American Journal of Surgery Case Reports

Research Article

The Study of Predictors of Outcome in Abdominopelvic Trauma

*Attri A, Sharma S, Yadav S and Bhartiya SK**

Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University, India

Abstract

Trauma can vary from trivial wounds to major injuries which are complex in nature, thus leading to organ dysfunction affecting multiple systems and causing shock. Trauma to pelvis with a high energy leads to severe impact and is linked with various associated traumatic injuries, requiring transfusions, and long-standing rehabilitation. Fractures of pelvic bone are generally caused due to external forces of high energy like those occurring during traffic or road accidents, and fall injuries. Such patients are found with an increased risk of the associated injuries to abdominal solid organs showing a poor rate of prognosis.

Keywords: Abdominopelvic trauma; Computed tomography; Surgical intervention

Introduction

It is probable to underestimate the related injury if the abdominal signs and symptoms are not much aggravating. The structures which are most frequently injured are the intraabdominal organs, out of which spleen, liver, and kidneys are affected the most with an incidence rate of 16.5%. It has been found that the most prevalent organs subjected to injuries are the liver (6.1%), followed by bladder and urethra (5.8%) [1-3]. The assessment of pelvis is done using anteroposterior compression, digital rectal examination, sensitive markers (serum lactate and base deficit) and laboratory markers (PT/INR, PTT, fibrinogen) [4].

Ultrasound is used to do a Focused Assessment with Sonography in Trauma (FAST) examination. In hemodynamically unstable patient, pelvic x-rays are helpful [5]. CT scan has the capability for a three-dimensional bony reconstruction and helps to provide a better operative planning for patients. In relation to fractures of pelvic bone, diagnoses of the injury to abdominal solid organ are very critical [6]. Rather than plain X-ray or ultrasonography, Computed Tomography (CT) scan is preferred for complicated injuries affecting the viscera of abdomen [7].

Thus the present study was done to assess the incidence of pelvic ring injuries and its different types, to study and compare injury severity scores, radiographic findings and other determinants such as age, mechanism of injury and transfusion in abdominopelvic trauma patients, and determine their correlation with Need for Surgical intervention, LOS in hospital, ICU requirement; functional and radiographic improvement in the followup.

Citation: Attri A, Sharma S, Yadav S, Bhartiya SK. The Study of Predictors of Outcome in Abdominopelvic Trauma. Am J Surg Case Rep. 2023;4(6):1077.

Publisher Name: Medtext Publications LLC

Manuscript compiled: Jul 03rd, 2023

***Corresponding author:** Bhartiya SK, Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University, Vara-nasi, 221005, Uttar Pradesh, India

Materials and Methods

The present study was a Prospective Observational Study conducted at Trauma Surgery Division, Department of General Surgery, Institute of Medical Sciences, BHU, and Varanasi, India from Jan 2021 to June 2022. The total of 30 patients aged 18-65 years with abdominopelvic trauma were enrolled for the study. Patients with isolated abdominal and pelvic trauma, with known systemic and bleeding disease and who refused to give consent were excluded from the study. The study was carried out after obtaining approval from the Institutional Research Ethics Committee (No. Dean/2020/EC/2282). An informed and written consent was obtained from all the patients.

Patients arriving at Trauma Centre were evaluated by primary and secondary survey as per ATLS protocol. Three most injured body regions of each patient were identified and Abbreviated Injury Scores (AIS) were calculated for these body regions. The highest AIS in each of these 3 body region was squared and then summed to calculate Injury Severity Score (ISS). Systolic blood pressure, GCS and respiratory rate was recorded and revised trauma score was calculated. Laboratory and radiographic evaluation was done. Majeed pelvic score was calculated after stabilization.

All the patients who were hemodynamically unstable or with perforation peritonitis and were either transient or non responder following resuscitation underwent Exploratory laparotomy. Failure of non operative management includes clinical parameters like persistent tachycardia (>100 beats per minutes), Hypotension (systolic blood pressure <90 mmHg), Low SpO2, significant rise in abdominal distension (>5 cm in 24 hours) and Biochemical parameters including significant fall in haematocrit and haemoglobin levels from baseline.

All patients with rotational instability/tenderness were applied pelvic binder for stabilization. External/Internal fixation was planned on the basis of pelvic instability and extent of pelvic fracture in CECT Pelvis. Regular clinical evaluation was done every 2 weeks till 12 weeks followed by every month till 6 months. Radiographic evaluation was done every 4 weekly. Majeed Score and SF-20 Scores were calculated at 3 months and 6 months. The statistical analysis was done using SPSS (Statistical Package for the Social Sciences) for Windows version IBM SPSS Version 20.0. Linear regression analysis was done to assess correlation between various parameters and dependent variable. The level of significance is taken at p value <0.05.

Results

Maximum 46.67% patients were aged 20-30 yrs of age, with the mean age being 30.4 ± 12.60 yrs. 66.7% and 33.3% were males and females respectively. Most common mechanism of onset was motor vehicle collision, followed by fall from height and fire arm injury. 63.3% subjects had undergone 1L of normal saline fluid resuscitation and 83.3% had whole blood transfusion. Maximum 50% patients had LC Type I, followed LC Type II pelvic ring injuries. Prevalence of various abdominal injuries in different types of pelvic ring injuries was also assessed (Table 1).

Maximum 96.7% patients had applied pelvic binder and 23.3% had skin traction. In 80% cases, no lower extremity fracture was seen and in 40% cases trauma of thoracic region was found. Patients were also evaluated on the basis of ISS (Injury Severity Score). 46.67% had serious Injury severity score, followed by 33.33% with severe injury with a mean RTS (Revised Trauma Score) being 7.24 ± 0.66. We also assessed study subjects according to injury grades for different organs. 63.3% didn't have any liver injury. Maximum 16.7% had AAST Grade II Liver injury, followed by 13.3% with grade III injury. 76.7% didn't have any splenic injury. Maximum 6.7% had AAST Grade III splenic injury. 73.3% didn't have any renal injury. Maximum 6.7% had AAST Grade III renal injury. 90% didn't have any bladder injury. Maximum 3.3% each had AAST Grade I, II and V bladder injury. 96.7% didn't have any pancreatic injury. Maximum 3.3% each had AAST Grade II pancreatic injury. 76.7% didn't have any bowel injury. Maximum 6.7% each had AAST Grade II, III and IV bowel injury.

Only 6.7% patients had evisceration and hemoperitoneum without solid organ injury. 36.7% cases had need for surgical intervention because of abdmoen/pelvic trauma, 10% underwent pelvic fixation, 33.3% had laprotomy and 20% had ICU requirement. Patients were assessed according to radiological parameters at follow-up periods. At 3 months 73.3% patients with abdominal injury showed improvement. 73.3% with pelvic injury showed partial union. In case of abdominal injury patients at 6 months, 73.3% were cured and 80% patients with pelvic injury showed complete union.

Mean majeed score and SF 20 scaled score (functional outcome) was recorded at different time periods. The mean majeed score was 63.67 ± 7.21 at 3 months that got increased at 6 months to 74.03 ± 4.61. From 3 months to 6 months, criterias like physical, and social functioning; mental health and health perception (SF 20 scaled score) showed an increase in mean score; whereas pain decreased with follow up. This reflects improvement in patients. Linear regression was done to estimate correlation between different parameters with RTS, and ISS (Table 2 and 3). On linear regression, an insignificant relation (p-value >0.05) was observed between all parameters with age and MOI.

Discussion

In present study, the most common affected age group was 20 yrs-30yrs of age, with male predominance. In accordance with our study, Larsen JW, et al. [8] found median age of patients being 31 years, with male predominance. This trend of involvement shows that elders are getting more active with an increased risk of injury even happening at an advanced age.

Similar to our study, Gönültaş et al. [9] and Pekkari et al. [10] also stated that the most prevalent cause of injury was motor vehicle collision. We observed that maximum cases had LC Type I, followed by LC Type II. Similarly, Alton et al. [11] stated that the most common fracture type was lateral compression, which is generally associated with rupture of bladder.

We also found that 46.67% had serious and 33.33% had severe Injury severity score. 16.7% cases had AAST Grade II liver injury, 6.7% had AAST Grade III splenic and renal injury; and AAST Grade II, III and IV bowel injury. 3.3% each had AAST Grade I, II and V bladder injury and Grade II pancreatic injury. Thus we found that maximum patients had injury to liver, followed by spleen, renal, bowel, pancreatic and bladder injuries. Larsen et al. [8] found that the most commonly affected organ was liver. Arumugam et al. [12] found that mean ISS score was 17.9 ± 10. Zhang et al. [13] and Arumugam et al. [12] reported that liver, spleen, and kidneys are found to be most commonly involved.

In our study, maximum 96.7% were applied with pelvic binder, 23.3% had skin traction and 16.7% had skeletal traction. Coccolini et al. [4] stated that minor traumatic injuries are generally managed using a nonoperative treatment. Moderate injuries are subjected to pelvic binder. Severe injuries need more intensive treatment. Pelvic binders are a transitory method till patient is subjected to a more definitive treatment [14].

We found that 3.3% had right proximal femur, distal tibia and left shaft femur fracture; 6.7% had right proximal tibia fracture. No cases with distal femur and shaft tibia fracture, 40% involving thoracic region. Schnoor et al. [15] also reported thoracic trauma in pelvic fractures.

Abdominal evisceration after blunt trauma is a rare condition [16]. In our study only 2 cases had Evisceration. Choi et al. [17] advocated that blunt force applied externally causes weakening of the abdominal wall thus shearing the musculofascial layers, and raising intra-abdominal pressure simultaneously. With sufficient force of injury, the skin can also be damaged causing evisceration. ISS, RTS, Glasgow Coma Scale scoring systems are usually applied for polytraumatized patients. We were also keen that how these trauma scores affect the death rate after abdomino- pelvic fractures. Thus in our study trauma was assessed by using various scores. We found that

Table 1: Prevalence of various abdominal injuries in different types of pelvic ring injuries.

Pelvic ring injuries	Liver injury		Spleen injury		Renal injury		Bladder Injury		Pancreas Inj.		Bowel injury	
	n	%	n	%	n	%	n	%	n	%	n	%
APC Type I	0	0	0	0	0	0	0	0	0	0	1	14.3
APC Type II	0	0	1	16.7	2	25	0	0	0	0	1	14.3
APC Type III	0	0	0	0	0	0	0	0	0	0	0	0
LC Type I	7	63.6	3	50	5	62.5	1	33.3	1	100	2	28.6
LC Type II	3	27.3	1	16.7	0	0	1	33.3	0	0	3	42.9
LC Type III	1	9.1	1	16.7	0	0	1	33.3	0	0	0	0
VS(Vertical Shear)	0	0	0	0	1	12.5	0	0	0	0	1	14.3
Total	11	100	6	100	8	100	3	100	1	100	7	100

Table 2: Linear regression to estimate correlation between parameters and RTS.

Coefficients[a]							
Model	Unstandardized Coefficients		Standardiz ed Coefficien ts	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	8.961	5.351		1.675	0.111	-2.28	20.202
LOS	-0.057	0.064	-0.448	-0.89	0.385	-0.193	0.078
ICU	0.952	0.604	0.583	1.576	0.133	-0.317	2.22
AI 3rd MTH	-0.184	0.329	-0.134	-0.56	0.582	-0.875	0.506
PI 3rd MTH	0.026	0.202	0.029	0.13	0.898	-0.398	0.451
MS 3rd MTH	0.002	0.032	0.024	0.07	0.945	-0.064	0.068
SF20 3rd MTH	-0.002	0.004	-0.101	-0.413	0.684	-0.01	0.007
AI 6th MTH	0.007	0.241	0.005	0.028	0.978	-0.501	0.514
PI 6th MTH	0.467	0.338	0.317	1.382	0.184	-0.243	1.178
MS 6th MTH	-0.041	0.049	-0.286	-0.845	0.409	-0.143	0.061
SF20 6th Mth	0.001	0.008	0.054	0.137	0.892	-0.016	0.018
Need of Surgery	-0.138	0.322	-0.102	-0.429	0.673	-0.815	0.539
a. Dependent Variable: RTS							

*p-value<0.05 is significant.

Table 3: Linear regression to estimate correlation between parameters and ISS.

Coefficients[a]							
Model	Unstandardized Coefficients		Standardiz ed Coefficien ts	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	-2.418	58.423		-0.041	0.967	-125.16	120.325
LOS	1.254	0.703	0.744	1.785	0.091	-0.222	2.731
ICU	1	6.594	0.046	0.152	0.881	-12.853	14.853
AI 3rd MTH	-2.105	3.589	-0.117	-0.587	0.565	-9.646	5.436
PI 3rd MTH	-1.456	2.206	-0.12	-0.66	0.518	-6.091	3.179
MS 3rd MTH	-0.677	0.344	-0.558	-1.967	0.065	-1.401	0.046
SF20 3rd MTH	-0.005	0.045	-0.024	-0.12	0.906	-0.099	0.089
AI 6Th MTH	-6.251	2.637	-0.382	-2.371	**.029***	-11.791	-0.712
PI 6th MTH	-4.84	3.693	-0.249	-1.311	0.206	-12.598	2.918
MS 6th MTH	0.787	0.531	0.415	1.48	0.156	-0.33	1.903
SF20 6th MTH	0.083	0.089	0.303	0.928	0.366	-0.105	0.271
Need of Surgery	-0.114	3.518	-0.006	-0.032	0.974	-7.505	7.276
a. Dependent Variable: ISS							

*p-value<0.05 is significant.

in our study, 46.67% had serious Injury severity score, followed by 33.33% with severe injury. Mean RTS (Revised Trauma Score) was 7.24 ± 0.66. In accordance with our study, Tseng IC al. [18] found that the median scores ISS, NISS, and RTS were 27, 29 and 12, respectively.

Mesenteric laceration is a rare cause of hemoperitoneum, having nonspecific signs and symptoms, with an increased risk of morbidity and mortality. We also found that maximum 6.7% had Hemoperitoneum without solid organ injury. The mean majeed score was 41.03 ± 12.946. In a study, Ayvaz et al. [19] found that mean Majeed functional pelvic score was 93.3. Unstable fractures of pelvic region need surgical fixation. External fixation helps in initial stabilization for hemodynamically unstable patients and in those having pelvic contamination [20]. In our study, maximum 36.7% had need for surgical intervention for abdmoen/pelvic trauma and only 10% had pelvic fixation. 33.3% patients were subjected to laprotomy. The mean length of hospital stay was 9.6 ± 5.189 and 20% had ICU requirement. Similarly Devaney et al. [21] found that median length of hospital stay was 16 (11-29) days. The median length of ICU stay was around 5 (2-10) days.

After subjecting patients to treatment of abdomino-pelvic fractures, they are followed-up and treatment success was assessed by radiological findings and scoring system. According to radiological parameters at 3 months, 73.3% patients showed improvement and 73.3% with pelvic injury showed partial union. At 6 months, 73.3% were cured and 80% patients with pelvic injury showed complete union. The mean majeed score was 63.67 ± 7.21 at 3 months that got increased at 6mths to 74.03 ± 4.61. The mean values of criterias of SF 20 Scaled Score (functional outcome) at follow-up periods were calculated. From 3 months to 6 months, criterias like physical, and social functioning; mental health and health perception showed an increase in mean score; whereas pain decreased with follow up. This reflects improvement in patients. Thus in our study, patients showed improvement in majeed and SF score. Radiographically improvement was observed in terms of union. Similar to our study, in a study, Ayvaz et al. [19] found that mean Majeed functional pelvic score was 93.3 and the average SF-36 scores were also found comparable with the normal population in terms of pain of body, overall health and social function.

In our study we did linear regression to estimate correlation between parameters and RTS, ISS, age, MOI to assess them as outcome of mortality. An insignificant relation (p-value >0.05) was observed between all parameters with RTS and age. An insignificant relation (p-value >0.05) was observed between all parameters with ISS and MOI, except with AI at 6th month. All scores showed linear relation with most of the parameters. In accordance with our study, Tseng et al. [18] determined the potential predictors that were related directly to mortality of patients after open pelvic fractures, using logistic regression analyses. Similarly, Agbroko et al. [22] assessed Injury Severity Scores and Revised Trauma Scores and revealed improvement after assessing the scores. They showed that high Injury Severity Score, delayed intervention, and associated significant brain injury were determinants of poor outcomes. Arumugam et al. [12] found that predictors of mortality were ISS, head injury, need for blood transfusion, and serum lactate.

Abdomino-pelvic trauma is a common traumatic injury having a significant impact on the outcomes. The organ involvement is an important contributor to late morbidity and mortality. In present study, we observed that scoring criteria and radiographic determinants are valuable adjunct with clinical variables to determine the outcomes of abdomino-pelvic trauma before and after surgical management. We observed limitations of less sample size and for limited period of follow-up. The study was done in a specific hospital setting, so the results of study can't be generalized to whole population of India.

Limitations of study:

1. The similar study can be replicated with larger sample with different demographic characteristics, settings and for longer period of follow-up.
2. Future studies should investigate whether various other trauma scores are also good determinants of prognosis of traumatic injuries.

Conclusion

The results of this study reveal that an abdomino-pelvic trauma is a common traumatic injury having a significant impact on the outcomes. The organ involvement is an important contributor to late morbidity and mortality. In present study, we observed that scoring criteria and radiographic determinants are valuable adjunct with clinical variables to determine the outcomes of abdomino-pelvic trauma before and after surgical management.

References

1. Kwon HM, Kim SH, Hong JS, Choi WJ, Ahn R, Hong ES. Abdominal solid organ injury in trauma patients with pelvic bone fractures. Ulus Travma Acil Cerrahi Derg. 2014;20(2):113-9.
2. Schulman JE, O'Toole RV, Castillo RC, Manson T, Sciadini MF, Whitney A, et al. Pelvic ring fractures are an independent risk factor for death after blunt trauma. J Trauma. 2010;68(4):930-4.
3. Giannoudis PV, Grotz MR, Tzioupis C, Dinopoulos H, Wells GE, Bouamra O, et al. Prevalence of pelvic fractures, associated injuries, and mortality: the United Kingdom perspective. J Trauma. 2007;63(4):875-83.
4. Coccolini F, Stahel PF, Montori G, Biffl W, Horer TM, Catena F, et al. Pelvic trauma: WSES classification and guidelines. World J Emerg Surg. 2017;12:5.
5. Guillamondegui OD, Pryor JP, Gracias VH, Gupta R, Reilly PM, Schwab CW. Pelvic radiography in blunt trauma resuscitation: a diminishing role. J Trauma. 2002;53(6):1043-7.
6. Haddad SH, Yousef ZM, Al-Azzam SS, AlDawood AS, Al-Zahrani AA, AlZamel HA, et al. Profile, outcome and predictors of mortality of abdomino-pelvic trauma patients in a tertiary intensive care unit in Saudi Arabia. Injury. 2015;46(1):94-9.
7. Deunk J, Brink M, Dekker HM, Kool DR, van Kuijk C, Blickman JG, et al. Routine versus selective computed tomography of the abdomen, pelvis, and lumbar spine in blunt trauma: a prospective evaluation. J Trauma. 2009;66(4):1108-17.
8. Larsen JW, Søreide K, Søreide JA, Tjosevik K, Kvaløy JT, Thorsen K. Epidemiology of abdominal trauma: An age- and sex-adjusted incidence analysis with mortality patterns. Injury. 2022;53(10):3130-8.
9. Gönültaş F, Kutlutürk K, Gök AFK, Barut B, Şahin TT, Yılmaz S. Analysis of risk factors of mortality in abdominal trauma. Ulus Travma Acil Cerrahi Derg. 2020;26(1):43-9.
10. Pekkari P, Bylund PO, Lindgren H, Oman M. Abdominal injuries in a low trauma volume hospital–a descriptive study from northern Sweden. Scand J Trauma Resusc Emerg Med. 2014;22:48.
11. Alton TB, Gee AO. Classifications in brief: young and burgess classification of pelvicring injuries. Clin Orthop Relat Res. 2014;472(8):2338-42.
12. Arumugam S, Al-Hassani A, El-Menyar A, Abdelrahman H, Parchani A, Peralta R, et al. Frequency, causes and pattern of abdominal trauma: A 4-year descriptive analysis. J Emerg Trauma Shock. 2015;8(4):193-8.
13. Zhang F, Liao L. Artificial urinary sphincter implantation: an important component of complex surgery for urinary tract reconstruction in patients with refractory urinary incontinence. BMC Urol. 2018;18(1):3.
14. Ben-Menachem Y, Coldwell DM, Young JW, Burgess AR. Hemorrhage associated with pelvic fractures: causes, diagnosis, and emergent management. AJR Am J Roentgenol. 1991;157(5):1005-14.
15. Schnoor J, Reindl M, Wein BB, Petersen PF, Erli H. [Treatment of the combined pelvic and thoracic trauma in the emergency room]. Unfallchirurg. 2006;109(9):797-800.
16. Cawich S, Islam S, Harnarayan P, Young-Pong C. Abdominal wall disruption with evisceration after blunt trauma. BMJ Case Rep. 2014;2014:bcr2014203646.
17. Choi HJ, Park KJ, Lee HY, Kim KH, Kim SH, Kim MC, et al. Traumatic abdominal wall hernia (TAWH): a case study highlighting surgical management. Yonsei Med J. 2007;48(3):549-53.
18. Tseng IC, Chen IJ, Chou YC, Hsu YH, Yu YH. Predictors of Acute Mortality After Open Pelvic Fracture: Experience From 37 Patients From A Level I Trauma Center. World J Surg. 2020;44(11):3737-42.
19. Ayvaz M, Çağlar O, Yilmaz G, Güvendik GI, Acaroğ RE. Long-term outcome and quality of life of patients with unstable pelvic fractures treated by closed reduction and percutaneous fixation. Ulus Travma Acil Cerrahi Derg. 2011;17 (3):261-6.
20. Halawi MJ. Pelvic ring injuries: Surgical management and long-term outcomes. J Clin Orthop Trauma. 2016;7(1):1-6.
21. Devaney GL, Bulman J, King KL, Balogh ZJ. Time to definitive fixation of pelvic and acetabular fractures. J Trauma Acute Care Surg. 2020;89(4):730-5.
22. Agbroko S, Osinowo A, Jeje E, Atoyebi O. Determinants of Outcome of Abdominal Trauma in an Urban Tertiary Center. Niger J Surg. 2019;25(2):167-71.