

Cerebral damage caused by nail gun injury

Chris Hedeman Andersen*, Maiken Kudahl Larsen

Department of Forensic Medicine, University of Aarhus, Denmark

*chris_andersen1980@hotmail.com

Abstract:

Background Accidents with nail guns are rather common, especially in the construction industry. Most injuries involve the extremities and several present with intracerebral injuries. When the patient is unconscious, it can be a big challenge to determine whether the injury is an accident, self-inflicted or a criminal act.

Case presentation A 43-year-old male worker was brought to the emergency department after his coworkers had found him on the floor in the cafeteria at work. He was admitted to the hospital due to a possible apoplexy. The CT scan revealed a nail in his skull and acute surgery was performed. The forensic examination showed lesions of intracranial surgery and minor bruises on the arms. No sign of defense injuries was found. There were no signs of malfunction of the nail gun-wielding robot. On the side of the machine, there were a handheld nail gun and the police investigated the case as a possible criminal act. They found bloodstains on the back of the machine. When awake, the man explained, that by accident, he had hit his head against a nail gun and as a result of this, the nail gun delivered a nail into his skull.

Conclusion Sometimes, the circumstances of a case are not clear and the investigators need to work with more than one theory. In criminal cases, it is important to carry out the forensic examination as soon as possible to preserve the trace evidence. In this case, the investigation of the scene of the accident disproved that a crime was committed.

Keywords:

Nail gun injury; work related accident; head injury

CASE PRESENTATION

A 43-year-old Lithuanian male worker was hospitalized at the emergency department for treatment for a possible apoplexy. He worked at a factory where he was making wooden pallets, operating a robot, which had a nail gun structure. His coworkers had found him on the floor in the cafeteria at work. The corner of his mouth was hanging and his left arm and leg were paralyzed. He was admitted to the hospital to get an acute thrombolysis. The CT scan revealed a 6.5 cm long nail in his skull, surrounded by blood and a minor displacement of the brain. Acute surgery was performed and the

nail was removed. A few days after the surgery, he was awakened from the induced coma and he regained consciousness.

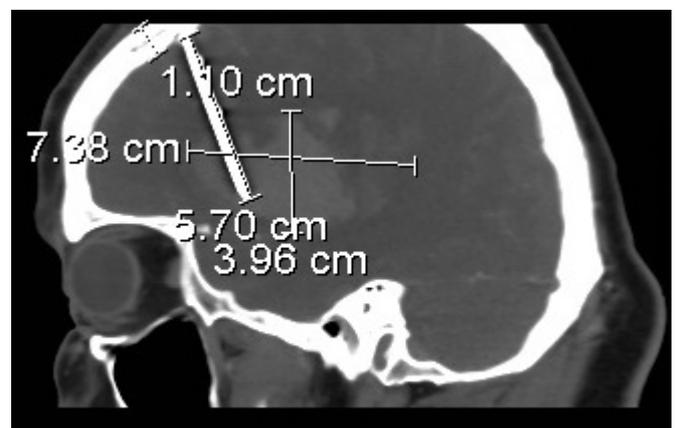
CLINICAL EXAMINATION

The prehospital medical doctor who examined the male worker found reduced responsiveness, no movement of the left extremities and swelling on the right side of the head. The doctor interprets the swelling as an older trauma, which may have caused an apoplexy. The acute surgery reveals a nail in the right side of the brain.

A forensic examination shortly after hospitalization revealed signs of intracranial surgery and minor bruises on the arms. There were no defense or other characteristic injuries on the man and the bruises were uncharacteristic.



Axial CTC scan showing the nail inside the brain, surrounded by blood



Sagittal view showing the size of the nail, bleeding and thickness of the skull

POLICE INVESTIGATION

The man worked at a factory making wooden pallets. He was operating a robot, which had two sections, one where he had to arrange the wood for the next pallet and one where the machine used a nail gun structure to assemble the pallets. Before reloading the nail gun, he had to turn off the air supply to avoid unintentionally fire of nails. Reloading was supposed to be done from the front of the machine but he thought it was easier from the rear side.

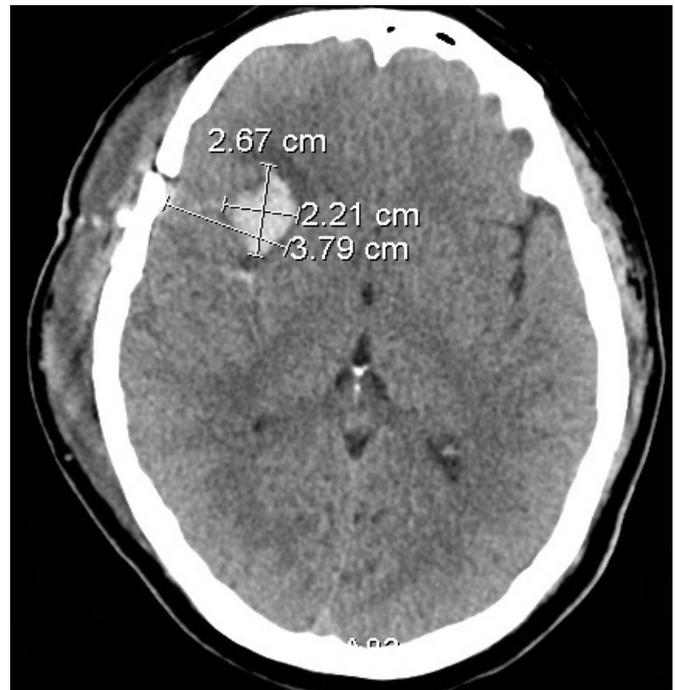
Around 3 a.m. he had to reload the nail guns but did not turn of the air supply. He accidentally hit one of them with his head and heard the gun fire. He felt pain in his head and felt a small wound but did not think he was hit by a nail. He did not call for help and did not tell anyone about the accident.

Shortly after, he went to the cafeteria to take a break with his coworkers. After the break, he went back to work for about two hours. He got nauseous and went back to the cafeteria where his coworkers found him on the floor. He told them, that the symptoms were due to his heart condition and that he only needed his medicine. They had called 112 and shortly after, an ambulance and a doctor arrived. The police made a preliminary examination of the robot and found no signs of malfunction. The machine was only able to fire nails when placing the wood properly in the machine. The boss did not think a suicide attempt was a possibility.

The day after the accident, the police found some bloodstains on the rear side of the machine which was interpreted as a sign of an accident instead of a criminal act. The Danish Working Environment Authority inspected the robot and found the safety mechanisms bypassed. Therefore, the nail guns would fire when activating the muzzle.

DISCUSSION

There have been several reports describing both accidents and suicide attempts involving nail guns [3-6]. This is apparently the first involving a robot held nail gun. Injuries to the extremities are the most common in work related accidents and several present with accidents with wounds in the skull. In the construction industry, time often equals money. Workers need to be as productive as possible and that sometimes compromises safety. In the US, nail gun accidents accounted for 15 % of all emergency department contacts from the construction industry [1]. Many accidents could be avoided with the correct safety precautions. A well-known way to bypass safety is keeping the main trigger depressed at all times. The nail gun will then fire when the muzzle hits the wood [2, 4, 6]. The Danish Working Environment Authority investigated the accident. According to their report, the nail gun safety mechanisms were bypassed. The nail gun-wielding robot would fire if there were any contact



Postoperative scan showing the residue of the bleeding and the extracranial hematoma

with the muzzle. The symptoms depends on the location of the penetrating trauma and vary from headache (4) to loss of vision (5) and hemiparesis (3). In the present case, the male worker was hemi paretic when admitted to the hospital. A few days after surgery, he presented only minor improvement of the paresis and presented a minor intellectual deficit.

CONCLUSION

Intracerebral penetrating trauma presents a wide range of symptoms from mild headache to paresis of extremities and loss of consciousness. A big challenge is to determinate if the trauma is caused by accident, self-inflicted or by another person. Such an accident also clarifies the importance of a thorough examination of a possible crime scene. The finding of bloodstains on the back of the robot, helped the police investigating the case as a work related accident instead of a criminal act. Under different circumstances, fast and thorough examination of a possible crime scene will preserve important DNA traces. To avoid similar accidents in the future, it is important to educate workers in the proper safety measurements.

REFERENCES

- [1] Non-fatal contact injuries among workers in the construction industry treated in U.S. emergency departments, 1998-2005. Lipscomb HJ, Schoenfish AL, Shishlov KS. *J Safety Res.* 2010 Jun;41(3):191-5. doi: 10.1016/j.jsr.2010.03.004. Epub 2010 May 12. PMID:20630269
- [2] How much time is safety worth? A comparison of trigger configurations on pneumatic nail guns in residential framing. Lipscomb HJ, Nolan J, Patterson D, Makrozahopoulos D, Kucera KL, Dement JM. *Public Health Rep.* 2008 Jul-Aug; 123(4):481-6. PMID:18763410
- [3] Serious penetrating craniocerebral injury caused by a nail gun. Jeon YH, Kim DM, Kim SH, Kim SW. *J Korean Neurosurg Soc.* 2014 Dec;56(6):537-9. doi: 10.3340/jkns.2014.56.6.537. Epub 2014 Dec 31. PMID:25628820
- [4] Unusual delayed presentation of a nail gun injury through the skull base. Lee AD¹, Oh YS. *Laryngoscope.* 2007 Jun;117(6):977-80. PMID:17440427
- [5] Penetrating craniocerebral injuries from nail-gun use. Selvanathan S, Goldschlager T, McMillen J, Campbell S. *J Clin Neurosci.* 2007 Jul;14(7):678-83. Epub 2007 Apr 23. PMID: 17452105
- [6] Intrakraniell læsion forårsaget af sømpistol. Homøe et al. *Ugeskr Læger* 1987; 149: 916-7