Air weapon fatalities

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Abstract

Aims—To describe characteristics of a series of people accidentally and deliberately killed by air powered weapons.

Methods—Five cases of fatal airgun injury were identified by forensic pathologists and histopathologists. The circumstances surrounding the case, radiological examination, and pathological findings are described. The weapon characteristics are also reported.

Results—Three of the victims were adult men, one was a 16 year old boy, and one an eight year old child. Four of the airguns were .22 airrifles, the other a .177 airrifle. Two committed suicide, one person shooting himself in the head, the other in the chest. In both cases the guns were fired at contact range. Three of the cases were classified as accidents: in two the pellet penetrated into the head and in one the chest.

Conclusions—One person each year dies from an air powered weapon injury in the United Kingdom. In addition there is considerable morbidity from airgun injuries. Fatalities and injuries are most commonly accidents, but deliberately inflicted injuries occur. Airguns are dangerous weapons when inappropriately handled and should not be considered as toys. Children should not play with airguns unsupervised.

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Air weapons are often considered to be toys in the United Kingdom, partly because no firearms certificate is required for their possession. Air powered weapons, however, are not without their dangers, and in the United Kingdom there is approximately one fatal incident with an air powered weapon each year, as well as non-fatal injuries. More than 30 000 air weapon injuries are reported in the USA each year and in the five year period up to July 1994 there were 33 air weapon related deaths in USA.1

Air weapons in the United Kingdom typically discharge a .177 in (4.5 mm) or .22 in (5.6 mm) calibre pellet, but larger pellets up to 0.30 in (7.62 mm) may be encountered.

We report five deaths caused by air powered weapons seen both by forensic pathologists involved in a suspicious death service and histopathologists who conduct a routine coroner’s necropsy practice.

Case 1

A 22 year old man was found dead in his flat, lying face down on the floor. A .22 Webley Vulcan air rifle was found at his feet. Necropsy examination revealed the presence of an entry wound in the right temple, with a 0.3 cm diameter hole and a surrounding rim of abrasion 0.3 cm, with no powder staining or...
burning (fig 1). On the outer aspect of the right ear was a collection of vertical, transverse, and horizontal curved abrasions, the lowest of which was 4.5 cm below the entrance wound. These abrasions corresponded to the foresight guard (figs 2 and 3).

A wound tract was identified, passing through the right squamous temporal bone, producing a 0.5 cm circular defect without any bevelling. The wound tract then passed through the lateral aspect of the right temporal lobe, crossing into the left cerebral hemisphere, exiting through the lateral aspect of the left temporal lobe, then re-entering the brain for 1 cm, where a damaged .22 pellet was recovered (figs 4 and 5).

The blood ethanol at necropsy was 164 mg/100 ml. Circumstantial evidence combined with the scene and the necropsy examination findings indicated that this was a case of suicide.

Case 2
A 23 year old man was playing with an unloaded .177 air pistol, which he pointed at his wife, and pretended to fire. In response she picked up a .177 Fienverkbau air rifle that was in the house. Normally the air rifle was stored empty, but when she cocked and fired the gun, her husband put his hand to his eye and exclaimed that the gun had been loaded. Blood came from his eye and he became unconscious and started fitting. He was taken to hospital. Computed tomography showed a right frontal lobe haematoma. Three pellet fragments were in the orbit and one was in the base of the brain (fig 6). Neurosurgery was performed at which a large haematoma in the right frontal lobe and damage to the anterior communicating artery...
were found. Bleeding was controlled and part of the right frontal lobe was resected, but he did not improve and died four days later.

At necropsy, a wound tract was identified extending from the medial side of the right orbit, the pellet having penetrated the inner aspect of the right upper eye lid, where there was a 0.5 cm diameter puncture wound. The pellet had entered the cranial cavity through the right anterior cranial fossa adjacent to the cribriform plate. The pellet then entered the right frontal lobe, crossing into the left frontal lobe where the main part of the pellet was recovered.

Case 3
A 16 year old male was playing with friends, who were firing a .22 air rifle at a book. The book fell over and was replaced by the victim. As he stood up the air rifle was discharged and he said that he had been hit. He then collapsed and was taken to hospital. A wound was identified in the right temple and computed tomography showed extensive subarachnoid haemorrhage and a pellet lodged near the apex of the left orbit. He did not regain consciousness and was declared brain dead the next day. At firing, the distance between the air rifle and the victim was more than two metres. At necropsy, an entrance wound was identified in the right temporal region, 0.3 cm in diameter, with a 0.3 cm rim of abrasion posteriorly. There was a 0.8 cm × 0.6 cm defect in the underlying skull with internal beveling (fig 7). The pellet had entered the brain in the right temporal lobe, crossed the midline and tracked across into the left frontal lobe, where the pellet was recovered. The pellet was a .22 waisted air pellet.

The gun was a Weihrauch .22 inch air rifle. It had been modified so that the safety catch could become disengaged while the gun was being cocked. The trigger pressure had been affected and only 1½ lb (0.68 kg) was required for firing. The air rifle, however, did not discharge pellets above 12 ft lb and was not subject to the Firearms (Dangerous Air Weapons) Rules 1969 despite its modifications.

Case 4
A 10 year old boy was playing with friends in his house. Several adults and children were present in the room. A loaded air rifle was also present in the room and was picked up. It was discharged and an eight year old girl, standing a few feet away from the boy, was hit in the chest. She cried out in pain, walked a few paces and collapsed. She was taken to hospital but resuscitation was unsuccessful. At necropsy, a 0.6 cm entrance wound was present on the left side of the chest, lateral to the sternum. The pellet had passed through the third intercostal space, through the pericardium, and then into the left ventricle, crossing the heart and exiting into the right chest cavity where it was recovered. The pellet was a .22 inch waisted lead pellet. The gun was a BSA .22 air rifle. The gun was not subject to the Firearms (Dangerous Air Weapons) Rules 1969. Cocking the air rifle required a pressure of 25 lb (11.34 kg). To fire the trigger a pressure of 4 lb 12 oz (2.16 kg) was required. The rifle could only be discharged by pulling the trigger.

Case 5
A 59 year old man found dead the same evening with a .22 air rifle by his side. Circumstantial evidence pointed to an intention to commit suicide. Necropsy examination revealed a 0.6 cm hole in a thin cotton shirt he was wearing, with an underlying 0.6 cm entrance wound in the left side of the chest 6 cm medial to the nipple (fig 8). There was a ring of surrounding bruising with abrasions at the edge matching the muzzle of the air rifle. The wound track passed through the second intercostal space, 1.5 cm lateral to the sternum. The wound then involved the pericardium, where there was a 0.8 cm defect. There was a tense haemopericardium. The intrapericardial
portion of the ascending aorta had been trans-
fixed by the pellet 5 cm above the aortic valve,
with 0.6 cm diameter entrance and exit
wounds. A .22 waisted pellet was lodged
between the aorta and the right main bronchus.
The gun was a .22 air rifle with a trigger pres-
sure of 2 lb (0.91 kg). Test firings showed it to be
within the legal limits for muzzle velocity.

Discussion
Much has been published on the effects of air-
gun pellets penetrating sensitive organs, par-
ticularly the eyes1 3–16 but fewer fatal cases have
been reported.2 17–32
In the United Kingdom, to be lawful an air
weapon should propel a pellet with an energy of
less than 12 ft lb (16.3 J). In seven fatal cases
quoted by Warlow, all had energy values below
the legal limits, and three of the victims were
adults.2 In comparison, .22 rimfire cartridges,
which are a relatively low velocity powder
charged cartridge but of the same calibre as
many air powered weapons, have much higher
energy values (27 to 111 ft lb) with velocities
between 650 ft/s (198.2 m/s) and 1710 ft/s
(521.2 m/s).

On test firing, one type of American air
powered weapon, the Sheridan air rifle, was
found to have a range of approximately 340
yards (310 metres). This weapon is designed to
fire a .20 Sheridan pellet. In carrying out test
firing on sections of beef rib with average
thickness of 3–4 mm, the pellets discharged
from this weapon did not penetrate.33 Most
pellets that are fired in the United Kingdom are
the diabolo waisted type, although pellets of
similar design to the Sheridan .20 pellet may be
encountered, such as the “rabbit magnum” for
.22 calibre weapons. This ammunition is
heavier than waisted pellets, being on average
just under 2 g (average 1.96 g). Pellets with a
plastic coat and aluminium core are also
encountered (fig 9).

The vast majority of fatal cases reported have
been with weapons that would be legal in the
United Kingdom. However, guns can be modi-
fied, increasing the velocity of the pellet. In the
case of Buchanan,3 the regular oiling of the
barrel was felt to have produced the effect of
“dieseling,” where the addition of oil or diesel
fuel is used so that it spontaneously ignites and
increases muzzle velocity. We have also en-
countered a fatal case where an air rifle was
modified and used with home made powder
ammunition, turning the gun into a home
made firearm, or so called “zip” gun.

The majority of fatal incidents reported have
involved children under the age of 16, with
boys outnumbering girls.2 17–32 The head is the
most common part of the body
penetrated.2 17–20 22–27 29 30 32 The entrance site
may be through the eye, the temple, or the
forehead, with the pellet then penetrating the
brain. Pellets penetrating the chest have killed
by penetrating the heart.2 21 23 31 In one case the
pellet penetrated the aorta, the child dying after
five days of monitoring. At necropsy the pellet
was found to have transfixed the intrapericar-
dial aorta.3 In adults the thicker skull makes
the temple and the eye the only sites that can be
penetrated by an airgun pellet fired from a nor-
mal gun. The abdomen may also be
penetrated.3

In the investigation of a possible airgun
death, the presence of the pellet may have been
identified radiologically. Computed tomogra-
phy has often been performed, as in two cases
in this series, and the pellet or its fragments can
be located. Airgun pellets do not exit the body,
so should always be identifiable whole, or in
fragments. These can be examined ballistically
like other bullets, and should be retained.2
With a .22 weapon, the entrance wound will
characteristically be approximately 0.5 cm in
diameter. There may be a small rim of
abrasion, but powder burning will not be
present, as it would be in a rimfire .22 rifled
weapon fired at close range. No skin splitting
was seen in these cases, as is seen in firearms,
particularly in contact head wounds where dis-
charged muzzle gases tear the skin. If the
weapon has been placed against the skin an
impression of the muzzle of the gun may be
left, as in two cases in this series. The muzzle
impression may vary but if the gun is available
it should be compared with the wound appear-
ance. If there are any suspicious circumstances
the death should be investigated by a forensic
pathologist.

The airgun should be examined by a
ballisticsexpert to determine its muzzle energy
and the trigger pressure. The trigger pressure
may give an indication of the likelihood of an
accidental discharge. Most air rifles have
trigger pulls of between 3 and 7 lb (1.4 to 3.2
kg, although in more expensive target guns which have adjustable pulls it can be less.2

Non-fatal injuries following airgun pellet penetration include significant brain damage, leaving permanent impairment. Those involving damage to eyes may result in blindness. In a study from Canada, 60% of all eye enucleations were due to trauma, with 25% of all enucleations for trauma being the result of airgun pellet injury.13 In one case complete blindness followed the development of sympathetic ophthalmitis in the other eye.14 Penetration into the chest or abdomen may require surgical intervention. Airgun pellets, like other projectiles, may undergo embolisation.12–14 Retention of the airgun pellet may be associated with long term problems, as in the fatal case of cerebral abscess reported by Shaw and Galbraith, the abscess developing around a pellet and causing death 19 months later when it ruptured.22 A retained airgun pellet may raise concerns about lead poisoning. Of 11 cases of retained orbital pellets described by Jacobs and Morgan, none had a raised serum lead concentration and it seems unlikely there is a significant risk of lead poisoning from a retained airgun pellet.11 Children are the most frequent victims of airgun injuries and fatalities, and boys far outnumber girls in all the reported fatal and non-fatal cases. Lack of appropriate supervision is a common feature, as the assailant is most often another child.

Of the five cases presented here, two were suicides and the other three accidents. Accidents far outweigh other reasons for injury and death. However, deliberately inflicted injury does occur, as evidenced by the case of Green and Good15 and one of the cases reported by DiMaio,26 where the deaths were considered homicides. Airguns as a weapon of suicide are unusual, but cases have been recorded, as well as unsuccessful attempts.22 The adult skull is vulnerable to penetration by airgun pellets, and if the temple region is chosen as the entry site, suicide may be achieved. In the case of Jacob and colleagues,29 the temple was the site of entry, as was one of the cases of suicide in this series. The chest is also a potential site for suicide as illustrated by our last case. In the self inflicted injuries in our series, a muzzle impression was left by the weapon, indicating a contact wound. In the suicide reported by Cohle et al, three pellets were fired with one penetrating into the occipital lobe.30 The victim also shot himself with a L2 bore shotgun in the chest, presumably because the airgun woudns did not produce the desired effect.

Air powered weapons are readily available in the United Kingdom, being purchasable without a licence. An estimated four million weapons are present in households in the United Kingdom.31 The damage that air weapons cause is frequently underestimated and they should not be thought of as toys. Children should not be allowed access to guns without full supervision by responsible adults.

2 Wadlow TA. Firearms, the law and forensic ballistics. London: Taylor and Francis, 1996.