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ABSTRACT:

Acetabular reconstructive surgery is a good alternative method to treat acetabular fractures. The aims of this study were to assess the incidence, clinical pattern, and the relationship between various factors and heterotopic ossification (HO). This was a retrospective study involving all cases of acetabular fractures that underwent reconstructive surgery at Khartoum North Teaching Hospital in Khartoum state during the study period, (December 2006 to December 2011). A total of 132 patients with acetabular fractures were reviewed. The complete preoperative and post-operative data, together with information on regular follow up visits at 3 months, 6months and 2 years for each patient were collected. The SPSS was used for data processing. The male to female ratio was 4.3:1. Of the 132 cases 13 (9.8%) of them developed heterotopic ossification as a complication of the surgery. This consisted of 12 (92.3%) male and 1 (7.7%) female patients. The age range of the patients was 26-50 years. Road Traffic Accidents (RTA) /occupant constitute the most common mode of trauma 46.2%. AO (Arbeitsgemeinschaft für Osteosynthesefragen foundation fracture classification) class A1 and B1 were the commonest types associated with HO. The mean hospital stay was 14 days. Male patients over 25 years of age with posterior hip dislocation, class A1 or A2, treated by posterior approach, were the highest at risk of developing Heterotopic Ossification.

KEYWORDS: *Acetabular fractures, Heterotopic ossification*

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INTRODUCTION:

Acetabular fractures, especially displaced ones, constitute serious intra-articular injuries and are often accompanied by posterior hip dislocation or other musculoskeletal injuries that may significantly affect the treatment protocol as well as the outcome [1]. Displacement of the fracture to more than 2.0mm is known to increase the danger of post-traumatic arthritis and lead to a poor functional outcome. Surgical treatment of displaced acetabular fractures is considered the treatment of choice today, because it ensures the best possible anatomical reconstruction of the joint surface, thus increasing the chances of a satisfactory functional result [2]

Heterotopic ossification was originally described in 1692 by Guy Patin, the Doyen of the Faculté de médecine de Paris [3]. Patin described a condition he observes in children and called myositis ossificans progressive. The next development in history of heterotopic ossification came in 1918 because of military injuries sustained during World War I Dejerine and Ceillier described a condition they referred to as par-aosteoarthropathy, which they observed in patients with paraplegia caused by gunshot wounds to the spinal cord [4]. The historical term of heterotopic ossification has been superseded. Ectopic ossification and myositis ossificans are used interchangeably with the term heterotopic ossification. The condition may affect the bones or the joints. Three types of heterotopic ossification have been described: myositis ossificans progressiva (Münchmeyer disease), is an autosomal dominant (a rare pediatric metabolic disease whereby skeletal muscles ossifies); Neurogenic heterotopic ossification (this occurs as result of burns or neurologic injury); traumatic heterotopic ossification (this follows injury to tissue surrounding the bones and joint [4].

Alternatively, pathologic bone formation surrounding the bone and joint can be defined histologically. Heterotopic ossification is the formation of mature lamellar bone in nonosseous tissue, whereas myositis ossificans is a specific type of heterotopic ossification that occurs in inflammatory muscle. Both of these processes are examples of ectopic ossification, and they may coexist although they are distinct from periarticular calcification, which is deposition of pyrophosphates within the soft tissues surrounding the joints.

There is no registry in Sudan about the cases of post-operative heterotopic ossification. The condition can be easily miss-diagnosed especially in the early presentation as painful lump that have large spectrum of differential diagnosis [5].

The aims of this study were to assess the incidence, clinical pattern, and the relationship between various factors and heterotopic ossification

PATIENTS AND METHODS:

This was a retrospective, descriptive hospital based study involving all cases of acetabular fractures that underwent reconstructive surgery at Khartoum North Teaching Hospital in Khartoum state during the study period (December 2006 to December 2011).

Acetabular reconstructive surgery was started during the last 5-6 years in Sudan in Khartoum North Hospital as an alternative method to the old methods which were mainly conservative.

A total of 132 Patients with acetabular fractures presented to the hospital. Proper history, thorough examinations including assessment of x-rays were done on each patient. The data for each patient was recorded regardless of whether it was acetabular fracture alone or combined with hip dislocation. Appropriate treatment decision was then made for each patient. Each patient then underwent surgery with different approaches.

Regular follow-up was done for each of them by the same means and information related to functional and psychosocial recovery and x-rays of the area in a regular interval at 3 months, 6 months and 2 years collected. Duration of hospital stay preoperative and postoperative was also recorded. A total of 13 patients were found to have heterotopic ossification and they were each reviewed. AO fracture classification and its relation to the incidence observed and other factors such as age and hospital stay and others were noted. The data used in the present study were taken from the patients records retrospectively, processed and analyzed using SPSS version 17. Statistical significance difference was considered when $p < 0.05$.

RESULTS:

In this study there was 107 male (81.1%) and 25 female (18.9%) patients, which is equivalent to 4.3:1 male to female ratio. The age range of all the patients was 8-70 years; the mean age was 36.2 ± 12.6 years (Mean \pm SD). Of the 132 patients 13 (9.8%) of them developed heterotopic ossification as a complication of the surgery. Gender distribution of the 13 patients indicated 12 (92.3%) males and 1 (7.7%) female. Their age range was 26-50 years and their mean age was 36.4 ± 8.7 years. 30.8 % of the patients were workers. Figure 1 shows the distribution of the 13 patients according to their mode of injury. The commonest (46.2%) mode of injury in the patients with HO was RTA/Occupants

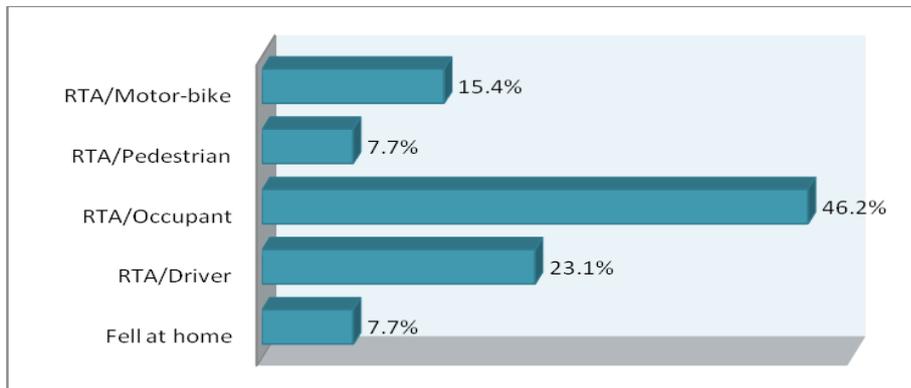


Fig 1: Mode of injury in patients with HO (n=13)

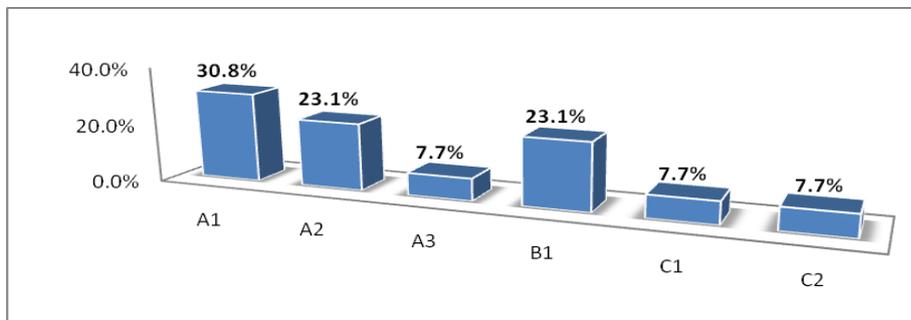


Fig 2: AO classification for HO pts (n=13)

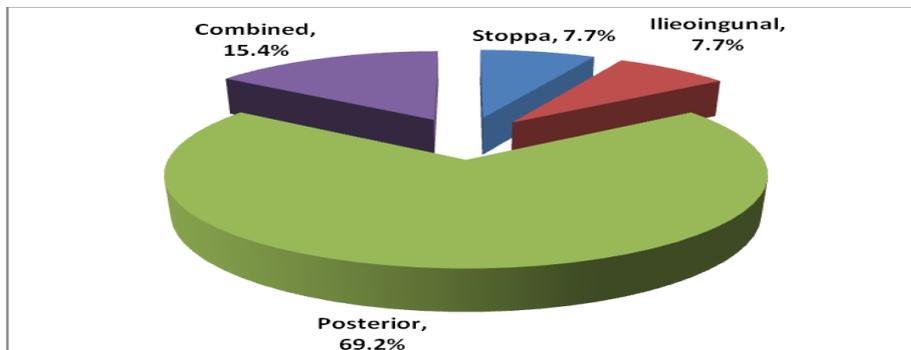


Fig 3: Surgical approach used (n=13)

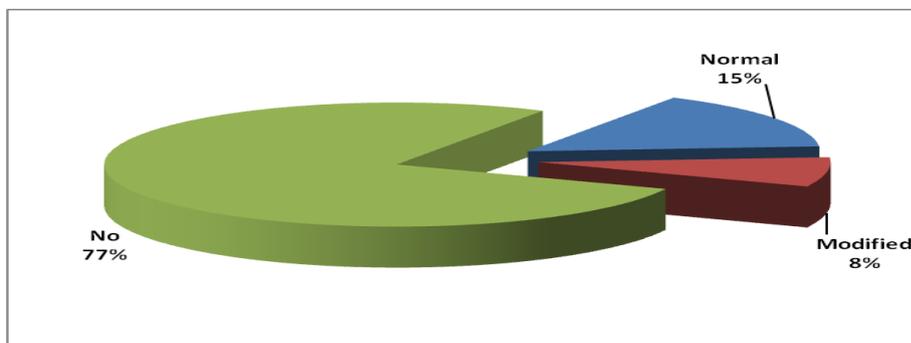


Fig 4: Functional outcome – work assessment (n=13)

There were 10 (76.9%) patients with only acetabular fractures and 3 (23.1%) patients with combination of acetabulum and pelvic fracture. Six out of the 13 pts who were HO positive had 11 types of associated injuries the highest was posterior hip dislocation in 4 pts (36.4%), upper limb injuries in 3 pts (27.3%), lower limb injuries in 2 pts (18.2%), 1 pt (9.1%) with chest injury and 1 pt (9.1%) with abdominal injury. Figure 2 shows the AO classification of the heterotopic ossification of the 13 patients. All patients were fixed by plates and screws (13 patients 100%), the surgical approach in 9 pts (69.2%) was posterior Kocher-Langenbeck, 1 patient (7.7%) was treated by Stoppa, 1 patient (7.7%) by ilioinguinal and 2 patients (15.4%) had a combination of 2 approaches. The result is presented in fig 3. By the time the HO became positive on the X-ray we found that 10 pts (76.9%) were positive at 3rd month of follow up, 2 pts (15.4%) at 1 year and 1 pt (7.7%) at 2nd year after the time of surgery. At the 3rd months of the follow up 7 pts (53.8%) had no pain, 6 pts (46.2 %) had mild pain and no patient had severe pain. Regarding sitting assessment 11 pts (84.6%) could sit normally and 2 pts (15.4%) had to modify the way they sit. We also found that 2 pts (15.4%) could walk normally without walking aids, 11 pts had a modified gait and using walking aids and there was no pt still in bed or using wheelchair at the 3rd month of follow up.

Four patients (30.8%) had normal sexual life, 2 patients (15.4%) had a modified sexual life, 3 patients (23.1%) did not return to any sexual activity and we had 4 patients (30.8%) still single at the 3rd month of follow up. Figure 4 shows that 2 patients (15.4%) return to the work they use to do before the injury, one patient (7.7%) modify his work and 10 patients (76.9%) still could not get back at the 3rd month of follow up. The mean hospital stay was 13.94 days, but it ranged from 3 to 64 days).

DISCUSSION:

Acetabular fractures are uncommon fractures; the average orthopedic surgeon will never see a large number of cases [6]. The aim of surgery is to preserve a painless hip with good mobility [2].

In this study the acetabular fractures were seen in younger age with mean age of 36.2 ± 12.6 years. This can be compared to the results reported by Matta in 1996 [2]. So the acetabular fracture can occur at any age.

The incidence of heterotopic ossification in our study was 9.8%, which is an acceptable one when compared to the literature as it ranges from 3-69 % [7, 8, 9, 10] and in a series of 262 patients reported by Matta [2] where no prophylaxis against heterotopic ossification was administered a rate of heterotopic ossification was as high as 82%. Giannoudis et al [11] in large Meta-analysis of 23 articles found the incidence was 25.6%.

There is not enough international data about the pre-operative delay and hospital stay and incidence of heterotopic ossification. In this study we did not find a difference in pre-operative delay or hospital stay in pts with or without heterotopic ossification. Gupta et al [12] in his result claimed that the delay is a major risk factor because the surgery needs more dissection and stripping and 3 of his 5 pts with HO positive presented late (more than 2 weeks). No specific correlation with age was found in literature [13], but some authors indicated that it is more common in the over 30 year's age group [14]. Our finding indicates that it occurs mainly among males between 25- 50 years. The male gender has a higher risk of heterotopic ossification, generally [13, 15] around hip, it is also higher in male after arthroplasty [16, 17]. In our study we find 92.3% of our patients were males so we consider gender as a risk factor.

The mode of injury in patients with heterotopic ossification was no different from any patients with acetabular fracture which high energy trauma caused by RTAs. The mode of injury in patients with heterotopic ossification was RTA related injury in 92.4% and the mode of injury in acetabular fracture in general as described by Matta [2] was 82% due to RTA related injury.

In our study we noticed the higher incidence of heterotopic ossification in patients who had acetabular fractures only without involvement of pelvic bones and also higher in the right side; although there is no clear explanation for that either in our study or in the literature.

Many authors tried to link the presence of heterotopic ossification to associated injuries, Ghalambor N et al [13] in his report of Heterotopic ossification following operative treatment of acetabular fracture, an analysis of risk factors, mentioned the chest and abdominal injury as a risk factor, also Webb et al [18] agreed on that and included head injury as a risk factor. In our study 18.2% of patients positive for HO had associated chest and abdominal injury. Nothing mentioned about association with upper or lower limb injury but Ghalambor N et al [13] indicated that the Injury Severity Score affects the incidence of heterotopic ossification; our results support this observation.

Regarding the association of HO with posterior hip dislocation we found that it is about 36.4% of patients. According to Koval et al [8] there was 2 % incidence of HO after posterior hip dislocation, they also indicated that the incidence of HO was directly related to the amount of initial soft tissue damage. Timothy et al [19] found 44% incidence of posterior dislocation but they reported that there was no significant association between the dislocation and grade of HO. The authors however did not indicate the association between the dislocation and presence of HO regardless of the grade. In addition they indicated that approaches that do not violate the gluteal muscles are believed to be associated with a lower rate of heterotopic ossification. Our data tends to indicate that posterior hip dislocation which

result from high energy trauma, violate the gluteal muscles and need posterior approach is one of the risk factors for HO.

In patients with HO we found the common fracture pattern was A1 (31.8%) which correspond to posterior wall fracture in Letournel classification [20] and 23.1% as type A2 which correspond to posterior columns; thus over 50% patients whom HO positive had posterior element fracture can be regarded as risk factor. However, Timothy et al [19] disagreed and found no correlation between fracture type and HO. In addition Kaempffe et al [21] reported 58% incidence and also did not find a correlation with fracture type, but 26 of 28 (92.9%) of their patients with trochanteric osteotomy developed HO. The posterior approach was used in 69.2 % of pts who developed HO and the combined approach was used in 15.4% of HO positive patients.

In a meta-analysis, Giannoudis [11] found the highest risk was the iliofemoral approach followed by the Kocher- Langenbeck approach. Matityahu et al [22] also agreed on that and he also had 14 % incidence with the combined approach. The iliofemoral approach was not used for any pt in our present study. There were 76.9% cases diagnosed by the 3rd month of follow up. Timothy et al [19] also found strong correlation between the duration of follow up and incidence of HO.

All our patients had mild form of HO except one pt (still there was no ankylosis or restriction of movement), most authors suggest that the poor outcome correlate with the severity of HO [19, 21]. Fang-Yao et al [23] reported 75% good to excellent outcome in patients with heterotopic ossification. The mean hospital stay of 13.94 days, which range from 3 to 64 days in our study, was similar to that reported by Matta [2]. He found that the mean hospital stay was 19 days (ranging 3-137) and keeps with a previous local study (24).

CONCLUSIONS:

Incidence of HO in our present study is within the range reported by others. Male pts over 25 years of age with posterior hip dislocation, class A1 or A2, treated by posterior approach, should be regarded as risky patients especially if they have past history of Heterotopic Ossification.

Competing Interests: The authors reported no conflict of interest and no funding was received for this project.

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