

Radiological evidence of a modern ‘martyr’s crown’: suicide by multiple self-inflicted nail gun shots

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ABSTRACT A man attempted suicide by shooting seven nails into his head with a nail gun; five in the right temporal region and two in the left. He subsequently presented at the emergency department with complaints of headache. He was found to be oriented in space and time, with no focal neurological deficits. The patient handed the nail gun to the doctors and informed them that he had earlier attempted suicide. Radiological studies showed the presence of nails arranged like a ‘martyr’s crown’. The man died six days after the surgical removal of the nails. Autopsy was refused by Italian authorities. We conclude that imaging techniques are an adjuvant to forensic medical diagnosis and forensic autopsies.

Keywords: cerebral ischaemia, nail gun, successful suicide
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Fig. 1 Radiographs of the head show the presence of nails in the right and left temporal regions, arranged like a ‘martyr’s crown’.

INTRODUCTION

The nail gun is a powerful industrial tool used to drive nails into various hard surfaces with ease. Pneumatic nail guns, in particular, greatly increase a worker’s productivity in wood-frame building construction. Its ease of use and speed of these nailing tools enhance productivity. 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 500 m.⁽¹⁾ The American National Standards Institute⁽²⁾ has classified nail guns into two different categories. In the high-velocity, direct-acting type, the expanding gas of a powder-loaded booster acts directly on the fastener, with the fastener 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 fastener into the material, with a free-flight velocity of below 99 m/sec. The most commonly found nail gun is a variant of the latter, in which compressed air is used to activate the piston.

We report the case of a man who fired seven shots from a nail gun into his head in a suicide attempt, and discuss the imaging findings.

CASE REPORT

A 62-year-old man presented to a local hospital with complaints of headache and multiple head wounds. He claimed to have attempted suicide by firing shots into his head with a nail gun, which he then handed over to the doctors. He admitted to being severely depressed due to the premature death of his son, and had attempted suicide a few months ago by ingesting drugs. He was conscious and oriented in space and time. No focal neurological deficits were detected. A metallic foreign body was observed at the scalp surface over the right temporal region. The patient was admitted to the Neurosurgery Department.

Radiography of the head revealed seven foreign metallic nails in the right and left temporal regions, giving the appearance of a ‘martyr’s crown’ (Fig. 1). Computed tomography (CT) of the head confirmed the presence of multiple nails that penetrated

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Fig. 2 CT image of the head confirms the presence of multiple nails.

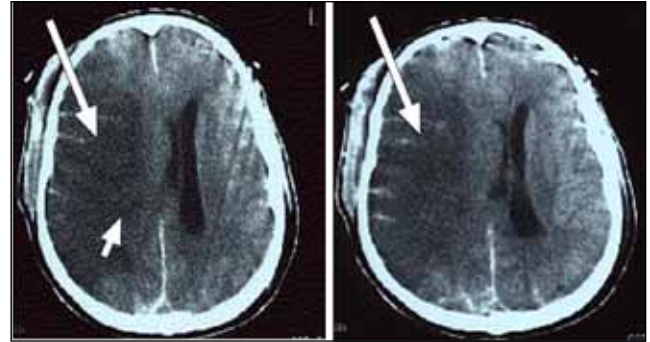


Fig. 4 Axial CT images of the head after neurosurgery show a large hypodensity in the right frontal-temporal and parietal cerebral parenchyma (arrows), and obliteration of the ventricular system (arrowhead) due to massive cerebral oedema.

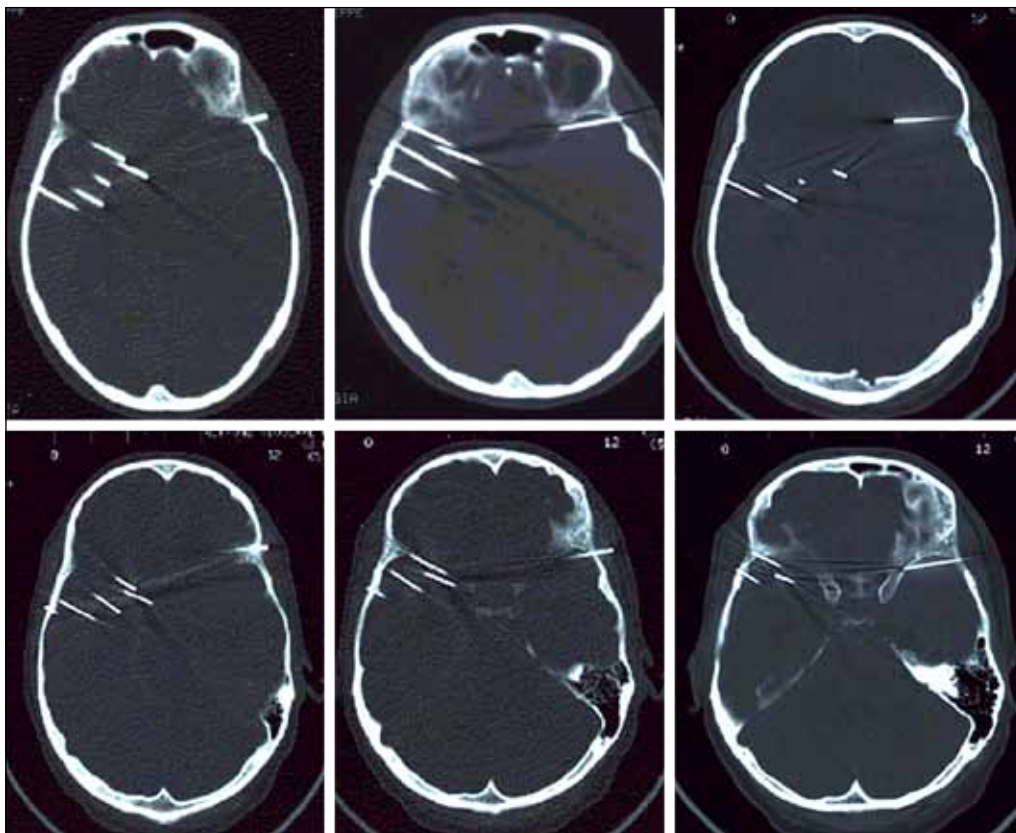


Fig. 3 Axial CT images (bone window) of the head show multiple nails in the right and left temporal regions, and obliteration of the ventricular system.

the skull (Figs. 2 & 3). There was subarachnoid haemorrhage with obliteration of both the lateral ventricles. Surgery was proposed in order to remove the nails. Six of the seven nails were removed easily, but craniotomy was necessary in order to remove the last nail, which was located in the right basal-temporal region, 2 cm below the skull. One hour after the surgery, the patient's condition rapidly deteriorated. He became drowsy and developed left hemiparesis, and required orotracheal intubation and mechanical ventilation. Repeat CT of the head showed large hypodensities in the right frontal-temporal and parietal cerebral parenchyma, with left shift of the ventricular system, consistent with ischaemia in the right medial cerebral artery territory, and massive cerebral oedema (Fig. 4). The

patient became comatose and died ten days after admission. The cause of death was acute respiratory failure due to secondary traumatic brain injuries. Postmortem external examination showed surgical incisions over the right and left temporal region, but was otherwise unremarkable. Autopsy was refused by the Italian authorities, as the deceased was deemed to be a suitable organ donor.

Examination of the extracted nails showed that they were 4 cm long and of the type commonly used for minor home repairs. The suicide weapon was a popular type of pneumatic nail gun, with the hammering force coming from compressed air generated by a separate gas-powered air compressor, producing a free velocity of 95 m/sec. The compressor of the nail gun generates a

constant supply of compressed air, which flows through a hose into the nail gun's air reservoir. The gun has a sliding piston that drives a long blade. When the air pressure below the piston is greater than that above it, the piston is forced downward, shooting the nail.

DISCUSSION

Nail gun-related injuries and deaths can be industrial accidents, suicide attempts, assaults or homicides.⁽³⁾ A visit to the incident scene, interrogation of witnesses, examination of the alleged weapon, anatomic location of the nail gunshot wound and radiological configuration of the nails can be helpful in determining the cause and modality of injury. In a surveillance report of nail gun injuries in Washington State, USA,⁽⁴⁾ the predominant sites of injury among construction workers were the hands and fingers, with 80%–89% of injuries being nail punctures. Industrial accidents causing life-threatening injuries to the head, brain, neck, chest, heart, lung, abdomen, pelvis or femoral artery have also been reported.^(5,6) Radiographs showing a bent nail suggest accidental injuries from a nail ricochet. Straight nail injuries, especially in the extremities, usually represent straightforward industrial accidents. Straight nail injuries to individuals other than the nail gun operator can occur when a nail overpenetrates a surface, often passing through a wall and striking another worker in an adjacent room. However, the use of a nail gun in attempted suicide is extremely rare. Case reports of the characteristics of weapons and wounds in both successful and unsuccessful suicides have previously been published.^(7–11) Suicide as a cause of injury should be considered when encountering straight nail wounds to the chest, head or abdomen, as many completed suicides reported in the literature have involved wounds to these locations.^(7–11)

Improvements in imaging techniques have brought radiology and forensic medicine closer together. One of the first uses of forensic radiology was to study foreign bodies in corpses. In the 1970s, the US American College of Pathologists⁽¹²⁾ signalled the importance of radiography for inquiry into some deaths as well as the use of echo-guided techniques of anatomical sampling. Radiographic identification and location of fragmented or undamaged bullets is essential for their removal. In the last ten years,^(13,14) the increasing availability of various imaging techniques has further enabled the two disciplines to work in close collaboration, thus refining methodology and increasing experience.

Postmortem CT and/or MR imaging examinations, sometimes called Virtopsy,⁽¹⁵⁾ are useful for objective and repeatable cross-sectional examination and documentation.

A three-dimensional study not only assists in the location of metallic foreign bodies, but also offers an excellent view of the intracorporeal trajectory. The autopsy is, unquestionably, a necessary part of the judicial investigation of death; for cross-sectional study of organs, collection of tissue and fluid for histology and toxicology, as well as for other specialised investigations such as DNA profiling, metabolomics and proteomics, which constitute the right corollaries to a modern postmortem investigation. Forensic imaging raises forensic investigation to a new level, especially for purposes of documentation and archiving. It can improve the quality of autopsy, but cannot replace autopsy itself. The use of multilayer volumetric CT imaging to produce three-dimensional composite images is more easily appreciated by coroners, judges and lawyers.

In conclusion, this case report of multiple nail gun headshots, with a long survival time of ten days and a unique pattern seen on radiographic and CT images, presents a rare event. Radiology was an important adjunct in the forensic investigation of the case, as autopsy was refused by the Italian authorities. However, it cannot be considered an alternative to autopsy.

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