Unusual presentation of more common disease/injury

Head trauma by captive bolt gun

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An 80 year-old former cattle-breeder committed suicide with a captive bolt gun. He was transmitted unconscious to emergency department. He had a large penetrating wound in right temporal area. Lateral radiograph of skull revealed a large rounded bony defect. CT verified a large rounded entry site and bony defect at the right pterion. It disclosed a wide, zonal-like haemorrhagic wound canal bearing intraparenchymal bony fragments at its end with no associated metallic fragments. Subarachnoid haemorrhage with bilateral subepidural hematomas and significant brain oedema was demonstrated.

BACKGROUND

The captive bolt gun, also known as 'slaughterer's gun' is a device used by butchers and vets to kill large animals in a painless manner, the so called 'humane killing'. When mis-used it is mainly for suicide attempts and can cause high mortality. The few reports in the literature come almost exclusively from Middle European countries, where this technique is mostly used and there is a less strict licence policy for these tools. Captive bolt gun causes very specific type of injury with almost pathognomonic findings on CT that can easily differentiate it from other types of penetrating injury. We report a case of head trauma caused by captive bolt gun during a suicide attempt.

CASE PRESENTATION

An 80 year-old former cattle-breeder committed suicide with a captive bolt gun (figure 1). He was transmitted unconscious to the emergency department with a large penetrating wound in the right temporal area and a Glasgow Coma Scale score of 3.

Figure 1 Captive-bolt gun.

INVESTIGATIONS

CT revealed a large rounded bony defect at the right pterion (figure 2) followed by a wide, zonal-like haemorrhagic wound canal within the brain bearing intraparenchymal bony fragments at its end, with no associated metallic fragments (figure 3). Subarachnoid haemorrhage with bilateral subepidural haematomas and significant brain oedema were also demonstrated (figure 3).

TREATMENT

The patient was transferred to the operating room and a craniotomy was performed in order to remove all the intraparenchymal bony fragments and the damaged brain tissue along with the skin that was forced into the wound canal.

OUTCOME AND FOLLOW-UP

The patient succumbed to his injuries few hours later despite the meticulous efforts of the medical staff (figure 4).

DISCUSSION

Brain injury caused by captive bolt gun is rare, reported almost exclusively in central European countries where this technique is mostly used and is inflicted during suicide attempts, with a high mortality of 60–90%.^{1–3} The captive bolt gun is used in the meat industry for killing large animals in a painless manner causing a specific type of injury.³ Powder filling pushes out a bolt with concave and sharp edges out of a gun barrel (figure 1). The bolt cuts the skin along with underlying soft tissues and breaks the bone forcing them into the depth of brain parenchyma for about 7–10 cm, before it is pulled back by a spring.¹

CT provides characteristic imaging findings allowing for an accurate diagnosis of a captive-bolt injury from other types of penetrating head injury. The pattern of a captive-bolt injury findings include: a large round bony defect at the entry site, a wide haemorrhagic intraparenchymal

Figure 2 Head CT. CT topogram (A): A round, well demarcated, wide entry point is demonstrated at the region of the right pterion. Axial unenhanced head CT at bone window settings (B): A round, well-demarcated bony defect is verified at the right temporal bone consistent with the entry point.

Figure 3 Head CT at parenchymal window settings, axial images (A, B). A wide intraparenchymal haemorrhagic wound canal is seen in the right parietofrontal area with no associated metallic fragments. Bilateral subdural haematomas (A) and subarachnoid haemorrhage (B) are present. A sizeable bone fragment is present at the end of the wound canal (B). Notable brain oedema and mass effect result in a slit-like configuration of the lateral ventricles (A) and effacement of the peripheral subarachnoid space (B).

wound canal with a large bone fragment at the end of the canal, absence of any metallic fragments and absence of exit site.^{3 4}

Mortality depends on penetration of the bolt into the brain and the potential damage of vital structures.⁵ This

type of brain injury may not cause immediate or rapid death, although the overall prognosis is poor. Late death may be caused by contamination of the impacted pieces of skin in these wounds with skin bacterial flora, leading to purulent cerebritis and encephalitis.³ Therefore, apart

Figure 4 Autopsy magnified view of the temporal area showing in retrospect the well-defined defect at the entry site.

from removing all destroyed brain tissue, it is imperative to attempt a full exploration up to the end of the wound to remove any potential foreign bodies (skin, bone fragments), and consequently to decrease the fatal complications of possible infection.³

The characteristic morphological and CT findings of captive-bolt head trauma during suicide attempt help identifying the mechanism of injury and differentiate it from any other type of penetrating head trauma, guiding the physicians to take appropriate actions and treatment measures.

Learning points

- ▶ The captive bolt gun is used in the meat industry for killing large animals in a painless manner. This technique is inflicted in suicide attempts and causes a specific type of brain injury.
- ▶ Captive bolt brain injury has a high mortality (60–90%) and depends on the degree of penetration and the damage of vital structures.
- ▶ CT provides characteristic imaging findings that can differentiate a captive-bolt injury from other types of penetrating head injury.
- ▶ CT findings of a captive-bolt injury are: a large round bony defect at the entry site, a wide haemorrhagic intraparenchymal wound canal with a large bone fragment at the end of the canal, absence of any metallic fragments and absence of exit site.

Competing interests None.

Patient consent Obtained.

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Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Oikonomou A, Astrinakis M, Birbilis T, Pavlidis P, Prassopoulos P. Head trauma by captive bolt gun. *BMJ Case Reports* 2011;10.1136/bcr.09.2011.4809, date of publication

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