Long-term results in the patients with traumatic hip fracture-dislocation: Important prognostic factors

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Abstract

Background: Traumatic hip dislocation with or without acetabular fractures can lead to various outcomes of the hip. Long-term follow-up studies on traumatic hip dislocation are few. We conducted a retrospective study of the treatment and long-term outcomes in patients with hip dislocation to determine prognostic factors.

Methods: From 2001 to 2016, we enrolled 38 patients in our study. All the patients had been diagnosed through radiography or computed tomography. Emergent closed reduction was performed initially. We hypothesized that poor outcomes, including osteonecrosis and traumatic osteoarthritis, are related to specific factors.

Results: All the patients had posterior dislocation initially. Closed reduction or open reduction due to irreducible after closed reduction was performed within 6 hours of dislocation in most patients. In total, nine patients had poor outcomes of the hip, including osteonecrosis and traumatic osteoarthritis and total hip arthroplasty. Specific factors that lead to poor outcomes were patient age and timing of reduction.

Conclusion: Although end results in severe traumatic hip dislocation are disappointing, conservatism in applying the secondary reconstructive procedure is desirable. In our series, crucial factors for long-term prognosis were patient age and timing of hip reduction.

Keywords: Adult; Closed reduction; Traumatic hip fracture-dislocation

1. INTRODUCTION

Traumatic hip fracture-dislocation is commonly caused by high-energy trauma. The incidence has increased over the years because of the more easily available traffic tools. In addition, over 60% hip fracture-dislocation occurs in the young adult population.[1] The injury constitutes 5% of all joint dislocations caused by trauma.[2] It often leads to poor prognosis when a delay in recognizing the injury and reducing the dislocated joint occurs.[3] Once the dislocation is reduced, a definitive treatment of the associated acetabular fracture can be addressed in patients suffering major traumas with hip fracture-dislocation as well as we ensure that the patient who has experienced major trauma achieves relative stability to receive the surgery.[4]

In addition, the outcome has been related to age,[5] damage of the femoral head,[6] incarcerated fracture fragment,[7] and type of fracture.[8] However, studies have been inconsistent because of variations in their method of variable assessment and management bias due to multicenter series. Many studies are available on the long-term follow-ups traumatic hip fracture-dislocations after treatment in long-term follow-up. Those studies had established that early recognition and prompt reduction through either a closed or open method are the cornerstones of proper treatment of this type of injury. However, those outcomes are dependent on many variables and degenerative processes of the hip. Few studies have focused on single-center or one specific injury pattern. This study investigated the long-term outcome of the treatment after posterior traumatic hip dislocation in single-center series.

2. METHODS

2.1. Study population

We enrolled 38 patients who were diagnosed with traumatic hip fracture-dislocation between January 2001 and December 2013 and were treated in our hospital. This retrospective study was conducted at a single hospital and was approved by the hospital's institutional review board. The inclusion criterion was primary traumatic hip dislocation. Patients <18 years, those with hip prosthesis or initial treatment performed at another

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hospital were excluded. The medical charts of all these patients were reviewed.

2.2. Treatment protocol of traumatic hip fracture-dislocation

Our routine protocol of traumatic hip fracture-dislocation includes the pelvic radiograph and computed tomography if combined with acetabular fracture. If the patient's condition is stable after an Advanced-Trauma-Life-Support survey, closed reduction is performed in an emergency room under anesthesia or in an operating room if skeletal traction is necessary. If the dislocation is irreducible, open reduction is performed in the operating room. Subsequently, the patients undergo open reduction and internal fixation of acetabular fracture or femoral head fracture if they are relatively stable following high-energy trauma.

2.3. Outcome of traumatic hip fracture-dislocation

The spanning hours (the time interval from the onset to the reduction of trauma) was stratified into three groups, namely <6 hours, 6–12 hours, and >12 hours. In our study, we defined treatment failure of traumatic hip dislocation in the following circumstances: osteonecrosis or osteoarthritic development (Kellgren-Lawrence classification[9]), which indicates total hip arthroplasty (THA) as an end point.

2.4. Statistical analysis

Data were entered and analyzed using SPSS software (version 17.0, SPSS Inc., Chicago, IL). Data were presented as mean, range, and standard deviation for continuous variables or number and percentages for categorical variables. Fisher's exact test was used to compare differences between the two groups for each discrete variable because one or more of the cells in the contingency table have an expected frequency of <5. Chi-square test was used to compare the groups for each category statistics. Student's *t* test was used to compare the groups for each continuous variable. In all statistical tests, a p value of ≤ 0.05 was considered significant. The endpoint event of converting to THA was estimated using Kaplan-Meier survival analysis and compared using log-rank statistics.

3. RESULTS

Most of the enrolled patients were male (n = 32, 84%), and the average age at injury was 38.5 ± 2.5 years (range: 18–81 y). The average follow-up times were 63.4 ± 4.1 months (range: 38–144 m). All of the cases were of posterior dislocation, including type I (8; 21%), type II (14; 37%), type III (11; 29%), type IV (1; 2%), and type V (4; 10%) based on the Thompson-Epstein classification. The stratification percentage of spanning hours was 69% (n = 26), 13% (n = 5), and 38% (n = 7) in the groups <6 hours, 6–12 hours, and >12 hours, respectively. The most patients (n = 32) were achieved closed reduction and 4 patients (10.5%) received open reduction due to irreducible condition of hip. All the open reduction was performed within 6 hours from injury. In this study, 26% (n = 9) of patients ended up with conversion to THA. Eight patients matched the indication due to osteonecrosis of the femoral head (ONFH), and one patient matched due to end-stage osteoarthritis and could not bear the hip pain. Approximately 24% of the study patients had ONFH, 39% had osteoarthritis, 2% had heterotrophic ossification, and 2% had chronic dislocation of the hip (Table 1).

In the analysis of the associated injury pattern around the hip joint, 5 (13%) patients had posterior edge involvement of the lesion side, 24 (63%) patients had acetabular involvement, and 6 (15%) patients had femoral head fracture (Table 2). Associated injuries are shown in Table 2.

A strong relationship was observed between the grading of hip osteoarthritis and age at injury (p = 0.035). Other factors in our hypothesis including the Thompson-Epstein classification, with acetabulum involvement, and spanning hours were not shown to be significantly related (Table 3).

In the survival analysis, the average durations for conversion to THA were 115 ± 4.8 and 42 ± 7.6 months, respectively, in the younger (≤ 40 y) and older (> 40 y) groups, respectively. The survival period significantly differed between the two groups (p < 0.001; Fig. 1). In addition, the average time to convert to THA was 105 ± 7.8 months in the <6 hours group, 78 ± 15.7 months in the 6–12 hours group, and 17.3 ± 5.1 months in the >12 hours group. The survival period significantly differed between the two groups (p < 0.001; Fig. 2).

Table 1.

Demographic data of the enrolled patients

Gender, n (%)	
Female	6 (16)
Male	32 (84)
Age at injury happened (y), mean (SD)	38.5 ± 2.5 (18–81)
Average follow-up (m), mean (SD)	63.4±4.1 (38–144)
Tompson-Epstein classification, n (%)	
Type I	8 (21)
Type II	14 (37)
Type III	11 (29)
Type IV	1 (2)
Type V	4 (10)
Spanning hours stratification, n (%)	
< 6	26 (69)
6–12	5 (13)
> 12	7 (38)
Indication to convert to arthroplasty	
ONFH	8 (24)
OA	1 (2)
Complication	
ONFH	8 (24)
OA	15 (39)
Heterotrophic ossification	1 (2)
Chronic dislocation	1 (2)

OA = osteoarthritis; ONFH = osteonecrosis of the femoral head; SD = standard deviation.

Table 2.

Associated injury with traumatic hip fracture-dislocation

Injury around hip joint, n (%)	
Posterior edge	5 (13)
Acetabulum fracture	24 (63)
Femoral neck fracture	0 (0)
Femoral head fracture	6 (15)
Other associated injury, n(%)	
Head trauma	3 (8)
Chest or abdominal trauma	1 (2)
Ankle fracture	1 (2)
Hand fracture	2 (5)
Hallux fracture	2 (5)
Clavicle fracture	0
Sciatic nerve injury	1 (2)
Humerus fracture	1 (2)
Knee fracture	0
Tibia fracture	2 (5)
Femur fracture	1 (2)

Table 3.

Correlation of age, classification, spanning hours, and acetabular fracture with the osteoarthritic stage of the hip

	Stage 0,[a] n (%)	Stage 1, n (%)	Stage 2, n (%)	Stage 3, n (%)	Stage 4, n (%)	*p*
Age (y)						
> 40	11 (28.9)	0	3 (8)	1 (2)	1(2)	0.035
≤ 40	12 (31.5)	6 (16)	4 (10)	0	0	
Classification[b]						
I	8 (21)	0	0	0	0	0.091
II	8 (21)	3 (3)	2 (5)	0	1 (2)	
III	7 (18.4)	1 (2)	2 (5)	1 (2)	0	
IV	1 (2)	0	1 (2)	0	0	
V	0	2 (5)	2(5)	0	0	
Spanning hours						
< 6	13 (34)	5 (13)	7 (18)	1 (2)	0	0.068
6–12	4 (10.5)	0	0	0	1 (2)	
> 12	7 (18.4)	0	0	0	0	
Acetabulum fracture						
With	13 (34)	4 (10)	5 (13)	1 (2)	1 (2)	0.643
Without	10 (26)	2 (5)	2 (5)	0	0	

[a]Classification: Thompson-Epstein classification.
[b]Kellgren-Lawrence grade of hip osteoarthritis.[9]

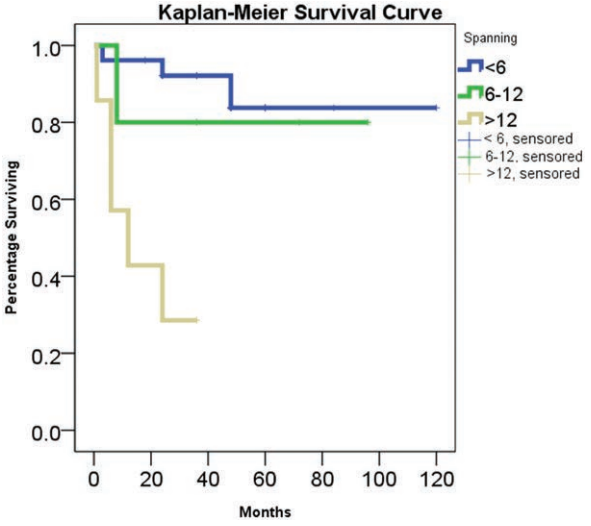

Fig. 1 The Kaplan-Meier survival period significantly differed between above 40-year-old and below 40-year-old group.

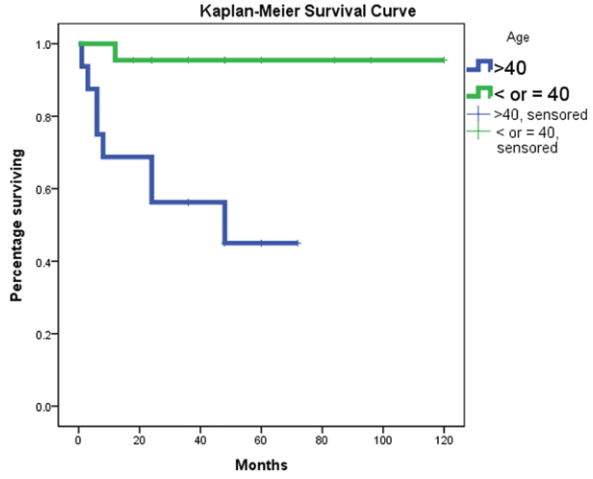

Fig. 2 The Kaplan-Meier survival period significantly differed between the spanning hours from injury to the index surgery.

4. DISCUSSION

Our study results clearly support the hypothesis that the prognostic value of time to reduction is crucial in patients with hip dislocation. However, the specific spanning time is still in debate. Moed et al.[10] studied 94 patients with a displaced posterior wall and stated that more than 12 hours would lead to poor outcomes. Furthermore, Hougaard et al.[11] showed that 88% of the hips reduced within 6 hours, obtaining a good or excellent outcome, only 44% of the hips reduced after 6 hours, preserving a good or excellent outcome. Our findings agree with those of Hougaard et al.[11] The significant survival curves in different reduction spanning hours highlight strictly that relocation within 6 hours may lead to good prognosis of the hip joint.

In our study, older age may lead to poor prognosis in hip fracture-dislocations. Matta[6] had conducted 262 surgical treatment of acetabulum fracture and showed age to be an independent risk for outcome. Younger than 40 years of age had better outcome.[6] Zha et al.[12] had also determined the elderly had negative outcome in posterior wall or femoral head injury. As a result, the older age may tend to have secondary surgery following the index surgery.

Reduction is usually achieved using a closed method unless open surgery is indicated, for example, fragment incarceration, soft tissue interposition within the joint space, or suspected sciatic nerve injury, before or after reduction.[13] If the stable reduction cannot be accomplished postreduction, skeletal traction is performed. If irreducible traumatic hip dislocation, the emergent open reduction should be considered.

As for the prognosis of posttraumatic arthritis, only age was a statistically significant factor correlated with the osteoarthritis stage. Acetabulum involvement, spanning hours to reduction, and the severity type of fracture classification were independent of the osteoarthritis stage. Bhandari et al.[14] presented that the quality of reduction of this type of injury pattern is the most essential variable in forecasting the outcome for patients with this injury. In addition, 88% in their series can achieve anatomical reduction. It means that the severity type of fracture

classification and acetabulum involvement might not lead to poor prognosis if anatomical reduction can be achieved.

Despite the radiologic aspect of the hip joint, pain is the most important factor to indicate surgical treatment in posttraumatic osteoarthritis. The most common procedure is THA, which can restore the function and relieve the symptoms.[15] In our study, nine patients, including eight patients who had ONFH and one who had intolerable osteoarthritis, had received THA. All regained good function with no requirement of revision surgery.

This study has some limitations. It is a retrospective study and has the inherent limitations of the study design and a low current functional score of the hip. In addition, we only analyzed preinjury status (age, gender, fracture pattern, spanning time to reduction) toward clinical outcome instead of surgical technique, surgical approach, or postoperative reduction quality. The study's strengths include single-center series and adequate follow-up durations comparable with those in the recent literature.

Hip dislocation should be reduced whenever possible, and early timing is probably an absolute determinant for good outcome. In addition, age is the factor related to the survival rate of the host hip and correlated to the osteoarthritis stage. However, the severity of the fracture pattern and acetabulum involvement may not be the factors leading to poor outcome.

REFERENCES

1. Suraci AJ. Distribution and severity of injuries associated with hip dislocations secondary to motor vehicle accidents. *J Trauma* 1986;**26**:458–60.
2. Brav EA. Traumatic dislocation of the hip: army experience and results over a twelve-year period. *J Bone Joint Surg Am* 1962;**44**:1115–34.
3. Pietrafesa CA, Hoffman JR. Traumatic dislocation of the hip. *JAMA* 1983;**249**:3342–6.
4. Alonso JE, Volgas DA, Giordano V, Stannard JP. A review of the treatment of hip dislocations associated with acetabular fractures. *Clin Orthop Relat Res* 2000;**377**:32–43.
5. Letournel Em, Judet R, Elson R. *Fractures of the acetabulum*. 2nd ed. Berlin, New York: Springer-Verlag; 1993.
6. Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg Am* 1996;**78**:1632–45.
7. Barquet A. A vascular necrosis following traumatic hip dislocation in childhood: factors of influence. *Acta Orthop Scand* 1982;**53**:809–13.
8. Murphy D, Kaliszer M, Rice J, McElwain JP. Outcome after acetabular fracture. Prognostic factors and their inter-relationships. *Injury* 2003;**34**:512–7.
9. Jacobsen S, Sonne-Holm S, Søballe K, Gebuhr P, Lund B. Hip dysplasia and osteoarthrosis: a survey of 4151 subjects from the Osteoarthrosis Substudy of the Copenhagen City Heart Study. *Acta Orthop* 2005;**76**:149–58.
10. Moed BR, WillsonCarr SE, Watson JT. Results of operative treatment of fractures of the posterior wall of the acetabulum. *J Bone Joint Surg Am* 2002;**84**:752–8.
11. Hougaard K, Thomsen PB. Coxarthrosis following traumatic posterior dislocation of the hip. *J Bone Joint Surg Am* 1987;**69**:679–83.
12. Zha GC, Sun JY, Dong SJ. Predictors of clinical outcomes after surgical treatment of displaced acetabular fractures in the elderly. *J Orthop Res* 2013;**31**:588–95.
13. Sahin V, Karakaş ES, Aksu S, Atlihan D, Turk CY, Halici M. Traumatic dislocation and fracture-dislocation of the hip: a long-term follow-up study. *J Trauma* 2003;**54**:520–9.
14. Bhandari M, Matta J, Ferguson T, Matthys G. Predictors of clinical and radiological outcome in patients with fractures of the acetabulum and concomitant posterior dislocation of the hip. *J Bone Joint Surg Br* 2006;**88**:1618–24.
15. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am* 1969;**51**:737–55.