CASE REPORT

Laparoscopic retrieval of an intra-abdominal air gun pellet

Zoe Oliphant,¹ Edward Tudor,¹ Richard Bamford,² David Mahon¹

¹Department of General Surgery, Musgrove Park Hospital, Taunton, UK
²Taunton and Somerset NHS Trust, Taunton, UK

Correspondence to
 Zoe Oliphant,
 zoe.oliphant@gmail.com

Accepted 3 April 2015

SUMMARY

A 19-year-old man presented to the emergency department following an air gun pellet injury to the abdomen. He was clinically stable and underwent laparoscopic retrieval of the pellet, which was found embedded in the small bowel mesentery. He recovered fully and was discharged after 2 days. We further discuss air gun-related injuries.

BACKGROUND

In the UK, air guns are used recreationally in shooting ranges and for hunting small birds and animals. Ownership does not require a licence, although air guns have been associated with serious injuries and fatalities.

There is only one other case reported of laparoscopic retrieval of an intra-abdominal air gun pellet.

CASE PRESENTATION

A 19-year-old man working at an activity centre presented to the emergency department with an abdominal wound following an air rifle pellet injury. He had been shot accidentally by a colleague, who was cleaning the rifle at the time, from a distance of 2 m. He presented with mild discomfort around the entry site situated in his right iliac fossa but was mobilising comfortably. Examination revealed a soft abdomen with mild superficial tenderness at the pellet entry site. The pellet was not palpable in the anterior abdominal wall. There was no evidence of an exit wound. Physiological observations were all within normal range.

INVESTIGATIONS

An anteroposterior view plain-film abdominal radiograph (figure 1) demonstrated the pellet in the right iliac fossa, with a lateral view (figure 2) showing the pellet to be 7 cm deep to the anterior abdominal wall, suggesting it had breached the peritoneum. The haemoglobin was normal (158 g/L).

TREATMENT

The abdominal wound was explored and washed under general anaesthetic. A small amount of fabric was removed but there was no evidence of the pellet lodged in the anterior abdominal wall or subcutaneous layers. Laparoscopy was initially undertaken to check the integrity of the peritoneum, and a pneumoperitoneum was created using a Hassan cut-down technique at the umbilicus with a 10 mm port. Two further 5 mm ports were placed in the suprapubic region and left iliac fossa. A small

Figure 1 Anteroposterior view abdominal radiograph showing position of the pellet.

circular defect was noted in the parietal peritoneum at the right iliac fossa, and there was a small amount of blood-stained fluid in the pelvis. The bowel was examined methodically along its length,

Figure 2 Lateral view abdominal radiograph showing position of the pellet.

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To cite: Oliphant Z, Tudor E, Bamford R, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-208552

Figure 3 Laparoscopic photograph showing pellet embedded in the small bowel mesentery.

revealing the pellet embedded in the visceral peritoneum of the small bowel mesentery 5 mm proximal to the small bowel serosa and 70 cm proximal to the terminal ileum (figure 3). The bowel was fully intact. The pellet was removed in a retrieval bag via the 10 mm port. Operative time was 45 min.

OUTCOME AND FOLLOW-UP

The patient was discharged the following day with no complications.

DISCUSSION

An air gun is defined by its use of compressed air to propel a bullet, pellet or ball.¹ In the UK, air guns are mainly used recreationally, often in activity centres as depicted here. They may be used as hunting weapons but are not considered in the same category under UK law as traditional ‘powder’ firearm weapons. Air guns may be owned in the UK without a licence, as long as the kinetic energy dissipated by the gun does not exceed 12 ft lb for air rifles and 6 ft lb for air pistols.²

Despite the legality of airguns, they still have potential to cause significant tissue damage. Their ballistic pattern of injury is poorly characterised compared with traditional firearms.³ One study⁴ investigating the ballistic profile of airgun pellets noted a difference between hunter (pointed) and bulldog (round ended) pellets. The bulldog pellet was associated with more tissue tearing and subsequently causing a higher morbidity. Depth of tissue penetration varies between solid organs; in the heart and liver, the bulldog pellet penetrated further. In the less-dense lung, the hunter pellet penetrated further. The study used gelatine as a medium for investigating the injury profile. Gelatine has been used elsewhere⁵ for profiling the ballistic pattern of injury but further work would be required to increase our understanding in this area.

Air guns in the UK cause an average of one fatality per year,⁶ and their harmful effects are documented in case reports. A number of air gun-related fatalities have occurred with injury to the head, face and neck.^{7–9} There have also been documented fatal injuries to the thorax and major vessels, including a case of suicide, in which an air rifle pellet penetrated the right ventricle.¹⁰ A 6-year-old child died in Macedonia when an air gun pellet penetrated the aorta causing cardiac tamponade.¹¹ A 10-year-old child in the USA died in a drive-by shooting, in which the pellet traversed the left lung and pulmonary vasculature.¹²

Intra-abdominal injury has also been reported in the literature and has been managed both operatively and non-operatively. One case series reports five children with enteric perforation

who all required a laparotomy.¹³ Similarly, a further case series¹⁴ reports three children with enteric perforations and a further child with a liver laceration and gall bladder perforation. These four cases all required a laparotomy with closure of the enterotomies. A literature review¹⁴ identified a total of 16 cases of air gun-related abdominal injuries in children. Fifteen of the children had plain abdominal radiograph films, and the projectile was identified as intraperitoneal in 14 of the cases; one film was inconclusive. The 15 children underwent exploratory laparotomies, including the child with inconclusive radiograph findings. In that particular case, the local wound was not explored and on exploratory laparotomy, the pellet was found to be extraperitoneal. Thirteen children had one or more bowel injuries. In contrast, an obese adult man with an uncomplicated colonic injury was managed conservatively, and the pellet unexpectedly passed per rectum 12 h after injury.¹⁵

Only one other case of laparoscopic retrieval of an air gun pellet has been previously reported.¹⁶ CT showed the pellet was sited in the retroperitoneum near the inferior vena cava, and the pellet was retrieved with a three-port laparoscopic approach. The pellet was 0.5 cm caudal to the right renal hilum and 0.5 cm from the inferior vena cava. The patient, a child, had an uneventful postoperative recovery.

Learning points

- ▶ Air gun misuse has been associated with considerable morbidity and mortality although ownership does not require a licence under UK law.
- ▶ Lateral and anteroposterior radiographs can indicate breach of the abdominal peritoneum.
- ▶ In the case of intra-abdominal injury, laparoscopic retrieval is a viable treatment option avoiding the associated morbidity of laparotomy.
- ▶ Wound exploration should be undertaken prior to laparoscopy.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- DiGuilio GA, Kulick RM, Garcia VF. Penetrating abdominal air gun injuries: pitfalls in recognition and management. *Ann Emerg Med* 1995;26:224–8.
- Home Office. The Firearms (Dangerous Air Weapons) Rules 1969, Statutory Instrument 1969; Guide on Firearms Licensing Law. 2013.
- Russell R, Clasper J, Jenner B, et al. Ballistic injury. ABC of major trauma, 4th edition. *BMJ* 2014;348:g1143.
- Wightman G, Cochrane R, Gray RA, et al. A contribution to the discussion on the safety of air weapons. *Sci Justice* 2013;53:343–9.
- Hallikeri VR, Gouda HS, Kadagoudar SA. Country-made scare gun vs. air gun—a comparative study of terminal ballistics using gelatine blocks. *Forensic Sci Int* 2012;214:148–51.
- Wightman G, Cochrane R, Gray RA, et al. A contribution to the discussion on the safety of air weapons. *Sci Justice* 2013;53:343–9.
- Bruce-Chwatt RM. Air gun wounding and current UK laws controlling air weapons. *J Forensic Leg Med* 2010;17:123–6.
- Radojevic N, Cukic D, Curovic I, et al. Fatal laryngeal oedema in an adult from an air rifle injury, and related ballistics. *Med Sci Law* 2015;55:54–7. (2014; epub ahead of print).
- O'Neill PJ, Lumpkin MF, Clapp B, et al. Significant pediatric morbidity and mortality from intracranial ballistic injuries caused by nonpowder gunshot wounds. A case series. *Pediatr Neurosurg* 2009;45:205–9.

- 10 Bakovic M, Petroveckí V, Strinovic D, *et al.* Shot through the heart—firepower and potential lethality of air weapons. *J Forensic Sci* 2014;59:1658–61. (2014; epub ahead of print)
- 11 Stankov A, Jakovski Z, Pavlovski G, *et al.* Air gun injury with deadly aftermath—case report. *Leg Med (Tokyo)* 2013;15:35–7.
- 12 Bligh-Gover WZ. One-in-a-million shot: a homicidal thoracic air rifle wound, a case report, and a review of the literature. *Am J Forensic Med Pathol* 2012;33: 98–101.
- 13 Bond SJ, Schnier GC, Miller FB. Air-powered guns: too much firepower to be a toy. *J Trauma* 1996;41:674–8.
- 14 DiGuilio GA, Kulick RM, Garcia VF. Penetrating abdominal air gun injuries: pitfalls in recognition and management. *Ann Emerg Med* 1995;26:224–8.
- 15 Oshodi TO, Bowrey D. Uncomplicated penetrating colonic injury. *J Accid Emerg Med* 1996;13:296–7.
- 16 Muranyi M, Jozsa T, Benjo M, *et al.* Laparoscopic removal of a paracaval air gun bullet in a child. *Urol Int* 2012;89:246–8.

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