

# Accidental Death of Construction Worker due to Unintended Nail Gun Discharge: a Case Report

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## ABSTRACT

**Background:** In spite of being rare, intracranial nail gun injury represents one of the fatal penetrating head injuries.

**Case Report:** Here we report a case of intracranial nail gun injury in a 28 years old well-trained construction worker who left the electric nail gun on the edge of the window to pick up one of his tools from the ground. Unfortunately, his leg got entangled in the nail gun cable and thus the nail gun dropped on the ground firing a nail that killed the worker.

**Conclusion:** To the best of our knowledge, this first time death from nail gun injury is reported in the Arab world; although, there are previous reports of survivable nail gun cardiac injuries and cranial injuries from Saudi Arabia. Thus, it is important to raise public awareness about such cases in order to reduce the occurrence of nail gun injuries. Moreover, health and safety inspections mandated and supported by law, might be much more effective in reducing such injuries.

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► *Implication for health policy/practice/research/medical education:* Accidental Death of Construction Worker due to Unintended Nail Gun Discharge

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## 1. Introduction:

Nail guns are popular and powerful industrial tool used to drive nails with ease into various hard surfaces as metal, wood, or concrete. The ease of use and speed of these nail guns, especially pneumatic nail gun; greatly enhance workers' productivity in wood-frame building construction. However, there is an increased risk of injury to workers due to the ballistic potential of nail guns,

which are capable of firing projectiles at speeds of 100–150 m/sec and distances of up to 500m (1, 2).

The American National Standards Institute has classified nails guns into two different categories. In the high-velocity, direct-acting type, the expanding gas of a powder-loaded booster acts directly on the nail, with the nail free-flight velocity in excess of 454 m/sec. In the low-velocity, indirect acting type, the expanding gas of a powder-loaded booster acts on a captive piston, which in turn drives the nail into the material, with a free-flight velocity of below 99 m/sec. The most commonly found nail gun is a variant of the

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latter, in which compressed air is used to activate the piston (3).

Various injuries have been reported as a result of their use since the 1950s. Injuries to heart, lung, central nervous system, eye, abdominal viscera, trunk, head, and extremities have been reported, sometimes with fatal consequences and loss of vision (1-7). In addition, nail gun-related injuries and deaths can be industrial accidents, suicide attempts, assaults or homicides (7). According to the Center for Disease Control, the incidence of nail-gun-related injuries presenting to emergency departments in the USA has tripled over the past two decades. Approximately, 37,000 cases of nail gun injuries occur annually, 40% of them are not employed in the construction industry. Although most of intracranial nail-gun injuries occur accidentally in work places, several cases of suicidal and deliberate-self harm have been reported (8, 9).

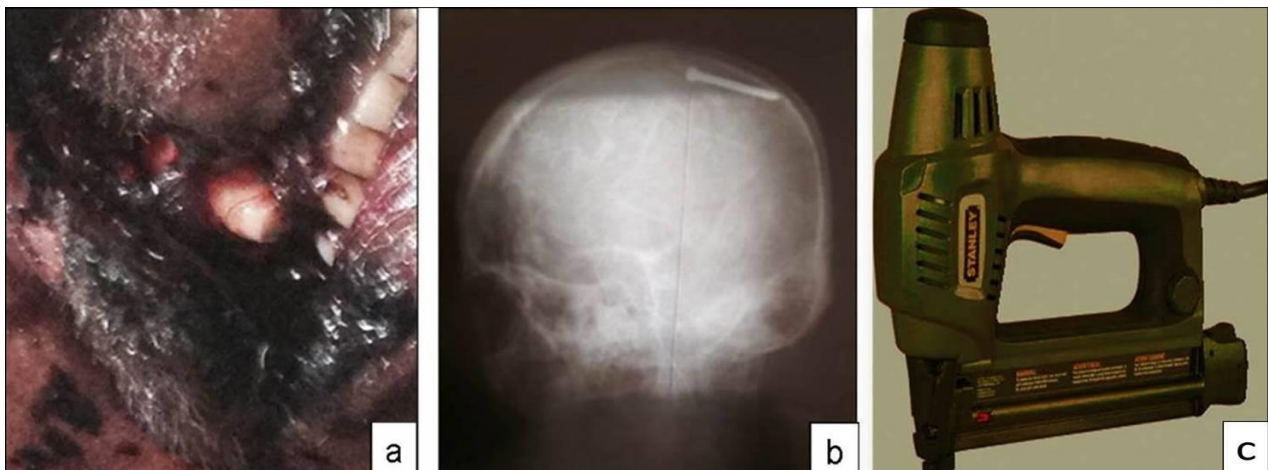
## 2. Case Report:

The well-trained worker, who had no past history of previous diseases, was fixing wooden window frame by an electric nail gun. The screw driver fell on the floor, so the worker put the nail gun on the window and bent down to pick up the screw driver. Unfortunately, his leg pulled the nail gun cable and the nail gun fell on the ground firing a nail through his upper lip piercing the maxillary sinus and resided into the cranial cavity. The worker died at the scene. Postmortem external examination showed a

lacerated wound 2 cm in length on the right side of the upper lip. Its lower end is at the lip border 2 cm from the right angle of the mouth and its upper end is at the right nasal opening as in figure (1a). Moreover, it did not reveal any blood in the upper airway passages and thus death due to aspiration of blood into the air passages has been excluded. Skull X-ray revealed a radio-opaque intracranial nail as shown in figure (1b). Although, the autopsy is, unquestionably, a necessary part of the judicial investigation of death, the Saudi authorities refused the autopsy. The manner of death in this case was considered accidental based on a visit and thorough examination of the incident scene, interrogation of witnesses, examination of the alleged weapon, and anatomic location of the nail gunshot wound, negative toxicological screening and radiological appearance of an intracranial nail.

## 3. Discussion:

Although several cases of suicide and deliberate-self harm have been reported, work-related accidents represent the most common category of nail gun injuries. In the majority of cases, patients recover completely with a good neurological outcome, provided that the brain stem and the major cerebral vessels are spared (9-11). In our case the worker died at the scene. The cause of death in such case could be intracranial hemorrhage due to injury of a major cerebral vessel in addition to brain



**Fig. 1.** a) A photo shows the nail gun injury in the upper lip. b) An antero-posterior X-ray of the worker's head shows the presence of intracranial straight nail. c) A photo shows the type of the nail gun.

tissue injuries along the nail path. Brain stem injury is quite possible in such case. Although, CT scan could show the damage to the brain or any consequent hemorrhage, it was impractical to transfer the body to the nearest regional hospital. The shape of the nail can provide clues to the trajectory of the nail. Radiographs showing a bent steel nails suggest accidental injuries from a nail ricochet, whereas straight-nail injuries are due to over-penetrating of the material being nailed or accidental mid-air firing<sup>12</sup>. In our case, the nail was straight, suggesting a mid-air firing. Moreover, the nail might have been ricocheted on the inner table of the skull as it lies at an angle which is different to a line drawn from the entry point in the upper lip. This ricocheting within the skull increases the area of damage. Most nail guns have both a sequential and a contact trip triggers. In case of using the sequential one, the worker has to depress the nose of the gun against the target before pressing the trigger in order to minimize the risk of accidents. But in reality, most workers prefer to use contact trip nail guns that allow workers to keep the trigger depressed at all times and press the gun against a surface to fire it, making the chances of an accidental discharge highly likely. The risk of acute injury is double in cases of a contact trip trigger than with a sequential trigger. It's very easy to hit a body part or a coworker instead of a piece of wood. Contact trip nail guns will also inadvertently discharge a nail if the tip contacts anything following the recoil that is associated with firing (13, 14). In fact, this could explain what happened in the case we present. Thus, it is highly recommended that Nail gun safety measures, especially the use of sequential trigger must be strictly implemented in work places. Moreover, training and establishing nail gun work rules definitely helps reducing nail gun injuries and addressing risk factors. Also, personal protective equipment, first aid and medical treatment should be provided to employees (15). Furthermore, we emphasize that both autopsy and brain CT are fundamental in such cases, although, autopsy has been refused in our case.

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