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Original Research Article

Functional assessment of daily living activities following surgical management of young-burgess lateral compression type-II pelvic fractures with combined anterior and posterior internal fixation

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ABSTRACT

Background: Fractures of the ischiopubic bones, S-I joint, and sacrum are among the most common bony injuries. Various procedures are available for managing this condition. Biomechanically, internal fixation of both the posterior and anterior lesions can offer complete stability to the pelvic ring. This study aimed to assess the functional assessment of daily living activities following surgical management of young-burgess lateral compression type-II pelvic fractures with combined anterior and posterior internal fixation.
Methods: This descriptive observational study was conducted at the Department of Orthopedics & Traumatology, Dhaka Medical College & Hospital, Dhaka, Bangladesh from July 2016 to June 2018. A total of 44 patients with pelvic injuries admitted to the respective department were purposively enrolled as the study population. Data analysis was performed using the MS Office tools.
Results: Most patients (68.18%) continued their jobs with reduced performance, while 22.72% maintained both job and performance levels. Regarding functional assessment, 54.54% could sit pain-free, with only 13.63% experiencing discomfort. None reported painful sexual intercourse. Mobility-wise, no one was bedridden or could only walk a few meters, and 0% needed walking sticks. Additionally, 18.81% could walk for one hour with a stick, while 63.63% had a normal walking distance for their age. No limitations in walking time or distance were observed in 63.63% of cases.
Conclusions: This study concludes that stabilization of LC type-II pelvic ring fractures by anterior, combined, or posterior reconstruction plate provides a good result concerning daily living activities.

Keywords: Functional assessment, Daily activities, Young-Burgess lateral compression fracture

INTRODUCTION

Fractures affecting the ischiopubic bones, S-I joint, and sacrum are common bony injuries, and various procedures exist for their management. Biomechanically, internal fixation of both posterior and anterior lesions can achieve complete stability of the pelvic ring, alleviating patients' pain and facilitating early mobilization.[1] Pelvic external fixators, when used alone, seldom provide adequate stability as a definitive treatment for high-energy pelvic ring disruption compared to internal fixations. In instances where the ring is broken in one area with displaced

fragments, there is likely a fracture or dislocation in another part of the ring. Pelvic ring stability hinges on the integrity of the posterior weight-bearing sacroiliac complex, which includes the major sacroiliac, sacrotuberous, and sacrospinous ligaments. The exceptionally robust posterior sacroiliac ligament maintains the normal position of the sacrum within the pelvic ring, creating an appearance akin to a suspension bridge. Additionally, the sacrospinous ligament, connecting the lateral edge of the sacrum to the ischial spine, serves to resist external rotation of the hemipelvis. The sacrotuberous ligament exerts both rotational and shearing forces in the vertical plane. Lesions in the anterior part of the pelvic ring are less critical for stability when the posterior portion remains intact.[2] Tornetta, Dickson, and Matta et al found that after anterior internal fixation of rotationally unstable but vertically stable fractures, 96% of their patients reported either no pain or pain only during strenuous activity. They recommended the use of a single four- or six-hole 3.5-mm reconstruction plate.[3,4] In a study by Miranda et al, comparing results in 80 patients with pelvic fractures, 61% were treated with external fixation, and 39% were treated nonoperatively. They reported similar rates of returning to previous occupations for Tile types A, B, and C injuries, ranging from 75% to 81%.[5] The definitive management of pelvic fractures is determined by the degree of instability. Stabilization of the pelvic ring is rarely indicated in Type A fractures, with anterior ring stabilization usually sufficient for Type B fractures. In contrast, Type C fractures typically require combined anterior and posterior stabilization, as per the Stability & Deformity classification.[6] Biomechanical studies emphasize that internal fixation of both the posterior and anterior aspects of the pelvic ring offers the highest stability. Hesp and Goldstein et al have demonstrated a reduction in mortality and systemic infection as a benefit of early open reduction and internal fixation.[7] In LC (lateral compression) injuries involving pelvic ring disruption, healing of the sacroiliac joint is crucial for a satisfactory outcome. Various internal fixation implants, such as a Sacral bar, Cobra plate, Reconstruction plate, or Ilio-sacral screw, have been advocated for posterior disruption. Open reduction and internal fixation of LC unstable fractures are considered to provide optimal fixation and clinical stability.

Objective

General objective

General objective was to analyze functional assessment of daily living activities following surgical management of young-burgess lateral compression type-II pelvic fractures with combined anterior and posterior internal fixation.

Specific objectives

Specific objectives were to determine the age and gender distribution of the study subjects; to investigate the occupation status of the patients; to assess the causes of injury among the respondents; to observe the type of fixation used in the study patients.

METHODS

This descriptive observational study was conducted at the Department of Orthopedics & Traumatology, Dhaka Medical College & Hospital, Dhaka, Bangladesh, from July 2016 to June 2018. All patients with pelvic injury admitted to the respective department were considered as the study population. A total of 44 patients were selected through the purposive sampling technique, adhering to the inclusion and exclusion criteria.

Inclusion criteria

Inclusion criteria were patients aged 18 to 60 years, encompassing both genders; patients diagnosed with Young Burgess LC type-II pelvic fracture; patients who presented within 3 weeks of the injury.

Exclusion criteria

Exclusion criteria were patients with acetabular fractures and other types of pelvic fractures; patients with active infections; patients with pathological fractures; patients with a dysmorphic sacrum; patients with complete spinal cord injury.

Data collection involved a pre-tested structured questionnaire encompassing history, clinical examination, laboratory investigations, and pre-operative, peri-operative, and post-operative follow-up findings, including complications. A comprehensive history, clinical examination, and relevant investigations were conducted. Open reduction and internal fixation were performed using a reconstruction plate or anterior column lag screw for anterior stabilization and a partially threaded cancellous screw or reconstruction plate for posterior stabilization. Patients underwent outpatient follow-ups for a minimum of six months and a maximum of twelve months postoperatively at three-week intervals, then after 6 weeks, 3 months, and 6 months. The collected data were analyzed using MS Office tools. Descriptive statistics were employed for data analysis, and the results were presented in the form of tables and charts with appropriate interpretations. Ethical clearance was obtained from the ethics committee of Dhaka Medical College and informed written consent was obtained from the study subjects.

RESULTS

In this study, the highest number of patients (54.54%) was observed in the 20-30 years age group, while the lowest number (18.18%) was in the more than 40 years age group. The mean age was 35.8±10.5 years, ranging from 18 to 60 years (Table 1). Among the study population, 32 (72.72%) were male, and 12 (27.27%) were female (Figure 3). Out of 44 patients, 16 (36.36%) were workers, 12 (27.27%)

were service holders, 8 (18.18%) were students, 4 (9.09%) were businessmen, and 4 (9.09%) were drivers (Figure 4).

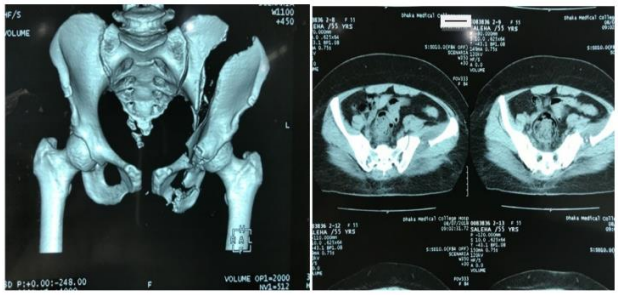

Figure 1: Pre-operative CT scan (3D) confirmed both rami fractures and ipsilateral posterior iliac fracture.

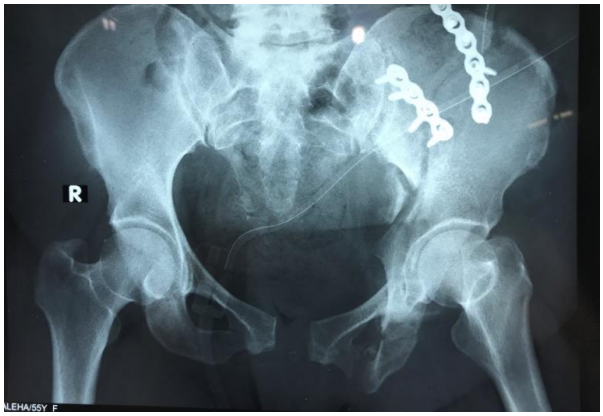

Figure 2: Postoperative X-ray pelvis anteroposterior view at 6th week.

Table 1: Age distribution of participants (n=44).

Age (in years)	N	%
20-30	24	54.54
31-40	8	18.18
>40	12	27.27
Mean± SD	35.8±10.5	

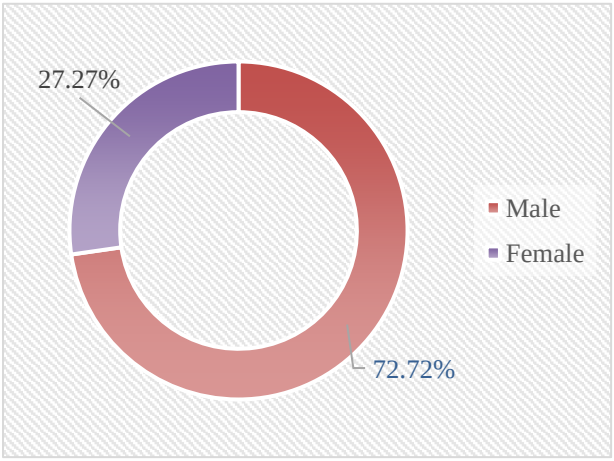

Figure 3: Gender distribution.

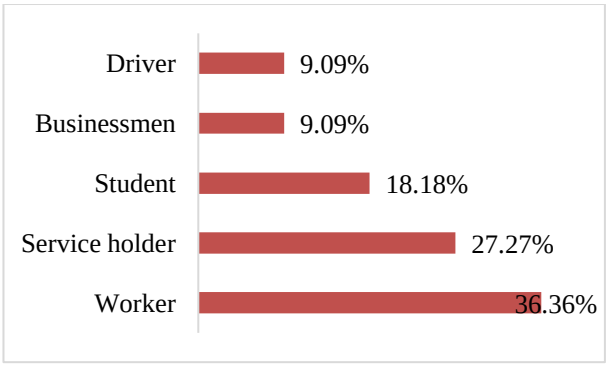

Figure 4: Occupation status of the patients.

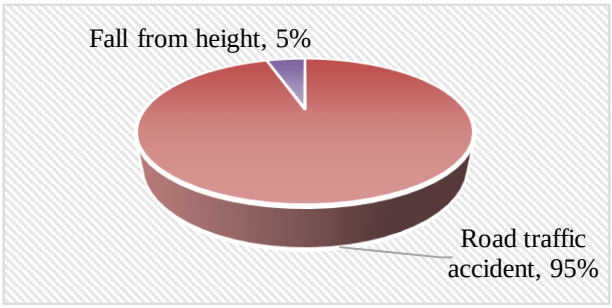

Figure 5: Mode of injury among the respondents.

In this study, 42 (95%) of fractures were caused by road traffic accidents (RTA), and the remaining 5.0% were due to falls from height (Figure 5). Among the 44 patients, all (100%) underwent SI joint fixation, with unilateral fixation in 42 (95.45%) and bilateral fixation in 4 (9.09%). Additionally, all patients underwent anterior pelvic plating of the pubic symphysis (Table 2).

Table 2: Type of fixation among participants.

Associated injury	N	%
SI joint fixation	44	100
Unilateral	42	95.45
Bilateral	2	4.54
Anterior pelvic plating	44	100

Table 3: Functional outcomes regarding pain.

Pain	N	%
Slight, occasional, or no pain	4	9.09
Mild pain, normal activity	30	68.18
Moderate activity, abolished by rest	6	13.63
Tolerable, but limited activity	4	9.09
Intense, continuous at rest	0	0.0
Intense with activity	0	0.0

In this study, pain assessment revealed that 4 (9.09%) patients had slight, occasional, or no pain, 30 (68.18%) experienced mild, intermittent pain during normal activity, 6 (13.63%) had pain with moderate activity that was relieved by rest, and 4 (4.54%) had tolerable pain that

limited activity. No patients reported intense continuous pain at rest or with activity (Table 3). Regarding functional assessment of work, the majority, 30 (68.18%) patients, were involved in the same job with reduced performance, 10 (22.72%) had the same job with the same performance, and 4 (9.09%) patients had changed their job. None of the patients reported an inability to perform their regular work (Table 4). In terms of the functional assessment of sitting, 24 (54.54%) patients could sit pain-free, 6 (13.63%) were uncomfortable, and 14 (31.81%) experienced pain if sitting was prolonged or awkward, while none reported pain during sitting (Table 5).

Table 4: Functional assessment regarding work.

Work	N	%
Same job, same performance	10	22.72
Same job, reduced performance	30	68.18
Change of job	4	9.09
Light work/ regular work	0	0.0
No regular work	0	0.0

Table 5: Functional assessment regarding sitting.

Sitting	N	%
Free	24	54.54
Uncomfortable	6	13.63
Painful if prolonged or awkward	14	31.81
Painful	0	0.0

Table 6: Functional assessment regarding sexual intercourse.

Sexual intercourse	N	%
Free	28	63.63
Uncomfortable	2	4.54
Painful if prolonged or awkward	10	22.72
Painful	0	0.0
Unmarried	4	9.09

Table 7: Functional assessment on standing with walking aids.

Walking aids	N	%
No stick	34	72.27
One stick	6	13.63
Two crutches	4	9.09
Wheelchair	0	0.0
Bedridden or almost	0	0.0

Regarding the functional assessment of sexual intercourse, no patient reported pain; 28 (63.63%) were free, 2 (4.54%) felt uncomfortable, and 10 (22.72%) experienced pain if intercourse was prolonged or awkward, while none reported pain (Table 6). 13.63% of patients used one stick, 4 (9.09%) used two crutches, and the majority, 34 (72.27%), did not use any stick (Table 7). It was observed that 4 (9.09%) patients could walk for one hour without sticks with slight pain or limp, none were bedridden or could walk only a few meters, none had a limited walk with sticks, 8 (18.81%) could walk for one hour with a stick with limitations, 28 (63.63%) had a normal distance for age and general condition, and none were found to have very limited time and distance for walking (Table 8).

Table 8: Functional assessment on walking distance.

Walking distance	N	%
Normal for age and general condition	28	63.63
One hour with a stick, limited without	8	18.18
One hour without sticks slight pain	4	9.09
Limited with sticks	4	9.09
Difficult without prolonged standing		

DISCUSSION

In this current study, the majority (54.54%) of the patients were in the 3rd decade, and the lowest number (18.18%) were in the 4th decade. The mean age was 36.41±3.4 years, ranging from 18 to 60 years. Avilucea, observed a mean age close to the current study.[7] Oh et al showed the average age of the patients was 41 years (ranges, 23 to 61 years).[8] In this series, the male-female ratio was 2.5:1, indicating male predominance. Similar observations were made by Zamzam et al, Van den Bosch et al, and Matta et al.[9-11] In this present series, 95.0% of fractures were caused by RTA, and the rest (5.0%) were due to falls from height. Kwon et al reported that RTAs accounted for 69.6%, pedestrians 37.37%, and drivers 10.1% of injuries.[12] Miranda et al found that 78.9% of fractures were due to motor vehicle accidents, 10.5% to pedestrian-car incidents, and 10.8% to falls from height.[13] In this series, 63.63% had associated injuries, including lacerated wounds (18.18%), femur shaft fractures (4.54%), Colles' fractures (9.09%), and urethral tears (31.81%). Zamzam noted 84.2% with associated injuries in his study, aligning with Pelvandi and Hasankhani's similar findings.[9,14] Regarding pain, 9.09% reported occasional or no pain, 68.18% had mild intermittent pain with normal activity, and 13.63% experienced pain with moderate activity, relieved by rest. Tornetta and Matta found that 63.0% had no pain or pain only during strenuous activity. In Tile's study, 36.0% had no pain, 52.0% had moderate pain, and 62.0% had severe pain. Despite longer follow-ups in previous studies, our 6 to 18-month follow-up showed higher pain levels. Regarding work, 68.18% had the same job with reduced performance, 36.36% had the same job with the same performance, 9.09% changed jobs, and none were unable to work. Tornetta and Matta found two-thirds returning to their original jobs, with 16.0% changing jobs due to associated injury.[14] Miranda et al reported 58.3% returning to previous occupations.[13] Van den Bosch et al found 5.4% were unable to work, 16.2% changing jobs, 51.4% resuming previous work, and 24.3% with physically demanding jobs.[10] Results from the above studies closely align with the current study. In the functional assessment of sitting, 54.54% of patients could sit pain-free, 13.63% were uncomfortable, and 31.81%

experienced pain with prolonged or awkward sitting, with none reporting severe pain. Van den Bosch et al found a lower sitting limitation at 39.0% in their study.[10] Regarding sexual intercourse, 63.63% reported pain-free experiences, 27.72% had pain with prolonged intercourse, 4.54% found it uncomfortable, and 9.09% were unmarried. Majeed's outcome scale mentioned a 40.0% change in sexual intercourse.[15] Patients in our study showed varied use of walking aids: none during walking, 13.63% with one stick, and 9.09% with two crutches, consistent with Van den Bosch et al's findings of 23.0% using walking aids.[10] Miranda et al reported 41.7% returning to previous sexual activity, aligning with our study.[13] In the assessment of walking distance, 63.63% walked normally for age and general condition, 18.18% could walk one hour with a stick, 9.09% found it limited with sticks and difficult without prolonged standing, with none reporting very limited time and distance or being bedridden. Tornetta and Matta found that 63.0% of patients ambulated without restriction, supporting our findings.11

Limitations of the study

The study was conducted in a single hospital with a small sample size and a short follow-up period. Consequently, the results may not be fully representative of the broader community. Additionally, post-operative CT scans were not conducted for all patients.

CONCLUSION

In the present study, the stabilization of LC type-II pelvic ring fractures using anterior, combined, or posterior reconstruction plates is observed to yield favorable outcomes for daily living activities. A significant majority of patients exhibit the ability to walk without aids, achieving satisfactory walking distances commensurate with their age and general condition. Additionally, the successful resumption of various other daily activities further underscores the positive impact of these stabilization techniques on patients' functional outcomes.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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