine the type and severity of injury, ranging from minor trauma to serious injuries. In the head and neck region, air gun can cause injury to the eyeball resulting in loss of vision. When air gun pellet enters through medial wall of the orbit and ethmoids air cells, thin papery bones of these structures offer less resistance to the pellet allowing deep entry even into intra cranial tissues. Entry of pellet into the cranium leads to intracranial bleeding, leakage of CSF, meningitis, brain abscess, formation of traumatic aneurysm and total carotid cavernous sinus fistula.<sup>[6]</sup> After brain injury, post-traumatic epilepsy can occur requiring careful observation of patient for long term.

Plain X-rays are adequate to localize metallic fragments. CT is essential to assess soft tissue and bone damage to evaluate the course of the projectile.<sup>[3]</sup> 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.<sup>[10]</sup>

There is a debate between removal of pellet by surgical intervention and the more conservative approach, the use antibiotic therapy. 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.<sup>[11,12]</sup> In general, if removal of pellet involves risk to important structures like optic nerve and internal carotid, brain tissue, it may be avoided.<sup>[12]</sup> Sino-orbital airgun injuries can be treated using conventional and endoscopic techniques. Nevertheless, endoscopic technique is the safest, minimally invasive, and therefore the most preferred management in such cases.<sup>[13]</sup> Long term sequelae of retained foreign body in Head – Neck area are chronic sinusitis, rhinolith formation, meningitis, chronic pain syndrome and even malignancy.<sup>[13]</sup> There is also a risk of lead poisoning although it is more often with Gunshot injury. Bowen and Magauran<sup>[14]</sup> reported raised serum levels of lead in 6 cases of ocular injuries caused by airgun pellet.

In the presented case, main pellet with its fragment was removed endoscopically from the posterior ethmoid, which was in close contact to cribriform plate. Thus external scar could be avoided in a young girl. Conservative management was utilized for tiny fragments in the retro-orbital fat of right eye, as there was no worsening in the orbital and neurological status of the patient. Keeping in mind the possible toxic effects of the metal, patient's frequent ophthalmic, neurological examination and measurement of trace elements were done during follow up.

Facial gunshot wounds, often comprising significant soft and bone tissue defects, pose a significant challenge. Immediately after injury, management is focused on advanced trauma life support with patient stabilization as the primary goal. Thorough examination along with appropriate imaging is critical for identifying any existing defects. For optimal recovery, an appropriate reconstructive approach should involve three stages, composed of the initial stabilization, definitive reconstruction, and potential secondary refinement.<sup>[15]</sup>

## CONCLUSION:

Air gun injuries are relatively uncommon, but have a wide clinical presentation from minor injuries to more serious life-threatening injuries. Patients must be carefully observed and examined even in minor injuries.

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