Post Operative Complications of Surgical Treatment for Acetabular Fractures, A Case Series with Short Term Results

Mohammed Hatem Salal, Ali Bakir Al-Hilli

ABSTRACT:

BACKGROUND:

Acetabular fracture is a complex injury, it mostly results from a high-energy mechanism and mostly in young patients. whenever indicated surgical treatment is possible thought several surgical approaches with different fixation constructs. Many authors proved the important relation between the occurrence of postsurgical complications and the presence of associated hip dislocation, whereas the fracture type and operative approach did not prove to be significant in the occurrence of complications after surgery. Recent studies focused on decreasing the rate of complications that follows the operative management.

OBJECTIVE:

To evaluate the complications of surgical treatment of isolated closed acetabular fractures including surgical site infection, iatrogenic nerve injury, heterotrophic ossification (HO), and femoral head necrosis (AVN) and to assess any relationship of these complications with fracture type, operative approach, and age of patients.

PATIENTS AND METHOD:

Thirty-one operatively managed acetabular fracture, 24 males and 7 females with a mean age of 37.2 years were studied over the period from October 2013 to June 2016 in Medical city complex / Baghdad with a minimum follow up of 6 months. Infection, AVN of femoral head, nerve injury and heterotrophic ossification were studied.

RESULT:

Significant relation between postsurgical complications and presence of hip dislocation at presentation was noticed while the fracture type and operative approach were insignificantly related to the complications.

KEY WORDS: acetabular fracture, post-operatve complication acetabular fracture, surgical traetment acetabular fracture.

INTRODUCTION:

Acetabular injuries most often results from a high-energy mechanism in a relatively young patient or from a low-energy mechanism in an older patients. Clear understanding of acetabular anatomy and the surrounding soft tissue is essential for the evaluation and treatment of an acetabular fracture(1).

The acetabulum described as being a hemisphere that is incomplete with a horseshoe-shaped joint surface that surrounds a non-articular cotyloid fossa[1]. Understanding the two-column structural model is crucial for fixing acetabular fractures(2).

Assistant Professor, Consultant Orthopedic Surgeon, College of Medicine - Baghdad University, Department of Orthopedic Surgery, Medical City Teaching Directorate – Baghdad, Iraq.

Careful radiological assessment of people with fractured acetabular is essential including at least four x-ray views; a standard anteroposterior view, the pelvic inlet view and two 45 degrees oblique views; obturator oblique view and iliac oblique view, CT-scan is mandatory if surgery is to be taken(2).

Judet and Letournel described 10 fracture patterns defined by the three standard radiographic films. They subdivided these into five elementary fractures and five associated fractures based on extensive anatomical and radiological studies(3). Accurate interpretation of the radiographs and classification of fracture patterns will help to determine the approach and pre-operative planning of these complex fractures(4), (figure 1and 2)

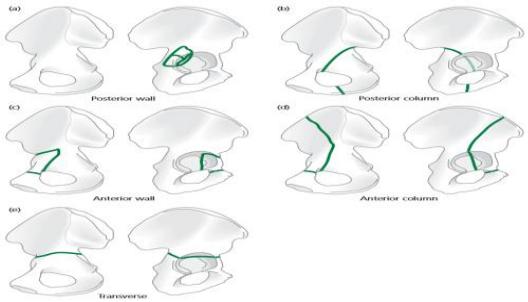

Figure 1: Elementary patterns—Anterior wall, anterior column, posterior wall, posterior column, and transverse[5].

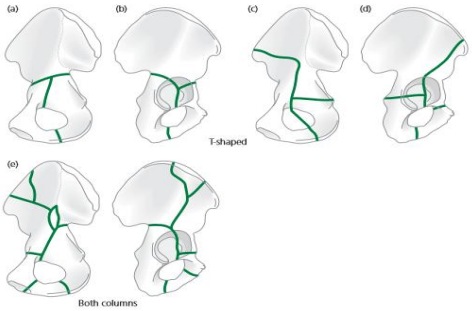

Figure 2: Associated patterns—Posterior column–posterior wall, transverse–posterior wall, T-shaped, anterior column–posterior hemitransverse, associated both-column5.

Most commonly used approaches for acetabular fractures are anterior or posterior based. Extended approaches, such as the extended iliofemoral approach rarely used[2]. Acetabular surgery associated with significant rate of complications and decreasing such rate is the focus of recent studies[6].

PATIENTS AND METHOD:

This is a case series study which is conducted in two of the hospitals of Baghdad Medical City Teaching complex through the period from October 2013 to June 2016.

Patients with isolated closed acetabular fractures and fractures with associated dislocation of the hip included in this study, while patients with open or multiple fractures and those associated with injured pelvic ring and pathological fractures were excluded.

Thirty one patients with isolated closed acetabular fractures +/- hip dislocation were operated upon for fracture fixation; all were included in this study with a mean age of ٣٧,٢±٨,٦ years (range 24-55 years) there were 24 males (77.4%) and 7 females (22.6%).

The main mechanisms of injury was "motor vehicle accident" (MVA) in 23 patients and "fall from height" (FFH) in 8 patients.

Eleven injuries were presented with associated dislocation of their hips, ten of them were referred without reduction after at least 24 hours from initial injury.

Fractures classified following the "Judet and Letournel" classification that was useful to decide the surgical approach.

The indication for surgery was according to roof arc angle, severity of displacement and associated irreducible hip dislocation. All surgeries was performed by a single surgical team within 14 days from the origional injury.

Radiological assessment, CT-scan and medical evaluation done. Patients received LMWH (Enoxaparin) in dose of 40 mg SC qDay starting

from hospital and continued till 4 weeks postoperatively as a prophylaxis for DVT and thromboembolism.

All patients received oral Naproxen 500mg on the day of their surgery and for three weeks postoperatively as prophylaxis against heterotrophic ossification.

Open reduction of the fractures done with internal fixation using 3.5mm self-tapping screws with reconstructable low profile pelvic plates for all the patients.

Postoperatively Muscle strengthening exercise and hip movements started immediately and all patients were examined every 2-4 weeks for assessment and follow up with a least follow-up of six months; during which infection, AVN, nerve injury, and heterotrophic ossification were clinically assessed and proved by investigations and imaging whenever indicated.

figure 3,4,5 are pre and per-operative imaging of one of the study group patients.

Statistical analyses:

Statistical analyses done using SPSS (version 17.9 for windows, SPSS, Chicago, IL, USA). Data are presented as mean ± standard deviation for quantitative variables and number and percentage of qualitative variables.

Differences between groups were evaluated with Student's t-test for quantitative data. Qualitative data were analyzed by Chi square test.

P value < 0.05 considered significant.

Figure 3: AP radiograph of left hip of one patient of the study group.

Figure 4: CT scan axial views of the previous case showing the fracture and the dislocated hip.

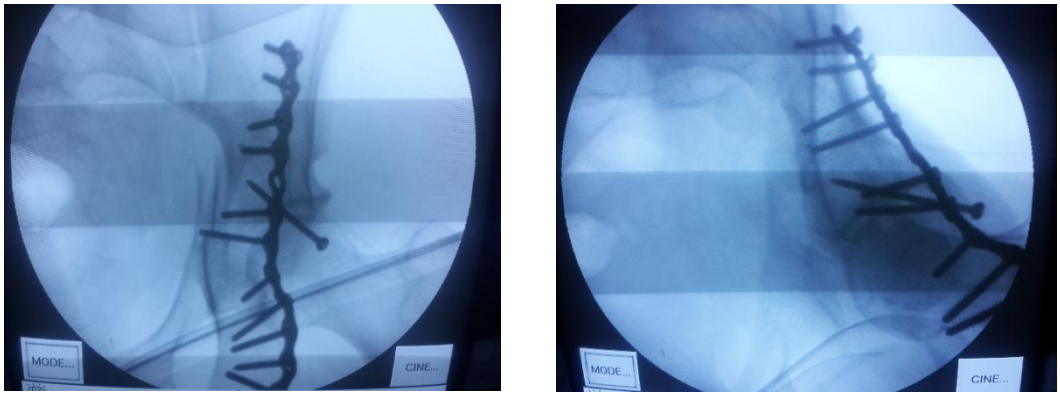

Figure 5: Intraoperative x-rays of the same patient.

RESULTS:

There were six cases (19.3%) AVN of femoral head, two of them sustained other complications. Four cases (12.9%) of HO were identified, two were associated with other complications. Two cases (6.4%) of nerve injury reported one was associated with other complication. One case (3.2%) of postoperative infection was noticed.

One patient developed HO, AVN with nerve injury all together and one patient developed HO with AVN.

There was none significant relationship (Chi square test=3.74, P value=0.587) between the complications and the type of fracture (table 1 and figure 6).

Table 1: Shows the relation of occurrence of complications and type of fracture.

			Complications		Total
			Yes	No	
Type	Posterior column +Posterior wall	Count	2	3	5
		%	40.0%	60.0%	100.0%
	Posterior wall	Count	4	3	7
		%	57.1%	42.9%	100.0%
	Transverse	Count	1	7	8
		%	12.5%	87.5%	100.0%
	Posterior column	Count	1	3	4
		%	25.0%	75.0%	100.0%
	Both column	Count	1	2	3
		%	33.3%	66.7%	100.0%
	Anterior column	Count	1	3	4
		%	25.0%	75.0%	100.0%
Total		Count	10	21	31
		%	32.3%	67.7%	100.0%

Chi square test = 3.74, P value = 0.587 (not significant).

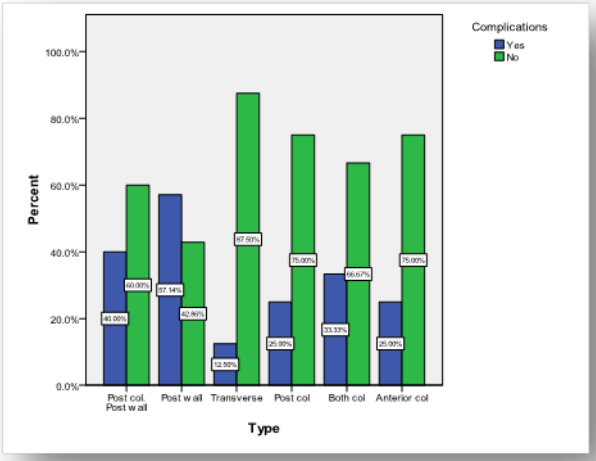

Figure 6: Shows the relation of the fracture type and the complications.

A statistically significant relationship (Chi square test=3.87, P value=0.049) seen between complications and associated dislocation at presentation as shown in table 2 and figure 7.

Table 2: Shows the relation of complications associated hip dislocation at presentation.

			Complications		Total
			Yes	No	
Dislocation	Present	Count	6	5	11
		%	54.5%	45.5%	100.0%
	Absent	Count	4	16	20
		%	20.0%	80.0%	100.0%
Total		Count	10	21	31
		%	32.3%	67.7%	100.0%

Chi square test = 3.87, P value = 0.049 (significant)

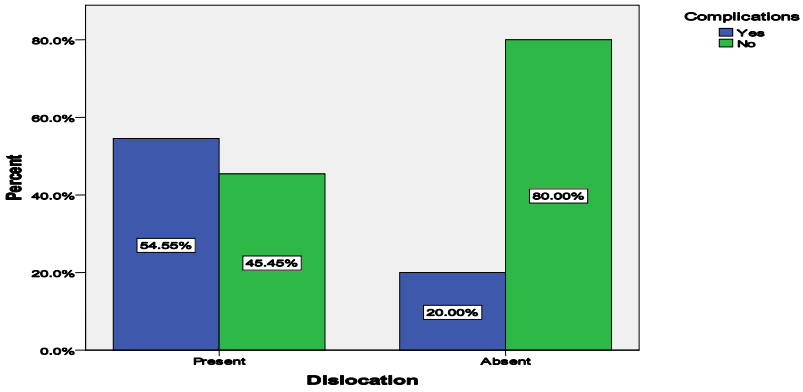

Figure 7: Shows the relationship of dislocation with the occurance of complications.

The study also showed statistically non-significant relationship (Chi square test=0.260, P value=0.878) between development of complications and operative approach (table 3 and figure 8).

Table 3: Shows the relation of development of complications to surgical approach.

			Complications		Total
			Yes	No	
Approach	Anterior	Count	1	3	4
		%	25.0%	75.0%	100.0%
	Posterior	Count	8	15	23
		%	34.8%	65.2%	100.0%
	Combined	Count	1	3	4
		%	25.0%	75.0%	100.0%
Total		Count	10	21	31
		%	32.3%	67.7%	100.0%

Chi square test = 0.260, P value = 0.878 (not significant)

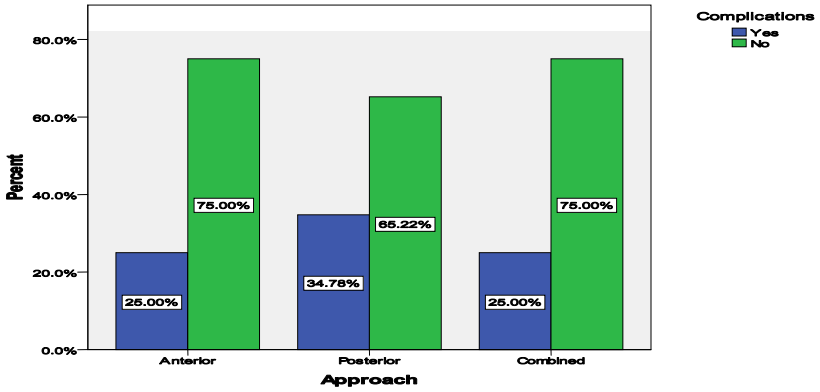

Figure 8: Shows the relationship of development of complications to surgical approach.

There was non-significant relationship (Student t-test=0.419, P value=0.6862) between the complications and the patient age at presentation. (table 4 and figure 9)

Table 4: Show relationship of complications to the patient age of at presentation.

	Complications	No.	Mean age	Std. Deviation	Std. Error Mean
Age	Yes	10	38.3000	11.22547	3.54980
	No	21	36.6667	7.38467	1.61147

Student t-test = 0.419, P value = 0.6862 (not significant)

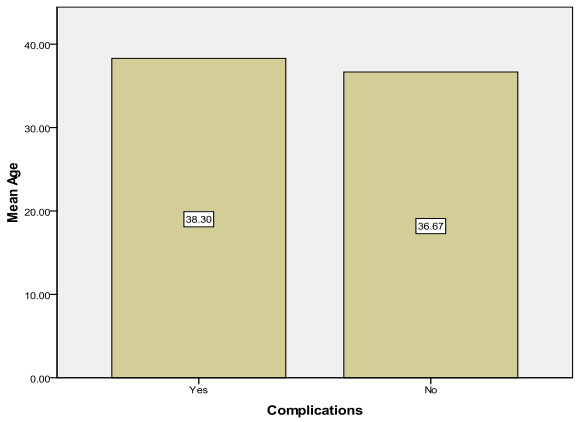

Figure 9: Shows the age distribution with to the presence of complications

DISCUSSION:

Current study reveals considerable rate of postoperative complications, however complications of surgical treatment of acetabular fractures are quite common. Surgical treatment for acetabular injuries is a highly demanding procedure and needs a protracted learning curve[7]. Meticulous tissue handling and optimum articular reduction are the most important influential factors[8].

The incidence of AVN in this study 19.3% was high compared to some other studies that reported an incidence of 2%, 7% and 5.8%[9,10,11] respectively the main reason behind this significant difference assumed to be the associated dislocation of hip and delay in its reduction. The timing of reduction of hip dislocation proved as being the most important and most essential factor that influence AVN of femoral head in patients with fracturedacetabulum[12,13,14] and early reduction of dislocated hips in those patients within 6 hours decreases the risk of AVN by 2 folds than those patients who reduced later on[15].

Associated dislocation may suggest a great force of injury and more complicated bony and other tissue damage as a result there will be an increased surgical time and difficulties with excessive bone and soft tissue compromise during the operation all of which may result in the possible associated complications.

Heterotrophic ossification (HO) is one common complication after acetabular fracture surgery, an incidence of 7 to 11.1% was reported by different studies despite indomethacine prophylaxis [8,9,10,16]. Zhang et al[11] and GlasPy and co-workers[13] showed a higher incidence of 29.4% and 35% respectively these results was attributed to the lack of prophylaxis in both studies.

H.O in this study found in 12.9% of patients this seems to be more towards the lower side, this is most likely due to naproxen prophylaxis, naproxen known to be effective to decrease heterotrophic ossification in hip surgeries and associated with less complications as compared with indomethacin[17]. On the other hand indomethacin reported 3 folds increase in nonunion of long bone fractures[18].

Iatrogenic sciatic nerve palsy of 3.3 up to 5% reported by variable studies[8,9,10,13,16] following surgical management of acetabular fractures. while Gansslen group[19] had an incidence as high as 8.9%. In this current study the report of 6.4% would rather be on the higher side. Technical measures and placement of bone retractors blamed to be the causes of high postoperative nerve palsy.

Pavelka 2009[10] and Kumar 2005[20] reported surgical site infection of 2% and 2.7% these, while Petsatodis G et al[9] and Hadjicostas 2008[14] noticed higher results of 6% and 6.4% surgical site infection respectively. The routine use of prophylactic antibiotics can explain such differences[21].

The type of fracture according to Letournel classification was used to determine the suitable surgical approach in this study and there was no clear relation between the two. It was proved that no clear link between fracture type and post-operative complications and optimum postoperative outcome is achieved by assurance of anatomic reduction[10,19]. Other studies showed that the time

of operation and reduction of articular surface within 14 days from the injury down to 0-1 mm step is a good prognostic factor and associated with favorable outcome[12,15]. imperfect articular surface reduction showed to be the most influential factor of surgical outcome in operative management of acetabular injuries[10].

Surgical approach by itself was not very much related to development of operative complications[12,16]. Authors Advocate using posterior approach alone in all acetabular injuries that have posterior wall/column element[11]. Most of the displaced fractures is best to be treated by posterior approach and this will give most favorable results except for isolated anterior column and/or anterior wall fractures which cannot be reached posteriorly[9]. Using a single approach that is most suitable for the fracture type will be associated with better results than combined approaches[13]. This work also showed the insignificance of the surgical approach.

The small patient sample in this study may declare the fact that there was insignificant relation between patient age and the complication, but similar results showed by different other authers[8,13,19] who analyzed groups of patients having wider range of age for longer periods and found no clear difference in the outcome. Despite that others still consider the age as poor prognostic factor in operative management of acetabular fracture[7].

Some believed that such fractures in patients above 65 year old are better treated by acute total hip replacement, which is associated with better outcome and less complications than acetabular fracture fixation[22, 23].

CONCLUSION:

In this study we reported a considerable rate of complications (AVN of femoral head, HO, wound infection and nerve injury) all of which showed insignificant association with type of fracture, surgical approach and patient age. Associated hip dislocation specially if delayed showed important relation to the possible postoperative complication.

The above results are rather acceptable when compared similar published literatures.

Complexity of fractures, associated dislocation, timing of surgery, surgical experience and precise reduction of fracture all are among the proved factors that can determine postoperative complications following surgery for closed acetabular fractures.

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