

Analysis of Blunt Abdominal Trauma with Respect to Associated Injuries, Period of Survival And Mechanism of Death Among Autopsies Conducted in Dept. of FMT, RIMS, Ranchi.

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Abstract :

Introduction: Since the abdominal cavity contains the vital organs like liver, spleen, kidney, stomach, intestines etc, trauma to this region challenges the integrity and even the viability of the individual. Because of its size and anatomical position, it is a major site of trauma in road accidents. Even with the improvement in safety measures in vehicles and greater availability of state of art resuscitative measures, the mortality rate in crush injuries to the abdominal region has not declined.

Material and Method: Materials for the present observational study were collected from the medico legal autopsies, showing blunt abdominal injuries, carried out at the mortuary of Rajendra Institute of Medical Sciences, Ranchi, during the period from 1st December, 2014 to 30th November, 2015.

Results: Among the 296 subjects studied, Blunt abdominal injuries were most commonly associated with Thoracic (198 cases i.e., 66.89%) and head injuries (160 cases i.e., 54.05%). Majority of cases died within 2 hours of sustaining injury which were mostly accidental in nature, the cause of death being Neurogenic shock and haemorrhage.

Keywords : abdominal cavity, mortality, road accidents, trauma, vital organs.

I. Introduction

Since ages it has been well known that the abdominal cavity and intra abdominal organs are quite vulnerable to trauma. This is due to the fact that there is no protection of any bony cage unlike the other two cavities like cranial and thoracic cavities which is well protected by bony skull and rib cage.

Deaths occur every day, in many different settings, involving injuries to the upper abdomen and lower rib cage that produce damage to the liver, spleen and pancreas. The location and severity of the blow and the position of the victim when injured give an idea of the combination of organs involved. These are life threatening injuries. It is an axiom that the early recognition and effective management of these injuries is essential for the survival and prevention of far reaching complications.

The abdomen is the common region of the body that is injured in civilian trauma. Blunt abdominal trauma is one of the leading causes of the mortality among trauma victims [1]. Haemorrhage is the leading cause of preventable death after trauma [2].

The tri-model distribution of trauma deaths was first described in 1983 [3]. As a function of time elapsed after injury, deaths from traumatic injury are classified as generally falling into one of three categories: immediate, early, and late. Immediate deaths are those that occur <2 hours after injury, making up ~50% of the total; early deaths occur within the first few hours after injury and account for 30%; and late deaths occur days to weeks after injury and are 20% of all trauma deaths. Immediate deaths are largely due to neurologic injury (brain, brain stem, spinal cord) or laceration of the major vessels like the abdominal aorta and are classified as not preventable. Early deaths are largely due to severe blood loss from the head, respiratory system, and abdominal organs. These deaths are largely treatable and therefore possibly preventable. Finally, most late deaths are due to infection and multi organ failure. Reducing the number of injury related deaths during each period largely relies upon expedient and optimal medical care [4, 5, 6].

II. Materials And Methodology

Materials for the present cross sectional observational study were collected from the medico legal autopsies, showing blunt abdominal injuries, carried out at the mortuary of Rajendra Institute of Medical Sciences, Ranchi, during the period from 1st December, 2014 to 30th November, 2015. The total numbers of autopsy conducted were 2819 out of which 296 cases involved blunt trauma to abdomen.

2.1 Inclusion criteria:

1. All the autopsies showing blunt abdominal trauma with a known method.
2. All those cases of blunt abdominal trauma with or without any associated body injuries who were hospitalized following accident and subsequently succumbed to their injuries.

2.2 Exclusion criteria:

1. Decomposed bodies and those autopsies where the nature of sustenance of injury was not known.
2. Cases showing penetrating abdominal injury.

III. Results

In majority of cases blunt injury of abdomen was associated with injuries to other body regions viz., head, chest, limbs, etc. Plain abdominal injuries (alone) were found in 26 cases (8.78%) of the total 296 cases. Associated injuries with highest frequency of occurrence involved injuries to chest, 198 cases (66.89%) followed by injury to head, 160 cases (54.05%) [TABLE 1]

Associated Injury	No. Of Cases	%
Abd. + Head	160	54.05
Abd. + Chest	198	66.89
Abd. + Spine	13	04.39
Abd. + Limbs	107	36.15
Abd. + Pelvis	43	14.53
Abd. + Head + Chest	47	15.88
Abd. + Chest + Limbs	20	06.76
Abd. + Head + Limbs	18	06.08
Abd. + Limbs + Pelvis	02	00.68

Table-1: Abdomen with Associated Injuries

Blunt Abdominal injury is most commonly associated with injury to Head and Chest with 47 cases (15.88%) and least commonly with those of Limbs and Pelvis (0.68%) [TABLE 1].

Period of Survival

In the 296 cases studied, it was found that 143 cases (48.32%) were either spot dead, i.e., died on the spot after sustaining injury or brought dead, i.e., died after some time interval of sustaining injury and were declared "Brought dead" on their arrival at hospital casualty or those who succumbed to their injuries after less than 2 hours of sustaining the injury [TABLE 2].

Survival Period	No. of Cases	Percentage
<2 hours	143	48.32
2-6 hours	46	15.54
6-12 hours	32	10.81
12-24 hours	31	10.47
1-3 days	14	04.73
3-7 days	07	02.36
1-2 weeks	05	01.69
>2 weeks	05	01.69
Unknown	13	04.39

Table-2: Showing Period of Survival in Cases of Blunt Abdominal Trauma

Mechanism of Death

The mechanism of death in cases of blunt abdominal trauma can be broadly classified into three categories, i.e., Neurogenic shock, haemorrhagic shock and septicaemia either occurring alone or in combination with one another.

Among the 296 cases studied the leading cause of death was found to be haemorrhagic shock involving 139 cases (46.96%) followed by combination of neurogenic shock and haemorrhagic shock with 129 cases (43.58%) [TABLE 3].

Duration	N.Shock	Haem.	Sept.	Haem.+N.Shock	Haem.+Sept.
<2 Hrs	1	23	0	117	0
2-6 Hrs	0	40	0	06	0
6-12 Hrs	1	28	0	03	0
12-24 Hrs	1	26	3	01	0
1-3 Days	0	07	7	00	0
3-7 Days	0	03	4	00	2
1-2 Weeks	0	02	2	00	1
>2 weeks	0	00	4	01	0
Unknown	0	10	1	01	1
TOTAL	3	139	21	129	4

Table-3: Showing Relation between Period of Survival and Mechanism of Death

It was observed that in victims who succumbed to their injury during the early periods of trauma i.e., within 24 hours of suffering blunt abdominal trauma, the mechanism of death was mainly neurogenic shock and haemorrhagic shock either individually or in combination whereas those who survived the initial 24 hours died mainly due to septicaemia [TABLE 3].

Nature of Death

The nature of death can be grouped under three broad categories viz., accidental, suicidal and homicidal. The table below depicts the nature of death involved in cases of blunt abdominal trauma.

Nature of death	No. of Cases	Percentage
Accidental	251	84.80
Suicidal	38	12.84
Homicidal	7	02.36
TOTAL	296	100

Table-4: Showing Nature of Death in Cases of Blunt Abdominal Trauma

Out of the 296 cases studied, Suicidal deaths comprised 12.84% of cases while homicidal cases were very few in number i.e., only 2.36% of cases. The rest 84.8% cases were accidental in nature [TABLE 4].

IV. Discussion

Associated Injuries

In the present study, majority of the victims (50.34%) had multiple intra abdominal injuries. Similar findings have also been reported by Singh Mousami et al (2012) [7], Naik V et al (2013) [8], Reddy N et al (2014) [9]. This high incidence can be explained by the following fact that Blunt injuries of abdomen as result of compression, traction or bursting forces cause widespread involvement of internal abdominal viscera. As shown in Table I, associated injury to chest was the most common (66.89%) followed by head (54.05%) and limbs (36.15%). Plain abdominal injuries involved 8.78% cases. Similar findings were observed by Goyal A et al (2014) [10] in their autopsy based study in which they reported thorax and head to be the most common associated injury. Reddy N et al (2014) [9] also had similar findings in their study. On the contrary, findings observed by Naik V et al (2013) [8] were quite different. In their study abdomen alone accounted for majority of the cases (47%) , Thorax was involved in 17% cases and head in 7% cases only.

Survival Period

In the present study, spot dead, brought dead cases and those who succumbed to their injury within 2 hours of the incident accounted for 47.64% of cases. 85.14% cases died within first 24 hours of sustaining trauma. These findings are well supported by the findings of Meera et al (2005) [11] who reported 91% deaths within the first 24 hours of sustaining blunt abdominal trauma whereas in studies done by Reddy N et al (2014) [9] and Archana et al (2005) [12] the results were quite contradictory; with more than 40% cases surviving the initial 24 hours. This emphasizes the fact that these victims need on spot emergency medical care and rapid transportation from the incident site to the hospital. S. Sevitt (1968) [13] reported spot deaths in 16% cases. K.E. Daly and P.R. Thomas (1992) [14] reported that majority of the deaths due to multiple injuries (70%) occurred before arrival at hospital. Naik V et al (2013) [8] reported that in 80% cases death occurred within two days of sustaining trauma. Similar findings were also reported by Subedi N et al (2013) [15]. It was noticed that youngsters of second and third decade, victims with associated injuries of chest had long survival period as compared to children and elderly people, and victims with associated injuries of head who had considerably

short survival period. These variations in survival period with age, and associated injuries can be of great value in the management of blunt abdominal trauma cases.

Mechanism of Death Following Blunt Abdominal Trauma

Main causes of death following blunt abdominal trauma are as follows:

(1) Haemorrhagic Shock

Intra-abdominal haemorrhagic shock was considered as the primary cause of death in 46.96% cases of which 39.53% died during the initial 24 hours of sustaining the injury. Similar findings have been reported by Gordon and Shapiro (1982) [16], D. Bergvist et al (1983) [17], O.P. Sharma (1989) [18] and E.O. Odelowo et al (1994) [19]. Majority of deaths (46.96%) in the present study due to peritoneal haemorrhage were as a result of injury to liver and spleen and is consistent with findings of O.P. Sharma (1989) [18]. M. Ndiaye et al (1995) [20] reported that haemorrhagic shock accounted for 44.82% of deaths in trauma cases. These findings are also well supported by the works of Naik V et al (2013) [8] who reported 55% deaths from haemorrhagic shock. Goyal A et al (2014) [10] reported 67% deaths from haemorrhagic shock.

(2) Haemorrhagic shock + Neurogenic shock

Haemorrhagic shock in combination with Neurogenic shock accounted for 129 cases (43.58%) of which 117 victims (39.52%) died during the initial 2 hours of sustaining injury. This high incidence can be explained by increase in traffic accidents in and around Ranchi. High incidence of head injury has also been reported by G.A. Barashkov and L.N. Gubar (1978) [21], J. Chandra et al (1979) [22], B.J. Brainard et al (1989) [23] and D.S. Talton et al (1995) [24]. M. Ndiaye et al (1995) [20] reported that brain damage accounted for 24.14% of deaths in trauma cases. Naik V et al (2013) [8] also reported a high incidence of head injury in combination with haemorrhagic shock (60%) to be the mechanism of death in cases of blunt abdominal trauma. Reddy N et al (2014) [9] reported a high incidence of head injury (47% cases) followed by visceral shock (42%) to be the cause of death in their study.

(3) Septicaemia

Septicaemia alone accounted for 21 cases (7.10%) and occurred in victims who had survived the initial 24 hours after the trauma. This is contrary to the findings observed by Naik V et al (2013) [8] who reported 40% deaths from septicaemia.

Thus the immediate cause of death was shock and haemorrhage and in those cases where death was delayed, cause of death was septicaemia.

Nature of Death

In the present study which involved 296 cases, 12.84% cases were suicidal, 2.36% cases were homicidal and the rest 84.8% cases were accidental in nature. Hence accidental cases were the most common among blunt injury abdomen. According to Modi J P (24th edition) [25] and other foreign writers, accidental cause of blunt injury of abdomen was most common, that was also found in the present study. Similar findings were also observed in the studies of Singh Mousami et al (2012) [7] who reported accidental deaths as high as 78.18%. The findings in this study is also well supported by the findings observed in the studies of Suresh B et al (2012) [26], Naik V et al (2013) [8], Goyal A et al (2014) [10] and Reddy N et al (2014) [9].

V. Conclusion

- Blunt abdominal injuries were most commonly associated with Thoracic (198 cases i.e., 66.89%) and head injuries (160 cases i.e., 54.05%).
- Isolated injury to abdomen occurred in 26 cases (8.78%) of all cases involving blunt abdominal trauma.
- Spot dead, brought dead cases and those who succumbed to their injury within 2 hours of the incident accounted for 47.64% of cases (141 cases).
- Most of the cases of blunt abdominal injuries were accidental in nature (84.8%), very few are homicidal and suicidal in nature.
- Most common cause of death was shock and haemorrhage, especially when the person died within few hours. In those cases where death was delayed, cause of death was septicaemia.

References

- [1]. King, Y., David, T., Onoja, F. and Inunduh, P. (2005) Blunt Injuries to the Abdomen in Makurdi, Benue State: Nigeria. *Nigerian Journal of Surgical Research*, 7, 173-175.
- [2]. Pfeifer R., Tarkin, L.S., Rocos, B. and Pape, H.C. (2009) Patterns of Mortality and Causes of Death in Polytrauma Patients—Has Anything Changed? *International journal of the care of the injured Injury*, 40, (9) 907-911.
- [3]. Trunkey, D.D. (1983) Trauma. Accidental and Intentional Injuries Account for More Years of Life Lost in the U.S. than Cancer and Heart Disease. Among the Prescribed Remedies Are Improved Preventive Efforts, Speedier Surgery and Further Research. *Scientific American*, 249(2), 28-35.
- [4]. Meislin, H., Criss, E., Judkins, D., Berger, R., Conroy, C., et al. (1997) Fatal Trauma: The Model Distribution of Time to Death Is a Function of Patients' Demographics and Regional Resources. *Journal of Trauma-Injury Infection & Critical Care*, 43, 433-440.
- [5]. Sauaia, A., Moor, F.A., Moore, E.E., Moser, K.S., Brennan, R., et al. (1995) Epidemiology of Trauma Deaths: A Reassessment. *Journal of Trauma-Injury Infection & Critical Care*, 38, 185-193.
- [6]. Demetriades, D., Kimbrell, B., Salim, A., Velmahos, G., Rhee, P., et al. (2005) Trauma Deaths in a Mature Urban Trauma System: Is "Trimodal" Distribution a Valid Concept? *Journal of the American College of Surgeons*, 201, 343-348.
- [7]. Mousami Singh, Amit Kumar, Anoop Kumar Verma, Sanjeet Kumar, Abhas Kumar Singh. Abdominal Organ Involvement in Blunt Injuries. *JIAFM Jan – March 2012*, Vol. 34, (1) ISSN 0971-0973.
- [8]. B. Vasanth Naik, Surendet Jakkam. Blunt Injuries of Abdomen In Warangal Area: An Analytical Study. *JIAFM Oct-December 2013*, Vol. 35, No. 4
- [9]. N. Bayapa Reddy, Hanumantha, Pallavi Madithathi, N. Nagarjuna Reddy, C. Sainarasimha Reddy; An epidemiological study on pattern of thoraco abdominal injuries sustained in fatal road traffic accidents of Bangalore: Autopsy based study; *J Emerg Trauma Shock*; 2014 Apr-June : 7(2); 116-120.
- [10]. Goyal A, Oberoi SS, Aggarwal KK, Aggarwal AD. Pattern of injuries cases in the mortuary in the year 2011-14, *JPAFMT 2014*; 14(2).
- [11]. Meera TH, Nabachandra H. A Study of Pattern and Injury Severity Score in Blunt Thoraco abdominal Trauma cases in Manipal. [Last accessed on 2005] ;*Ind Med-Medico Legal Update 2005* 5(2).
- [12]. Archana K, Sinha US, Kapoor AK, Pathak YK, Susheel S, Singh A, et al. An Epidemiological study of Fatal Road Traffic Accidents in Allahabad region. *Indian Internet J Forensic Med Toxicology*. 2005;3 (1).
- [13]. Sevti S.; Fatal road accidents; *British-J-Surg*. 1968; Vol.55: 481-505.
- [14]. Daly K.E. and Thomas P.R.; Trauma deaths in the South West Thames region; *International Journal of the Care of the Injured Injury*. 1992; Vol.23, (6): 393-396.
- [15]. Subedi N, Yadav BN, Jha S, Paudel IS, Regmi R: A profile of abdominal and pelvic injuries in medico-legal autopsy; *Journal of Forensic and Legal Medicine* 20(6), 792-796.
- [16]. Gordon I. and Shapiro H.A.; *Abdominal injuries*; 1982; 2nd ed: 310-320.
- [17]. Bergvist D., Hedelin H., Karlson G., Lindblad B. and Matzsch T.; Abdominal trauma during thirty years: analysis of a large case series; *International journal of the care of the injured* 1981: Vol.13 (2): 93-99.
- [18]. Sharma O.P.; Traumatic diaphragmatic rupture - not an uncommon entity - personal experience with collective review of the 1980s; *J-Trauma*. 1989 May; Vol.29, No.5: 678-682.
- [19]. Odelowo E.O.; Pattern of trauma resulting from motorcycle accidents in Nigerians - a two year prospective study; *Afr-J-Med-Sci*. 1994 June; Vol.23, No.2; 109-112.
- [20]. Ndiaya M., et al; Closed traumas of the thorax; *Ann-Chir*. 1995; Vol.49, No.3: 241-244.
- [21]. Barashkov G.A. and Gubar L.N.; Characteristics and structure of automobile injuries; *Vestn-Khir*. 1978 May; Vol.120, No. 5: 73-78.
- [22]. Chandra J. and Dogra T.D.; Pattern of injuries in various road users involved with different vehicles in fatal accidents; *J. Police Research and Development*. 1978 April-June; 26-28.
- [23]. Brainard B.J., Slauterbeck J., Benjamin J.B., Haganan R.M. and Higie S.; Injury profiles in pedestrian motor vehicle trauma; *Ann-Emerg-Med*.1989 August; Vol.18, No.8: 881-883.
- [24]. Talton D.S., Craig M.H., Hauser C.J. and Poole G.V.; Major gastro enteric injuries from blunt trauma; *Am-Surg*. 1995 January; Vol.61, No.1.; 69-73.
- [25]. Modi J P. Text Book of Medical Jurisprudence and Toxicology; *Regional Injuries*; 24th edition : 599-693.
- [26]. B. Suresh Kumar Shetty, Tanuj Kanchan, Ritesh G. Menezes, Bakkannavar SM, Nayak VC. Victim Profile and Pattern of Thoraco Abdominal Injuries Sustained in Fatal Road Traffic Accidents. *J Indian Acad Forensic Med*. 2012;34:17–20