Are TASER guns really safe?

The use of TASER or stun guns has become increasingly popular among police agencies. They are proposed as an alternative non-lethal incapacitating device which can be used against aggressive or potentially violent individuals. It has been suggested that they produce no long-term medical problems. Such devices have been available to the police in the USA since the early 1980s, but have become more prevalent in the UK within the last few years. The police federation of the UK have stated that they want to further increase TASER availability to non-firearms officers in the field. If, as expected, the use of electrical guns becomes more common, there will no doubt be an increase in the number of victims presenting to the emergency department. Whether this is as a result of injuries secondary to being 'shot' or for removal of the electrical darts, medical practitioners will need to recognize the consequences, both short and long term, of such devices.

What does the TASER gun do?

The TASER gun is an electrical device, which shoots two to four connected darts, used to incapacitate aggressive or violent individuals. It can deliver up to 50 000 volts to the victim through the darts up to a distance of 20 feet. The current flows through the victim's skin on depression of the gun's trigger. Immobilization occurs secondary to tetanic contraction of the muscles. Once incapacitated, the darts connection to the gun is severed, although any barbs which have penetrated the skin must be removed surgically.

The TASER is the most popular example of an electromuscular incapacitation device, and is named after its inventor Thomas A Swift (Thomas A Swift's Electrical Rifle). It has been used in the USA since the 1980s by both the police and civilians, but it has only been available to British police since the early 2000s. More than 3000 TASER guns have been issued since 2003 to firearms officers in Britain and, according to Home Office figures, there were approximately 800 deployments between April 2003 and June 2007 (BBC News, 2007). The Home Secretary announced the availability of an £8 million package to increase the supply of TASER weapons in November 2008.

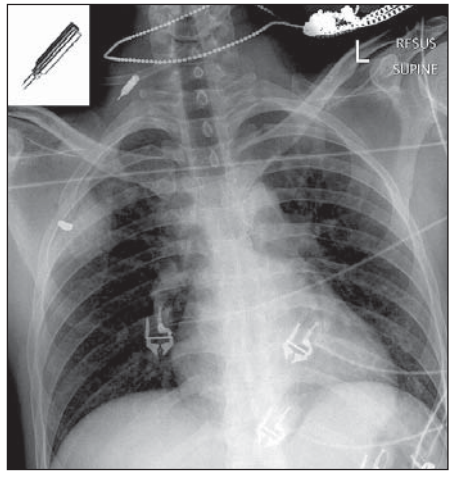
The safety of TASERs and other similar weapons has been much debated since their use has increased. Amnesty International has questioned the safety of such devices for many years, and although they do not completely oppose their use, they believe that TASERs should be handled by highly-trained firearms officers rather than broadly used throughout the police force (Amnesty International USA, 2007).

What are the risks?

The continued presence of TASER guns as an alternative to more conventional firearms may indicate that they are thought to be safer; they have been in use in the UK since 2004 and are not associated with any fatalities. However, the story in the US differs somewhat, where human rights groups have blamed such devices for around 300 deaths, either directly or indirectly. Despite vociferous reassurances, TASER guns certainly pose some risk to the victim. The most common injuries are those to the eye, musculoskeletal, cardiovascular and neuroendocrine systems. *Figure 1* shows an example of a penetrative injury to the chest.

The eye is at risk of injury like any part of the body which is exposed to the barbs from the gun. The most common injuries to the eye are related to direct trauma (Hans et al, 2009), but there have been reports of secondary electrical effects to the eye. Electric injury can damage several parts of the eye leading to mydriasis, iritis, optic neuritis, macular cysts and cataract (Miller et al, 2002). Electric cataracts can occur in up to 5% of cases of electrical injury of the head (Martinez and Nguyen, 2000), and cataract formation has been reported as a secondary result of TASER (Seth et al, 2007). Given the association of electrical injury and cataract formation, one may conclude that barb contact above the neck may well result in injuries to the victim.

Figure 1. The first reported victim of a TASER injury in the UK: case from 2003.



The most controversial medical effects of TASER are those associated with the cardiovascular system and, in particular, the physiological effects on the heart. A number of theories have been proposed which include fatal arrhythmias, development of severe acidosis and hyperkalaemia (Nanthakumar et al, 2008).

Opponents of TASER have cited the potential induction of long-term ventricular fibrillation by electric stun guns, which would ultimately lead to a cardiac arrest. This has been reproduced in some porcine models (the accuracy of this in relation to the human cardiac model is debatable), but a study of custodial deaths in which an electrical device was used determined that the initial heart rhythm recorded by paramedics was asystole or pulseless electrical activity. These patients typically responded to atropine or adrenaline, differentiating them from patients with long-term ventricular fibrillation (Swerdlow et al, 2008).

Although acidosis can cause delirium, delirium and associated psychological symptoms such as agitation, incoherence, hyperthermia and paranoia can lead to a severely acidotic state. This physiological scenario consequently can lead to catastrophe and ultimately, death. However, whether this is a direct result of TASER injury is debatable. Several in-vitro and clinical reviews have reassured the sceptics regarding its effects although clearly more research is necessary.

The effect of conducted electrical weapons on the human stress response is not fully understood yet. When compared with other methods of passification such as physical force it appears that there is no significant difference in the stress response (Dawes et al, 2009).

Conclusions

Certainly it is difficult to blame TASER use for directly causing any deaths. All the current evidence suggests that they cause no long-term effects and deaths associated with such devices may be considered coincidental. Clearly, there will always be a risk of penetrating injury depending on where the gun is aimed, but professional removal of the dart should prevent further injury.

As an alternative to more conventional firearms, TASER guns are no doubt a better option, but any invasive incapacitating device will always have the potential to do harm. As clinicians and scientists it is our responsibility to weigh up both clinical experience and research when confronted with such issues. It seems likely that doctors will see more TASER-related injuries and for the time being we must be alert to managing these patients appropriately. **BJHM**

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KEY POINTS

- The availability and usage of non-lethal electrical stun guns such as TASERs is set to rise.
- Consequently, doctors will encounter more injuries associated with TASERs.
- Although such devices are deemed 'safe', there are many critics of TASER use and reports of significant injuries associated with this use.
- There is no evidence to suggest TASER use has long-term effects on the body, but doctors must be aware of potential injuries.