



ELSEVIER



CASE REPORT

Shotgun “12/20 burst” injuries to the upper limb

Titus S. Adams*, Roderick Dunn

Department of Burns, Plastic and Maxillofacial Surgery, Salisbury NHS Foundation Trust, Salisbury District Hospital, Salisbury SP2 8BJ, United Kingdom

Received 30 September 2008; accepted 3 July 2009

KEYWORDS

Shotgun;
Upper limb;
Explosion;
Mechanism

Summary Barrel explosions (or “bursts”) can occur when different gauge cartridges are inadvertently placed into the breech of a shotgun. This article describes two cases in which injuries were sustained to the left hand and forearm as a result of the placement of 12- and 20-gauge cartridges into 12-bore shotguns. Although the incidence of catastrophic barrel failure and the injuries they cause are not known, there is concern that such cases may be increasing as the use of 20-gauge shotguns is becoming more popular.

The unusual nature of this type of injury has not been described in the medical literature. © 2009 British Association of Plastic, Reconstructive and Aesthetic Surgeons. Published by Elsevier Ltd. All rights reserved.

If a 20-gauge cartridge is inadvertently loaded into the breech of a 12-bore shotgun, the 20-gauge cartridge will slip into the chamber out of sight. If a 12-gauge cartridge is loaded behind the 20-gauge cartridge and fired, a catastrophic barrel failure may occur. The barrel may bulge or possibly explode. A barrel explosion of this sort is commonly referred to as a ‘12/20 burst’. This report describes two patients presenting with significant injuries to the left hand and forearm sustained following a 12/20 burst.

Case one

A 42-year-old man presented to the Accident & Emergency Department with a shotgun blast injury to the thumb and

thenar musculature of his left hand. As a novice, he had been participating in a corporate game-shooting event during which the left barrel of his side-by-side shotgun burst. He accidentally placed a 20-gauge cartridge into the left barrel, which subsequently failed to fire. He then placed a 12-gauge cartridge down the same barrel and the subsequent explosion caused a localised, high-energy blast amputation injury to his left thumb through the trapeziometacarpal joint, which was deemed unreconstructable. No other injuries were sustained. He required cover with a free groin flap and then later underwent pollicization of the left index finger.

Case two

A 46 year old highly experienced shotgun user had been teaching during a clay-pigeon shoot, working with a gun ‘loader’ who had mistakenly mixed his cartridges. His over-

* Corresponding author. Tel.: +44 1865 558148, fax: +44 1865 231091.

E-mail address: titus.adams@btinternet.com (T.S. Adams).

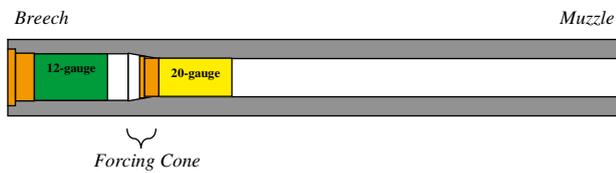


Figure 1 Schematic diagram to demonstrate the placement of 12-gauge and 20-gauge cartridges in the barrel of a shotgun.

and-under shotgun burst, causing widespread injury to the left volar forearm, wrist and base of thumb. In the history, the patient reported holding the shotgun with his left hand along the barrel itself with the elbow extended, and not clasping the foreend in his palm, which is a more typical stance. There were wood splinters from the foreend in the forearm and wrist, and loss of sensibility along the radial and ulnar borders of the left thumb. Radiographs revealed widespread 12-gauge lead shot in the wrist and thumb.

Under general anaesthesia, the splinters of wood and lead shot were removed. The course of one shot was seen lodged within the median nerve in the distal forearm.

The patient made an uneventful recovery with improving sensibility at 3 months post surgery.

Discussion

The incidence of shotgun explosions and their injuries are unknown in the UK. Incidents are occasionally reported to the Birmingham and London Proof Houses.^{1,2} The details of 12/20 bursts are often purposefully vague, as a result of embarrassment at the shooter's carelessness or ignorance. It is recognised that the purchase and use of 20-gauge shotguns are becoming more fashionable as they are lighter with less recoil, which suits the female or older shooter.³ With the increase in circulation of 20-gauge cartridges, there is evidence to suggest an increase in 12/20 shotgun bulges, bursts, and injuries relating to them.¹

To a correctly placed cartridge in the breech face of a shotgun of the same bore, the anvil in the primer must be struck absolutely correctly for it to fire. Since the diameter of a 20-gauge cartridge is smaller than that of a 12-gauge cartridge, the smaller 20-gauge cartridge will either fail to ignite on firing, or slip down into the chamber usually resting up against the 'forcing cone', a tapered section between the chamber and the narrower main barrel (Figure 1). It is the subsequent placement of a 12-gauge cartridge behind this, that on firing, can cause barrel bulging or failure in over 65% of occasions.⁴ Figure 2 shows the effects of a 12/20 burst of the left barrel of a side-by-side 12-gauge shotgun.

Shayegan and Allsop (2001) quantified peak pressures generated during simulated 12/20 bursts. They have demonstrated that these pressures occur 22 mm beyond the leading edge of the obstruction and occur at the level of the 'forcing cone'.⁵ The point of barrel rupture coincides with the position of the distal left forearm and wrist, with further direction of the blast away towards the thumb and radial fingers. The left upper limb position would account for the differences in magnitude and distribution of injury between the two cases described here.



Figure 2 Example of 12/20 shotgun bursts of the left hand barrel of 12-bore shotguns. The injuries to the left hand and thumb would be highly significant.

This case report emphasizes that shotgun injuries can occur to any user, whether a novice or experienced shooter. 12/20 bursts can occur to both over-and-under and side-by-side shotguns. The position of the left hand, particularly the thumb on the foreend, is vulnerable. The differences in the severity of injury are multifactorial, and can be attributed to the types of barrel position, left hand positioning, which one of the two barrels explodes, the propellant load of cartridges, as well as the age and overall quality of the gun.³

In the management of these injuries, careful history taking is critical to establish both the cause and the mechanism by which they occur.

Acknowledgments

We wish to express our thanks to Dr. D.F. Allsop, Cranfield University, Royal Military College of Science and Alan Horne Ltd., for their professional opinions and expertise. We would also like to thank Mr R.J. Morris (Consultant Plastic Surgeon, Derriford Hospital, Plymouth, Devon, UK) for providing a photograph of a 12/20 burst shotgun.

Conflict of interest statement

None.

References

1. Roger Hancox, Proof Master, Birmingham proof house. Personal communication.
2. The Proof House, The worshipful company of gunmakers of the City of London.
3. Alan Horne, Personal communication.
4. Shayegan S, Woolmore N, Allsop DF. *Shotgun barrel failures caused by accidentally mixing 12 bore and 20 bore cartridges*. Cranfield University, Royal Military College of Science. Available from: www.basc.org.uk; July 2001.
5. Shayegan S, Allsop DF. *The effects of barrel obstructions on shotgun barrel failures*. Cranfield University, Royal Military College of Science. Available from: www.basc.org.uk; July 2001.