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A Study On Surgical Management Of Unstable Pelvic Fractures.

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ABSTRACT

Pelvic injuries are an important aspect of orthopaedic trauma, which are caused by high velocity injuries such as road traffic accidents and industrial accidents. The management, especially those of unstable pelvic ring injuries is complex and challenging to the orthopaedic surgeon. The aim of this study is to analyze the results and functional outcome of the patients with unstable pelvic fractures who were managed by surgical treatment. Our study is an analysis of 21 cases of unstable pelvic injuries (Type B and C) managed surgically by external fixation or open reduction and internal fixation. The study period extends from Department of Orthopedics Venkateshwara Medical College Hospital & Research Centre, Ariyur, Pondicherry October 2021 to April 2021. All the patients with stable pelvic ring injury (type A) were excluded from the study. Unstable pelvic injury patients, who died before surgical intervention (3 patients) and patients who couldn't be operated for various reasons were excluded from the study. Twenty-one patients with unstable pelvic fractures were treated surgically and analyzed with an average follow up of 8.7 months (range 3-16 months). Functional outcome of the survived patients was assessed using the pelvic outcome scale by Cole et al. It is based on a 40-point scale for pain, ambulation, work and activity status, clinical examination and radiographic appearance. Three patients died and two patients were lost for follow up. In one patient the functional outcome couldn't be assessed due to associated injury. Out of 15 remaining patients, 12 had good, 2 had fair, and 1 patient had poor outcome. Despite better understanding of the personality of the acutely injured pelvis and modern aggressive treatment modalities, the mortality rate still remains high. Early aggressive but thoughtful management of the patients with unstable pelvic injuries is essential for maximizing the immediate survival and long-term functional outcome. Periodic thorough clinical and radiological assessment is mandatory to identify any occult injury.

Keywords: pelvic fractures, trauma, accident.

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INTRODUCTION

Pelvic injuries are an important aspect of orthopaedic trauma, which are caused by high velocity injuries such as road traffic accidents and industrial accidents [1]. The management, especially those of unstable pelvic ring injuries is complex and challenging to the orthopaedic surgeon [2]. Conventional orthopaedic wisdom is that patients who survive disruption of pelvic ring eventually have few musculoskeletal problems [3]. However, the literature has been concerned more with life threatening problems than with the natural history of such injuries. Also, the literature in general failed to compare similar cases since there was little standardization of classification of pelvic injuries [4]. Of late, several studies underscore the fact that not all pelvic disruptions are alike. The stable injuries generally have a good prognosis, whereas as without thoughtful orthopaedic management the unstable types have a much poorer prognosis. In this study, a brief and comprehensive review of the anatomy of the pelvis, biomechanics, the mechanism of different types of unstable injury and the classification are presented followed by the clinic-radiological assessment of patients with pelvic injuries and their management by various surgical modalities. We have analyzed then the outcome of these unstable pelvic injuries with surgical management [5].

METHODS

The study period extends from Department of Orthopedics Venkateshwara Medical College Hospital & Research Centre, Ariyur, Pondicherry October 2021 to April 2021. Our study is an analysis of 21 cases of unstable pelvic injuries (Type B and C) managed surgically by external fixation or open reduction and internal fixation. All the patients with stable pelvic ring injury (type A) were excluded from the study. Unstable pelvic injury patients, who died before surgical intervention (3 patients) and patients who couldn't be operated for various reasons were excluded from the study. Recently operated patients with less than three months duration at the time of conclusion of this study were excluded. In our study, Advanced Trauma Life Support (ATLS) protocol was followed for management of patients in the acute stage. A detailed clinical examination and radiological assessment was done in all patients by means of which the injury pattern and stability of the injured pelvis ascertained. Decision on emergent external fixation or elective internal fixation was made on case by case basis, depending on the hemodynamic stability of the patient and the fracture pattern. Only those patients who were hemodynamically unstable after aggressive general resuscitation were taken up for emergent external fixation. All other patients whose hemodynamic status got stabilized after resuscitation were managed by elective open reduction and internal fixation irrespective of the type of fracture.

RESULTS

Twenty one patients with unstable pelvic fractures were treated surgically and analyzed with an average follow up of 8.7 months (range 3-16 months). Functional outcome of the survived patients was assessed using the pelvic outcome scale by Cole et al. It is based on a 40-point scale for pain, ambulation, work and activity status, clinical examination and radiographic appearance. Three patients died and two patients were lost for follow up. In one patient the functional outcome couldn't be assessed due to associated injury. Out of 15 remaining patients, 12 had good, 2 had fair, and 1 patient had poor outcome.

Table 1: Age Incidence and Distribution

The age of the patients ranged from 13 to 58 years. The mean age was 31.5 years.

Age in years	No. of patients	Percentage
11-20	03	14.28
21-30	07	33.33
31-40	04	19.04
41-50	04	19.04
51-60	03	14.28

Table 2: Mode of Injury

Majority of patients suffered road traffic accidents followed by fall from height.

Mode of injury	No. of patients	Percentage
RTA	18	85.7
Fall from height	02	9.5
TTA	01	4.8

Table 3: Type of Injury (Classification)

Two patients suffered open fractures in our series and the rest were closed injuries.

Tile's type	No. of patients
B1	06
B2	06
B3	01
C1	08
C2	Nil
C3	Nil

Table 4: Associated Injuries

In our study, 11 patients (52.4%) had associated skeletal and/or soft tissue injuries. Four patients had multiple associated injuries.

Associated Injury	No. of Patients
Fracture of shaft of humerus	01
Fracture of BB forearm	01
Fracture of scapula and ribs	01
Fracture of neck of femur	02
Subtrochanteric fracture of femur	02
Fracture of shaft of femur	01
Fracture shaft of tibia	01
Fracture of acetabulum	01
Posterior dislocation of hip	01
Nerve injury (L4, L5 roots)	02
Injury to urethra	01
Injury to urinary bladder	01
Injury to external iliac artery	01
Head injury	01

Table :5 Surgical Procedures

Various surgical procedures and approaches used are as follows.

Procedure	No. of cases
External fixation	06
Open reduction and internal fixation of sacroiliac joint	
Anterior approach (Plating).	02
Posterior approach (Ilio sacral screws).	03
Open reduction and internal fixation of ilium	03
Open reduction and internal fixation of symphysis pubis (Plating)	
Symphysis pubis diastasis.	07
Locked symphysis.	01

Table 6: Functional Outcome

Functional outcome of the survived patients were assessed using the pelvic outcome scale by Cole et al. It is based on a 40 point scale for pain, ambulation, work and activity status, clinical examination and radiographic appearance. Pelvic Outcome Scale (Cole et al.)

Category	Description	Points
Functional pain	Pain secondary to physical activity	
	None	5
	Pain only with strenuous activity	4
	Mild pain with stair climbing, lifting, moving, or other moderately strenuous activities	3
	Moderate pain with start up of activities and intermittent radicular pain	2
	Pain with sitting or standing longer than 1 hour, requires frequent position changes	1
	Chronic severe pain regardless of activity	0
Subjective pain	Average of resting and ambulation scores on a scale of 1 (no pain) to 10 (severe pain)	
	1-2 points	4
	3-4 points	3
	5-6 points	2
	7-8 points	1
	9 - 10 points	0
Narcotic use	Narcotic use > 12 weeks postoperatively	
	No	1
	Yes	0
Activity status	Ability to resume previous work, household, or recreational activities	
	Without limitations	10
	With some discomfort	8
	With limitations such as tires more easily or cannot lift as much as before injury	6
	With marked limitations requiring change in work status to part time, sedentary, or with restrictions; requires assistance with household activities or avoids strenuous recreational activities	4
	Unable to resume any previous work, household, or recreational activities; cannot drive and requires assistance with stairs or with shopping	2
	Unable to resume any previous work, household, or recreational activities; requires assistance with activities of daily living	0
Physical Examination	Gait	
	Normal gait	4
	Antalgic gait or limp	3
	Requires assistive device (cane)	2
	Requires assistive device (walker; occasionally uses wheelchair)	1
	Nonambulatory	0
	Trendelenberg	
	Negative	1
	Positive	0
	Tenderness	
	No sacral or pubic tenderness	2
	Sacral or pubic tenderness	1
	Sacral and pubic tenderness	0

	Lower extremity muscle group strengthflexion/ extension	
	Bilateral thigh flexion and extension = 5/5	1
	Thigh flexion or extension <5/5	0
	Abduction / Adduction	
	Bilateral thigh abduction and adduction =5/5	1
	Thigh abduction or adduction < 5/5	0
	Range of motion	
	Normal hip and trunk range of motion	1
	Trunk flexion <90 ⁰ , hip flexion <90 ⁰ or > 20 ⁰ difference in hip internal or external rotation when compared with contralateral side	0
Pelvic radiographs (AP, inlet, and outletviews)	Posterior (normal sacroiliac joint space =4mm)	
	Displacement ≤0.5 cm without sacroiliacjoint reactive changes	6
	Displacement ≤0.5 with sacroiliac jointreactive changes	5
	Displacement > 0.5 cm and ≤1.0 cm	4
	Displacement > 1.0 cm	2
	Nonunion	0
	Anterior (normal pubic symphysis space = 0.5 cm)	
	Displacement ≤ 0.5 cm	4
	Displacement >0.5cm and ≤1.0 cm	3
	Displacement >1.0 cm and ≤2.0 cm	1
	Displacement >2.0 cm	0

DISCUSSION

Conventional orthopaedic wisdom is that patients who survive disruption of the pelvic ring eventually had few late musculoskeletal problems. But studies on the natural history of the pelvic ring injuries proved that the unstable types had high mortality in the acute stage and chronic morbidity in the long term [6]. Despite aggressive resuscitation including application of external fixators, the mortality of 10-20% remain unchanged. This led to clinical trials on internal fixation and several studies have shown that early open reduction and stable internal fixation improves the chances of survival and more importantly, reduces the incidence of late musculoskeletal morbidity [7]. The mean age of the patient in our study was 31.5 years where as the SunnyBrook Medical Centre series reported 30.9 years. Cole et al [5] reported an average age of 32 years. Sunil et al [6] reported on 78 cases with an average age of 29.99 years (range 10-65). There was extreme male preponderance in our series with more than 85% of male patients. The sunny Brook medical centre [2] study reported only slight male dominance with 55%. Cole et al [5] reported male preponderance with a male: female ratio of 36:28 in 64 patients. The most common mode of injury was road traffic accident (85.7%) in our study. Sunny Brook Medical Center’s [2] prospective study reported 81% road traffic accidents. Skeletal injuries, especially to the extremities comprised the major associated injury (47.6%) in our series. SunnyBrook Medical Center study [2] reported a 38% incidence of head injury as their major associated injury. Cole et al [5] reported skeletal injuries as the frequent associated injury. Tornetta et al [7] reported associated skeletal injuries in 24 of 39 patients who suffered rotationally unstable pelvic disruption. Radiological assessment was done with three standard views of x-rays (AP, inlet & outlet projections) and a CT scan whenever needed. 13 of the 21 cases suffered Tile’s type B injury against 8 cases of type C injury. But Tile’s type C1 (unilateral vertical shear) comprised of the single most common of subtype (8 cases/38%) followed by type B1 and B2(6 cases each). We did not encounter any case with Tile’s type C2 or C3. Cole et al [5] in their series of 64 vertically unstable injuries reported Tile’s type C1 in 75% of cases. Miranda et al in his series of 80 patients, reported 31 cases of Tile’s B type and 24 cases of

C type injuries. A rare case of type B injury, a locked symphysis pubis was treated successfully by open reduction and internal fixation with symphyseal plating. Among nine patients with pubic symphysis diastasis, 8 patients were treated with elective open reduction and symphyseal plating, and one patient with emergent external fixation. The patient who was treated with external fixation died in the acute phase and 1 patient in internal fixation group lost follow up. Other seven patients had good functional results. A single plate was used in all fractures. One patient, in whom anterior plating was done, had implant loosening with screw migration down the thigh. Tornetta et al [7] reported on 29 patients operated with a single symphyseal plate. In our study, 7 patients were treated with open reduction and posterior internal fixation, including one case of combined fixation. Two patients had anterior plating of the sacroiliac joint, three patients were treated with open reduction and posterior iliosacral screw fixation and three others had 3.5 mm reconstruction plating for ilium. In two patients treated with iliosacral screws, reduction was unsatisfactory with sacroiliac joint mal alignment. One of them had further vertical displacement at the sacroiliac joint after he started early weight bearing. Both the patients had posterior pain. Analyzing the significant associated intrapelvic soft tissue injuries in our study, we had one case each of urethral, bladder, neurological (L5) and vascular injury. Sunil et al [6] reported 78 cases of which 17 patients had urogenital injuries, commonest being the urethral injury (8 cases). Injury to the intrapelvic vasculature is probably the single most important associated injury in pelvic trauma, since the major cause of mortality in pelvic fractures is hemorrhage. Direct injury to arteries is reported in 10-20% of patients with massive hemorrhage [2]. The incidence of direct tear of a large bore artery like external iliac artery is rare (Wolfgang K Ertel). Metz et al reported on 39 consecutive patients with hemodynamic instability who underwent pelvic angiography. In their study, bleeding from either internal iliac artery or its branches were the cause of hemorrhage in all of their patients. However it is surprising that in our study, we came across three patients with arterial injury and all of them had external iliac artery injury. (Two of the patients were died before skeletal stabilization who were excluded from this study and one patient treated with external fixation and vascular repair also died on 3rd day). [10,15] The incidence of deep vein thrombosis in major pelvic fracture patients was 10-80% in various studies. However, we did not use thromboprophylaxis and did not have any symptomatic deep vein thrombosis.

CONCLUSION

Despite better understanding of the personality of the acutely injured pelvis and modern aggressive treatment modalities, the mortality rate still remains high. Early aggressive but thoughtful management of the patients with unstable pelvic injuries is essential for maximizing the immediate survival and long-term functional outcome. Periodic thorough clinical and radiological assessment is mandatory to identify any occult injury. The role of team approach with various specialists cannot be over emphasized. The degree of hemodynamic instability does not correlate with type of pelvic injury. Emergent external skeletal fixation alone is not sufficient to restore hemodynamic stability in all patients who fail to improve after initial resuscitation. Anatomic reduction and internal fixation of unstable pelvic injuries gives excellent stability, allows early mobility with good functional outcome. Delayed internal fixation was not associated with increased perioperative morbidity and might achieve better reductions than those could be obtained with external fixation. Delaying the fixation, however, increased the difficulty of obtaining anatomic reduction in certain cases. Even delayed internal fixation may yield equally good functional outcome in patients where anatomic reduction could be obtained. Acute management of unstable pelvic injuries is challenging and techniques of safe internal fixation are demanding. Constant dedication to improvement is and must be the goal of pelvic surgeons.



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