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Original Research Article

Functional Outcome Analysis after ORIF of Transverse Acetabular Fracture Using Kocher-Langenbeck Approach

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Abstract: ***Background*:** Transverse acetabular fractures often involve the weight-bearing dome of the acetabulum and require precise anatomical reduction for optimal functional recovery. Open reduction and internal fixation (ORIF) using the Kocher-Langenbeck approach remains a preferred method for managing such injuries. This study aimed to evaluate the functional outcomes following ORIF of transverse acetabular fractures using this posterior approach. ***Methods*:** This prospective observational study was conducted in the Department of Orthopaedic Surgery at Dhaka Medical College Hospital over 24 months from July 2017 to June 2019. A total of 25 patients aged 21–80 years with radiologically confirmed transverse or associated acetabular fractures were included. All underwent ORIF through the Kocher-Langenbeck approach within three weeks of injury. Functional outcomes were assessed using the Merle d'Aubigné and Postel scoring system at six months postoperatively. ***Results*:** The mean age of patients was 36.2 ± 14.12 years, with most (76.0%) between 20–40 years. Anatomical reduction was achieved in 80.0% of cases. At six months, 40.0% of patients had excellent, 20.0% good, 4.0% fair, and 36.0% poor outcomes. Overall, 76.0% had satisfactory outcomes. Pain-free status was observed in 76.0%, normal walking in 76.0%, and 95%–100% hip range of motion in 60.0% of patients. Functional outcome showed a significant distribution difference ($p = 0.021$), though not significantly associated with reduction quality ($p > 0.05$). ***Conclusion*:** ORIF through the Kocher-Langenbeck approach provides favorable functional outcomes in the majority of patients with transverse acetabular fractures.

Keywords: Acetabular Fracture, Transverse Fracture, Kocher-Langenbeck Approach, Functional Outcome, ORIF, Merle d'Aubigné Score.

INTRODUCTION

Acetabular fractures are among the most complex injuries encountered in orthopedic trauma, frequently resulting from high-energy mechanisms such as road traffic accidents or falls from height [1]. These fractures often involve young, active individuals and pose significant challenges in terms of anatomical restoration, functional recovery, and long-term joint preservation [2, 3]. Among various fracture patterns, the transverse type is relatively uncommon but clinically significant due to its involvement of both anterior and posterior columns of the acetabulum, requiring precise reduction and stable internal fixation [4].

The goals of surgical treatment in acetabular fractures include restoration of the joint congruity, preservation of hip function, and prevention of post-traumatic arthritis [5, 6]. Open reduction and internal fixation (ORIF) remains the gold standard for managing displaced transverse acetabular fractures. Among the various surgical approaches available, the Kocher-Langenbeck approach is widely used for posterior column and wall involvement [7]. It offers adequate exposure of the posterior acetabulum and is especially suited for transverse and associated fracture patterns when managed within the early post-injury period [8].

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Functional outcomes following ORIF of transverse acetabular fractures are influenced by multiple factors, including the quality of fracture reduction, timing of surgery, associated injuries, and postoperative rehabilitation [9]. The Merle d'Aubigné and Postel scoring system is a validated tool for assessing hip function postoperatively, while the Matta radiographic criteria remain the standard for evaluating the quality of fracture reduction [10]. Despite advancements in surgical techniques and fixation devices, variability in long-term functional outcomes persists [11].

There is limited data from Bangladesh evaluating functional outcomes following ORIF of transverse acetabular fractures using the Kocher-Langenbeck approach. Therefore, this study was undertaken to analyze the functional outcome of such cases using standardized clinical and radiological criteria. The findings aim to guide future management strategies and optimize postoperative results in patients with this challenging injury pattern.

METHODOLOGY & MATERIALS

This prospective observational study was conducted at the Department of Orthopaedic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh, over a period of 24 months from July 2017 to June 2019. A total of 25 patients aged between 21 and 80 years, of both sexes, with clinical and radiological evidence of transverse or associated acetabular fractures (including T-type, transverse with posterior wall, anterior column with posterior hemitransverse) were enrolled. Patients were selected using convenience sampling. Only those who underwent open reduction and internal fixation (ORIF) through the Kocher-Langenbeck approach within three weeks of injury were included. Patients with open fractures, active or latent infection, age below 21 or above 80 years, or with significant comorbidities such as uncontrolled hypertension, diabetes mellitus, COPD, or left ventricular hypertrophy were excluded.

Informed written consent was obtained from each patient or their legal guardian after clearly explaining the study objectives, procedures, benefits, risks, costs, and confidentiality measures in a language they understood. Ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College.

Each patient underwent a thorough clinical assessment, including history-taking and physical examination, along with radiographic evaluation using X-ray and CT scan of the pelvis. Surgery was performed following standard operative protocols, and postoperative care was uniformly maintained. Functional outcome was assessed using the Merle d'Aubigné and Postel scoring system, while radiological outcome was evaluated using Matta's criteria. Data regarding complications, reduction quality, and baseline demographic and clinical variables were recorded in a structured questionnaire. All data were analyzed using SPSS version 22, with results presented in tables and figures. Statistical significance was determined using appropriate tests as per the variable type.

RESULTS

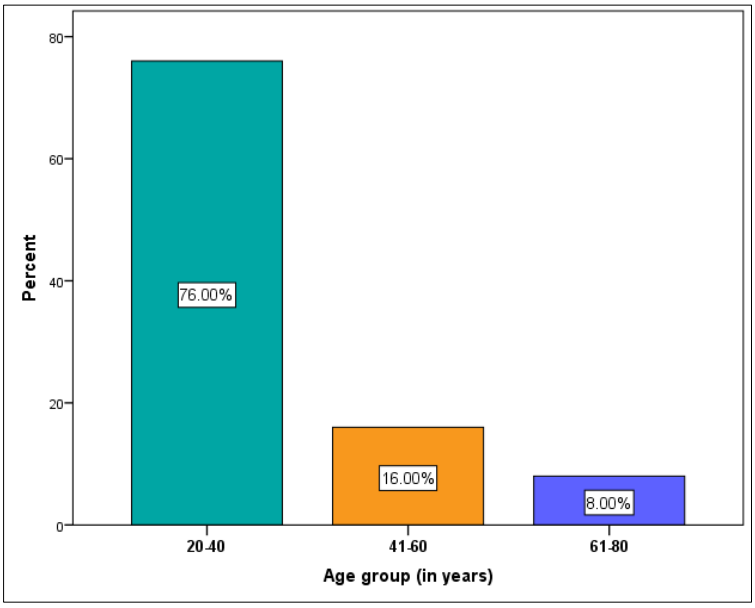

Figure 1: Bar diagram showing the study subjects by age group (n=25)

Maximum patients (76.0%) had age group 20-40 years followed by 16% patients had age 61-80 years and only 8% patients had age g 61-80 years. The mean was 36.2±14.12 years (ranging from 21 to 75) (Figure 1).

Table I: Association between Quality of reduction of transverse fracture with functional outcome (n=25)

Quality of reduction of transverse fracture	Frequency	Functional outcome		p-value
		Satisfactory	Unsatisfactory	
Anatomical	20(80.0%)	17(68.0%)	3(12.0%)	0.099[ns]
Imperfect	3(12.0%)	1(4.0%)	2(8.0%)	
Poor	2(8.0%)	1(4.0%)	1(4.0%)	
Total	**25(100.0%)**	**19(76.0%)**	**6(24.0%)**	

Data were analyzed by Chi-square test, ns= not significant

In this study 20(80.0%) patients had anatomical reduction, 5(20.0%) patients had non-anatomical (imperfect and poor) reduction. Among 20(80.0%) patients of anatomical reduction, 17(68%) patients had satisfactory and 3(12.0%) patients had unsatisfactory functional outcome. Among 5(20.0%) patients of non-anatomical reduction, 2(8.0%) patients had satisfactory and 3(12.0%) patients had unsatisfactory functional outcome. No statistically significant difference between functional outcome and quality of reduction (p>0.05) (Table I).

Table II: Functional outcome according to Merle d' Aubigne and Postel scores 6 months after operation (n=25)

Functional outcome	Frequency	Percentage	Outcome		Z-proportion test
			Satisfactory	Unsatisfactory	
Excellent	10	40.0	19(76.0%)	6(24.0%)	
Good	5	20.0			Z= 2.3
Fair	1	4.0			p=0.021
Poor	9	36.0			
Total	**25**	**100.0**			

Excellent + Good = Satisfactory
Fair + Poor = Unsatisfactory

Evaluation of functional outcome by Merle d' Aubigne and Postel scores 6 months after operation demonstrated that 10 patients (40.0%) had excellent, 5(20.0%) had good, 1(4.0%) patient had fair and 9(36.0%) patients had poor functional outcome. Mean score was 16.1±1.91, ranges was 12-18. Excellent and good outcome were considered as satisfactory, fair and poor outcome were considered as unsatisfactory functional outcome. Proportion test revealed there is a significant difference in functional outcome in excellent, good, fair and poor group (p=0.021) (Table II).

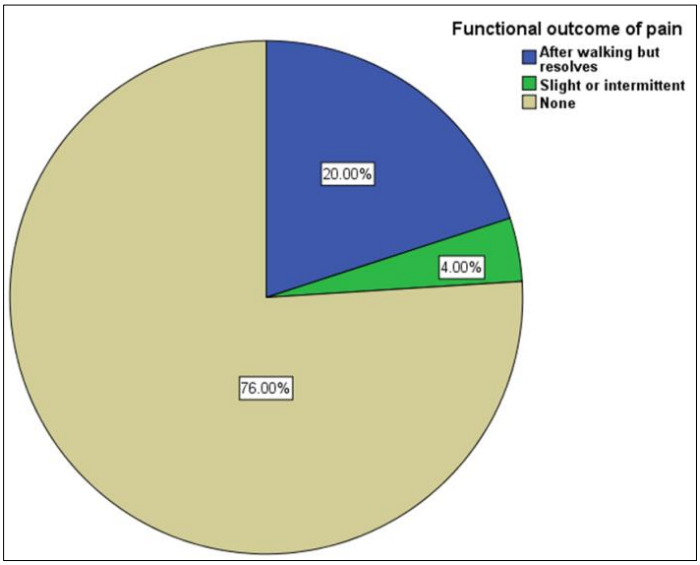

Figure 2: Pie chart showing functional outcome of pain of the study subjects according to Merle d' Aubigne and Postel scores 6 months after operation

19(76.0%) patients had no pain, 5(20.0%) patients had slight or intermittent pain, 1(4.0%) had pain after walking but resolve after 6 months of operation. Mean score was 5.7±0.5, range 4-6 (Pain measured by objective pain estimation and subjective pain discriminated by visual analogue scale) (Figure 2).

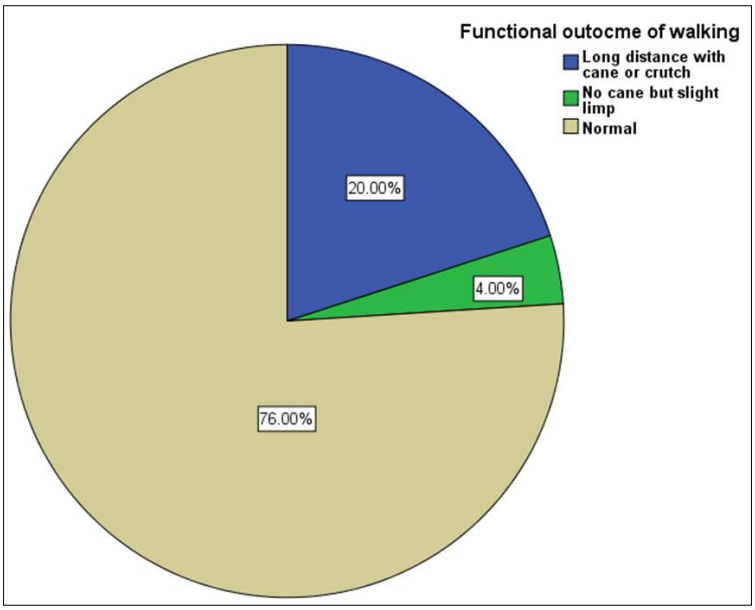

Figure 3: Pie chart showing functional outcome of walking of the study subjects according to Merle d' Aubigne and Postel scores 6 months after operation

Figure 3 shows 19(76.0%) patients had normal walking, 5(20.0%) patients had walking with cane or crutch and 1(4.0%) had no cane but slight limp.

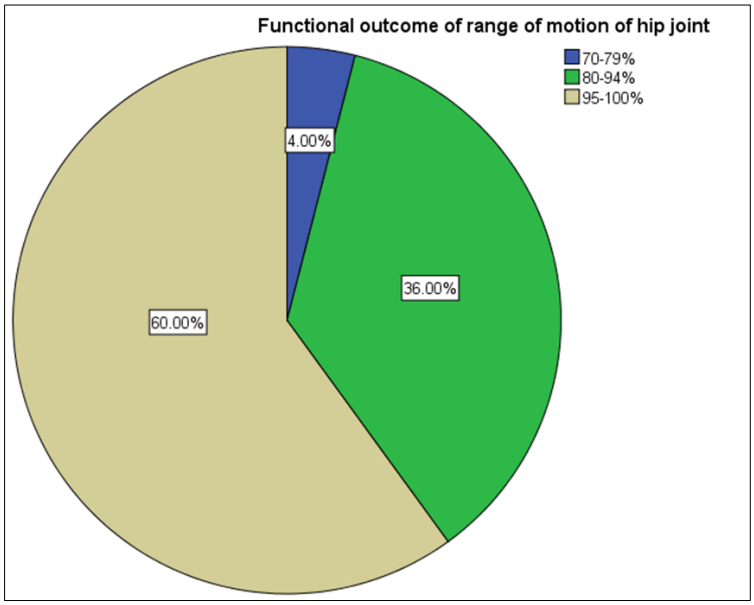

Figure 4: Pie chart showing functional outcome of range of motion of hip joint of the study subjects according to Merle d' Aubigne and Postel scores 6 months after operation

Figure 4 found 15(60.0%) patients had 95%-100% range, 9(36.0%) patients had 80%-94% and 1(4.0%) patients had 70-79% range of motion of hip joint after 6 months of operation. Mean score was 5.4 ±0.63 range 4-6.

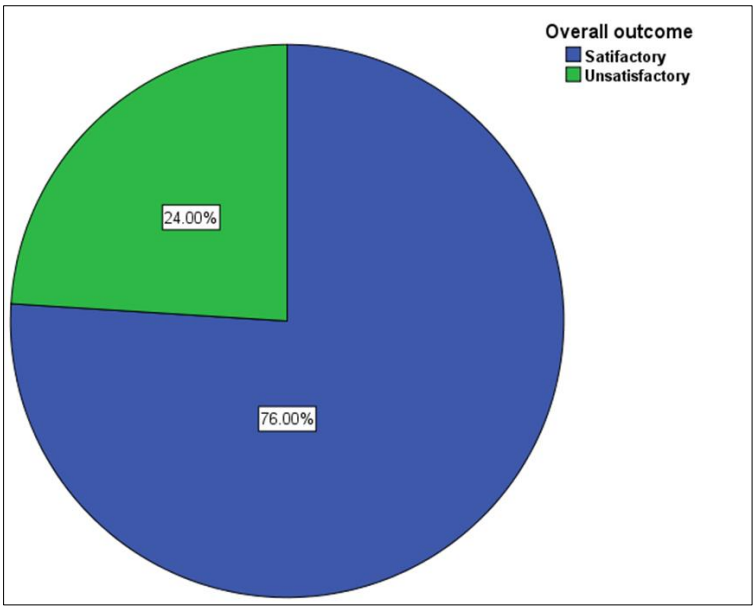

Figure 5: Pie diagram showing the overall outcome of the study subjects

Overall outcome was 19(76.0%) satisfactory and 6(24.0%) patients had unsatisfactory outcome (Figure 5).

DISCUSSION

This prospective observational study evaluated the functional outcomes of patients with transverse acetabular fractures treated with open reduction and internal fixation (ORIF) via the Kocher-Langenbeck approach. The study included 25 patients with a mean age of 36.2 ± 14.12 years, which is consistent with the findings of Lim *et al*., who reported a mean age of 35 years in a similar population [12]. This aligns with other studies by Yu *et al*., and Kreder *et al*., where the mean ages were 34.9 and 39 years, respectively, suggesting that acetabular fractures frequently occur in young, active individuals who are more prone to high-energy trauma due to their occupational and social activities [13, 14].

In this study, anatomical reduction was achieved in 80% of the patients. Functional outcomes were assessed using the Merle d'Aubigné and Postel scoring system six months postoperatively. The results showed that 40% of the patients had excellent, 20% had good, 4% had fair, and 36% had poor outcomes. Overall, 76% of the patients achieved a satisfactory functional outcome (excellent + good), while 24% had unsatisfactory results (fair + poor). Although the association between anatomical reduction and functional outcome was not statistically significant ($p > 0.05$), a trend toward better function in anatomically reduced cases was evident. This finding supports the notion that quality of reduction plays a critical role in determining functional success, as highlighted by Panella *et al*., who reported that anatomical reduction is a key predictor of favorable outcomes following acetabular fixation in elderly patients [15].

Our findings are consistent with the results of Magu *et al*., who reported 53% excellent, 23% good, 12% fair, and 12% poor outcomes following acetabular ORIF ($p = 0.006$) [16]. Similarly, Ebraheim *et al*., found 34% excellent, 40% good, 9% fair, and 15% poor outcomes, emphasizing the variability in results and the influence of patient- and injury-related factors on recovery ($p = 0.037$) [17].

Pain relief was notable in this study, with 76% of patients reporting no pain and only 4% reporting pain that resolved within six months postoperatively. This is a positive indicator of functional recovery and joint stability. Comparable findings were observed by Mesbahi *et al*., who noted significant pain reduction and functional improvement following ORIF, especially in patients with timely intervention and minimal complications [18].

Walking ability and hip range of motion (ROM) also showed promising outcomes. In our study, 76% of patients walked normally, and 60% achieved 95%–100% ROM, further indicating that proper surgical technique can restore near-normal joint function. These results resonate with those of Alexa *et al*., who demonstrated that the Kocher-Langenbeck approach, when used correctly, allows for satisfactory exposure and alignment, leading to favorable clinical and radiological outcomes in transverse and posterior acetabular fractures [19].

However, a proportion of patients in this study had poor functional outcomes. Factors contributing to these unsatisfactory results may include delayed surgery, initial displacement, associated injuries, or intra-articular damage that could not be fully corrected. Xu *et al*., highlighted that delayed management of acetabular fractures often results in suboptimal reduction and

increased risk of secondary osteoarthritis, negatively impacting functional scores over time [20]. Similarly, Wójcicki *et al*., found that acetabular fractures predispose patients to coxarthrosis, particularly in cases with imperfect reduction or cartilage damage, reinforcing the importance of early and precise intervention [21].

Complication rates were not specifically detailed in this study, but avoiding complications such as infection, avascular necrosis, and heterotopic ossification is essential to preserving hip function. Mardanpour *et al*., emphasized that adherence to surgical principles and proper patient selection significantly reduce complications and enhance long-term outcomes in complex acetabular fractures [22].

Limitations of the Study

This study had several limitations. The sample size was relatively small, which may limit the generalizability of the findings. The follow-up period was only six months, potentially insufficient to capture long-term complications such as post-traumatic arthritis. Additionally, the study was conducted at a single center, and functional outcomes were assessed using only one scoring system, which may not reflect all aspects of recovery. Future multicenter studies with larger cohorts and longer follow-up are recommended to validate these findings.

CONCLUSION

In conclusion, this study supports the effectiveness of the Kocher-Langenbeck approach in managing transverse acetabular fractures, with most patients achieving satisfactory functional outcomes at 6 months. While the quality of reduction remains a pivotal factor, timely intervention and comprehensive postoperative rehabilitation are equally crucial. Although some variability in outcomes persists, the findings are in line with international studies and contribute valuable data from a Bangladeshi tertiary center. Further large-scale studies with longer follow-up are recommended to validate these results and explore the long-term impact on hip joint preservation.

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Conflicts of Interest: There are no conflicts of interest.

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