

Functional assessment of operative and non-operative management in major pelvic fracture at Dr. Moewardi Hospital, Surakarta, Indonesia



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ABSTRACT

Introduction: Pelvic fractures are responsible for skeletal injuries and soft tissue-related injuries. Pelvic fracture is a disorder of the pelvis bones' structure, including the hip bone, sacrum, and coccyx. The condition will result in stable status if the pelvis can resist weight-bearing loads without the incidence of any displacement. This study aims to determine pelvic fracture outcome, in which operative and non-operative management used the Majeed score to evaluate the functional results.

Method: A retrospective case-control study was performed to retrieve data from medical records of patients with pelvic fractures at Dr. Moewardi Hospital Surakarta for the period from January 1st, 2017, until December 31st, 2019. The evaluation of reduction quality was conducted following the scores put forward by Majeed to evaluate the clinical outcomes. Data analyzing used SPSS V.24.0 (IBM Corp). *P-value* of <0.05 was determined as the statistical significance.

Results: In this study, there were 40 samples of pelvic fracture cases; 60% were male, 55% were aged 19 – 40 y.o, motor crash caused 67%, 37.5% were cases of pubic rami fractures. Besides, operative management was 52,5%, while non-operative was 47,5%. Further, operative management's functional outcome was excellent at 66%, good at 19%, fair at 9%, and poor at 8% of the patients. Patients treated with operative management had significantly fewer severe injuries, as rated using the Majeed score than the non-operative group.

Conclusion: The results suggest that operative treatment may be a viable option in treating major pelvic fracture as it provides better functional results than non-operative treatment.

Keywords: Pelvic fracture, Non-operative management, Operative management, Majeed score.

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BACKGROUND

Pelvic fractures are responsible for skeletal injuries with less than 5%. However, these occurrences should be noticeable due to higher number of soft tissue-related injuries and the threat of critical blood loss, adult respiratory distress syndrome (ARDS), sepsis, and shock. Similar to other severe injuries, it requires mixed method by competent specialists. Approximately two-thirds of the pelvic fracture incidents happened on the road, including pedestrians with visceral injuries comprising more than 10% of patients. Also, the probability of death rate reaches above 10%.¹

The prevalence of high-energy pelvic

fractures can be found due to motorcycle accidents, falls, motor vehicle, automobile-pedestrian, and crush injuries caused in industrial settings. The most common issues of high-energy pelvic fractures comprise great vessels and nerves found in the pelvis and major viscera, for instance, bladder, urethra, and intestines. These fractures may be followed by degloving injuries in closed and open injuries in surrounding soft tissues and may lead to treatment complexity. The death rate of severe pelvic fracture varied from 10% to 50% in several open pelvic fracture cases. Gilliland et al. and other studies revealed that the rise mortality risk factors encompassed the level of severity and age, blood loss, hypotension, head or visceral-

related injuries, unstable or open pelvic fractures, and coagulopathy. The most prevalent cause of early death is closed head injury or hemorrhage, and multiple system organ failure sepsis may lead to late deaths.²

Pelvic fracture is a disorder of the pelvis bones' structure, including the hip bone, sacrum, and coccyx.³ The condition will result in stable status if the pelvis can resist weight-bearing loads without the incidence of any displacement. It only may happen if bones and fundamental ligamentous structures remain undamaged. A state in which full weight-bearing can occur with the absence of pelvic deformity will result in stable pelvic ring injury. The test cannot be performed on acutely injured patients.

Table 1. Functional assessment system after pelvic fracture

Pain – 30 points		Standing – 36 points	
Intense, continuous at rest	0-5	<i>Walking aids (12)</i>	
Intense with activity	10	Bedridden or almost	0-2
Tolerable, but limits activity	15	Wheelchair	4
With moderate activity, abolished by rest	20	Two crutches	6
Mild, intermittent, normal activity	25	Two sticks	8
Slight, occasional or no pain	30	One stick	10
		No sticks	12
Work – 20 points		<i>B Gait unaided (12)</i>	
No regular work	0-4	Cannot walk or almost	0-2
Light work	8	Shuffling small steps	4
Change of job	12	Gross limp	6
The same job, reduced performance	16	Moderate limp	8
Same job, same performance	20	Slight limp	10
		Normal	12
Sitting – 10 points		<i>C Walking distance (12)</i>	
painful	0-4	Bedridden of few metres	0-2
Painful if prolonged or awkward	6	Very limited time and distance	4
Uncomfortable	8	Limited with sticks, difficult without prolonged standing possible	
Free	10	One hour with a stick limited without	6
		One hour without sticks slight pain or limp	8
		Normal for age and general condition	10
Sexual Intercourse – 4 points			12
Painful	0-1		
Painful if prolonged or awkward	2		
Uncomfortable	3		
Free	4		

Table 2. The grade of clinical status; working patients 160 points and non-working patients 80 points

Working before injury	Not working before the injury	Grade
>85	>70	Excellent
70 to 84	55 to 69	Good
55 to 69	45 to 54	Fair
<55	<45	Poor

In this regard, several classifications can be used. The classification used in this research follows what has been proposed by Young and Burgess (1986; 1987) (Table 1 & 2).¹

This study aims to challenge the functional assessment of operative and non-operative management in our department regarding major pelvic fracture incidents. The cases studied are based on the operative and non-operative management experiences of major pelvic fractures at Dr. Moewardi Hospital from January 1st, 2017 until December 31st, 2019, in the patient profile with functional outcome review.

METHODS

This study is a retrospective case-control study. The study was conducted at the Orthopaedics and Traumatology Subdivision/Department of Surgery FK-UNS/Dr. Moewardi Hospital Surakarta from January 1st, 2017, until December 31st, 2019. We used total patients with pelvic fractures at Hospital Dr. Moewardi, who met the criteria of the research object in the period January 1st, 2017 until December 31st, 2019, took the data from the medical records of Dr. Moewardi Hospital. The data obtained were tabulated and presented in the form of tables and

diagrams. Follow-up data were gathered as a whole, and after six months, patients were summoned back. During the follow-up, the clinical outcomes were evaluated through Majeed's scoring system.

Mann-Whitney and chi-square tests were administered to find the dissimilarities between groups were tested using, while Fisher's exact test utilized SPSS V.24.0 (IBM Corp). *P-value* of <0.05 was determined as the statistical significance.

RESULTS

Pelvic fracture patients, including 40 patients, were treated at Dr. Moewardi Hospital Surakarta, with 24 male patients (60%) and 16 female patients (40%) (Table 3).

Based on the age, the patients were between 5-80 years, with distribution: three patients aged 10-18 years, 22 patients aged 19-40, and 15 patients aged over 40 years (Table 4).

The causes of pelvic fractures in this study were traffic accidents as many as 35 patients (87.5%), in which the two-wheeled vehicles were 27 cases (67.5%), pedestrian were eight cases (20%), and falling from a height was five cases (12.5%)

Table 3. Patients' distribution by gender

Gender	Patients	Percentage
Male	24	60%
Female	16	40%

Table 4. Patients distribution by age

Age	Number of Patients	Percentage
< 18 y.o	3	7.5%
19 - 40 y.o	22	55%
>40 y.o	15	37.5%

Table 5. Patients' distribution by the mechanism of injury

MOI	Patients	Percentage
Motor vehicle accident	27	67.5%
Pedestrian	8	20%
Falling from height	5	12.5%

Table 6. Patients' distribution by cases

Cases	Patients	Percentage
Fr Os Ileum	9	22.5%
Fr Ramus Pubis	15	37.5%
LC	6	15%
APC	8	20%
VS	2	5%

Table 7. Patients' distribution by treatment

Treatment	Number of Patients	Percentage
Non-operative treatment	18	45%
Bed Rest + ORIF elective	13	32.5%
Pelvic sling + ORIF elective	8	20%
Pelvic sling + C-Clamp	1	2.5%

(Table 5).

It was obtained nine cases of os ileum fractures (22.5%), 15 cases of pubic rami fractures (37.5%), six cases of lateral compression (15%), eight cases of Anteroposterior compression, and two cases of sheer vertical (5%) (Table 6).

Treatments were taken to deal with cases, such as non-operative treatment in 18 cases (45%), bed rest + ORIF elective in 13 cases (32.5%), pelvic sling + ORIF elective in eight cases (20%), a pelvic sling + C - Clamp in one case (2.5%) (Table 7).

According to Majeed's score, a mean

score of 91.9 ± 6.09 ; range 80-100 is the patients' score with the non-operative treatment group. In details, 47% (9) patients showed excellent results, 32% (6) in good, 21% (4) in fair, and 0% (0) in poor clinical outcomes. Meanwhile, a mean Majeed score of 83.9 ± 7.96 ; range 80-100 are the score of patients with the operative treatment group. In the operative treatment group, 66% (14) patients presented excellent results, 19% (4) good, 9% (2) fair, and 6% (1) poor (Table 8).

The following are the significant differences between the groups for non-operative and operative management. The operative group showed significantly lower complications in the Majeed score ($p < 0.05$). Meanwhile, the percentage of the non-operative group was significantly higher (66% vs. 47%) (Table 9).

DISCUSSION

In this retrospective case-control study, there were 40 cases of pelvic fracture. The majority of patients were males, aged between 19-40 years old, have had motor vehicle accidents, with pubic rami fractures being the most frequent, and most fractures were stable. Moreover, the standard treatment was conservative treatment followed by internal fixation.

In the United States, the pelvic fracture incidence data is estimated at 37 cases per 100,000 persons per year. The pelvic fracture incidence mostly occurs in people at the age of 15-28 years. Men have more chance of experiencing pelvic fractures than women if they are younger than 35 years. Contrastively, women experienced more pelvic fractures than men if they are older than 35 years. The high-energy mechanism is the cause of most pelvic fractures that happened to the younger patients, whereas in the elderly patients, the pelvic fractures occurred from minimal trauma, for example, a low fall.^{4,5}

Furthermore, fracture of the pelvic represented three-percent to six-percent of all fractures in grown persons and happened in up to twenty percent of all polytrauma cases. They presented a bimodal age distribution with the highest injuries occurring at fifteen to thirty and over sixty years age range. Up to seventy-percent of all pelvic injuries are experienced by men.³

Table 8. Functional (clinical) assessment according to treatment

	Functional outcome			
	Excellent	Good	Fair	Poor
Non-Operative	47% (9)	32% (6)	21% (4)	0% (0)
Operative	66% (14)	19% (4)	9% (2)	8% (1)

Table 9. Functional assessment based on the patients' Majeed score based on the treatment patient n-number; the data are presented as mean \pm SD.

Majeed's Score Criteria	Majeed's Score	
	Non-operative (n = 19)	Operative (n = 21)
Pain	27.9 \pm 3.34	25.0 \pm 3.97
Work	19.0 \pm 1.80	16.9 \pm 1.64
Sitting	8.6 \pm 1.55	7.7 \pm 1.34
Sexual Intercourse	3.2 \pm 0.75	3.0 \pm 1.07
Walking Aid	11.6 \pm 0.77	11.8 \pm 0.61
Unaided Gait	11.0 \pm 1.04	10.6 \pm 1.14
Walking Distance	10.0 \pm 1.20	9.6 \pm 1.14
Total	91.9 \pm 6.09	83.9 \pm 7.96
<i>p-value</i>	0.52	0.01

Meanwhile, up to twenty percent of all pelvic fractures occurred were estimated to unstable pelvic fractures; a further 22% pelvic fractures would stay stable even if there are major injury to the ring of pelvic. The remaining pelvic fractures (58%) were less severe and remained structural stability and hemodynamic. The pelvic fracture incidence as a result of blunt trauma ranged from 5-11.9%. It occurred more likely to obese patients who sustained a fracture of the pelvic from blunt trauma than patients with no obesity. Fracture of pelvic related to penetrating trauma rarely occurred. Fractures of open pelvic were less frequent of all pelvic fractures and it was accounted for 2.7-4% only. It was informed range 7.6% until 19% was the patient mortality percentage reached the hospital due to pelvic fractures.^{3,6}

The potential of high-energy pelvic fracture complications comprises of damages to the nerves of the pelvis and

major vessels and the major viscera, including the bladder, urethra, and intestines. Degloving damages to the surrounding of both open and closed soft tissues could also go with the fractures and complicate the treatments.^{2,7}

In this case, effective pelvic ring stabilization should be instigated as early as possible, preferably before the patient is moved, and could be completed using applying for circumferential support and a proper pelvic splint. Nevertheless, care should be taken to make sure that the over-compression does not happen. As suggested by the expert consensus, appropriate pelvic splints are preferable to improve techniques of immobilization. In all methods, the major trochanters applied circumferential pressure instead of the iliac crests. Care should be practiced to make sure that the pelvis does not lie to reduce beyond the position of its normal anatomy. Injuries of soft tissue and sores

of pressure may happen, if immobilization devices are fitted inaccurately.¹

The current study revealed that nine patients were back to their previous jobs. Sixty seven-percent returned to the former jobs without restrictions in the most extensive patient series cured with internal fixation and open reduction of posterior pelvic damages that are unstable.⁸ In other research, patients owned neurologic damages (35%) and experienced related to damages obstructing normal gait (23%) where all fractures were operatively reduced to less than residual displacement 10mm. Fractures of pelvic in female inclined to have dyspareunia and more complaints of urinary.⁹ This current research indicated that the pelvic ring anatomical restoration connected with the higher possibility of good functional and clinical outcomes.

Comparing the functional outcomes in the current study with functional results of patients with nonoperative and operative treatment, as elucidated in the literature, there was no functional result in the current research, classified as poor or fair in patients who experienced major fractures of pelvic.

The Majeed score was implemented as it represents functional criteria to evaluate mid-term functional outcomes, which reflect patient satisfaction and the possibility of doing work and walking. As Kabak et al., related injuries altered the functional outcome in patients who experienced unstable pelvic injuries.⁶

Nevertheless, this study's limitation was that the functional outcome after major pelvic damage depended on the extent and severity of soft tissue injury and radiological features because of the relatively small number of patients. With an outcome assessment of major pelvic fractures based on Majeed's score, the present study's findings suggested that the operative treatment may be a viable option in treating major pelvic fracture as it provides better functional results than non-operative treatment. Further studies in more extensive patient series are needed to confirm this.

CONCLUSION

The present study's findings suggested that the operative treatment may be a viable

option in treating major pelvic fracture as it provides better functional results than non-operative treatment.

DISCLOSURES

Author Contribution

All authors contributed in designing and concepting the research, analyzing the results, and preparing published manuscript.

Conflict of Interest

All authors stated no conflict of interest regarding this research.

Ethical Statement

This research has approved by Universitas Sebelas Maret Medical Ethic Commission.

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