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CASE REPORT

Firearm Injuries-Unusual cases

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Abstract

A family of three was shot at a close distance, but surprisingly all three survived. In one of the victims, the bullet traversed a different path after hitting a bone. In another case, a toll booth employee was also shot at close range; however, the bullet missed vital organs after hitting the rib.

Keywords

Firearm Injury; Ricocheting; Atypical Features; Documentation

Cases 1-3

History- A family of three, husband 50 years, wife 45 years and son 24 years were shot at from close range by their tenant at around 10.30 pm in their house. All three were admitted to tertiary care hospital.

Case 1

Husband: 50-year male admitted with a history of injury due to a firing incident at home. On examination, comminuted fracture of right shaft of femur with a bullet in situ was observed. The entry wound on the anterior aspect of the right mid-thigh was measuring about 0.5 cm in diameter. Distal pulses were intact, swelling and tenderness was present. The movement was restricted. X-ray revealed a foreign body (bullet) in the right thigh with comminuted fracture of the right shaft of the femur. Arterial and venous Doppler was normal. On C-arm guidance bullet was visualized in anteroposterior area of mid-thigh. A small incision was taken over the injury site, and the bullet was extracted.

Case 2

The 24-year-old son, who was also shot, was admitted to the hospital. The firearm wound of entry was 0.5 cm in diameter, 4 cm medial to the right greater trochanter. The exit wound was 0.5 cm X 0.5 cm on the posterior aspect of the right thigh. Pain and tenderness were present on the medial aspect of the greater trochanter with mild oozing from the thigh. The right thigh with hip joint was normal on X-ray. Arterial and venous Doppler was normal.

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Case 3

45-year-old wife was also admitted with a gunshot wound. The entry wound in the 3rd intercostal space on the right side of the chest lateral to the midclavicular line was seen. Bleeding was present at the site of entry. There was no history of unconsciousness, but she complained of breathlessness. On auscultation, air entry was decreased on the right side. X-ray chest showed metallic foreign body overlying L-1 vertebra. X-ray abdomen revealed a radiopaque shadow (bullet) at L-1 level. MSCT abdomen showed an embedded foreign body in the left posterior abdominal wall in subcutaneous tissue. HRCT Thorax plain revealed bilateral lung contusions and collapse with minimal bilateral haemothorax and right minimal pneumothorax. Bilateral rib fractures with fracture T-12 vertebra were also seen. Thoracotomy revealed a huge clot in the lateral and posterior part of the pleural cavity, with approximately two litres of blood clot removed. No obvious penetrating lung injury was seen, but contusion was present on the lower medial part of the lung. Superior vena cava, inferior vena cava and azygous vein were intact. Removal of the bullet was done on the ninth day of admission through an incision made 6 cm from the spine in the paraspinal region of the left side.

Case 4

A toll booth employee was shot at from a close range after an altercation with an unknown person overpayment of toll charges. The patient complained of chest pain & breathlessness. Firearm wound of entry was seen on the left side of the chest, measuring about 2x2 cms, on the superomedial aspect of the left nipple. The bullet was palpated in the subcutaneous plane below the left infra-scapular region. No other injury was visible on the body. X-ray revealed a metallic foreign object in left thorax at the level of 5th rib along with left-sided haziness, consistent with pleural fluid. CT scan showed left hemopneumothorax with associated contusion/ collapse involving all segments of the left lower lobe. A foreign body with metallic density was noted in the posterolateral chest wall

in a subcutaneous plane at the D6-D7 vertebral level. Shrapnel was noted in the anterior basal segment of the left lower lobe with surrounding ground-glass haziness. Another shrapnel was noted in the muscle plane of the left lateral chest wall just inferior to the angle of the scapula. A mildly displaced fracture of the anterior end of the left 5th rib was seen. On ultrasonography examination a bullet was observed in the soft tissue in relation to the tip of the scapula (left infra-scapular region)

Figure 1: Case 2A -Entry wound

Figure 2: Case 2B- Exit wound

Figure 3: Case 3A- Entry wound

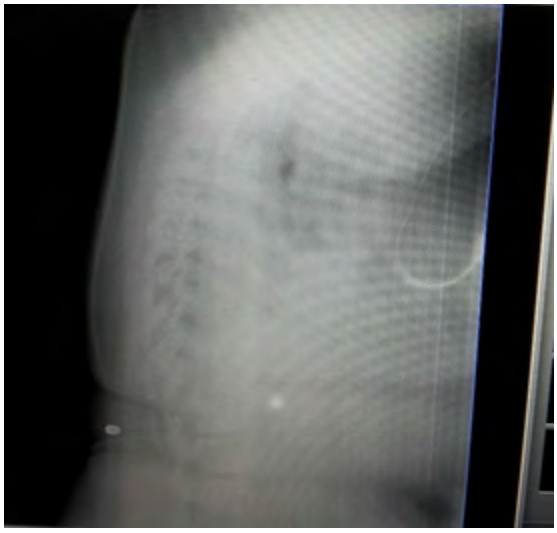

Figure 4: Case 3B- Radiograph- Bullet visualized near L1 vertebra

Figure 5: Case 3C- CT scan showing bullet

Figure 6: Case 4A- Entry wound

Figure 7: Case 4B- Bullet in infrascapular region

Discussion

Firearm injuries are nowadays common due to multiple reasons like easy availability, local manufacturing, smuggling of weapons etc. The use of firearms as weapons of assault outside conflict or police settings continues to increase.[1] Although firing was from close range, all people survived without any fatal injury in the cases discussed here. In cases 1 and 2, the two males of the family, the injury was to the lower limb. In the father's case (case-1), there was a comminuted fracture of the right shaft of the femur with a bullet in situ. The bullet was removed and handed over to the police. In the son's case (case-2), the bullet went through and through without any injury to the bone. There was no injury to major vessels, as confirmed by Doppler.

In the case of the wife (case-3) injury was on the right side of the chest in the 3rd intercostal space. The bullet was removed from the left paraspinal region 6 cm lateral to the spine. There was a fracture of the T12 vertebra. Although firearm injury was on the right chest lateral to the midclavicular line, there was no penetrating injury to the lung. Fracture of the rib indicates that the bullet hit the rib resulting in a change in direction and then possibly going along the curvature of the lung, hitting the T12 vertebra and getting lodged in the subcutaneous tissue of the paraspinal region on the left side. There was only contusion of the lung with no evidence of penetrating injury. This indicates that the bullet had ricocheted after hitting the rib.

In case-4, a 26-year-old male was admitted with firearm injury to the chest; the entry wound was on the superomedial aspect of the left nipple. There was a left hemopneumothorax with injury to the left lower lobe of the lung. There was a slightly displaced fracture of the left 5th rib. Shrapnel was noted in anterior basal segments of the left lung. The bullet was lodged subcutaneously at the T6-T7 level. In this case also, the man was shot at from a close range (occupant of the vehicle). Though the injury was over the left side of the chest, no major vessel, heart or lung was involved. After hitting the rib, the bullet changed direction(ricocheting) and got lodged below the infrascapular region on the left side near the T6-T7 vertebra.

The injuries found in a patient or at autopsy depend mainly on the bullet-tissue interaction and, therefore, on the particular combination of crush/punch/tear and stretch/splash effects.[2] Ricocheting of a bullet is a well-known phenomenon. A ricochet bullet may take a devious and circuitous course inside the body and ultimately be found in unexpected situations.[3] Deflection of the bullet on encountering slight obstacles has been ascribed partly to the obliquity with which it strikes and partly to the rotary motion in its axis.[4]

In two current cases under discussion, the bullet hit the ribs and then changed its course. The bullet striking the rib at an angle may sometimes travel under the musculature of the chest following the curvature of the chest. It may exit on the opposite side without entering the pleural cavity.[4] If the bullet strikes a solid object, either a bone or even a firm organ, it may be diverted within the body to exit well off the original trajectory.[5] A bullet may strike the body surface at a shallow angle, enter and then re-emerge some distance away, having travelled superficially under the skin.[5]

Firearm damage to internal organs may be of any nature but broadly falls into two categories-a. Contusion and laceration from low-velocity impact. b. High-velocity missiles producing disproportionate damage relative to their diameter because of cavitation effects.[5] In the case of the woman (case-3) thoracotomy revealed, no obvious penetrating injury of the lung but contusion on the lower medial part of the lung. Clinically there was pneumothorax and haemothorax. In the case of the 26-year male (Case-4), thoracotomy was not done. CT showed left hemopneumothorax with contusion/ collapse involving the left lower lobe segments. Lungs usually show minimum disruption of the passage of bullet due to the presence of elastic fibres.[3] The internal effects of bullet depend upon their kinetic energy. Low velocity, low energy missiles such as shotgun pellets and some revolver bullets cause simple mechanical disruption of the tissues in their path.[1] In both cases (3 & 4), the bullet was retrieved from T12-L1 and the T6-T7 region. Many bullets are retained within the body because they do not possess

enough energy to complete the passage through it, or the energy is dissipated on contact with other structures (e.g., bone). Wound severity is related to the bullet construction and its trajectory and the properties of the body tissues traversed.[1]

For both solid surfaces and water there is a critical angle of impact(incidence) below which a bullet striking the surface will ricochet rather than penetrate. The critical angle is determined by the nature of the surface, the construction of the bullet and the velocity of the bullet. Thus round-nosed bullets are more likely to ricochet than flat-nosed, full metal-jacketed than lead and low velocity more than high velocity. Bullets ricocheting off solid surfaces usually ricochet off at smaller angles than the impact.[6] Mechanism of projectile wound production depends on many factors like shape, size, the velocity of the missile, character of motion in the flight, the density of the tissues, hydrostatic forces, rate of energy transmission from the missile to the tissue.[4]

A radiological examination is an important tool for diagnosing and investigating firearm cases. The usefulness of x-ray examination of gunshot victim is undeniable. X-ray is important for locating missiles/pellets, fragments or jackets, determining the track of the wound, defects in bones in the areas not easily approachable on direct examination.[4] In all cases, not only x-ray examination but CT, USG and Doppler were also done. CT & x-ray both helped in locating the bullet and its retrieval. In fact, in case-4, the operation could be avoided, and the bullet was retrieved by taking a subcutaneous incision. Another important aspect of firearm cases is proper documentation and collection of evidentiary material. In the cases discussed here, Forensic Medicine & Toxicology department and the General Surgery department worked together for accurate documentation of injuries, photographs and collection of necessary evidence.

Conclusion

Firearm injury is not a rarity nowadays; Forensic Medicine faculty should be able to handle clinical medico-legal work. In the family (husband, son and wife, i.e., case-1, 2, 3), all three were shot at but survived. The wife had a chest injury, but because of the bullet hitting the rib and resultant ricocheting, major organs/vessels were spared. In the 4th case, the injury was on the left side of the chest, but again, there was no injury to the heart/great vessels because of the intervening rib. Thus, although firing was from close range (less than 1 meter), all the victims survived and two because of the ricochet effect. In the present cases, the authors could not examine clothes as police took them immediately for an examination. In the case of the family, there was a dispute with the tenant, who shot them in their house from close range. In the 4th case, the person was working at a toll booth, and there was an altercation overpayment of toll, so one of the occupants fired at the worker from close range. It is rare to see victim/s survive when fired from close range.

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