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Value of Surgical Hip Dislocation in Hip Trauma Patients

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Abstract:

Introduction: Surgical dislocation of the hip has been well described and documented, and is emerging as a method for treating acetabular and femoral head fractures. Aim of work: The aim of this study was to assess and evaluate the outcome of surgical dislocation approach for fixation of displaced hip fractures including preoperative planning, operative technique, and complication encountered during the study period. Patients and methods: This study was included 50 patients presented with displaced hip fractures either acetabular fracture, fracture head femur or combined using surgical hip dislocation approach. Results: hospital stay of the studied group and it showed that the most of the studied sample had hospital stay duration equal to 2 weeks (46%) with a ranged from 10 days – 6 weeks with mean value 2.82±1.118 weeks. Conclusion:, The integration of SHD approach for dealing with FHFs offered acceptable functional and radiological outcomes with a wide range of safety in regards to the hip joint vascularity and the development of avascular necrosis, the formation of heterotopic ossification, and the development of posttraumatic osteoarthritis; however, it still carries its unique risk of trochanteric flip osteotomy nonunion and persistent lateral thigh pain.

Key words: Surgical Hip, Dislocation, Hip Trauma, acetabular.

1. Introduction

Surgical dislocation of the hip has been well described and documented, and is emerging as a method for treating acetabular and femoral head fractures. [1] The procedure involves a digastric trochanteric flip osteotomy and full surgical dislocation of the femoral head without any risk of avascular necrosis of the femoral head when performed correctly. This allows a full view of the acetabulum to be obtained so that the adequacy of the reduction of an intra-articular fracture can be judged. **[2]**

Surgical dislocation of the hip in the treatment of acetabular fractures allows the femoral head to be safely displaced from the acetabulum. This permits full intra-articular acetabular and femoral inspection for the evaluation and potential treatment of cartilage lesions of the labrum and femoral head, reduction of the fracture under direct vision and avoidance of intra-articular penetration with hardware. **[3]**

Acetabular fractures are growing in developing countries with increasing incidence of high energy trauma like road traffic accidents or falls from a significant height According to epidemiology data, the incidence of acetabular fractures is approximately three per 100 000 per year.**[4]**

Acetabular fractures mainly occur after high-energy trauma, e.g. motor vehicle accidents and falls from height. Such incidents are known to cause poly-trauma and therefore have a high mortality rate. Fracture patterns could be indicative for trauma mechanism. **[5]**

Surgical treatment of acetabular fractures is one of the most challenging techniques for orthopedic surgeons. Open reduction and internal fixation are the gold standard for displaced fractures involving the weight-bearing dome and fractures with intra-articular fragments. Traditional treatment methods involve inter-fixation and restoration of articular anatomy with stable internal fixation to allow early mobilization of the patient. Fixation of most displaced fractures requires extensive exposure, which may lead to complications, including blood loss, neural or vascular injury, postoperative infection, wound healing problems, and heterotopic bone formation. **[6]**

The aim of this study was to assess and evaluate the outcome of surgical dislocation approach for fixation of displaced hip fractures including preoperative planning, operative technique, and complication encountered during the study period.

2. Patients and Methods

This study was included 50 patients presented with displaced hip fractures either acetabular fracture, fracture head femur or combined using surgical hip dislocation approach.

Exclusion Criteria

Any cases with the following criteria were excluded: Incomplete X-ray documentation and inaccurate radiological documentation before or after the surgery.

Methods of Diagnosis

All patients are evaluated clinically by a history and physical examination. All patients had full series x-ray of pelvis and acetabulum and CT pelvis. CT 3D reconstruction in selected patients with displaced fractures.

Preoperative planning

Evaluation of the type of hip fracture to determine if we need either single surgical dislocation approach or combined with anterior approach.

Surgical technique

A Kocher-Langenbeck skin incision was used and gluteus maximus was split or Gibson interval. Identification of the posterior border of gluteus medius and vastus

lateralis a digastric trochanteric osteotomy was performed with step cut osteotomy. The deep branch of the medial femoral circumflex artery crosses posterior to the tendon of obturator externus and runs cranially, anterior to the remaining external rotator muscles and

was protected during the trochanteric osteotomy by leaving part of attachment of gluteus meduis as a safety belt. The interval between the postero-inferior border of gluteus minimus and the cranial border of piriformis and its tendon was developed for exposure of the joint capsule. In patients with an intact joint capsule, a Z-shaped capsulotomy was performed and the femoral head was dislocated posterosuperiorly.

Intra-operative assessment of the femoral head vascularity was performed through the 'bleeding sign', a procedure first described by Ganz. This test consists of a 2.0- mm drill hole carried out on the non-weight-bearing area of the femoral head straight after its dislocation. The test was performed in all patients with the hip in adduction, flexion and external rotation. A positive bleeding test was taken to be an immediate appearance of active bleeding after drilling. The test was considered as negative if no bleeding occurs.

Postoperative Care

The patients were received intravenous antibiotics for at least 48 hours, pain medication as required and LMWH for at least one week. Physical examination and radiographic evaluations was recorded at weeks 4 and 8 during follow-up. Those who show radiographic bone healing and no pain at surgical site with motion was allowed to full weight bearing and abductor muscle strengthening exercises. The hip joint range of motion (ROM) of the patients at week 12 during follow-up was recorded. All classic radiographic views (AP, obturator and iliac) was obtained. X rays views were repeated after 8 weeks, 3 and 6 months postoperatively. MRI was done for patients showing negative bleeding sign intraoperatively, pain at surgical site or patients with limited range of motion to exclude avascular necrosis of head femur.

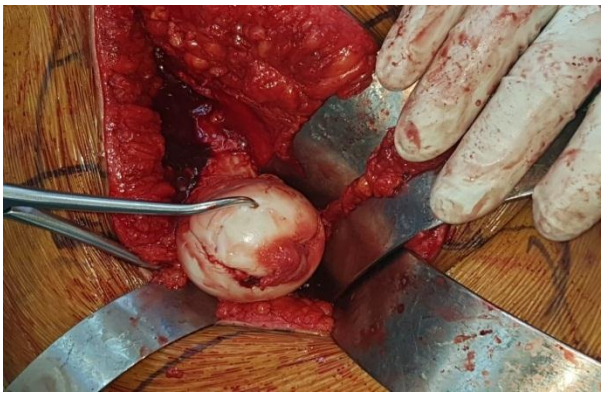

Figure (1): Reduction of head femur after surgical hip dislocation.

Fig. (2) Post-operative x- ray for fracture head femur fixed after fracture head dislocation.

Postoperative rehabilitation during the first 8 weeks, only to touch weight bearing and no active muscle exercises are allowed, but only passive bedside exercises to prevent extensor muscle weakness. When the radiographs at 8 weeks showed fracture healing, progressive weight-bearing and active exercises for strengthening the abductor muscles started, patients with limited ROM was included in an intensive physical therapy program.

Follow-up was up to 5 years.

Assessment and outcome evaluation: The patient data was include injury mechanism, type of the fracture, type of the surgery, size of the incision, duration of the surgery, duration of admission, time from surgery to first walking, quantity of pain in the follow ups, union quality and presence of nerve injury.

Statistical analysis: Statistical analyses were done with the Windows version of SPSS Version 20.0. T-test and Chi-square were utilized; a p-value≤0.05 was judged statistically significant.

3. Results

Table (1) Distribution of studied sample according to demographic data.

	Number	Percent
Age (years)		
≤20	5	10.0
21 – 30	18	36.0
31 – 40	5	10.0
41 – 50	17	34.0
51 – 60	2	4.0
>60	3	6.0
Range	18-64	
Mean±S.D.	36.38±12.868	
Sex		
Male	47	94.0
Female	3	6.0

Table (1) shows demographic data of the studied group. Age ranged from 18-64 years with mean value 36.38±12.868 years. Male cases were 47(94.0%) while female cases were 3(6.0%).

Table (2) Distribution of studied sample according to mechanism of injury.

Mechanism of injury	Number	Percent
RTA	46	92.0
Fall from height	4	8.0
Total	50	100.0

Table (2) shows mechanism of injury of the studied group. The majority show that their mechanism of injury was RTA (92.0%) and only four patients their mechanism of injury was fall from height (8.0%).

Table (3) Distribution of studied sample according to site of fracture.

Site of Fracture	Number	Percent
Left Hip	25	50.0
Right Hip	25	50.0
Total	20	100

Table (3) shows site of fracture of the studied group. The half had injury in the left hip (50.0%) and the other half had injury in the right hip (50.0%).

Table (4) Distribution of studied sample according to operation time.

Operation time	Number	Percent
<2 hours	2	4.0
2 – 3 hours	12	24.0
3 – 4 hours	26	52.0
>4 hours	10	20.0
Range	1.5 – 7	
Mean±S.D.	3.51±1.223	

Table (4) shows operation time of the studied group and it was ranged from 1.5 – 7 hours with mean value 3.51±1.223 hours.

Table (5) Distribution of studied sample according to mean time from trauma to surgery.

Mean time from trauma to surgery	Number	Percent
2nd day	9	18.0
3rd day	14	28.0
4th day	3	6.0
5th day	24	48.0
Range	2 – 5	
Mean±S.D.	3.84±1.218	

Table (5) shows mean time from trauma to surgery of the studied group and it was ranged from 2 – 5 days with mean value 3.84±1.218 days.

Table (6) Distribution of studied sample according to labral affection.

Labral affection	Number	Percent
Fracture head femur	11	22.0
Fracture acetabulum	39	78.0
Labral avulsion	24	48.0
Bony labrum	15	30.0
Total	50	100

Table (6) shows labral affection of the studied group. The majority had Fracture acetabulum (78.0%) and the rest had fracture head femur (20.0%).

Table (7) Distribution of studied sample according to range of motion after 6 months.

Range of motion	Number	Percent
Score		
1	0	0
2	6	12.0
3	0	0
4	6	12.0
5	14	28.0
6	24	48.0
Percentage		
Range	55 – 97	
Mean±S.D.	86.06±12.773	

Table (7) shows range of motion of the studied group and it show that the half of the studied sample had score equal to 6 while the percentage was ranged from 55 – 97 with mean value 86.06±12.773.

Table (8) Distribution of studied sample according to x-ray in last follow up after 6 months.

x-ray in last follow up	Number	Percent
Excellent	0	0
Good	27	54.0
Fair	17	34.0
Poor	6	12.0
Total	50	100

Table (9) Relation between labral tear and AVN.

AVN	Labral tear				X^2	P value
	No (n=19)		Yes (n=31)			
	No.	%	No.	%		
No	14	73.7	20	64.5	0.455	0.549
Yes	5	26.3	11	35.5		
Total	19	100	31	100		

Table (9) show relation between labral tear and AVN and it shows no statistically significant differences between labral tear and AVN.

4. Discussion

Traumatic hip dislocation is a true emergency that requires immediate orthopedic evaluation and reduction. [7] Hip dislocations are serious injuries that are associated with significant long-term morbidity, most notably avascular necrosis and posttraumatic osteoarthritis. **[8]**

Patients with traumatic hip dislocation should undergo a complete evaluation by the trauma service because of the high prevalence of additional injuries, especially in the setting of a motor vehicle crash. In patients with hip dislocation resulting from a motor vehicle crash, there is a reported prevalence of nonorthopedic injuries in 67% of cases, including 24% with closed-head injuries, 21% with craniofacial fractures, 21% with thoracic injuries, and 15% with abdominal injuries. **[9]**

This Prospective study was conducted in orthopedic surgery Department of Benha University hospital Egypt and al razi hospital in Kuwait. This study was conducted on 50 patients presented with displaced hip fractures either acetabular fracture, fracture head femur or combined using surgical hip dislocation approach.

Regarding the demographic data of the studied group, we found that the age ranged from 18-64 years with mean value 35.60±12.869 years. Male cases were 19(95.0%) while female cases were 1(5.0%).

The current study was in line with the retrospective consecutive case series by **Abdelnasser et al.,** [10] aimed to investigate the short term functional and radiological outcome with the use of surgical hip dislocation in acetabular fractures. The study enrolled 36 patients with acetabular fractures underwent surgical hip dislocation; the mean age of the studied patients was 35.56 ± 12.6 years with 30 (88.2%) males.

Also, the study by **Chen et al.,** [11] retrospectively investigated the clinical outcome and risk factors of secondary hip osteoarthritis requiring total hip arthroplasty after the surgical treatment of acetabular fractures with central hip dislocation. The study enrolled 50 cases with acetabular medial wall fractures with central hip dislocation treated with open reduction and internal fixation by a single surgeon. The number of male patients was modestly higher than that of female patients (54% vs. 46%); patients' median age was 54.5 years.

Furthermore, the study by **Moreta et al.,** [12] aimed to identify the variables and prognostic factors associated with clinical and radiological outcome after a traumatic hip dislocation at long-term follow-up. The study included 29 patients, of the 29 patients, there were 20 males and 9 females and the mean age at the time of the injury was 35 years (range, 14-77 years).

Also, the study by **Ma et al.,** [13] conducted a retrospective study of the treatment and long-term outcomes in patients with hip dislocation to determine prognostic factors. The study enrolled 38 patients 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 study by **Abdelnasser et al.,** [10] reported that motor car accident in all patients, while the study by **Moreta et al.,** [12] reported that the most common mechanism of injury was a traffic accident (20; 66.7%), followed by sports accidents (4; 13.3%), falls from a height (3; 10%) and low-energy trauma (3; 10%).

Regarding the distribution of studied sample according to site of fracture, our results showed that half had injury in the left hip (50.0%) and the other half had injury in the right hip (50.0%).

The study by **Haefeli et al.,** [14] reported that Left hips injuries were in 34 (56%).

Regarding the distribution of studied sample according to type of fracture, we found that the majority had pipkin type IV fracture (45.0%) followed by Type I and Type II (10.0% and 10.0 respectively).

The review by **Khalifa et al.,** [15] reported that in one study **[26],** the fracture classification was not reported, while in the remaining eight studies **[19-25, 27],** the fracture classification according to Pipkin was as follows, 77 (62.6%) type I and II, while 46 (37.4%) were type IV, and none (0%) were Pipkin type III.

Regarding the operation time of the studied patients, we found that it was ranged from 1.5 – 7 hours with mean value 3.48±1.313 hours.

While the study by **Abdelnasser et al.,** [10] reported that the mean surgical time was 135 ± 11.7 minutes.

In agreement with our values the study by **Haefeli et al.,** [14] reported that the mean Duration of surgery was 3.5 (SD 1) (range:2 to 7) hours.

The review by **Khalifa et al.,** [15] reported that the operative time was reported in five studies **[20-22, 24, 26].** No significant heterogeneity was detected (I^2 = 41.33%, P = 0.164) using the fixed-effect model for analysis. The mean operation time ranged from 120.0 to 155.2 min, with the pooled estimate being 123.7 (95%CI: 116.58–130.89). The result was statistically significant (Z = 33.91, P = 0.000).

Regarding the mean time from trauma to surgery of the studied group and it was ranged from 2 – 5 days with mean value 3.85±1.268 days.

While the study by **Abdelnasser et al.,** [10] reported that the mean time from trauma to surgery was 5 ± 2 days.

However, the study by **Haefeli et al.,** [14] reported that the mean time from trauma to surgery 3±4 days ranged from 0 to 13 days.

Regarding weight bearing of the studied group and it was ranged from 8 – 14 with mean value 9.25±1.916.

One of the major determinants of the long-term outcome after Open Reduction and Internal fixation (ORIF) of acetabular fractures is the accuracy of reduction of the articular surface, particularly at the level of the weightbearing area. [16]

The study by **Chen et al.,** [11] revealed that the analysis of weight-bearing dome involvement revealed that most patients had transtectal fractures (62%), followed by juxtatectal (34%) and infratectal (4%) fractures.

The study by **Chen et al.,** [11] revealed that According to the AO/OTA classification, about 60% of patients had transverse-type fractures (62B), and 40% had associated both column fractures (62C).

Also, **Moreta et al., [12]** reported that in terms of associated fractures, 21 cases (70%) were simple dislocations and 9 (30%) complex dislocations, i.e., with associated fractures of the acetabulum or femoral head.

Regarding labral affection of the studied group, the majority had Fracture acetabulum (80.0%) and the rest had fracture head femur (20.0%).

However, the study by **Abdelnasser et al., [10]** reported that the capsule was torn in 19 (55.8%) patients, so they modified the Z-shaped capsulotomy to allow dislocation of the femoral head. Incarcerated intraarticular fragments were found in 3 (8.8%) patients. After dislocation of the head, they were easily removed. In one case (2.9%), there was only labral detachment after a reduction of the dislocated hip for with suture anchors were used to reattach. In one case (2.9%), the femoral head fracture was associated with a

tiny posterior wall fragment for which spring plates were used to fix it.

Our results regarding the clinical score of the studied group showed that 6(30%) were excellent, 8(40%) were good, 3(15%) were fair and 3(15%) were poor while the score was ranged from 4 – 18 with mean value 14.70±3.511.

However, the study by **Abdelnasser et al.,** [10] reported that at a mean of 30 ± 16.8 months, the functional score was excellent in 5 (14.7 %), very good in 8 (23.5%), good in 9 (26.5%), fair in 2 (5.8%), and poor in 10 (29.4%) patients.

The study by **Chen et al.,** [11] revealed that at the final follow-up, they used the Majeed scoring system for functional evaluation; the score was excellent in 18 hips (36%), good in 20 (40%), fair in 11 (22%), and poor in 1 (2%).

As well the study by **Haefeli et al.,** [14] reported that the Merle d'Aubigné score was Excellent in 8 (17%), Very good in 15 (33%), Good in 12 (26%), Fair in 6 (13%) and Poor in 5 (10%).

Also, **Moreta et al.,** [12] reported that On the Merlé d'Aubigné-Postel scale, the patients with simple dislocations had a mean score of 17.4 (range, 17-18) and those with complex dislocations a mean of 15.2 (range, 10-18). the Merle d'Aubigné score was Excellent in 11 (36.67%), Good in 16 (53.33%), Moderate in 2 (6.67%) and Poor in 1 (3.33%) patient.

Also, the study by **Haefeli et al.,** [14] reported that according to the Matta classification of reduction,2 there were 57 hips (93%) with an anatomical reduction (persisting gap or step-off after fracture reduction of 0 mm to 1 mm), and four (7%) with a satisfactory reduction (2 mm to 3 mm).

Regarding the complications of the studied group, we found that more than half of the studied sample had HO (65%) followed by AVN (30%).

However, the study by **Abdelnasser et al.,** [10] reported that Conversion to total hip arthroplasty (THA) was done in 5 patients (14,7%): four for AVN and 1 for end-stage arthritis at a mean of 20 ± 10 months postoperatively. The other four patients (11.7%) with poor Matta grading for osteoarthritis were scheduled for THA. Trochanteric osteotomy showed osseous healing in all cases. No patient developed nerve injury or infection. One patient developed sever (grade III) heterotopic ossification.

The review by **Khalifa et al.,** [15] reported that all included studies reported on the Overall complication rate ranged from 30% to 86%, with avascular necrosis, heterotopic ossification, and osteoarthritis being the most common complications occurring at an incidence of 12%, 25%, and 16%, respectively.

Regarding the hospital stay of the studied group our results revealed that the most of the studied sample had hospital stay duration equal to 2 weeks (45%) with a ranged from 10 days – 6 weeks with mean value 2.77±1.086 weeks.

All the retrieved studies not reported the hospital stay duration.

Comparison between Associated injury and other parameters showed that there were no statistically significant differences between associated injury types. Also, regarding the Relation between dislocation post trauma and AVN, we found no significant correlation between AVN and dislocation post trauma as well as labral tears.

5. Conclusion:

The integration of SHD approach for dealing with FHFs offered acceptable functional and radiological outcomes with a wide range of safety in regards to the hip joint vascularity and the development of avascular necrosis, the formation of heterotopic ossification, and the development of posttraumatic osteoarthritis; however, it still carries its unique risk of trochanteric flip osteotomy nonunion and persistent lateral thigh pain.

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