Original Article

Stray bullet: An accidental killer during riot control

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Abstract

Background: The use of force to control public uprisings, riots, unruly mobs is an important tool in any administrative setup. Law enforcement agencies often resort to aerial firing, which can be responsible for unintended injuries due to stray bullets. This study was designed to study the pattern of stray bullet injuries and to generate awareness about the hazards related to the use of live ammunition during riot control.

Methods: This study was conducted in our unit of the neurosurgery department over a period of 18 months, from June 2008 to December 2010. We enrolled all patients who had head or spine injuries caused by stray bullets from firing during riot control far away from the site of injury.

Results: We had two patients with head injury and two with spinal injury sustained because of stray bullets. One of the patients with head injury was operated and the other one was managed conservatively; the latter died on the third day of injury, while the former is surviving with some residual neurological deficit. Amongst the patients with spinal injury, neurological deficits persist till date. None of the patients were aware that they had sustained a bullet injury, and it was only after inquiry that we came to know that the police had resorted to aerial firing for controlling public agitation in nearby areas.

Conclusion: Aerial firing of live cartridges is generally considered an ‘innocuous’ method; however, in view of the potential for injury to innocent bystanders, we recommend that the use of live cartridges during aerial firing be banned.

Key Words: Bullet, injury, stray

INTRODUCTION

Unintentional bullet injuries have been reported in many case series.1-4 Our literature review shows all these series have dealt with injuries sustained during celebratory firing, cleaning of guns, playing with guns, irresponsible weapon handling etc.1-6 Ours is the first series that describes stray bullet injuries sustained during aerial firing by law enforcement agencies.

MATERIAL AND METHODS

During the period of 18 months from June 2008 to December 2010, there were many unfortunate incidents
of public uprising in Kashmir State, with loss of many human lives. We studied those patients who had sustained injuries due to aerial firing by law enforcement agencies remote from the site of injury.

**Case 1**
A 7-year-old boy was playing in a field when he suddenly fell down unconscious. He presented to our center with a Glasgow coma scale (GCS) of 3 and was evaluated for his loss of consciousness. CT scan of the head revealed that a bullet was lodged in the cerebellum. Nobody in the boy’s family could explain how he had sustained the bullet injury. Though initially missed, a small entry wound was seen in the scalp in the temporoparietal region. The patient was managed conservatively (with ventilator support) as the bullet was not causing any significant mass effect [Figure 1]. He succumbed on the third day of the injury.

**Case 2**
A young woman was working in the kitchen garden when she suddenly felt a pain in the back and became paraplegic. Her family members noted a wound in the back which was bleeding. The entry wound was in the dorsal region. On examination, the patient was in shock and had paraplegia. X-ray revealed a bullet in the pelvis [Figure 2]. She underwent urgent laparotomy; the intra-abdominal hematoma was evacuated and the bullet was retrieved. MRI of the dorsal spine done after 2 days revealed the bullet tract at C7-D2 level. The cord was intact and only the muscles and other soft tissues were involved, without any canal injury [Figure 3]. No surgical procedure was warranted. Ten months later, she continues to be paraplegic.

**Case 3**
A young male was playing cricket when he suddenly fell down, with complete paraplegia. The patient was taken to a local hospital where he was evaluated with an x-ray and CT scan, which revealed a bullet inside the canal at the L3-4 level [Figures 4 and 5]. Laminectomy was done and the bullet was retrieved [Figure 6]. The patient has not shown any improvement in power after 2 years of follow-up.

**Case 4**
A teenage boy was walking in his village when he suddenly dropped down with hemiplegia on the left side followed by unconsciousness. There was a bleeding scalp wound and cerebrospinal fluid (CSF) was leaking from the wound. On evaluation he was found to have a bullet lodged in the right parieto-occipital region [Figure 7]. He was operated and the bullet, which was lying superficially, was removed along with evacuation of the local hematoma. The patient gradually improved, though he still has spasticity of the involved limbs and needs minimal support for his daily activities.
In all these cases, the patients were not aware of the bullet injury and it was only after enquiry that it became clear that at the time of injury, security forces had resorted to aerial firing for crowd dispersal some 1–3 km from the site of the injury.

**DISCUSSION**

Over the past few decades, the incidence of firearm injuries has risen exponentially, both in the setting of organized warfare and in the setting of civilian violence.\[^{6-10,15}\] Reports cite accidentally sustained injuries as an important cause of mortality and morbidity in firearm injuries. In the last two decades, the increase in domestic and urban violence has led to an increase in the incidence of accidental firearm injuries. Such injuries are also being noted in conflict zones, where the noncombatant population is also susceptible to accidental firearm injuries.

The various reports of unintentional firearm injuries show that such injuries can occur during:
- Celebratory gunfire
- Handling of weapons, i.e., cleaning, playing, and accidental discharge
- Game shooting

To the above mentioned categories of unintentional firearm injuries, we have added “Aerial shooting during riot and mob control” (in previous studies injuries caused by stray bullets during riot control have not been described). Such injuries are being increasingly noted in the setting of conflict zones and riot control.

Cherry *et al.*\[^{3}\] have reported in their study on firearm injuries that in the year 1998 firearm injuries accounted for 30708 deaths in the US. Out of these, 3% of the deaths were reportedly due to accidental injuries. Out of one fatality, 14–20 non-fatal accidental injuries were treated in hospitals. The age-group between 15–24 years
accounted for 37% of the cases. Such accidental injuries were commonly self-inflicted in adults and inflicted by a relative or friend in children. A number of victims believed that the weapon was not loaded at the time of the accident.

Beever et al.\textsuperscript{[12]} noted in their study that unintentional firearm injuries were common in children and young adults. In their study on firearm injuries in the pediatric age-group, 25% fatalities were due to accidental injuries. Hand guns (48%), shot guns (22%), and rifles (17%) accounted for most of the injuries. The male to female ratio of the victims in their study was 3:1. They did not find any differences in racial distribution in the study. The most common anatomical site of injury leading to death was the central nervous system in 62% of cases, the chest and the mediastinum in 20% cases, the abdomen in 10% cases, and other organ systems in 8%. In a large number of cases the guns were found to be kept unsecured in the homes.

Other than in the setting of warfare and urban violence, accidental firearm related injuries have been noted to occur during celebratory gunfire. This is a ritual commonly practiced in regions like Balkans, the Middle East, Northern India, Pakistan, Afghanistan, parts of US, and in Latin American countries like Puerto Rico. This practice has been implicated in many cases of random injuries and deaths due to stray bullets. Falling bullets after aerial shooting can cause mortality of as much as 32%, primarily due to the high incidence of head injury in these cases. Projectiles with high kinetic energy are likely to transfer enough energy to the cranium to transform bone fragments into secondary missiles. This is particularly true of tangential hits that travel through the periphery of the cranium.\textsuperscript{[15]}

In their series of accidental bullet injuries, Choi et al.\textsuperscript{[14]} noted that in case of a single fatal gunshot wound, the head was the involved area in 76% cases, the neck in 4%, and the back in 2% of the cases. The high mortality in accidental firearm injuries to the nervous system underscores the need for prompt and urgent management of such injuries. The delay in transporting such patients from local hospitals to specialized centers having expertise in managing such injuries also contributes to the high mortality, especially in developing and under-developed countries. This was true in our patients as well, as they were referred to us after a delay of 8–36 hours.

Firearm injuries to the head contribute to 35% of deaths from brain injury in persons less than 45 years of age. The primary injury results from a number of factors, including injury to soft tissue, fracture of overlying bone, and direct impact of the projectile. In firearm injuries to the spine, the order of probability of getting involved is the thoracic spine (48%–64%), the cervical spine (19%–37%), and the lumbar sacral spine (10%–29%).

Spinal firearm injuries in the civilian setting are primarily due to direct injury from the bullet, whereas military weapons create injury due to shock waves and cavitation. Brohi et al.\textsuperscript{[13]} reported a case of Brown–Sequard syndrome and CSF leak in a child with a stray bullet injury. Radiographs and a CT of the spine showed that the bullet was lying in the spinal canal, lodged under the C1-C2 lamina. Laminectomy at the C1-C2 level was done and the bullet was successfully removed at surgery. The patient improved neurologically and the CSF discharge stopped.

In a study of firearm injuries, Ojo et al.\textsuperscript{[5]} noted that 23.5% of the cases were due to accidental firearm discharge, with 6 cases being due to stray bullets. The stray bullet injuries were sustained during gun testing, crowd dispersal, and celebratory gunfire during festive celebrations. This study emphasized the need for safety measures, such as testing guns only in open fields and repairing guns only after unloading them.

Vernich et al.\textsuperscript{[7]} carried out a study on the incorporation of safety measures in guns to prevent accidental discharge. The safety measures studied were:

1. Personalization devices, which allow the gun to be operated only by a single user
2. Loaded chamber indicator, which indicates that the gun contains ammunition
3. Magazine safety, which prevents the gun from firing when the magazine is removed.

They concluded that 44% deaths in their series could have been prevented by using one of the above safety devices. Thirty-seven percent of the deaths could have been prevented with the use of personalization devices, 21% with the use of loaded chamber indicators, and 4% with the use of magazine safety devices. The study emphasizes the need for incorporation of these devices in guns to prevent accidental firearm injuries.

Accidental and stray bullet injuries may have variable presentations, depending on the type of weapon used and on the organ system(s) involved. Fatality is high in injuries involving the head region. Both primary brain injury and secondary complications may account for the high fatality. The mortality and morbidity is higher with high-muzzle-velocity bullets (as in military weapons) than with low-muzzle-velocity bullets (as in handguns).\textsuperscript{[14]}

The point we wish to highlight is that during mob control law enforcement agencies often resort to aerial firing to disperse the crowd without causing any mortality but, unfortunately, the victims may be those far away from the site. The reason is that modern police rifles are capable of firing bullets with high velocity, which may range up to 2000 m/sec.\textsuperscript{[11]} Bullets can travel a long distance from the site of firing, falling in a parabolic trajectory, and any unfortunate person can be the victim. We strongly
recommend that the use of this method of mob control be stopped and be replaced by methods that are not so deadly.

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