A POSTMORTEM STUDY OF BLUNT CARDIAC INJURIES

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ABSTRACT

35 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of Regional Institute of Medical Sciences, Imphal have been studied to find out types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc. It was observed that 48.57% of the cases with blunt cardiac trauma had associated sternal and rib fractures. Maximum number (60%) of the cardiac rupture was seen in run-over cases. 40% of the cases had injury to the right ventricle. All the injuries were located on the anterior surface of the heart. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was observed. In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries as has been highlighted in the present study will be of great help in a timely intervention.

Key Words: Vehicular accident, rib fracture, sternal fracture, blunt cardiac trauma etc.

INTRODUCTION

Blunt thoracic trauma may be produced by low velocity as well as high velocity blunt force injuries. The low velocity blunt injuries such as blow with a club or fist may lead to soft tissue contusions with or without any internal injuries, whereas high velocity blunt force as seen in vehicular accidents may produce a wide variety of external as well as internal injuries. Following blunt trauma, the chest wall may show superficial injuries to its soft tissues such as abrasions, bruises, lacerations, hematoma, etc.

Depending on the mechanism and severity of the trauma, the cardiac injury ranges from a mild contusion to rupture of the cardiac wall [1]. Though rupture of the heart is rare, it is the commonest form of deadly cardiac injury from blunt trauma [2,3]. Interestingly, the cardiac ruptures are usually discovered at autopsy. According to Getz B.S., et al. [4], the mechanisms of cardiac injury in blunt trauma may be summarized as (1) direct blow to the anterior chest (most common cause of ventricular rupture); (2) indirect injury that causes a sudden increase in preload, resulting in atrial rupture; (3) compression of the heart between the sternum and vertebral bodies; (4) acceleration/deceleration of the heart and great vessels; (5) blast injury and (6) penetrating injury of a cardiac chamber by a fractured rib or the sternum. The heart may be ruptured by compression or from a blow or a fall, usually on its right side and towards its base [5]. Contusions or lacerations of the heart may also be produced by blows from a blunt weapon or by compression of the chest even without fracturing any bone of the thorax or showing marks of external injury [6]. Therefore, there is always a possibility of fatal cardiac injuries to be unnoticed leading to a fatal outcome.

MATERIAL AND METHODS

35 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of the Regional Institute of Medical Sciences, Imphal have been considered for this study. The cases were studied to analyze the types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc.

RESULTS

All the victims were males within the range age of 21-40 years, and all of them were involved in vehicular accidents. Out of these 35 cases of blunt cardiac trauma, 17 cases (48.57%) had associated sternal and rib fractures. 40% of the
cases had only associated rib injuries. Only two cases (5.71%) had no associated sternal or rib fractures (Table-1).

**Table 1**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Cardiac Injuries</th>
<th>No.</th>
<th>P.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>With sternal fracture</td>
<td>2</td>
<td>5.71%</td>
</tr>
<tr>
<td>2</td>
<td>With rib fracture</td>
<td>14</td>
<td>40.00%</td>
</tr>
<tr>
<td>3</td>
<td>With both sternal and rib fractures</td>
<td>17</td>
<td>48.57%</td>
</tr>
<tr>
<td>4</td>
<td>Without sternal or rib fractures</td>
<td>2</td>
<td>5.71%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>35</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Type of Vehicular accident</th>
<th>No.</th>
<th>P.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Run-over</td>
<td>21</td>
<td>60.00</td>
</tr>
<tr>
<td>2</td>
<td>Knocked-down</td>
<td>5</td>
<td>14.29</td>
</tr>
<tr>
<td>3</td>
<td>Collisions</td>
<td>4</td>
<td>11.42</td>
</tr>
<tr>
<td>4</td>
<td>Self</td>
<td>5</td>
<td>14.29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>35</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Diagram 1.

**Showing the details of bluntheart injuries**

(Total no. of cases = 35)

(R.A = Right Atrium; R.V = Right ventricle; L.A = Left Atrium; L.V= Left Ventricle; B.V= Both Ventricles and B.A = Both Atria)

Diagram-1 shows that the right ventricle of the heart was involved in 14 (40%) cases. It was lacerated in 13 (92.86%) of these 14 cases, while the remaining one (7.14%) had contusion. The right atrium was lacerated in four (11.42%) cases. Both atria were lacerated in four (11.42%) cases, while both the ventricles were lacerated in two (5.71%) cases. The right ventricle and right atrium combined were lacerated in six (17.14%) cases. Extensive lacerations of the heart involving both the ventricles and both the atria were seen in three (8.57%) of the cases. The left ventricle and the left atrium and left atrium combined were contused in one (2.86%) case each. The lacerations in all these cases were located on the anterior surface of the heart. Contusion of the heart was also located on the anterior surface. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was seen and it was observed in a motorcyclist knocked down by a truck.

**DISCUSSION**

Waele J.J.D. et al.[7] observed that blunt cardiac injury was common after sternal trauma and the severity of the fracture was an indicator of possible myo or pericardial damage. This holds true in the present study as cardiac injuries were associated with sternal and rib fractures in 48.57% of the cases. In the run-over cases, the mechanism of injury could be attributed to compression of the heart between the sternum and vertebral bodies or penetration by a fractured rib or sternum. A direct blow to the anterior chest or penetration by a fractured rib or sternum could be the cause in the remaining cases. Bright E.F., Beck C.S.,[2] and Parmley L.F. et al[3]. observed that while all the four chambers of the heart are susceptible to rupture in non-penetrating trauma, ventricular ruptures are preponderant. This is in concurrence with the present study. The findings of the present study were also comparable to the findings observed by Brathwaite C.E. et al [8] except for the fact that they observed a higher right atrial involvement (40.6%). The common sites of traumatic cardiac rupture in order of diminishing frequency are: right auricle, right ventricle, left ventricle, left auricle, ventricular septum and valves [3]. The preponderance of right ventricular injury over the left in blunt trauma can be explained by the fact that the sternocostal surface of the heart is mainly formed by the right ventricle, so the major brunt of the trauma is borne by the right ventricle ultimately leading its rupture. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was seen in the present study. The laceration of the right atrium without any
external injuries of the chest region signifies that serious cardiac injuries may be present in absence of any visible external injuries.

CONCLUSION

In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries sustained by them is often required. Patients with cardiac rupture who reach the hospital alive can often be saved by prompt diagnosis and immediate surgical treatment[9]. Interestingly, survival is more common with right-sided injuries, especially right atrial lacerations[10]. Moreover, as most of the cardiac injuries have associated rib and sternal fractures, proper monitoring of the victims with rib and sternal fractures is desired in blunt thoracic trauma cases. The presence of fatal cardiac trauma in head-on collision cases emphasizes the utility of safety belts while driving.

References

4. Getz BS, Davies E and Steinberg SM. Blunt cardiac trauma resulting in right atrial rupture, JAMA, 1986; 255:761-763.