

# Management of Displaced Ankle Fractures in Elderly Patients – is it worth performing osteosynthesis of osteoporotic bone?

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## SUMMARY

**Background.** Ankle fractures in the elderly with osteoporotic bones are often difficult to manage. It is debatable whether we should treat such fractures conservatively, surgically, or even plan primary arthrodesis. Furthermore, there is a risk of difficult or failed fixation.

**Material and methods.** The study was a retrospective evaluation of the management and follow up of 126 patients presenting with displaced ankle fracture between 2001 and 2007. All patients were over 60 years old at the time of injury.

**Results.** About 75% of our patients underwent open reduction and internal fixation (ORIF). The remaining had closed manipulation under anaesthesia (MUA) performed. Some patients had multiple co-morbidities including diabetes (14% of patients). The results of fixation were satisfactory. Early complications included superficial wound infection (13% of patients) and one chest infection. There was no difference in diabetic patients. Metalwork failure occurred in one case only. Satisfactory union of fracture was achieved in all patients. Amongst patients who underwent MUA, more than 22% had chronic ankle pain. Significant ankle deformity was reported in 9% of patients.

**Conclusion.** Our results show that accurate reduction and internal fixation of ankle fractures in elderly patients is beneficial and associated with lower complication rates compared to MUA alone. The osteosynthesis failure rate was very low and patients spent less time in plaster and started physiotherapy earlier.

**Key words:** ankle fracture, osteoporotic fracture, anklefixation

## BACKGROUND

Ankle fractures are among the most common orthopaedic injuries in general [1]. Ankle fracture is one of the most commonly encountered non-spinal fractures in the elderly population, especially in postmenopausal women and its incidence has increased over the last few decades [2].

In developed countries, not only the incidence of ankle fractures in patients over 60 years of age is increasing, but the population at risk is constantly expanding as well [3]. In previous demographic studies, the age-adjusted incidence of low-trauma ankle fracture in both sexes clearly rose in all age groups over 60 years [3,4]. Court-Brown et al. indicated in their study that about 20%–30% of ankle fractures in the elderly are displaced bi- or tri-malleolar fractures, which means that definitive treatment is necessary, whether by conservative or operative methods [5].

Since many elderly patients have coexisting medical conditions, the treatment of such fractures is often challenging. The goal of treatment in ankle fractures is to restore biomechanical stability to the ankle and hence increase the functional ability of this age group. This would help avoid health deterioration and associated complications. While the anatomical reduction of fracture fragments is certainly more commonly achieved with operative treatment, such treatment is not without risks [1].

The aim of this study was to assess the immediate and short-term outcomes and complication rates of both conservative and surgical options in the management of ankle fractures in patients over 60 years of age.

## MATERIAL AND METHODS

This retrospective case control study was designed to evaluate the outcomes and complications of treatment of displaced ankle fractures in elderly patients presenting to our district general hospital between 2001 and 2007.

Patients were identified using the ORSOS theatre database. We identified a total of 185 patients, of whom only 126 fit our inclusion criteria. All patients were above 60 years of age at the time of injury and they were treated by open reduction and internal fixation (ORIF) or manipulation and closed reduction (MUA). We included all patients with displaced ankle fractures with complete medical records, digital radiographic studies and follow-up data till discharge from the outpatient fracture clinic. In all patients, ankle fracture was their only injury. All poly-trauma patients or those with missing x rays or follow-up documentation were excluded from this study.

We reviewed clinical notes and digital radiographs during initial and follow-up stages and retrieved available data on patients' demographics, concomitant medical problems, mechanism of injury, fracture pattern, treatment given, and complications.

All preoperative radiographs of the injured ankles were reviewed and classified according to the Danis-Weber classification. All radiographs were assessed by the senior author (B.R.) according to a standard definition as described for the Weber classification for adequacy of reduction and during follow-up visits. Accurate reduction was judged as up to 1 mm displacement of either malleolus, less than 20% of the posterior tibia lip and congruent ankle mortise.

Clinically dislocated joints were reduced immediately and the reduction was maintained in a below knee posterior slab. The decision on conservative or operative treatment was taken later by the treating consultant.

In the conservative treatment group, fractures were examined and manipulated under regional or general anaesthesia. The protocol of our department is to change the posterior slab into a below knee cast and verify the accuracy of reduction immediately and before discharge from the hospital. Radiographs were taken on day 3 then during outpatient clinic visits on 2, 4, 6 weeks. Partial weight bearing was allowed after 6 weeks.

In the surgical group, internal fixation of all fractures was performed in accordance with standard AO/ASIF principles and techniques [8]. In 29% of cases, only the lateral malleolus was fixed and only the medial malleolus was fixed in 7% cases, while the remaining 64% of patients had fixation to both medial and lateral malleoli. Fibular fractures were fixed with a lag screw and a tubular plate in most cases (89%), with a locking plate used (LC-DCP) in the remaining cases. The medial malleolus was fixed in all cases with 2 partially threaded cancellous screws. All patients received three doses of peri-operative intravenous antibiotics. Our departmental policy dictated that a postoperative short-leg cast be applied for 4 to 6 weeks before ankle mobilisation could be initiated. The weight bearing status was determined by the treating surgeon based on intra-operative stability of fracture fixation as well as follow-up radiographs and clinical examination.

All patients in both groups received thromboprophylaxis (low molecular weight heparin) during their stay in the hospital until starting non-weight bearing mobilisation. All patients were followed-up at consistent intervals until satisfactory outcomes were achieved. Typically, this consisted of follow-up visits at 2, 4, 6, and 10 weeks then at 6 months.

Rehabilitation of the patients in both groups did not follow a specific protocol. The treating surgeon referred patients with stiffness, pain and functional deficit to a pragmatic physiotherapy program which was tailored to patients according to their clinical needs.

The two groups were compared for length of hospital stay, time needed for partial weight bearing, time needed before removal of cast, and complication rates.

Statistical analysis was performed using SPSS statistical software (version 7; SPSS, Chicago, Illinois). Comparison of the differences between the groups was made with Student's t test and Mann-Witney U test for parametric and non-parametric data, respectively. The level of significance was determined at  $P < 0.05$  and the significance levels provided refer to two-tailed tests.

## RESULTS

The conservative (MUA) group included twenty-six females and six males. Their average age was 72.8 years (range 60-91). The average follow-up of this group was 17.4 weeks (range 6-47).

In the ORIF group, the ratio of females to males was 69:25. The average age at the time of injury was 69.9 years (range 60-90) with average follow-up of 14.6 weeks (range 6-65). Demographic data for each group are shown in Table 1.

Using the Weber classification system, there were 75 type B and 19 type C fractures in the ORIF group. In the MUA group, types B and C fractures were found in 28 and 4 patients, respectively. Most pa-

tients had bimalleolar fractures (66%) followed by tri-malleolar fractures in 27%. Isolated lateral malleolus fractures represented 7% of all patients.

Only 13 patients (14%) in the ORIF group needed syndesmotic screws and that was expected from the pre-operative radiographs, and the type of fracture was confirmed in those patients during the surgical procedure after fixation of the fracture.

ASA grading was retrieved from the operative and anaesthetic notes. 30% of patients in the conservative group were ASA grade III and IV compared to 16% in the ORIF group. Table 2 shows the different types of co-morbidity found in each group.

In the MUA group, the median length of hospital stay was 14 days with inter-quartile range of 3.2 to 23.7 while in the ORIF group it was 5 days (3.0 to 7.9). The difference between the two groups was significant ( $P = 0.04$ ). The average time needed for partial weight bearing was 6 weeks  $\pm$  1.7(SD) in the MUA group and 4.7  $\pm$  1.3(SD) in the ORIF group. The difference was very significant ( $P = 0.001$ ). The cast was retained in the MUA group for an average of 8.1 weeks  $\pm$  2.7 (SD) and 6.4 $\pm$ 1.4 in the ORIF group ( $P = 0.026$ ).

In the conservative group, the main complications were as follows: loss of reduction (19%), stiff joint (28%), mal-union (19%), ankle pain for more than 3 months (23%), plaster ulcers in 3 patients, unstable ankle in 2 patients and valgus deformity in another 3 patients. This is reflected in Table 3. Only 8 patients (25%) returned to their normal level of activity. In the majority of cases patients had to support themselves with walking aids and suffered long-

Tab. 1. Demographic data between groups

	MUA Group (N = 32)	ORIF group (N = 94)
Gender (M/F ratio)	26:6	69:25
Average age (years)	72.8 (range 60-91)	69.9 (range 60-90)
Average follow-up (weeks)	17.4	14.6

Tab. 2. Co-morbidity in both study groups

	MUA (n=32)	ORIF (n=94)
Diabetes	9	8
Hypertension	21	44
Previous DVT or PE	0	3
Ischemic Heart Disease	0	13
Bronchial asthma	4	13
COPD	4	2
Osteoarthritis	8	15

Tab. 3. Complications in patients treated conservatively

	Number of cases (N=32)	% of patients
Loss of reduction	6	19
Ankle stiffness	9	28
Mal-union	6	19
Chronic ankle pain	7	22
Pressure ulcers	3	9
Valgus deformity of ankle	3	9

Tab. 4. Complications in patients treated surgically

	Number of cases (N=94)	% of patients
Superficial wound infection	13	14
Ankle stiffness	21	22
Chronic pain	7	8
Metalwork loosening	5	6
Failure of fixation	1	1

Tab. 5. Return to level of activity following trauma

	MUA Group (N = 32)	ORIF group (N = 94)
Gender (M/F ratio)	26:6	69:25
Average age (years)	72.8 (range 60-91)	69.9 (range 60-90)
Average follow- up (weeks)	17.4	14.6

term mobility problems. Two patients required long-term orthosis.

In the surgical group, complications were as shown in Table 4. There were 13 cases of superficial wound infection; all of them were controlled with oral antibiotics, elevation and appropriate dressings/wound care. One patient required revision of open reduction and internal fixation due to fixation failure. The lag screw and tubular plate were replaced with a locking plate (LC-DCP).

Four patients from the ORIF group were initially treated conservatively but because of obvious instability after joint reduction, the surgical option was adopted after an average time of 10 days.

In the conservative group, because of deterioration of joint reduction, MUA had to be repeated once in 3 patients, twice in one patient and three times in another patient.

During the last follow-up visit, most patients treated conservatively demonstrated reduced mobility and activity comparing to their pre-injury status. 75% of them could not walk as well as prior to fracture, and 44% of them had to use an additional walking aid (not used before fracture) to support their mobility. Patients treated surgically did better, with 62% of them returning to pre-injury levels of mobility. Eleven patients (12%) who had ORIF required long-term use of walking aids (all those patients used to walk independently prior to their injury). Please see Table 5 for further details.

This is in keeping with the findings described by Jackowiak, who reported on the outcome of ankle fractures treated conservatively and operatively, and found that more than 70% of patients who were treated with stable reconstruction of a fibular fracture had excellent or good long-term results [6]. In his study, the author discussed the prevalence of post-traumatic arthritis in conservatively treated patients. Furthermore, Gajda at al. reported excellent to good results in 13 of 16 patients treated surgically [7].

## DISCUSSION

We found that the average length of hospital stay in the ORIF group was significantly shorter than that in the MUA group. These results are contradictory to what Salai et. al. found in their study on patients over 80 years with ankle fractures [9]. This may be attributed to the fact that 5 patients from the MUA group needed further manipulation at some stage. In addition, three patients had plaster ulcers and needed repeated dressings, antibiotics and social input. There were 7 patients from this group who stayed more than 3 weeks as inpatients.

Similarly, it has been demonstrated that partial weight bearing and plaster removal are both significantly different in both groups. The ORIF group started to partially weight bear and to have the cast removed earlier than in the MUA group. In previous well-conducted studies, it was suggested that early weight bearing did not affect the clinical result in either operatively or non-operatively treated fractures of the ankle [10,11]. However, patients who needed rehabilitation therapy started at an earlier stage in the ORIF group. In a study enrolling patients over the age of 65 at one year after surgically treated ankle fractures, the majority of patients continued to have symptoms and reported functional limitations. Sixty percent or more of the patients reported pain, swelling, problems when stair-climbing and had reduced activities of daily life. Less than half of the subjects had returned to their pre-injury physical activity level [12,14]. This may be a good reason to start physiotherapy in this age group as soon as possible to regain their functional ability.

In our study, after 3 months, ankle stiffness was reported in 28% and 22% of patients in the conservative and surgical groups, respectively. Previous studies have shown that non-operative treatment may be followed by slightly faster recovery of the range of motion, but no lasting advantage has been shown [11,13].

Egol et al. in their study with one year follow-up of surgically treated ankles, identified several factors

that were significantly associated with a delay in functional recovery at one year: older age, an ASA classification of 3 or 4, the presence of diabetes mellitus, and female sex [15]. However, Koval et al. examined the Medicare database and identified low rates of complications in elderly patients two years after surgery [16].

The ASA classification is known as a general indicator of a patient's health at the time of surgical intervention [17]. In our study, 30% of patients in the conservative group were ASA grade III and IV compared to only 16% in the ORIF group.

On the other hand, studies have revealed impaired bone healing in diabetic patients, which places those patients at additional risk for mal-union and the need for subsequent surgery [18,19]. For these reasons, it has been suggested that patients with diabetes require longer immobilization and should receive longer postoperative bracing compared with patients without diabetes [20]. In our study, diabetic patients who were treated surgically did well and there was no difference in their recovery and complications comparing to rest of our group. Only one diabetic patient in the ORIF group was documented to have postoperative wound infection and swollen ankle and that settled in 5 months with repeated dressings and antibiotics.

In our study, patients with diabetes who were treated conservatively required a longer stay in a cast. Two patients had skin necrosis and plaster ulcers, and two other patients had ankle deformity.

Figure 1 shows mal-union and a deformity in an 83-year-old diabetic female after conservative treatment where closed manipulation had been repeated three times before discharge from hospital. This

highlights the fact that unstable ankle fractures could be very difficult to reduce and to maintain in reduction with closed methods. This is especially important in diabetic patients as their bones take longer to heal and the skin is vulnerable.

Kleczkowski and Szymczyk reported on outcomes of ankle fractures treated surgically, where no external immobilisation was used when the fixation was stable [21]. Their results were in favour of fixation and early mobilisation. When physiotherapy is started early, the risk of chronic stiffness is reduced.

## CONCLUSION

The results of this study suggest that the magnitude of risks in both operative and non-operative groups supports recommendations for careful patient selection and heightened precautions when planning to treat ankle fractures in the elderly. Long-term results were achieved in patients who had fractures treated by anatomical reduction and internal fixation. Post operative risks are common, but recovery, inpatient hospital stay and long term functional outcomes are in favour of internal fixation compared with conservative management.

On the basis of these results, we suggest that wound infection is the most common and serious complication after open reduction and internal fixation of fractured ankles in the elderly. However, our results showed that all infected wounds, including those in diabetic patients, were superficial and settled with antibiotics and dressing. Careful attention must be paid to surgical wounds in elderly ankle fracture patients, especially those with co-morbid diabetes, in response to the relatively high risk for post-operative complications in this patient group. On the other



Fig. 1. Mal-union and deformity in an 83-year-old diabetic female after conservative treatment

hand, loss of function and deterioration of mobility are more common complications of conservative management. The functional outcome and mobility level of patients treated conservatively was worse compared to those who had had internal fixation.

Based on our results, we may support surgical fixation of displaced ankle fractures in the elderly patient with careful patient selection and taking all precautions in the peri-operative period to minimise the magnitude of post-operative risks.

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