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## Case Report

### **Carelessness leading to Impalement injury to orbit – an avoidable consequence for motorcyclists.**

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Road Safety.

#### Abstract

A Road traffic incident (RTI) is an accident which is defined “as any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road”. It is the leading cause of mortality which happens due to the carelessness of the people. There are multiple types and pattern of injuries observed in such incidents. However, the impalement injuries also play a major role in causing devastating and deadly injuries. Here we report a case of one such deadly incident involving an element of impalement. The novelty of this case is to create awareness scientifically among the public to follow the safety measures while driving. In addition to this, the injuries observed is compared with various other literature published and the mechanism by which they had been produced.

#### 1. Introduction

A Road traffic incident (RTI) is an accident which is defined “as any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road”.<sup>1</sup> It is heading the list of leading causes of the global disease burden. RTI, not only affect the people physically but also cause huge economic loss to victims and their belongings indirectly affecting the country’s productivity as a whole. This cannot be eliminated but can be prevented by following the safety measures like wearing helmets, wearing seatbelts, adhering to speed limits and avoid

drunken driving etc. Multiple injuries can be observed in a RTI which are specific to the mechanism of occurrence of respective RTI. The impalement injuries are one such type which occur in RTI however, they are commonly observed in the fall from height cases.

The impalement injuries in the transorbital intracranial region are quite uncommon among the motorcyclist. This is due to strict implementation of Motor Vehicle Act 1988 which was recently amended in the year 2019. Accordingly, section 129 of the act mandates compulsory wearing of the

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helmet for every person above four years of age who is driving or riding or being carried on a motorcycle of any class or description shall, while in a public place. Failure to follow this is punishable with a fine of one thousand rupees and he shall be disqualified for holding license for a period of three months.<sup>2</sup> The literature review concludes that impalement injuries in the transorbital intracranial region is an uncommon variant of head injury which occur mostly in accidental manner. The victims are usually children and old age people; however, case reports are also reported in rest of the age groups.<sup>3</sup> There are case reports with intracranial transorbital penetrating injuries into the brain parenchyma without much devastating external injuries.<sup>4</sup> Here we report a case of impalement injury to the transorbital intracranial region due to the careless attitude of driving of the deceased causing complete destruction of the orbit anatomy and corresponding brain parenchyma injury. The possible mechanism of the injury sustained was recreated at autopsy.

## 2. Case History:

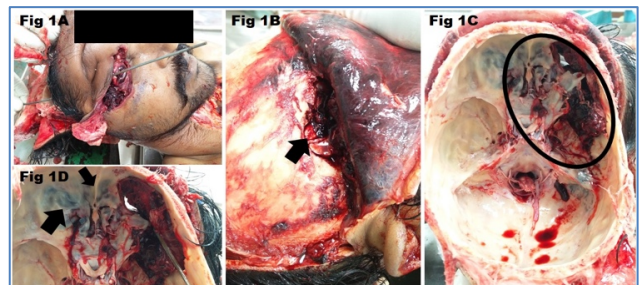
The deceased was a male in third decade of life. He was brought dead to our tertiary health centre after sustaining a fall from two-wheeler hitting upon a barricade placed on the road to control the speed of the vehicles at a highway. He was taken immediately to a nearby government hospital from where he was referred to our tertiary health centre in an unconscious state, where he was declared dead on arrival. He survived for a period of one and half hours approximately following the incident as per police investigation. Autopsy was requested by the police to ascertain the cause of death in this case.

## 3. Autopsy findings:

At autopsy, an avulsed lacerated wound with surrounding dried blood stains packed with a white gauze in the orbit was present involving the right eye and adnexa measuring 11cm x 5cm x cranial cavity deep. Periorbital ecchymosis was present involving the right eye. The brain matter was found to ooze through the lacerated wound. On removal of the blood-soaked gauze, the brain matter was seen exteriorly along with an organized clot was seen and retrieved (Fig 1A). On reflecting the scalp, a diffuse scalp hematoma with the peri-cranial hemorrhage was found underlying the laceration of right eye. A comminuted fracture of right supraorbital region and glabella was seen exteriorly (Fig 1B). The base of skull showed a bony defect of size 2cm x 1cm over the

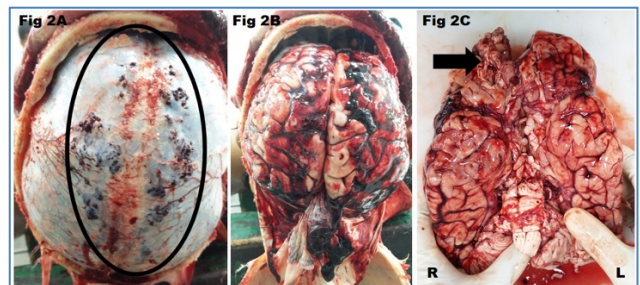
lateral part of right roof of the orbit through which the brain matter herniated through the orbit exteriorly causing a perforating injury. There were comminuted fractures involving medial end of right roof of orbit with the fractured segments pointing towards the brain causing the brain laceration; along with comminuted fractures of ethmoidal plate, crista galli (Fig 1C). Hemorrhages into the frontal and ethmoidal sinuses seen through the base of skull (Fig 1D).

**Figure 1A:** The herniation of Brain parenchyma through the right orbit. The wound track is showed by a probe. **Figure 1B:** Comminuted fracture involving the supraorbital region. **Figure 1C:** Comminuted fracture of right orbital roof. **Figure 1D:** Blood collection in the frontal and ethmoidal sinus.



**Figure 2A:** Extradural hemorrhages over the mid frontoparietal region.

**Figure 2B:** Diffuse subdural hemorrhage, subarachnoid hemorrhage was noted over bilateral fronto-temporo-parietal region. **Figure 2C:** Contused Laceration over the base and medial aspect of right frontal lobe.

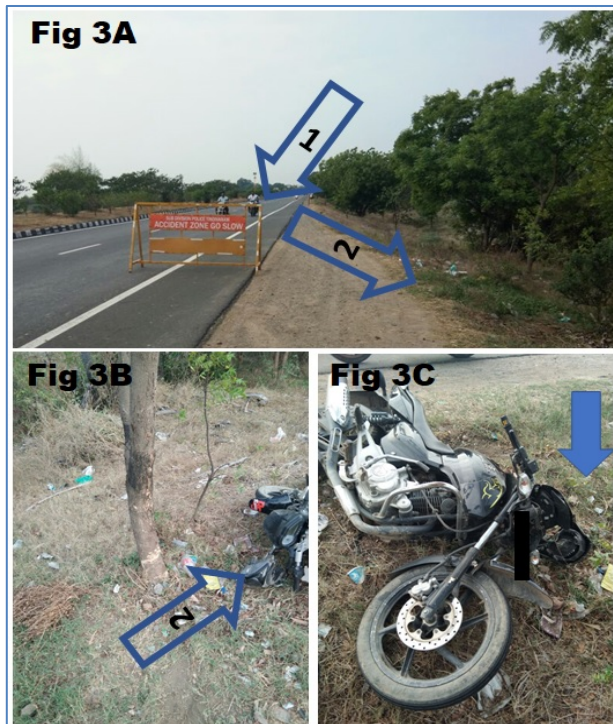


The dura had multiple small extradural hemorrhages over the mid fronto-parietal region (Fig 2A). A diffuse subdural hemorrhage, subarachnoid hemorrhage was noted over bilateral fronto-temporo-parietal region (Fig 2B). A laceration along with contusion of the base and medial aspect of right frontal lobe was noted with loss of brain parenchyma, measuring size 4cm x 2cm x parenchymal deep was present (Fig 2C). Bleeding was noted in the lateral ventricles. There are multiple reddish graze abrasions and reddish contusions noted over the left side of face, left shoulder, left arm and left knee joint. This ruled out the possibility of homicidal element. The cause of death was given as Hemorrhagic shock due to injuries sustained to the right eye and brain consequent upon a blunt force/surface impact possible in the alleged circumstance.

#### 4. Scene reconstruction:

Based on the injuries found on the body, post-mortem findings, crime scene evaluation it was concluded that the deceased hit on the left side of barricade which was placed on the left side of the road. The deceased could have lost balance as a result of which the possibility of a direct impact of barricade on the right eye and the supraorbital region of the face exist. The bike had its damage on the left side coinciding with the majority of the graze abrasions which were seen on the left side of the body of the deceased made us to conclude that the deceased had fallen on his left side. Thus, the injuries interpreted at post-mortem were correlated with the crime scene images submitted by the investigating officer (**Fig 3A, B&C**).

**Figure 3A:** 1: The direction in which the deceased came in his motorcycle. 2: The impact was on his right orbit over the barricade placed on the road. **Figure 3B:** The deceased was found at the place adjacent to the road. **Figure 3C:** The headlight of the deceased is completely broken as a result of fall on the ground.



#### 5. Discussion:

Impalement injury is a penetrating injury caused by a rod-like object that produces a canal-shaped wound track when it pierces the body along its longitudinal axis. The causative agent of such injuries could be both sharp and blunt. The manner in such instances is mostly accidental. The common scenarios of such an occurrence are during road traffic accidents, fall from height where the protruding objects at the time the fall cause such

injuries.<sup>5</sup> The orbit is the weakest part following the petrous part of temporal bone in the skull. Hence, it is more prone part of face to sustain damage. A mild amount of force in this region can cause severe amount of damage to the victim. This could be a reason for making a separate clause for the eye while defining grievous hurt i.e., “permanent privation of sight of either eye”.<sup>6</sup>

The injuries suffered in RTI to the orbital region are more destructive than self-inflicted injuries to orbital region as the control of injury causation is in the hands of the victim for the latter. The literature review suggested that the impaling objects were mostly bicycle handle brake, pen, umbrella, scissors etc. There were no gross deformity of the face or orbit except for a small laceration.<sup>3,7, 8, 9</sup> In our case, the impaling object was a barricade placed on the road which is rarely reported. The brain parenchyma was found to herniate through the orbit at the time of presentation. The reason for the finding appreciated in our case is explained below by comparison with findings observed in the published case reports from the literature.

The velocity of the impact plays a major role in the type of injuries caused. The high velocity impact causes direct fractures to the walls of orbit.<sup>10-13</sup> The low velocity impact gets deflected by the anatomy of eye ball.<sup>14-17</sup> Thulukkanam K et al. in their study discussed that fracture of roof of orbit is rare in occurrence.<sup>18</sup> In our case, the deceased sustained fracture to the roof and lateral wall of the orbit as a result of direct high velocity impact to the orbit. This explained the periorbital ecchymosis observed in the right eye and the blood collection observed in the frontal and ethmoid sinus. The deceased was riding his two-wheeler without wearing helmet at a high speed. He lost control and sustained injuries from pointed end of barricade due to high velocity penetration. This was confirmed by the eye witness at the time of incident along with crime scene photos given by the investigating officer.

Ahmad et al reported a case of bicycle accident, in which the handle brake had reached the anterior and middle cranial fossa. Chattopadhyay et al. reported a similar finding where the impaling surface was a bicycle handle brake. The impaling surface causing such injuries were narrow and rod like and hence, they had reached the middle cranial fossa in consideration with the velocity of the penetration.<sup>19, 20</sup> Shahpurkar and Agrawal had

reported a case of accidental fall in which the impaling surface was a fencing and a spectacle side bar which was also a rod like in shape. The depth of the injury was observed till middle cranial fossa.<sup>21</sup>

In our case the impact surface is broad and hence the injuries were limited to the anterior cranial fossa causing depressed fracture of roof of orbit with underlying protrusion of brain parenchyma through the orbit with laceration and contusions.

#### 6. Recommendations and Conclusion:

This case scientifically explains the injury caused due to the carelessness of the deceased. The case is published with a social interest to create an awareness about the usefulness of wearing helmet while driving the motor vehicles. Even though the government works hard for safety of the people by implementing the motor vehicle act strictly, people are least bothered about their own safety. The points for an autopsy surgeon from this case is that the impalement injuries are not only caused by the sharp objects but the blunt objects are equally qualified to cause such injuries.

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