Original Article

Pattern of Pelvic Fractures, Associated Injuries and Early Complications in Patients Presenting to a Trauma Centre

Raja Umar Liaqat[1], Abeer Makhmoor[2], Rida Qasim Awan[3], Riaz Ahmed[4], Abdul Jabbar[5], Talia Urooj[6]

[1] Senior Registrar, Orthopaedics,. Rawalpindi Medical University
[2,3,5,6] House Officer, Rawalpindi Medical University
[4] Dean Orthopedics, Neurosurgery & Trauma Rawalpindi medical University

Author`s Contribution
[1,4] *Conception of study*
[1,2,3,,5,6] *Experimentation/Study conduction*
[2,3] *Analysis/Interpretation/Discussion*
[1,2] *Manuscript Writing*
[4] *Critical Review*
[1] *Facilitation and Material analysis*

Corresponding Author
Dr. Raja Umar Liaqat
Department of Orthopaedics,
Benazir Bhutto Hospital, Rawalpindi, Pakistan.
Email: drumarpgt@hotmail.com

Article info.
Received: 4/3/2019
Accepted: 16/8/2019

Funding Source: *Nil*

Conflict of Interest: *Nil*

Abstract

Background: To determine the frequency, pattern, associated injuries and early complications of pelvic fractures in patients presenting to a trauma centre.

Methods: This prospective, cross-sectional study was done at the Department of Orthopaedics, Benazir Bhutto Hospital, Rawalpindi, Pakistan. The study involved patients aged 18 years and above admitted in the Orthopaedic department with pelvic fractures. The patients were managed according to Advanced Trauma Life Support (ATLS) protocol, and after stabilization, were followed up for a period of 3 weeks to look for any complications. This was done on day 1, 7, 14 and 21. Pelvic fractures were classified using Antero-posterior (AP), In-let and Out-let pelvic views, and all associated injuries were documented. Data was analyzed using SPSS version 22.

Results: The study found that majority of patients with pelvic fractures were male (78%) with a mean age of 35.7±10.3 years. The average time before initiation of ATLS was 54.2±106.2 minutes. The main mechanism of injury was motor vehicle accidents (58%). The main Tiles fracture type was type B (68%). Head injury (22%) followed by genito-urinary injuries (16%) were the most common associated injuries.

Conclusion: Associated injuries remain a challenge to the management of patients with pelvic fractures. Motor vehicle accidents were the major cause of pelvic fractures.

Keywords: Advanced Trauma Life Support, Hemorrhagic shock, Pelvic fractures, Tiles classification.

Introduction

Pelvic fractures have always confronted medical practitioners owing to the fracture pattern and connected complications.[1] Despite advanced care, such fractures are highly morbid and fatal.[2] Given how perplexing pelvis fractures have been, surgeons and clinicians have sought to systemize their occurrence and ancillary complications from early times in order to counter and diminish morbidity and fatality.[3] Complications are numbered somewhere between 36.7-50 percent whereas the mortality falls between 9 - 30 percent.[4]

Open pelvic fractures are known to have greater mortality roughly around 50 percent owing mostly to fracture instability, perineal injury and late institution of diverting colostomy.[5] 66 percent of such fractures

are perplexed by soft tissue abrasions and more fractures. Urethral injury is one such example.[6]

When managing a multiple trauma patient, it is of paramount importance to look for associated complications and injuries. There has been an established correlation between occurrence of injuries and their connected perplexities.[7]The average time at hospital lasts variably from 17-21 days.[8]Advanced Trauma Life Support (ATLS) usage has been an efficacious method in preliminary assessment of pelvis fractures. It has also improved identification of connected injuries. It usually constitutes trauma series radiographs of cervical spine, chest x-ray, and pelvis.[9]
Managing a pelvic fracture requires progressive life support from scene of occurrence to hospital. Due to associated injuries and complications, this should involve multiple teams with different expertise.[10]
There is no local data about the incidence, pattern, associated injuries and early complications of pelvic fractures. So this study was done as it would guide protocols on the evaluation of the pelvic fracture patient with better intuition, frequency of complications and better patient outcomes.

Patients and Methods

This prospective, cross-sectional study was conducted for a duration of one year, i.e. from 30th June 2017 to 29th June 2018 at the Department of Orthopaedics, Benazir Bhutto Hospital, Rawalpindi, Pakistan. The inclusion criteria were all patients aged 18 years and above belonging to either gender and presenting to the emergency department with a pelvic fracture. The patients who did not consent were excluded from the study. The study was started after taking approval from the ethical review board of the hospital. Data was recorded on pre-formed proformas which contained information on demographics, mechanism of injury, type of pelvic fracture, associated injuries and early complications.

The patients were examined on day 1, 7, 14 and 21 of injury. The following assessments were done:
Head injury assessment: This involved looking clinically for lacerations and any deformities of the head and face, and the Glasgow Coma Scale (GCS). CT scan of head was performed in cases where there was an indication.
Cervical spine assessment: This was done using clinical examination and cervical spine radiographs. Other spinal injuries were also assessed clinically and through radiographs. Any neurological deficit found was documented.
Thoracic assessment: This involved clinical examination and radiographs of the chest. Most often this will suffice.
Abdominal assessment: This was done with clinical abdominal examination, focused abdominal sonography after trauma (FAST) and CT scan, where required.
Genitourinary assessment: This involved clinical inspection of the perineum, urethral orifices, vulvovaginal vault for any injuries. Urine looked for any gross hematuria. Where required a micturating cystourethrogram (MCU), and ascending urethrogram were done.
Musculoskeletal assessment: Clinical examination of both the upper and lower limbs was done.
Pelvic fracture assessment: Fracture pattern was identified using Anteroposterior, pelvic inlet and outlet view radiographs of pelvis. For complex injuries, a CT scan was employed. In this study, Tiles pelvic fracture classification was used.

Data analyzed using SPSS version 22. The baseline variables were presented as means and standard deviation. All statistical tests were performed at 5% level of significance and 95% confidence interval.

Result

The study included 50 patients. Majority (78%) of the patients were male. The mean age of patients was 35.7±10.3 years within the range of 19 to 68 years.
The average time before ATLS protocol started was 54.2±106.2 minutes within the range of 20 and 720 minutes. Mean blood pressure was 108.9/71.3; pulse rate 88.6; respiratory rate 18.2; Sapo2 (%) 98.6 (Table-1).

Table-1: Physiological vital parameters

	Minimum	Maximum	Mean	Standard Deviation
Time Before ATLS Protocol (Minutes)	20	720	54.2	106.2
Systolic Blood Pressure (mm Hg)	80	158	108.9	15.8
Diastolic Blood Pressure (mm Hg)	35	107	71.3	12.4
Pulse Rate (per minute)	70	124	88.6	14.6
Respiratory Rate (per minute)	10	26	18.2	3.2
Sapo2 (%)	80	100	98.6	3.3

The most common mechanism of injury of pelvic fractures was motor vehicle hitting pedestrians seen in 58% of cases (table-2).

Table-2: Mechanism of injury

Mechanism of Injury	Frequency (n)	Percentage (%)
Motorcycle (Rider)	2	4%
Motorcycle (Passenger)	6	12%
Motor Vehicle (Driver)	4	8%
Motor Vehicle (Passenger)	2	4%
Motor Vehicle (Pedestrian)	29	58%
Fall (< 4 metres)	3	6%
Fall (> 4 metres)	2	4%
Assault	2	4%

Majority of the cases (68%) had B-type pelvic fracture. Acetabular fractures were found in 30% of cases. There was no significant relationship between acetabular fracture and pattern of pelvic fractures (p-value = 0.9) (table-3).

Table-3: Tiles pattern of pelvic fractures

Pelvic fracture	Interpretation	Frequency (n)	Percentage (%)	Acetabular Fracture (n)
None	None	2	4%	2
A	A2	4	8%	0
B	B1	12	24%	2
	B2-1	16	32%	6
	B2-2	1	2%	0
	B3	5	10%	2
C	C1-1	6	12%	2
	C1-2	1	2%	1
	C2	3	6%	0

There was no significant relationship between mechanism of injury and pattern of pelvic fractures (p-value = 0.3).

In associated trauma, head injuries were the most common (22%) (table-4)

Table-4: Associated injuries in pelvic fractures

Region	Injury	Frequency (n)	Percentage (%)
Head	Head injury	11	22%
Thoracic	Blunt Thoracic injury	6	12%
Abdominal	Abdominal injury	2	4%
Genitourinary	Urethral injury	4	8%
	Bladder injury	1	2%
	Perineal injury	3	6%

There was no significant relationship between associated injuries and pattern of pelvic fractures (p-value = 0.2).

Discussion

This study showed that majority of the patients who presented with pelvic fractures were male (78%). This is similar to a study by Pereira et al. that showed 57.5% of pelvic fracture patients were male[11]. However other studies showed a variation in gender depending on the age of the patient. The incidence was shown to be higher in males than females in patients below 49 years and higher in female than males in those above 49 years. This has been attributed to the higher incidence of osteoporotic fractures in elderly females[12].The mean age of the patients was 35.7 years which is a relatively young population. This result was comparable to a study by Paydar et al which had a mean age of 40.1 years[13]. The average time after accident and before ATLS protocol initiation was 54.2 minutes. In our study most of the patients were hemodynamically stable (93.4%). The mean blood pressure was 108.9/71.3 mm Hg; pulse rate 88.6; respiratory rate 18.2 per minute; and Sapo2 (%) 98.6.

The majority of patients were hit by motor vehicles (58%). This is higher than Mardanpour et al study which showed pedestrians involved in motorcycle accidents were 46.5%. In his study Mardanpouret al also had a higher proportion of passenger and drivers involved in motor vehicle accidents at 37.5%. Motorcycle accidents contributed 16% to pelvic fractures as compared to Mardanpour et al 3%, almost a five-fold rise.[14] This is attributable to the increase in motorcycle use in the country as a form of transport. Two cases of assault were also recorded in this study. The commonest type of pelvic fracture

pattern in this study was the tiles B2-1. This is a rotationally unstable but vertically stable injury. In this study, B2-1 was seen in 32% of injuries. This is similar to Tiles et al research and also the Young Burgess research of an earlier time.[15] Stable fractures of type A2 were found in 8% of cases. Notably 30% of the pelvic fractures were associated with acetabular fractures. This concomitant presentation has been shown to adversely affect outcome of management. The rotationally and vertically unstable fractures type C accounted for 20%.[16] In a comparative classification system - the Kane modification of the key and Conwell system used in Mardanpour et al study, he found 51.5% type 2 fractures. This corresponds to the Tiles classification B1 and B2 used in this study which represents 56.6%. The Kane type 1 represented 6% and in this study the equivalent tile type A represented 8.7%.[14]

In our study, the highest number of associated trauma was head injuries seen in 22% of cases. In a study by Halawi, 47% of pelvic fracture patients had head injury, with only 3% presenting with severe head injury.[17] In other studies Internationally, there lacks a clear constant in the highest incidence of an associated injury. Blunt abdominal injury was 4% in our study which is comparable to a study by O'Rourke et al, in which it was 5%.[18] Urologic injuries accounted for 16% and were mostly diagnosed clinically. Hematuria was found in one case. These injuries included urethral injuries, bladder contusion and perineal injuries. In the study by Tsing et al, 23% of the patients had a urological injury.[19]

Conclusion

Associated injuries remained a challenge to the management of patients with pelvic fractures. Motor vehicle accidents were the major cause of pelvic fractures.

Reference

1. Oberkircher L, Ruchholtz S, Rommens PM, Hofmann A, Bucking B, Kruger A. Osteoporotic Pelvic Fractures. DtschArztebl Int. 2018;115(5):70-80.
2. Arroyo W, Nelson KJ, Belmont PJ, Bader JO, Schoenfeld AJ. Pelvic trauma: What are the predictors of mortality and cardiac, venous thrombo-embolic and infectious complications following injury? Injury. 2013;44(12):1745–49.
3. Yoshihara H, Yoneoka D. Demographic epidemiology of unstable pelvic fracture in the United States from 2000 to 2009: trends and in-hospital mortality. J Trauma Acute Care Surg. 2014;76(2):380–85.
4. Langford JR, Burgess AR, Liporace FA, Haidukewych GJ. Pelvic fractures: part 1. Evaluation, classification, and resuscitation. J Am AcadOrthop Surg. 2013;21(8):448–57.
5. Sen RK, Gopinathan NR, Tamuk T, Kumar R, Krishnan V, Sament R. Predictors of early outcome in unstable pelvic fractures. Chin J Traumatol. 2013;16(2):94–98.
6. Tosounidis G, Culemann U, Stengel D, Garcia P, Kurowski R, Holstein JH et al. Complex pelvic trauma in elderly patients. Unfallchirurg. 2010;113(4):281–86.
7. Gabbe BJ, SteigerDR, Esser M, Bucknill A, Russ MK, Cameron PA. Predictors of mortality following severe pelvic ring fracture: results of a population-based study. Injury. 2011;42(10):985–91.
8. Flint L, Cryer HG. Pelvic fracture: the last 50 years. J Trauma. 2010;69(3):483–88.
9. Sems SA, Johnson M, Cole PA, Byrd CT, Templeman DC. Minnesota Orthopaedic Trauma Group. Elevated body mass index increases early complications of surgical treatment of pelvic ring injuries. J Orthop Trauma. 2010;24(5):309–14.
10. Prieto-Alhambra D, Avilés FF, Judge A, Van Staa T, Nogués X, Arden NK et al. Burden of pelvis fracture: a population-based study of incidence, hospitalization and mortality. Osteoporos Int. 2012;23(12):2797–803.
11. Pereira GJC, Damasceno ER, Dinhane DI, Bueno FM, Leite JBR, Ancheschi B da C. Epidemiology of pelvic ring fractures and injuries. RevistaBrasileira de Ortopedia. 2017;52(3):260-69.
12. Osterhoff G, Scheyerer MJ, Fritz Y. Comparing the predictive value of the pelvic ring injury classification systems by Tile and by Young and Burgess. Injury. 2014;45(4):742–47.
13. Paydar S, Chaabi M, Akhavan M, Ghahramani Z, Dehghankhalili M. Outcome Determinants of Patients with Traumatic Pelvic Fractures: A Cohort Study in a Level I Trauma Center in Southern Iran. Malaysian Orthopaedic Journal. 2017;11(3):23-30.
14. Mardanpour K, Mardanpour N, Rahbar M, Zarei E. Incidence of pelvic trauma and relative risk factors for mortality: a population based study in Iran. Clinical Practice. 2018;15(SI):577-86.
15. Haq RU, Dhammi IK, Srivastava A. Classification of pelvic fractures and its clinical relevance. Symposium on pelvic trauma. 2014;7(1):8-13.
16. Moliere S, Dosch JC, Bierry G. Pelvic, acetabular and hip fractures: What the surgeon should expect from the radiologist. Diagnostic and Interventional Imaging. 2016;97(8):709-23.
17. Halawi MJ. Pelvic ring injuries: Emergency assessment and management. J ClinOrthop Trauma. 2015;6(4):252-58.
18. O'Rourke MC, Burns B. Blunt Abdominal Trauma. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2018. Available from: https://www.ncbi.nlm.nih.gov/books/NBK431087.
19. Tsing V, Jessica NG, Wullschleger M. Risk Factors Associated with Lower Urinary Tract Injuries in Traumatic Pelvic Fractures. Med Sur Urol. 2017;6(1):188-94.