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Evaluation of the Results of Open Reduction and Internal Fixation of Posterior Wall and Posterior Column Fracture of Acetabulum by Reconstruction Plate and Screw by Kocher-Langenbeck Approach

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Abstract **Original Research Article**

Background: Historically, acetabular fracture therapy was generally insufficient, leaving many patients with incapacitating pain, mobility limitations, and joint failure. It's caused by high-velocity injuries and affects young, economically productive people. Proper treatment including optimum surgical care should be offered, especially in our uninformed and fiscally unstable society, to preserve lives and reduce long-term consequences and impairments. This research aims to examine and manage the posterior wall and column of acetabular fracture, focusing on aspects the treating physician may influence. ***Objectives:*** To assess the outcome of open reduction and internal fixation of posterior wall and column fracture of acetabulum which may help the orthopaedic surgeons to take appropriate measures as needed. ***Materials and Methods****:* 15 posterior acetabular fracture patients were studied. Cases were clinically and radiologically diagnosed in NITOR's emergency or outpatient departments (NITOR). All patients had open reduction and internal fixation by Kocher-Langenback technique. 1 hour 55 minutes was average operating time 21-day average hospital stay. Per- and post-op were uneventful. Patients were released with follow-up appointments. Patients were clinically and radiologically examined at each follow-up. ***Results:*** Most injuries were from RTAs (86.66 percent). Most patients had left acetabular injuries (66.66 percent). Posterior wall acetabular fractures were more common (53.33%) than posterior column and wall fractures (33.33 percent). Most patients had surgery within 2 weeks after injury (60 percent). 4 (26.66%) and 6 (40%) patients had good clinical and radiological outcomes following surgery. Most patients' clinical (46.66%) and radiological outcomes were favorable (53.33 percent). About 20% of patients were clinically and radiologically fair. 6.6% of patients had poor physical result, while none had poor radiological outcome. 20-40-year-olds had a largely favorable outcome, according to the research. Most research participants had acceptable (Excellent+ Good) functional outcomes (73.33 percent). After surgery, 3 patients (20%) experienced superficial wound infection and 2 (13.33%) suffered temporary sciatic neuropraxia. ***Conclusion:*** Finally, it can be concluded that open reduction and internal fixation of the posterior wall and posterior column fracture of acetabulum using reconstruction plate and screw is a satisfactory method of treatment.

Keywords: Open Reduction, Internal Fixation, Posterior Wall, Posterior Column Fracture, Acetabulum, Reconstruction Plate, Kocher-Langenbeck Approach.

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INTRODUCTION

Historically, acetabular fracture therapy was generally insufficient, leaving many patients with incapacitating pain, mobility limitations, and joint failure [1]. It's caused by high-velocity injuries and affects young, economically productive people [2]. Though acetabular fractures are rare: of 37 per 100,000 pelvic fractures in the US yearly, only 10% include the acetabulum, with an estimated 4000 per year among the elderly (Mayo *et al.*, 2007), these intra-articular fractures may lead to severe morbidity, particularly if not treated effectively. Intra-articular mal-union and joint incongruity destroy cartilage quickly, causing hip

arthrosis [2]. High-velocity trauma, such as car accidents or falls, causes acetabular fractures in younger people [3]. Due to osteoporosis, moderate or minor trauma fractures are a risk for persons over 35 [4]. Force from the femur head to the acetabulum causes fractures. The femoral head works as a hammer, transmitting stresses from the greater trochanter, knee, or foot to the acetabulum. Position of the femur upon impact and force direction dictates fracture pattern and displacement [3]. Acetabular fractures are frequently life- threatening. In a meta-analysis of 819 patients, the most prevalent injuries were head damage (22%), abdominal injury (12.1%), pelvic ring injury (6.2%), extremity injury (40.3%), and others (5.6%) [5]. The direction and strength of the femoral head's impact determines the kind of acetabular fracture [6]. Judet and Colleagues' approach is used to classify acetabulum fractures. The system considers fracture orientation and structure. This system defines 10 acetabular fractures. 5 elementary and 5 connected patterns make up the 10 designs. Elementary fractures have a single orientation, whereas related fractures combine elementary fractures. Front wall, back wall, front column, back column, and transverse fracture are elementary patterns. Column fractures, posterior column fracture with posterior wall fracture, transverse fracture with posterior wall fracture-shaped fractures, and anterior column fracture with posterior hemi-transverse fracture are associated patterns [7]. Most acetabulum fractures are both-column fractures. Anterior and posterior column fractures are rare [6]. Letournel E (1993), Matta JM (1994), and Dakin GJ (1999) reported incidences of 27.9%, 33.3%, and 14.1% for both-column fractures. 22.4%, 8.6%, 12.9% had posterior wall fractures. 2.3%, 3.1%, and 1.2% of patients had isolated posterior column fractures, whereas 3.5%, 3.9%, and 18.8% had posterior column plus posterior wall fractures. According to a meta-analysis of 3670 individuals, posterior wall fractures were more common: 23.6%, 21.7%, 3.5%, and 5.7% [5]. According to another research, posterior wall fractures occur for 24% of acetabular fractures [4].

Posterior wall fractures include the acetabular rim, retro-acetabular space, and articular cartilage. Extended posterior wall fractures might encompass the larger or lesser sciatic notch, the ischial tuberosity, or both [3]. Posterior column fracture involves the ischial bone. The posterior column displaces the retro-acetabular surface. Inferior pubic ramus fracture the fracture line sometimes splits the ischial tuberosity immediately posterior to the obturator foramen. The pelvic brim may shift with the posterior column [3]. Posterior column with posterior wall fracture separates the column into a huge column and a wall [3]. Early in this century, acetabular fractures were dreaded and treated with pessimism because of dismal non-operative outcomes [1]. Judet and Letournel suggested surgery for all acetabular fractures since close reduction failed in many instances. Many writers reported favorable outcomes with conservative therapy, whereas operational problems such as heterotrophic ossification and insufficient reduction were highlighted [1]. Recently, it's become clear that correct fracture reduction is necessary for a good result, and open reduction is preferable than close reduction. Many sites with a high proportion of good and exceptional performance are well-equipped tertiary referral institutions or trauma clinics [1]. Open reduction and internal fixation is the treatment of choice for acetabular fractures, according to a 2003 research by Tan *et al.*, In 262 displaced fractures, Matta JM (1996) found 40% excellent and 36% satisfactory outcomes. Ruesch *et al.*, (1994) found 81% acceptable outcomes in 102 operatively treated fractures, while Mayo KA (1994) reported 75% good to outstanding outcomes in 163 operatively treated fractures. These results, together with 30 years of effort by Judet and Letornel, reaffirmed the standard of treatment for acetabular fracture surgery [8]. The transition from non-operative to operational therapy is based on improved radiographic assessment, surgical anatomy and approaches, and internal fixation methods [3], Viability of fracture fragments, precise anatomical reduction, plating to sustain comminuted fragments, and neurovascular protection are keys to surgical success [3]. Acetabular fractures are tough because they are complicated and typically involve substantial damage [1]. Multiple injuries occur often. Hofmann *et al.*, reported 20% mortality [9]. Improved fracture diagnostic and surgical exposure and stabilizing procedures increase treatment effectiveness. General ideas and methodologies must be studied extensively, and case preparation must be comprehensive [3]. As road traffic collision is one of the most prominent etiological reasons of acetabular fracture, and the victims are frequently young, adequate therapy including optimal surgical care should be provided to preserve lives and reduce long-term problems and associated impairments. This research reviews the examination and therapy of posterior wall and posterior column acetabular fractures, focusing on aspects the treating physician may influence.

OBJECTIVE

- To see the outcome of evaluation of posterior wall and posterior column fracture of acetabulum which in turn may help the health care providers (Orthopaedic surgeons) and health care policy makers to make appropriate measures as needed.

MATERIALS AND METHODS

This Descriptive evaluative study was carried out at National institute of traumatology and Orthopaedic rehabilitation (NITOR) during the period from January 2012 to July 2013.15 patients having posterior wall and posterior column fractures of acetabulum of both sexes admitted in NITOR with definite inclusion and exclusion criteria during the above-mentioned period.

Inclusion Criteria

1. Patients over 18 years of age.
2. Both sexes.
3. Posterior wall and / or posterior column fractures with significant displacement.
4. Patients presented within three weeks of injury.

Exclusion Criteria

1. Patients <18 years of age.
2. Elderly patients with osteoporotic bone.
3. Old fracture>3 weeks.
4. Open fracture.
5. Debilitated patients/Patients unfit for anaesthesia.

Data Collection and Analysis

Data were collected using a structured questionnaire (researchinstrument) which contained all the variables of interest. Analysis was done taking care of set standard criteria of evaluation. Analysed datawere presented in the form of tables and figures with appropriate interpretations.

RESULTS

The present study was carried out between January 2012 and July 2013 at NITOR. Total 15 patients of both sexes age between 18 to 60 years of posterior wall and posterior column fractures of acetabulum with definite inclusion and exclusion criteria were selected. After proper resuscitation and investigation, all patients were treated by open reduction and internal fixation through Kocher-Langenbeck approach by reconstruction plate and screws and followed- up for at least 6 months. After 6 months follow-up the following findings were compiled. All the relevant findings obtained from data analysis are presented in tables and figures.

The commonest age group was 20-40 years (73.33%), (Table -1).

Table 1: Distribution of the patients according to age (n=15)

Age of the patient	Frequency	Percentage%
20-40 years	11	73
41-60 years	4	27

Majority of the patients (73%) were between according to age (n=15) and there was a male predominance (86.66%), (Fig-1) among 15 patients, male 87% & female 13%.

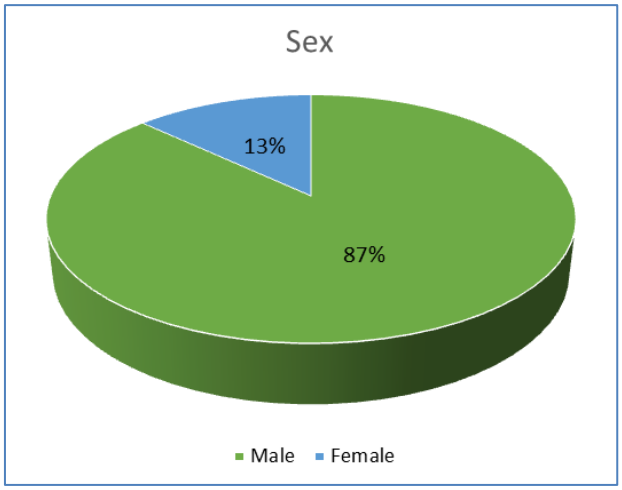

Figure 1: Distribution of the patients according to sex (n=15)

Majority of the sufferers belonged to service holders (46.66%), (Fig-2).Among 15 patients service holder 47%, businessman27%, student 13% & housewife 13%.

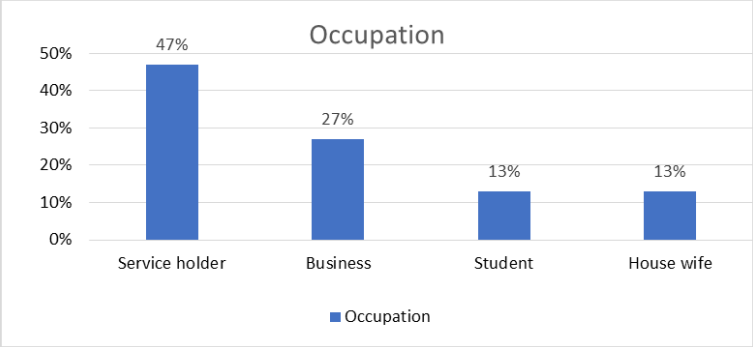

Figure 2: Distribution of the patients according to occupation (n=15)

Regarding mode of injury the commonest cause was road traffic accident (RTA) (86.66%), (Fig-3). RTA caused injury in 87% patients fall from height caused injury in 13% patients.

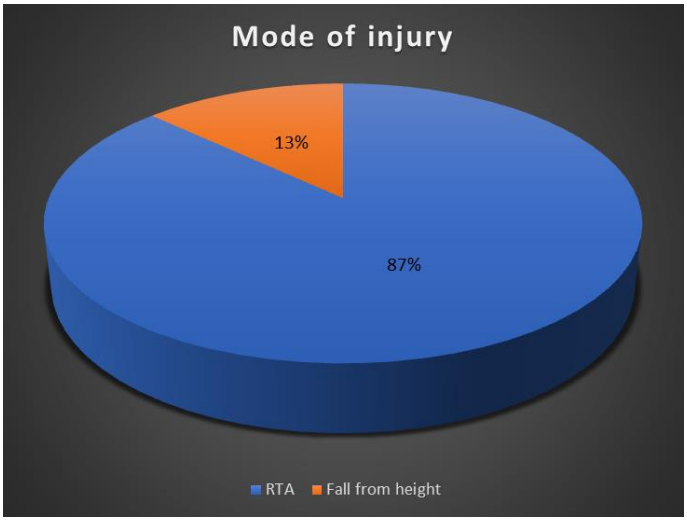

Figure 3: Distribution of the patients according to mode of injury (n=15)

Most of the patients came with left sided acetabular injury(66.66%),(Fig-4). 67% injury involved left side, 33% injured right side.

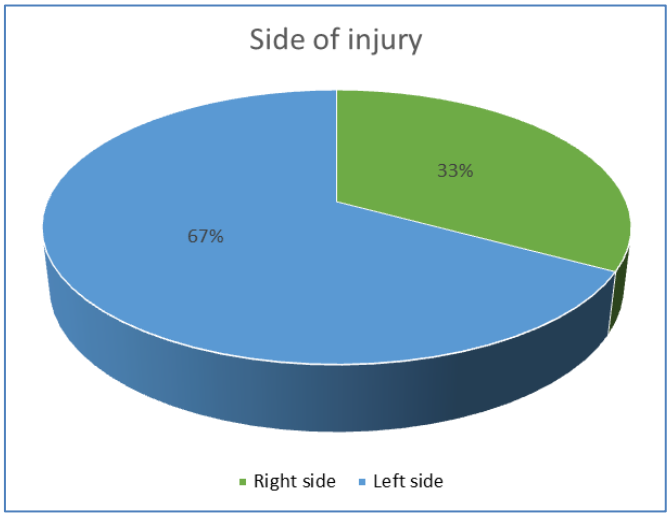

Figure 4: Distribution of the patients according to side of injury (n=15)

Among all the cases the number of posterior wall acetabular fracture were more (53.33%), then combined posterior column and posterior wall fracture (33.33%)(Fig-5). Among 15 patients wall fracture 53%, posterior wall with posterior column fracture 33% & posterior column fracture 13%.

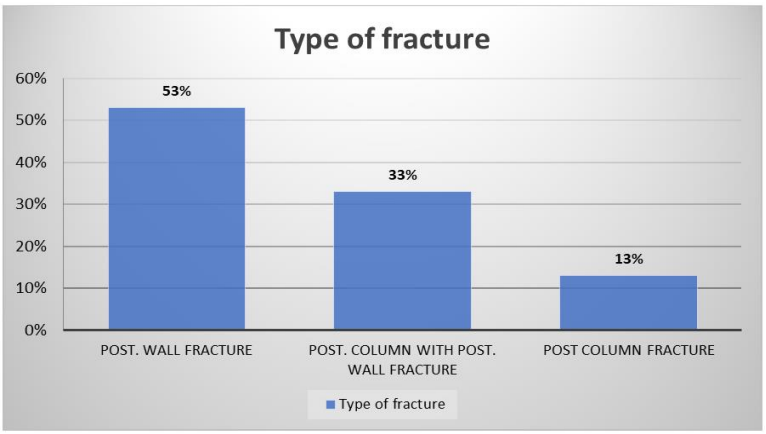

Figure 5: Distribution of the patients according to type of acetabular fracture (n=15)

Majority of the patients underwent surgery during the 2nd week of injury (60%), (Fig-6). 60% patients operated in 2nd week and 40% patients operated in 3rd week.

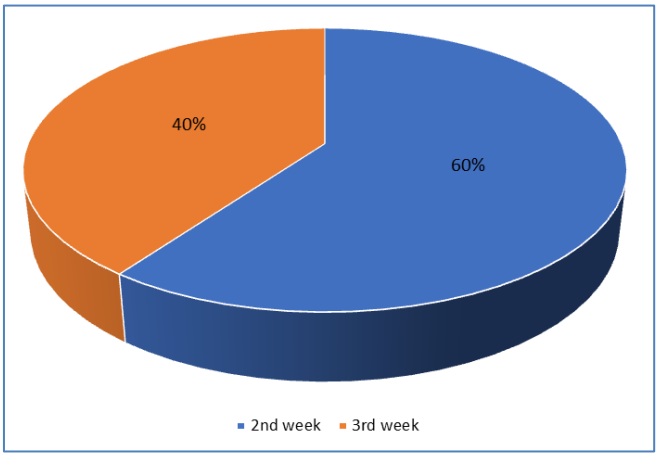

Figure 6: Distribution of the patients according to time interval between injury and operation (n=15)

Regarding clinical outcome of the patients after surgery about 4(26.66%) patients were rated as excellent and 7 (46.66%) patients as good. Radiologically 6(40%) patients were rated as excellent and 8 (53.33%) patients as good.

About 20% patients were rated as fair clinically and 6.66% radiologically. 1(6.66%) patient was found having poor physical outcome whereas no one belonged to poor radiological outcome, (Fig-7) and (Fig-8).

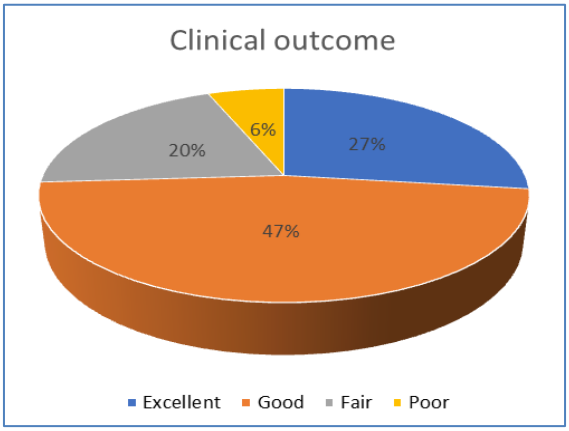

Figure 7: Distribution of the patients according to clinical outcome (n=15)

Clinically excellent, good, fair & poor result was achieved respectively in 27%, 47%, 20% & 6% patients.

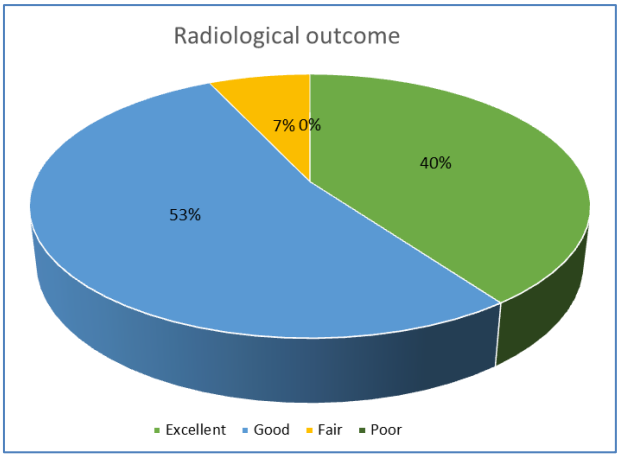

Figure 8: Distribution of the patients according to radiological outcome (n=15)

Radiologically excellent, good, fair & poor result was achieved respectively in 40%, 53%, 7% & 0% patient.

Regarding relationship between outcome and age of the study population, it was found that, among the age group of 20-40 years, the result was mostly satisfactory (81.8%).

Overall clinical outcome of the study population revealed that most of the patients belonged to satisfactory (Excellent+Good) outcome (73.33%), (Fig-9).73% patients were satisfactory & 27% were unsatisfactory

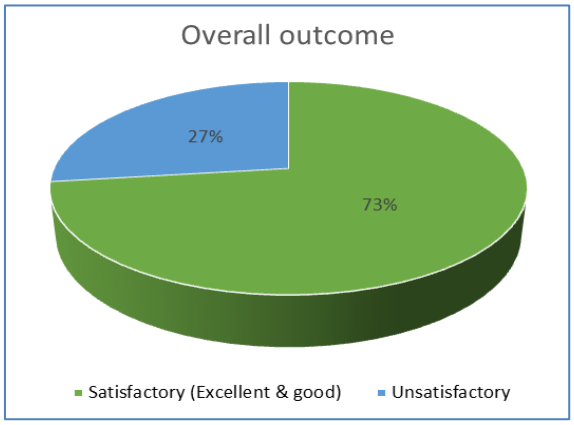

Figure 9: Distribution of the patients according to overall outcome (n=15)

Regarding quality of reduction majority of the patients (73.33%) achieved satisfactory (≤2mm) reduction, (Fig-10).Satisfactory reduction achieved in 73% cases, unsatisfactory reduction achieved in 27% cases.

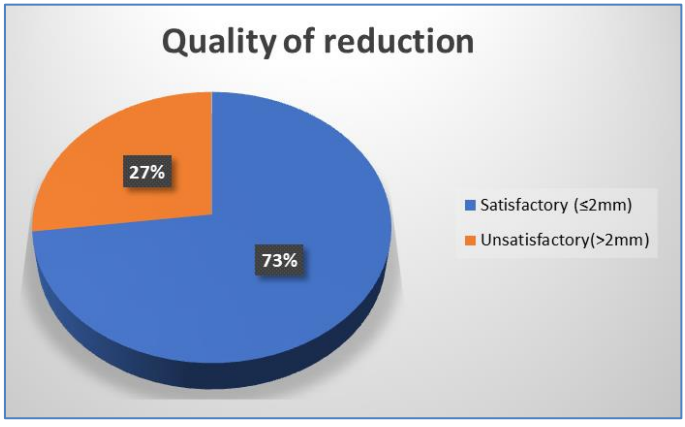

Figure 10: Distribution of the patients according to quality of reduction (n=15)

About 67% patients had other associated injuries of which injury to the extremities was the most common (26.67%), (Fig-11).Associated injury in extremities, head, pelvis & chest was found respectively in 27%, 20%, 13% & 7% cases.

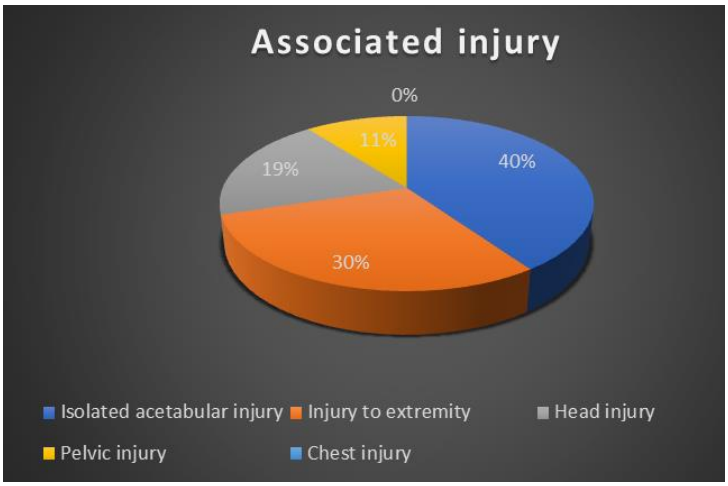

Figure 11: Distribution of the patients according to associated injury (n=15)

Among all the cases after surgery 3 patients (20%) were developed superficial wound infection and 2 patients (13.33%) became the sufferers of transient neuropraxia of sciatic nerve, (Table-2).

Table 2: Distribution of the patient according to post-operative complication (n=15)

Complications	Frequency	Percentage%
Superficial wound infection	3	20
Transient neuropraxia of sciatic nerve	2	13
Incidence of superficial wound infection was more (20%)		

DISCUSSION

Open reduction is better than close reduction for reaching a satisfying output [1]. This research evaluated the functional result of open reduction and internal fixation of posterior wall and posterior column acetabular fractures by plate and screws. 15 patients with posterior acetabular fractures within 3 weeks after occurrence were recruited in this research from January 2012 to June 2013. The current results were compared to earlier investigations.

In this research, 11 (73.33%) patients were aged 20-40, while 4 (26.67%) were aged 41-60. 36 9.2 was the mean age. Similar to the present research, Lim *et al.*, (1994) found a mean age of 35 with ages ranging from 23 to 66. KY Tan *et al.*, (2003), Jung Kuang *et al.*, (2003), Kreder *et al.*, (2006) found virtually equal mean patient ages of 34.9, 39, and 41.6 years. According to a meta-analysis by Giannoudis *et al.*, (2005) among 3639 patients, the mean age was 38.64.6 years [1, 10 ,11, 5].

In this series, the male-to-female ratio was 6.5:1, indicating that men were predominate. This may be attributed to men working outdoors and being more prone to road traffic accidents, while women are still trailing behind in domestic duties. Lim *et al.*, (1994), Jung Kuang *et al.*, (2003), Krede R, *et al.*, (2006), Giannoudis *et al.*, (2005), and Carter *et al.*, (1960).

In this research, 86.66% of fractures were caused by RTAs and 13.34% by height falls. Tan *et al.*, (2003) found that 66.7% of fractures were caused by car accidents and 33.3% by falls. Lim *et al.*, (1994) discovered that car accidents cause most acetabular fractures. Traffic accidents caused acetabular fractures in 84% of patients, followed by falls from height in 16%. A meta-analysis of 3639 acetabular fracture patients indicated that traffic accidents caused 80.5% and falls from height 10.7% [5]. The aforementioned authors' fracture-cause results are congruent with ours.

In this research, most patients (66.66%) had left-sided acetabular fractures, which contradicts a 2003 study by Jung Kuang *et al.*, Matta *et al.*, (1984) reported right-sided acetabular fracture preponderance [10, 12].

In this research, posterior wall acetabular fractures were greater (53.33%) than posterior column and wall fractures combined (33.33 percent). Two patients suffered posterior column fractures. Lim *et al.*, (1994) discovered that most fractures impacted the acetabulum's posterior wall. Giannoudis *et al.*, (2005) found that posterior wall fractures are more common. Like the present research, there were few isolated posterior column fractures. Dakin *et al.*, (1999) found 18.8%, 14.1%, and 1.2% posterior wall and posterior column fractures, which differs from the present research [1, 5, 13].

In this research, 60% of patients were treated after 2 weeks of injury, whereas 40% were operated between 15 and 21 days (3rd week). Lim *et al.,* (1994) showed that most patients were operated within 2 weeks following injury, which matches the current research. In a meta-analysis by Giannoudis *et al.,* (2005), the average period between injury and operation was 2 weeks [1, 5].

In this series, 67% Whs20% and 13.33% had pelvic ring damage. Similar to the current research, Lim *et al.,* (1994) found that 77% of patients with posterior acetabular fractures had severe concomitant injuries. Matta *et al.,* (1984) found that among 63 patients with acetabular fractures, 41 had additional injuries, most often extremity and head traumas. Most acetabular fracture patients had concomitant injuries, according to Giannoudi *et al.,* (2005). Most injuries were to the limbs (40.3%) and head (22%). Most patients with posterior wall acetabular fractures had accompanying injuries, with both extremities being the most frequent (93 patients). All the aforementioned research [1, 5, 11] corroborate the current investigation about related damage.

In this series, 26.66% and 46.66% of patients had excellent and good Merle d' Aubigne clinical outcomes following surgery. 20% of patients had acceptable clinical result, 6.6% had bad. After open reduction and internal fixation, Matta (1996) found excellent results for 40%, good for 36%, fair for 8%, and bad for 16% of hips. Letournel *et al.,* (1984) found that 74% of 426 patients had good clinical outcomes. Both of the prior investigations found more patients with great functional outcomes, which contradicts the current research, which found more patients with satisfactory outcomes [14, 15].

Tan *et al.,* (2003) found that 13.3%, 66.7%, 13.3%, and 6.7% of patients had excellent, good, fair, and poor clinical outcomes, comparable to the current research [8].

Lim *et al.,* (1994) found that most patients (72%) had satisfactory or outstanding functional outcomes [1].

Most patients had excellent or good functional outcomes, according to Wang Xianquan *et al.,* (2004) [16].

Both researches corroborate this one. Matta *et al.,* (1984) found excellent or good clinical result in 35% of patients and fair or poor in 65%, contradicting the present research [12].

Giannoudis *et al.,* (2005) found that after open reduction and internal fixation, 82.4%, 63%, and 83% of patients with posterior wall fractures, posterior column fractures, and combined posterior wall and posterior column fractures had excellent or good functional results, while 17.6%, 37% had fair or poor results.

Regarding post-surgery radiological outcomes use Mata's grading system.

Excellent, good, fair, and poor outcomes were attained by 40%, 53.3%, 6.6%, and 0% of patients, respectively (Lim *et al.,* 1994) [1].

Matta *et al.,* (1984) found excellent or good radiological outcomes in 28% of patients, fair in 31%, and poor in 41% [14].

Regarding the association between outcome and age of the study population, the 20-40 age groups had a higher proportion of good results (81.8% vs. 50%) It's consistent with another research by Matta (1996), which found that, of 166 fractures in patients under 40, 81% had a good outcome, compared with 68% in patients over 40.

In this research, most patients had acceptable (excellent+good) outcomes (73 percent). Carter R. kowe *et al.,* (1960) studied 17 posterior acetabular fractures and found good results in 65% and unsatisfactory results in 35% [17].

In this research, most patients (73.33%) had good (2mm) reduction compared to 926.67% who had unsatisfactory (>2mm) reduction. This is similar with Kreder *et al.,* (2006), who found 0 to 2 mm residual displacement in 42 (95.5%) and 15 (68.2%) of 44 isolated posterior wall fractures and 22 posterior wall combined with posterior column fractures.

In 13.33% of patients, post-operative complications included superficial wound infection and temporary sciatic nerve neuropraxia. Kreder *et al.,* (2006) found a 4.5 percent incidence of superficial wound infection in solitary posterior wall fractures and combined posterior wall and posterior column fractures. Nerve damage was 2.3% in posterior wall fractures and 0% in posterior wall and column fractures combined. Giannoudis *et al.,* (2005) identified iatrogenic nerve palsy in 8% of patients and local infection in 4.4%. Matta *et al.,* (1984) found 9 percent wound infection and nerve palsy [11, 5].

These problems were less common in previous research. Carter *et al.,* (1960) found that 35% of posterior acetabular fractures were related with sciatic nerve damage.

CONCLUSION

It is concluded that open reduction and internal fixation of posterior wall and/or posterior column fractures of acetabulum by reconstruction plate and screw by Kocher-Langenbeck approach is a satisfactory

and effective method of management for early mobilization and rehabilitation of the patients.

As the outcome evaluation was done 6 months after operation, complication beyond 6 months like a vascular necrosis of femoral head, heterotrophic ossification and symptom status could not be ascertained. So further study should be contemplated taking long term evaluation into consideration.

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