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Observation of Complications After Open Reduction and Internal Fixation of Young-Burgess Lateral Compression Type-II and III Pelvic Fractures

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Abstract

Introduction: *Pelvic fractures, particularly lateral compression type II and III fractures according to the Young-Burgess classification, present unique challenges in orthopedic management. Open reduction and internal fixation (ORIF) are commonly employed surgical interventions for stabilizing and realigning these fractures. This study aimed to analyze the complications after open reduction and internal fixation of young-burgess lateral compression type-II and III pelvic fractures.*

Methods: *In this descriptive observational study conducted at the Department of Orthopedics & Traumatology, Dhaka Medical College & Hospital, Dhaka, Bangladesh, data were collected from July 2016 to June 2018. The study population comprised 22 patients with pelvic injuries who were admitted to the department. The analysis of data was carried out using MS Office tools.*

Result: *In analyzing the complications among the participants, it was observed that 3 patients (13.63%) experienced wound infection, 1 patient (4.54%) had erectile dysfunction, and 1 patient (4.54%) encountered implant failure. No complications were reported in 17 patients (77.27%). Regarding the functional gait assessment, 9 patients (40.90%) had a slight limp, 10 (45.45%) exhibited a normal gait, and 3 (13.63%) demonstrated a moderate limp with shuffling small steps. No patients displayed a gross limp or reported an inability to walk.*

Conclusion: *Following open reduction and internal fixation of Young-Burgess lateral compression type-II and III pelvic fractures, the likelihood of major complications is minimal. While there is a slight possibility of complications such as wound infection, erectile dysfunction, or implant failure, the overall risk is low.*

Keywords: *Open reduction and internal fixation, Gait, Pelvic fracture, Complications, Stability*

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I. INTRODUCTION

The human pelvis is a highly stable structure that requires significant force to disrupt. For example, a high-energy impact, ranging from 6000 to 9000 N force, is typically needed to cause a Lateral Compression-1 (LC-1) fracture [1]. The pelvis is not only robust but is also richly supplied with an extensive neurovascular network. These characteristics contribute to the increased mortality associated with pelvic ring disruptions when compared to other types of bony injuries [1]. An unstable pelvic fracture can be life-threatening, earning it the reputation of being a "killing" fracture [2]. The pelvic structure forms a ring, comprising the centrally located sacrum and two fused bone planes on each side, including the ischium, ilium, and pubic bones [3]. Forces acting upon a hemipelvis involve external rotation, internal rotation (compression from the lateral side), and vertical shear. In certain complex high-energy injuries, forces may defy detailed descriptions. This study aims to elucidate the internal rotation (lateral compression) caused by a direct blow to the lateral aspect of the iliac crest

or an indirect force through the femoral head. This mechanism produces a compression fracture of the posterior complex and fractures of the rami anteriorly. The posterior and anterior lesions may manifest on the same side of the pelvis (ipsilateral side) or on opposite sides (bucket handle type). The latter type is linked to significant rotational deformities and may lead to malunion. In some instances, a lateral compression force may halt before rupturing the posterior structures, while in others, rupture occurs, resulting in an overlapped locked symphysis or a superior ramus fracture rotated around the disrupted ring [4]. The definitive management of pelvic fractures is contingent upon the degree of instability. Clear indications for stabilizing the pelvic ring are exceptional in Type A fractures, where stabilization of the anterior ring is usually sufficient for Type B fractures, and a combination of anterior and posterior stabilization is necessary in Type C fractures [2], as per the classification of Stability & Deformity [5-7]. Open reduction and internal fixation (ORIF), in comparison to external fixation, offer better fracture reduction, superior biomechanical stability, and enable earlier ambulation. Indications for ORIF include symphyseal widening >2.5 cm, difficult-to-close reduced tilt fractures, SI joint dislocation, iliac fracture, unstable acetabular fracture, and in conjunction with laparotomy in the absence of fecal or urinary contamination [8]. While there are substantial possible complications associated with open reduction and internal fixation, overcoming these challenges is feasible with excellent operative technique and postoperative follow-up [7]. In patients with pelvic fractures, especially those who are hypotensive, identifying and treating the source of bleeding can be challenging. A thorough understanding of pelvic anatomy is crucial for the assessment and treatment of these injuries [9]. Anatomical restoration of the pelvis is essential for achieving long-term outcomes comparable to population norms following severe pelvic trauma. Chronic issues frequently associated with these injuries include sexual dysfunction and pain. Irrespective of the fracture type, neurological injury universally signals poor outcomes [10]. The general objective of this study was to assess the complications after open reduction and internal fixation of young-burgess lateral compression type II and III pelvic fractures.

II. 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. The study population comprised all patients with pelvic injuries admitted to the respective department. A total of 22 patients were selected using the purposive sampling technique based on the inclusion and exclusion criteria.

Inclusion Criteria

- Patients of 18 to 60 years and both genders.
- Patients with Young Burgess LC type-II and III pelvic fractures.
- Patients presented within 3 weeks of injury.

Exclusion Criteria

- Patients with acetabular fracture and other types of pelvic fracture.
- Patients with active infection or pathological fractures.
- Patients with dysmorphic sacrum or complete spinal cord injury.

The study utilized a structured questionnaire to collect data, covering patient history, clinical exams, lab investigations, and pre-, peri-, and post-operative details, including complications. Open reduction and internal fixation were performed with either a reconstruction plate or anterior column lag screw for anterior stabilization and partially threaded cancellous screws or reconstruction plates for posterior fixation. Regular outpatient monitoring occurred for six to twelve months postoperatively, with assessments at three-week intervals up to six months and utilizing the Majeed functional outcome score beyond that. MS Office tools were used for data analysis. Ethical clearance was obtained from the ethics committee of Dhaka Medical College. Informed written consent was taken from the study subjects.

III. RESULTS

In this study, the majority of patients (54.54%) fell within the 20-30 years age group, while the lowest number (18.18%) were in the more than 40 years age group. The mean age was 35.8±10.5 years, ranging from 18 to 60 years. Among the study population, 72.72% were male, and 27.27% were female. Of the 22 patients, 36.36% were workers, 27.27% were service holders, 18.18% were students, and 9.09% were businessmen and drivers. The study found that 95% of fractures were caused by road traffic accidents (RTA), while 5.0% resulted

from falls from height. In the study, 18.18% of patients presented with lacerated wounds, 4.5% with a fractured shaft of the femur, 9.09% with Colles' fracture, and 22.72% with bladder tear/urethral injury. Additionally, 45.45% of patients had no associated injury. Among the 22 patients, all (100%) underwent sacroiliac (SI) joint fixation, with 95.45% undergoing unilateral fixation and 9.09% bilateral fixation. All patients also underwent anterior pelvic plating of the pubic symphysis. Regarding the time interval between injury and operation, 40.90% of patients were operated on within 10 days, while the remaining 59.09% were operated on between 11-20 days of injury. The mean hospital stay duration was 18.04 ± 5.15 days, ranging from 9 to 33 days, with most patients staying in the hospital for 11 to 20 days. Complications were observed in a limited number of cases, with 13.63% having wound infection, 4.54% experiencing erectile dysfunction, and 4.54% encountering implant failure. No complications were reported in 77.27% of patients. In terms of unaided gait assessment, 40.90% showed a slight limp, 45.45% had a normal gait, and 13.63% exhibited a moderate limp with shuffling small steps; no gross limp or inability to walk was observed.

Figure 1: Pre-operative CT scan (3D)

Figure 2: Bilateral retrograde percutaneous anterior column lag screw placement for anterior stabilization under fluoroscopy guidance

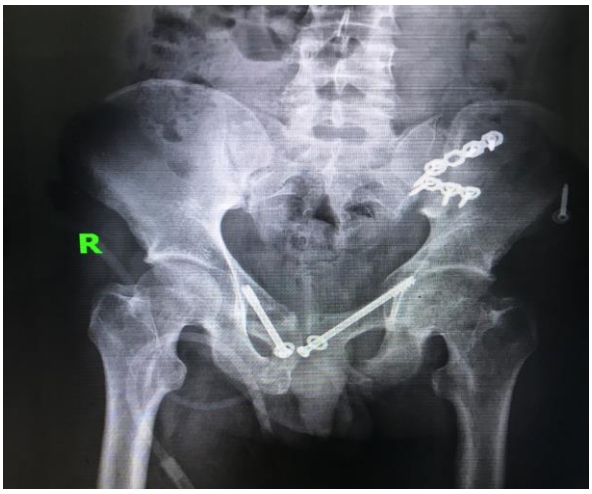

Figure 3: Postoperative X-ray pelvis outlet view in 6th week

Table 1: Age distribution of the study patients (N=22)

Age (in years)	n	%
20-30	12	54.54
31-40	4	18.18
>40	6	27.27

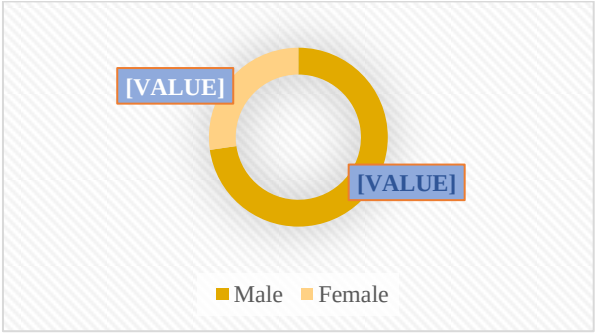

Figure 4: Gender distribution of the study subjects (N=22)

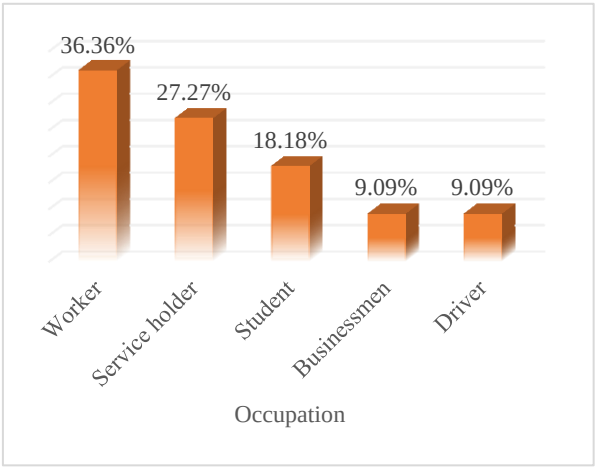

Figure 5: Occupation status of the patients. (N=22)

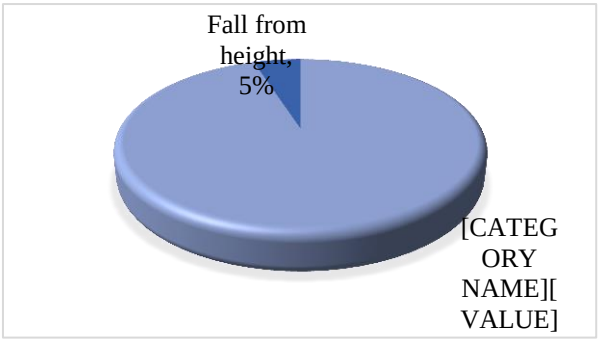

Figure 6: Cause of injury among the respondents

Table 2: Associated injury of the study patients (N= 22)

Associated injury	n	%
Lacerated wound	4	18.18
Fracture shaft of the femur	1	4.5
Colles' fracture	2	9.09
Urethral injury	5	22.72
No injury	10	45.45

Table 3: Type of fixation of the study patients (N=22)

Associated injury	n	%
SI joint fixation	22	100%
Unilateral	21	95.45%
Bilateral	1	4.54%
Anterior pelvic plating	22	100%

Table 4: Time interval between injury and operation (N=22)

Days	n	%
0-10	9	40.90
11-20	13	59.09
Mean±SD	10.6±3.02	
Range (min-max)	(6-18)	

Table 5: Hospital stay of the study patients (N=22)

Hospital stays (days)	n	%
11-20	16	72.72
21-30	5	22.72
>30	1	4.54
Mean±SD	18.04±5.15	
Range (min-max)	(09-33)	

Table 6: Distribution of the study patients according to post-operative complication (N=22)

Postoperative complication	n	%
Wound infection	3	13.63
Erectile dysfunction	1	4.54
Implant failure	1	4.54
No complication	17	77.27

Table 7: Distribution of the patients according to functional assessment of gait unaided (N=22)

Gait unaided	n	%
Normal	10	45.45
Slight limp	9	40.90
Moderate limp	3	13.63
Gross limp	0	0.0
Shuffling small steps	0	0.0
Cannot walk or almost	0	0.0

IV. DISCUSSION

In this study, the mean age of the participants was 36.41±3.4 years, ranging from 18 to 60 years. The mean age observed by Avilucea, Whiting, and Mir et al. was 36 years, which aligns closely with the current study [11]. Oh et al. reported an average age of 41 years [12], Kwon et al. found a mean age of 38.4±18.0 years [13], and Turfan et al. reported a mean age of 40.6±20.9 years [14]. Similarly, Zamzam, Pelvandi, and Hasankhani observed an almost identical mean age of 37 years and 37.3 years, respectively [15,16]. In this series, the male-female ratio was 2.5:1, indicating a male predominance, possibly due to males being more exposed to road traffic accidents while working outside. Turfan et al. reported 64% male patients [14]. Similar observations of male predominance were noted by Zamzam et al., Van den Bosch et al., and Matta et al. [15,17,18]. In this series, the majority (95.0%) of fractures were caused by road traffic accidents, with the remaining 5.0% due to falls from height. Kwon et al. reported that road traffic accidents accounted for 69.6%, pedestrians 37.37%, and drivers 10.1% [13]. Holstein et al. also demonstrated that the most frequent causes of injury were road traffic accidents, including car, motorcycle, bicycle accidents, and falls from high altitudes [19]. Miranda et al. found that 78.9% of fractures were due to motor vehicle accidents, 10.5% resulted from

pedestrian versus car incidents, and 10.8% were due to falls from height [20]. In this series, 63.63% of patients had associated injuries, including 18.18% with lacerated wounds, 4.54% with fracture shaft of the femur, 9.09% with Colles' fracture, and 31.81% with urethral tear. Zamzam's study, which included 38 patients, reported that 84.2% of patients had associated injuries [15]. In terms of the time interval between injury and operation, 40% of the patients were operated on within 10 days, while 60% underwent surgery between 11-18 days, with a mean duration of 10.6±3.02 days (range: 9 to 18 days). Oh et al. reported a longer interval of 17.4 days (range: 11 to 30 days) in their study [12]. Consistently, Tornetta and Matta found a mean duration of 14 days, aligning with the present study [21]. In the present study, the mean duration of hospital stay was 18.04±5.15 days, with most patients staying 11 to 20 days. Cole et al. reported a mean postoperative hospital stay of 16 days [22], while Zamzam found a mean total hospital stay of 29 days [15]. Postoperative complications in the current study included wound infection in 13.63% of patients, erectile dysfunction in 4.54%, and implant failure in one patient (4.54%), while 77.27% had no postoperative complications. Bosch et al. [23] reported that 35.1% of patients had postoperative complications, including 8.1% with ARDS, 8.1% receiving treatment for an ileus, 10.8% with pulmonary atelectasis or pneumonia, and 8.1% with other complications. This is comparable to the present study; however, wound infection was not observed in their studies. This difference might be attributed to the high-level hospital facilities, hospital environment, and operation theater facilities in their setting.

Limitations of the study

The study's limitations, including its single-hospital setting, small sample size, and short follow-up period, may impact the generalizability of the results to the broader community. Additionally, the absence of postoperative CT scans in all patients could be a limiting factor in the comprehensive assessment of outcomes.

V. CONCLUSION

The postoperative outlook for individuals undergoing open reduction and internal fixation for Young-Burgess lateral compression type-II and III pelvic fractures is generally favorable, with a minimal likelihood of major complications. Although there exists a slight possibility of encountering issues such as wound infection, erectile dysfunction, or implant failure, the overall risk remains low. These findings underscore the effectiveness of the surgical intervention and suggest that, in the majority of cases, the procedure offers a successful and well-tolerated approach to managing these specific pelvic fractures.

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Conflict of interest: None declared

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