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ORIGINAL STUDY

Concomitant ipsilateral acetabular and femoral fractures – an appraisal of outcomes and complications in 34 patients

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Concomitant ipsilateral femoral and acetabular fractures are complex injuries which result from high-velocity trauma. Surgical treatment is the accepted management of such injuries. The objectives of this study were to evaluate the outcomes and study the complications in patients treated for concomitant ipsilateral acetabular and femoral fractures (type 'B' floating hip injuries).

This retrospective study was conducted at a tertiary care teaching hospital on patients operated for type B floating hip injuries, who had completed a minimum of one-year follow-up after the surgery and whose complete records were available. Those with floating hip injuries with pelvic fractures were excluded. All patients were operated on the femoral side first, followed by the acetabular side.

34 patients were included ; most of them were young males. A road traffic accident was the most common mode, with a dashboard injury being the most common mechanism of injury. No association between the type of acetabular and femoral fractures was found. The clinical (measured with Harris hip score) and radiological (Matta's method) outcomes at the latest follow-up were excellent or good in >60% cases and had a significant association with the quality of reduction on the post-operative radiographs. Complications were seen in 12 out of the 34 patients.

Type B floating hips injuries can be managed well with acceptable short-term results by following a femur first strategy. However, patients must be informed of the possible complications and the probabilities of poorer outcomes when compared to isolated acetabular or femoral fractures.

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Keywords : floating hip ; acetabular fracture ; pelvis fracture ; femoral fracture ; floating injuries.

INTRODUCTION

Floating hip injuries have simultaneous skeletal disruptions above and below the hip joint. There must be a femoral fracture associated with either an ipsilateral pelvic fracture (Type A) or acetabular fracture (Type B) for the injury to be considered a floating hip injury *(1,2)*. Type B injuries are often considered as true floating hip injuries *(1)*. They result from high-velocity trauma and are associated with high rates of morbidity and mortality *(3)*. They are frequently associated with other fractures, organ-system, and neurovascular injuries. Appropriate planning of treatment is paramount for obtaining optimal results *(1,4,5)*. Life-threatening injuries of

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the head, chest, and abdomen are often managed prior to performing any definitive stabilization of the skeletal injuries. Stabilization of the pelvis is essential in cases where a pelvic fracture is present as bleeding from pelvic injuries can result in life-threatening situations.

While it is accepted that these patients require surgical intervention, there are areas where consensus is lacking. This is because these are uncommon injuries that are reported as case-reports and case series *(1-18)*. Information on the mechanism and type of fractures, sequence of fixation, outcomes, and complications of these injuries is limited *(1,3,5-7)*. There is inadequate data on the optimal timing of surgery, sequence of fixation, and complications.

While patients with type B injuries can be operated first either on the pelvic side or the femoral side, at our institution the femur is operated on first followed by the acetabulum in almost all the cases. This study analyses these patients in terms of the mode and mechanism of injury, fracture types, associated injuries, parameters related to the surgical intervention, radiological and functional outcomes at their latest follow-up, and complications encountered during treatment.

MATERIAL AND METHODS

This retrospective study was conducted at a tertiary care teaching hospital after obtaining approval from the departmental review board. Data of patients treated for pelvi-acetabular trauma between January 2013 and January 2019 was retrieved from records, which were screened to select patients with Type B floating hip injuries. Patients with complete details of the parameters being studied, follow-up, and outcome data were selected ; those with a concomitant pelvis and femur fracture but without any acetabular fracture were excluded. These details were collected in a pre-defined proforma (Tables I and II). Acetabular fractures were classified according to Leturnel and Judet classification *(19,20)*. Femoral fractures were classified based on the anatomical location of the fracture and the AO classification.

All patients were operated upon on a radiolucent operating table. Surgical approaches for the acetabulum and implants for femoral and acetabular fractures were decided by the surgeon based on the fracture type. Whether the surgery was completed in one or two anaesthetic sittings was a decision of the anaesthesiologist. Decisions were based primarily on the patients' condition after the femoral surgery and the expected duration and blood loss in the acetabular surgery.

All patients received low molecular weight heparin (LMWH) for deep vein thrombosis prophylaxis for 4 weeks and indomethacin (25 mg thrice a day) for heterotopic ossification prophylaxis for 6 weeks. Non-weight-bearing ambulation was permitted from the second post-operative day. However, weight-bearing was allowed after 3-12 weeks of surgery depending on fracture type, degree of comminution, and stability of fixation. The quality of reduction was assessed on the immediate postoperative radiographs using Matta's method *(19)*. Patients were advised for follow-up at 2 weeks, three months, and every six months thereafter.

Radiographs at the latest follow-up were used for assessing radiological outcome by Matta's scoring system *(19)*. Clinical outcome was evaluated using Harris hip score at each visit after one year. Heterotopic ossification was classified using the method described by Brooker et al. *(18)*.

The data was analysed using SPSS version 26 (IBM Corp., Armonk, NY). The frequency was calculated for categorical variables. Mean values were calculated for continuous data. Fisher's exact test was used for evaluating clinical and radiological outcomes with the reduction quality on the postoperative radiographs. A 'p' value of <0.05 was considered significant.

RESULTS

565 patients of pelvic-acetabular trauma were treated during the study period. 44 patients with Type B floating hip injuries were operated on. 10 patients were excluded as the required details were unavailable (incomplete data or follow-up). 34 patients were thus included. Among these 33 were males and 1 was female. Road traffic accident (32 patients, 94.1%) was the most common mode of trauma. Dashboard injury was the commonest

Table I. — Table summarizing the details of patients in terms of age, gender, mode and mechanism of injury, acetabular and femoral fracture types, associated injuries, interval between injury and first surgery, number of sittings of surgery and the femoral implants used

Patient number	Age (years)	Gender	Mode of Injury	Mechanism of Injury	Acetabular fracture type	Femoral fracture type (anatomical)	Femur Fracture (AO classification)	Associated Injuries	Interval between injury and first surgery (in days)	Surgical sittings	Choice of femoral Implant
1	45	M	RTA	Unknown	AC	SOF	32-A2	Metatarsal #	5	Single	A. IMN
2	32	M	RTA	Dashboard	PW	ST	32-B3		3	Single	PFLCP
3	34	M	RTA	Unknown	AC & Q plate	IT with ST	31-A3	Head Injury	7	Single	DHS
4	38	M	RTA	Dashboard	PC	SOF	32-A3		3	Single	A. IMN
5	50	M	RTA	Dashboard	PW with PC	SOF	32-A1	Head Injury	6	Single	A. IMN
6	28	M	RTA	Dashboard	Transverse	SOF	32-A2	Head Injury	4	Single	A. IMN
7	35	M	FFH	Lateral blow	BC	NOF	31-B2		5	Single	CC Screw
8	40	M	RTA	Unknown	PW	ST/NOF	31-A2	Head Injury	5	Single	PFLCP
9	44	M	RTA	Dashboard	Transverse with PW	SOF	32-C2		5	Single	A. IMN
10	30	M	RTA	Dashboard	PW	NOF	31-B2	SNP	5	Single	CC Screw
11	28	M	RTA	Dashboard	Transverse	SOF	32-C2		5	Two	A. IMN
12	35	M	RTA	Dashboard	PW with PC	ST	31-A2	Radius, Talus #	7	Two	PFN
13	42	M	RTA	Lateral blow	BC	ST	31-A3	Head Injury	5	Two	PFN
14	32	M	RTA	Dashboard	PW with PC	SOF	32-C2	SNP	5	Single	A. IMN
15	40	M	RTA	Dashboard	T Type	SOF	32-C1	Chest trauma	5	Two	A. IMN
16	30	M	RTA	Dashboard	Transverse	SOF	32-A2		2	Single	A. IMN
17	24	M	RTA	Dashboard	Transverse	SOF	32-C2	Humerus #	10	Two	A. IMN
18	45	M	RTA	Lateral blow	AW & Q plate	NOF	31-B3		3	Single	CC Screw
19	20	M	RTA	Unknown	AC	SOF, FH	32-B3	Tibia #	2	Two	A. IMN, Headless screw
20	20	M	RTA	Lateral blow	Transverse	IT	31-A1	Radius #	7	Two	DHS
21	31	M	RTA	Dashboard	Transverse	SOF	32-A1		5	Single	A. IMN
22	45	M	RTA	Dashboard	T with PW	Distal femur	33-A1	Humerus #	5	Single	DFLCP
23	20	F	RTA	Lateral blow	Transverse	IT	31-A1	Abdominal trauma	2	Single	DHS
24	30	M	RTA	Dashboard	PW	NOF	31-B2		3	Single	CC Screw
25	23	M	RTA	Dashboard	PW	Distal femur	33-A3		2	Single	DFLCP
26	56	M	RTA	Dashboard	PW	ST	31-A3		5	Single	PFLCP
27	24	M	RTA	Dashboard	PW	SOF	32-C2		2	Single	A.IMN
28	25	M	RTA	Dashboard	Tranverse with PW	SOF	32-A2	Patella #	5	Two	A.IMN
29	42	M	RTA	Unknown	AC with PHT	NOF	31-B2		3	Single	CC Screw
30	25	M	RTA	Dashboard	Transverse	SOF	32-A3		1	Single	A.IMN
31	52	M	RTA	Lateral blow	T with PW	SOF	32-A2	Scapula @	5	Two	A.IMN
32	26	M	RTA	Dashboard	Transverse	ST	31-A3		3	Single	PFLCP
33	22	M	RTA	Dashboard	Transverse	SOF	32-A2	Chest trauma	7	Two	A.IMN
34	30	M	RTA	Dashboard	PW	IT	31-A3	Chest trauma	3	Single	PFLCP

The abbreviations used are M=male, F=female, RTA=road traffic accident, FFH=fall from height, PW=posterior wall, PC=posterior column, AW=anterior wall, AC=anterior column, Q plate=quadrilateral plate, PHT=posterior hemi-transverse, BC=both columns, SOF=Shaft of femur, NOF= Neck of femur, IT=intertrochanteric, ST=subtrochanteric, FH=femoral head, '#' = fracture, A.IMN = Antegrade Intramedullary nail, CC = cannulated cancellous, DHS=dynamic hip screw, PFN=proximal femoral nail, PFLCP=proximal femoral locking compression plate, DFLCP=distal femoral locking compression plate.

Table II. — Table describing the details surgery and follow-up of the patients included in the study.

Patient number	Acetabular approach	Acetabular surgery position	Acetabular reduction quality (Matta)	Hospit al stay (in days)	Recent Follow-up from day of surgery	Harris Hip score (HHS)	Clinical outcome based on HHS	Radiological outcome	Complications
1	MI screw	Supine	Anatomical	5	18	82	Excellent	Excellent	Nil
2	KL	Lateral	Congruent	5	16	70	Fair	Good	Nil
3	Modified Stoppa	Supine	Anatomical	5	15	76	Good	Good	Nil
4	MI screw	Supine	Anatomical	2	24	90	Excellent	Excellent	Nil
5	KL	Lateral	Congruent	8	18	84	Good	Good	Nil
6	KL	Lateral	Congruent	7	48	70	Fair	Fair	Iatrogenic sciatic nerve injury
7	Ilioinguinal (IL)	Supine	Anatomical	3	36	90	Good	Good	Nil
8	KL	Lateral	Anatomical	10	36	80	Good	Good	Heterotopic Ossification
9	KL	Lateral	Congruent	5	26	86	Good	Good	Nil
10	KL	Lateral	Incongruent	10	48	40	Poor	Poor	Surgical site infection
11	Lateral window IL	Supine	Anatomical	4	20	86	Excellent	Excellent	Nil
12	KL	Lateral	Congruent	10	54	70	Fair	Good	Nil
13	Modified Stoppa	Supine	Anatomical	5	16	88	Excellent	Excellent	Nil
14	KL	Lateral	Congruent	5	15	70	Fair	Good	Nonunion femur, exchange nailing and BG
15	Ilioinguinal	Supine	Congruent	10	22	70	Fair	Good	Knee stiffness
16	MI screw	Supine	Anatomical	5	20	88	Good	Good	Nil
17	Lateral window	Supine	Anatomical	5	14	88	Excellent	Excellent	Nil
18	Stoppa	Supine	Anatomical	5	24	70	Poor	Poor	AVN, secondary arthritis
19	lioinguinal	Lateral	Anatomical	7	15	50	Poor	Poor	Infected nonunion femur, nail removal, monorail
20	Modified Stoppa	Supine	Anatomical	4	20	85	Good	Excellent	Nil
21	KL	Lateral	Anatomical	8	35	80	Good	Good	Nil
22	Dual	Floppy lateral	Congruent	12	50	85	Fair	Excellent	Nil
23	KL	Lateral	Anatomical	15	50	55	Poor	Poor	Surgical site infection
24	KL	Lateral	Anatomical	5	12	88	Excellent	Excellent	Nil
25	KL	Lateral	Anatomical	5	24	70	Fair	Fair	Non-union femur, plating and BG
26	KL	Lateral	Anatomical	5	60	92	Excellent	Excellent	Nil
27	KL	Lateral	Anatomical	3	22	90	Excellent	Excellent	Nil
28	Dual	Floppy lateral	Anatomical	5	15	82	Good	Good	Nil
29	Modofied Stoppa	Supine	Anatomical	5	72	82	Good	Excellent	Nil
30	KL	Lateral	Anatomical	5	20	80	Good	Good	Non-union femur, exchange nailing and BG
31	Dul	Lateral	Congruent	7	30	74	Good	Fair	Nil
32	Ilioinguinal	Supine	Anatomical	5	42	90	Excellent	Good	Nil
33	Dual	Floppy lateral	Congruent	15	58	75	Fair	Good	Vascular injury
34	KL	Lateral	Incongruent	10	36	60	Poor	Poor	Surgical site infection

The complications encountered have also been enumerated. MI : minimally invasive, KL : Kocher Langenbeck, HHS : Harris Hip Score and BG : Bone grafting.

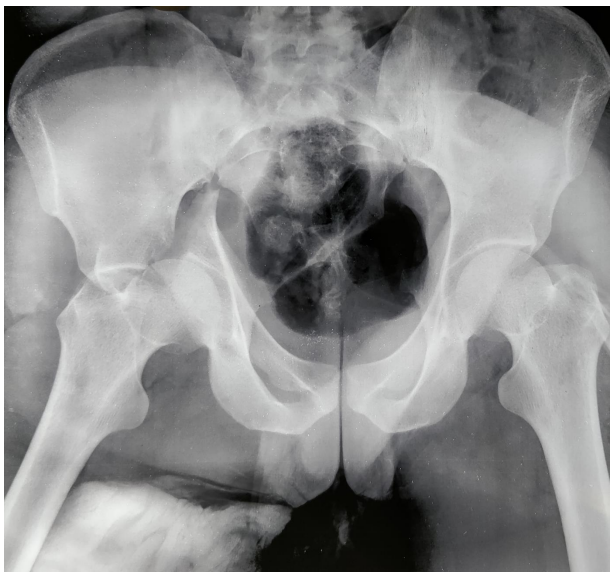

Fig. 1A. — Anteroposterior radiograph of a patient showing a transverse fracture of the right acetabulum.

Fig. 1B. — Anteroposterior and lateral radiographs of the patient showing a concomitant ipsilateral femoral shaft fracture.

Fig. 1C. — 20 months post op radiograph of the acetabular fracture showing good radiological outcome of the acetabular fracture.

mechanism of injury (23 patients, 67.6%) with lateral blow reported in 6 patients (17.6%). Transverse fracture (10 patients, 29.4%) was the commonest acetabular fracture type followed by posterior wall (PW) fracture (8 patients, 23.5%).

19 patients (55.9%) had associated injuries. A fracture of the lower or upper limb was the most common associated injury (8 patients). Injury to the head, chest, and abdomen was seen in 5, 3, and 1 patient, respectively. Post-traumatic sciatic nerve palsy was present in 2 patients. The mean interval between injury and first Orthopaedic surgical intervention was 4.41 days. Closed reduction of the hip was done in all patients who presented with a dislocation at the time of admission and if the hip was found to be unstable or non-reducible, the surgery was performed on an emergency basis. 24 (70.6%) cases were operated on in a single anaesthetic sitting and 10 (29.4%) in two sittings after an interval of 2 to 5 days (Table I). Antegrade intramedullary nailing (IMN) was done in all 17 patients with femoral shaft fractures. Among these, 7 patients (PW, posterior column (PC), and transverse fractures) had femoral nailing and acetabular fixation in the lateral position in the same anaesthetic sitting (Figures 1A-1C). 3 patients with femoral shaft fractures who had un-displaced or minimally displaced PC or anterior column (AC)

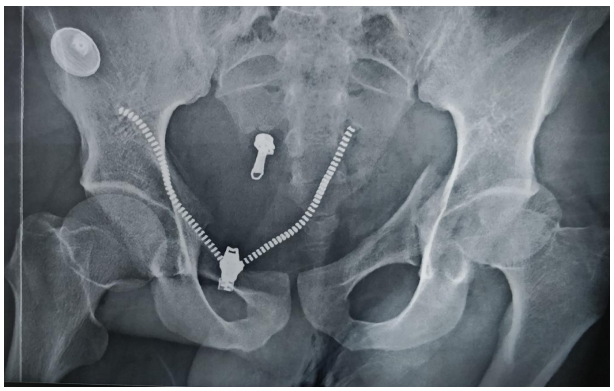

Fig. 2A. — Anteroposterior radiograph of a patient (number 19 in tables I and II) showing anterior column fracture with a femoral head fracture.

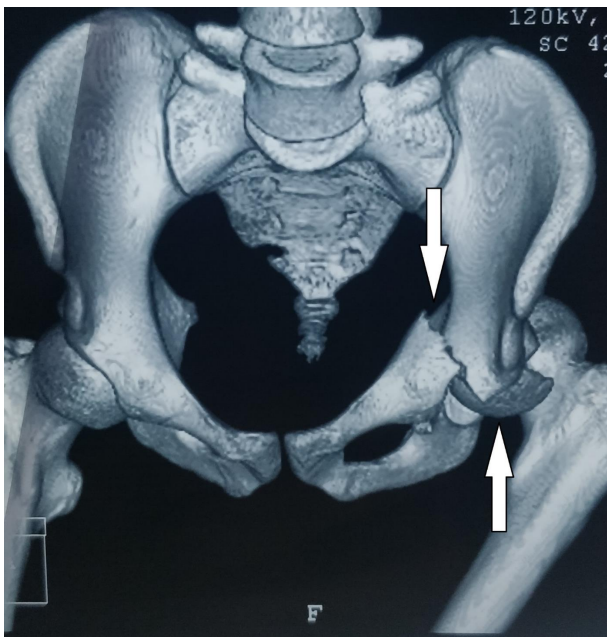

Fig. 2B. — 3D CT reconstruction showing the anterior column fracture (down pointing arrow) and femoral head fracture (up pointing arrow).

fractures had minimally invasive screw fixation of the columns after IMN. One patient (patient 19 in Tables I and II) had an AC fracture with a femoral head and shaft fracture. He also had a tibial shaft fracture. He was operated on in two sittings. In the first sitting, femoral IMN followed by femoral head fixation by safe surgical dislocation was done. Tibial IMN was done too. The AC was fixed after

Fig. 2C. — Immediate post-operative radiograph showing fixation of femoral head, femoral shaft and anterior column with headless screws, intramedullary nail, and reconstruction plate, respectively.

3 days by an Ilioinguinal approach (Figures 2A-2C). 2 patients with femoral shaft fractures needed a cerclage wiring for stabilization of butterfly fragment during IMN.

Among the 5 patients with femoral neck fractures, 2 had PW fractures. Femoral neck fixation with cannulated screws followed by PW fixation in lateral position in the same sitting was done for them. In the rest, femoral neck fixation was done with cannulated screws on a fracture table. Acetabular fracture fixation was subsequently done after re-draping in the same sitting.

Among the 10 patients with per-trochanteric fractures, proximal femur locking plate fixation (PFLCP) and PW fixation by Kocher Langenbeck (KL) approach were done in lateral position in 4 patients. One patient who received PFLCP was

operated on by the ilio-inguinal approach in a supine position. Dynamic Hip screw fixation (DHS) was done in 3 patients. Proximal femur nailing (PFN) was done in 2 patients on a fracture table and the acetabular fracture fixation was done in a second sitting. 2 patients had extra-articular distal femur fractures which were managed with a locking compression plate (DFLCP) in the supine position (Tables I and II).

The quality of acetabular reduction based on Matta's criteria on the postoperative radiographs was anatomical in 22 patients, congruent in 10, and incongruent in 2 patients. Acetabular reduction quality as assessed by chi-square test was not significantly different when the femoral fracture was of the proximal part (femoral neck, head, or pertrochanteric fractures) or the shaft and distal part (p=0.117). In patients with a femoral shaft or distal femur fractures, there were 16 excellent or good reductions and 3 fair or poor reductions. While in those with proximal femur fractures, there were 13 excellent or good reductions and 2 fair or poor reductions. The average postoperative hospital stay was 6.62 days (range, 2-15 days).

Complications were seen in 12 patients. Surgical site infection occurred in 2 patients at the acetabular site. Both were operated in a lateral position in a single sitting using the KL approach for the acetabulum. While one of them improved with intravenous antibiotics, the other required debridement and split skin grafting. One patient with a femoral neck fracture had SSI ; he failed to improve with repeated debridement and required excision of the femoral head. Infected femoral non-union was seen 6 months after surgery in patient 19 (Tables I and II) ; he had required cerclage at the time of primary surgery. He was managed with implant removal, debridement, and monorail fixator application. Non-union of the femoral fracture was seen in 3 other patients too. All of them were operated on in a single anaesthetic sitting. 2 patients were managed with exchange nailing and 1 with repeat DFLCP. All of them received autologous iliac crest bone grafts.

In the 2 patients with post-traumatic sciatic nerve palsy, the nerves were intact on exploration. Both improved spontaneously. Iatrogenic sciatic nerve palsy occurred in 1 patient, which recovered with supportive treatment. Heterotopic ossification of Brooker grade II was seen in one patient who also had a head injury. Post-operative vascular occlusion occurred in one patient with diaphyseal femur fracture and T type acetabular fracture. His acetabular fracture was operated in the second sitting by KL followed by IL approaches. He required a bypass procedure by the vascular surgeons. Chondrolysis (Figure 2D) was seen in the patient who had a femoral head fracture (patient 19). Avascular necrosis with secondary arthritis occurred in another patient with a femoral femur neck fracture. The average duration of follow-up was 30.32 months (range, 12-72 months). The radiological outcome of acetabular fracture was excellent or good in 26 (76.47%) and fair or poor in 8 (23.5%) patients (Table III). However, the clinical outcome was excellent or good in 21(61.7%)

Fig. 2D. — Radiograph at 15 months follow-up showing a reduced hip joint space in patient number 19 (tables I and II). His clinical and radiological outcomes were poor.

Table III. — Table summarizing the details of clinical and radiological outcomes at latest follow up and their comparison relation to the reduction quality assessed on post-operative radiographs.

Outcomes at latest follow-up		Reduction quality on post-operative radiographs			
		Anatomical	Congruent	Incongruent	'p' value on Fisher's exact test
Clinical outcome based on Harris Hip Score (HHS)	Excellent	9	0	0	0.001
	Good	9	3	0	
	Fair	1	7	0	
	Poor	3	0	2	
Radiological outcome of acetabular fracture based on Matta's score	Excellent	10	1	0	0.015
	Good	8	7	0	
	Fair	1	2	0	
	Poor	3	0	2	
Total		22	10	2	

patients, fair or poor in 13 (38.23%) patients (Table III). A statistically significant difference was found on Fisher's exact test when the radiological and clinical outcomes were analysed in relation to the post-operative reduction quality (p values, 0.015 and 0.001 respectively) (Table III).

DISCUSSION

Liebergall et al have been credited for coining the term 'floating hip' injuries *(1,5,6)*. Operative treatment of pelvi-acetabular trauma and femur fractures, in isolation is well accepted as the standard of care but literature on floating hip injuries is limited. These injuries occur predominantly in young people and result from road traffic accidents or a fall from significant height. Surgical stabilization helps in rehabilitation and an early return to productivity. While Liebergall et al. *(5)* preferred operating first on the femur, Siavashi *(13)* managed 10 out of their 11 patients by operating first on the pelvi-acetabular fractures. Suzuki et al. *(3)*. performed external fixation of pelvic fractures first and then addressed the acetabular and femoral fractures. At our centre, a similar pattern is followed, and the pelvic fracture is addressed first if it has the potential to produce hemodynamic instability. In this series, patients with only concomitant ipsilateral acetabular and femoral fractures (true floating hips injuries) were studied and those with pelvic injuries were excluded.

We noted a male predominance (33:1) and that the patients were primarily young. Liebergall et al. *(1,5)*, Suzuki et al. *(3)*, and Burd et al. *(7)* have reported that males were affected more than females in their respective studies. Muller et al. *(6)* and Siavashi *(13)* had almost an equal number of patients of each gender. The almost exclusive male involvement in our series can be attributed to their greater outdoor exposure as compared to the females in our region.

Acetabular fractures result from an impact of the femoral head on the acetabulum when forces are transmitted along the femoral shaft to the head, as occurs in dashboard injuries or when forces are transmitted from greater trochanter, as occurs in lateral impact injuries *(1,5)*. Liebergall et al. *(5)* reported a strong positive correlation between dashboard injury and posterior type of acetabular fractures (PW, PC, T with PW), and between lateral impaction and central type of acetabular fracture (Transverse, T type, BC, AC with PHT or AC with quadrilateral plate fracture). Additionally, they reported a strong correlation between midshaft femoral fractures and posterior type of acetabular fractures and between proximal fractures of the femur and central type of acetabular fractures. In this series, an equal number of patients had a posterior acetabular fracture or an anterior acetabular fracture and either a proximal femur or a femoral shaft fracture (n=7 and 8, respectively). 2 patients with distal femur fracture had posterior acetabular fractures. 2 patients had AC and femoral shaft fractures. A distinct correlation between the acetabular and femoral fracture type was not found in the present series. Burd et al. *(7)* too had failed

to find any significant correlation between the type of acetabular and femoral fractures. In this series, transverse fracture (10 patients, 29.4%) was the commonest acetabular fracture type. Muller et al (36.6%) and Burd et al (32.5%) have reported similar findings *(6,7)*. Sen and Jha *(14)* in their literature review had concluded that acetabular fractures in floating hip injuries were frequently transverse or posterior wall type or a combination of both. The average time between injury and the first Orthopaedic surgery in this series was 4.41 days and is comparable to that reported by Burd et al (3.6 days) and Muller et al (5.5 days). This resulted primarily from the fact that most patients were referred from other hospitals after initial stabilization.

Femur first strategy has already been reported *(1,3,5)* and it is postulated to reduce chances of fat embolism *(3)*, facilitate proper positioning, surgical site preparation and draping, exposure, and reduction of the acetabular fractures *(7)*. In the present series, the femoral fractures were always fixed first with the intention that if the surgery could not be completed in one sitting then at least the femur would be stable thereby decreasing the chances of fat embolism and increasing the ease of nursing care. This strategy was reported by Burd et al. *(7)* too.

In this series, 24 (70.6%) cases were operated on in a single anaesthetic sitting. Burd et al. *(7)*, Liebergall et al. *(5)* and Muller et al. *(6)* have operated on 65%, 65%, and 47% of their patients respectively, in a single sitting. Antegrade femoral nailing can be performed in a lateral position, through an incision which can then be easily incorporated into the KL approach. Even DHS or PFN placement can also be done in lateral position followed by a KL approach for the acetabulum in the same sitting. But in these cases, technical difficulties in fluoroscopic visualization were almost always encountered. Also, an additional scrubbed assistant is frequently needed in these cases. A two-stage surgery was done in 10 (29.4%) cases, of which 4 cases were of complex acetabular fractures requiring simultaneous or sequential dual approaches.[21]

Quality of reduction has been reported to be an important predictor of clinical and radiological outcomes in acetabular fractures *(22)*. The relationship between quality of reduction and the clinical and radiological outcomes was found to be statistically significant in this study. A comparable analysis has not been performed in previous studies on floating hip injuries. The clinical outcome at recent follow-up was excellent or good in 61.7% of patients and was inferior when compared to studies that have evaluated the outcomes in isolated acetabular fractures *(19,22-24)*. Zamora-Navas et al[18] also found inferior results in floating hip cases when compared to isolated acetabular fractures. This might be a result of the additional femoral fracture which can affect a person's mobility and his/her day-to-day activities. Additionally, few patients in this study who had an excellent initial reduction of the acetabular fracture ended up having poor or fair outcomes probably due to the complication seen in them. Infection occurred in 4 patients (11.76%, 2 on the acetabular side, and 2 on the femoral side). This infection rate was comparable to the 12.1% rate reported by Zamora-Navas et al. *(18)* but was higher than the 5-10% rate reported in isolated acetabular fractures *(19,22-24)*. Acetabular side SSIs were seen in patients operated by the KL approach in the same anaesthetic sitting along with the femoral fracture fixation. Routine prophylaxis with LMWH and Indomethacin was probably helpful as there was only one case of heterotopic ossification and no case of DVT. Iatrogenic sciatic nerve injury occurred in one patient.

There are a few notable shortcomings of this study. The quality of reduction was examined on plain radiographs and CT scans were not obtained out of financial constraints. Scores assessing the severity of trauma were not available as most patients were referred from other centers and invariably had received some initial care. No patient was operated first on the acetabular side thereby introducing an inherent selection bias and hence the ideal sequence of surgery cannot be conclusively stated upon. 16 (around 47%) patients have a follow-up of fewer than 2 years. The number of patients returning to pre-injury level of activity was not examined.

Inclusion of patients with concomitant acetabular and femoral fractures only and exclusion of pelvic fractures can be considered a strength of this study. The evaluation of outcome measures done by us in relation to the initial reduction quality is an important

aspect. A detailed description of the complications faced during treatment as presented will be helpful for other surgeons. We believe that this study adds to the existing knowledge on floating hip injuries and would be helpful for decision-making by surgeons planning to manage these complex injuries.

CONCLUSION

Floating hip injuries with an acetabular component can be managed successfully by a femur first approach with reasonable short-term clinical and radiological outcomes. A randomized study comparing the outcomes of femur first and acetabulum first strategies is warranted to definitively answer the question of which fracture should be operated on first. Complications are not uncommon, and it is imperative for the surgeon to inform the patients about them and the expected relatively poor outcomes when compared to isolated acetabular fractures.

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