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Ankle Fractures Treated According to AO Principles - an Experience with 30 Cases

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SUMMARY

Thirty cases of ankle fractures were classified by Danis-Weber system and treated by open reduction and internal fixation according to the AO principles. The stabilization of the lateral malleolus was emphasized. All cases were available for functional assessment with an average follow up of two years. The results were good or excellent in 90 percent of type A fractures, 80 percent in type B and 70 percent in type C fractures. There was no death or non-union. Local complication included wound infection rate of 3 percent. This study illustrates the importance of exact anatomical reduction and stable internal fixation to allow early movement after an intra-articular fracture of the ankle.

INTRODUCTION

The ankle which bears up to five times the body weight is the most congruous joint of the lower extremity[1]. Full restoration of ankle function is the aim of treatment which is extremely difficult to achieve by closed methods of treatment and the risk of so called plaster disease caused by immobilization is always present[2]. For this reason we changed our policy for the treatment of ankle fractures and followed the AO principles. Most ankle fractures result from indirect injuries around the ankle joint. AO summarized the twisting forces as the resultant of tilting and external rotation of the talus within the ankle mortice. They stressed that the chief aim of operative treatment is to reconstruct the fibular component of the mortice exactly and rigidly.

SUBJECTS AND METHODS

From January 1988 to December 1990, 30 cases of malleolar fractures were treated in the department of Orthopaedic Surgery Sheikh Zayed Hospital Lahore according to AO principles with anatomical reduction and rigid internal fixation. Patients who sustained injury by direct forces, had open physis and pilon fractures were excluded from the study. The ankle fractures were classified according to Danis-Weber system. According to this system, fracture dislocation at the ankle are divided into three types A, B, and C depending upon the height of fibular fracture in relation to the syndesmosis and to the horizontal tibio-talar joint space.

There were 4 type A fracture, 18 type B and 8 type C fracture, with average male to female ratio of 80:20 (Tables 1 and 2).

Table 1: Type of ankle fractures.

Type	*No. of cases*	*Percent*
A	04	12
B	18	64
C	08	24
Total	**30**	**100**

Table 2: Sex and type of fracture distribution.

Type	*No. of cases*	*Male*	*Female*
A	04	03	01
B	18	15	03
C	08	06	02
Total	**30**	**24(80%)**	**6(20%)**

Most fractures were in age group between 20-40 years and operated within 24-48 hours (Tables 3 and 4). The causes of delay were marked odema, poor skin condition like fracture blisters and abrasions, non availability of treatment at the time of injury and concomitant injuries that took priority like head injury.

Table 3: Age and type of fracture distribution.

Type	*No. of cases*	*Age in years*		
		20	*20-40*	*40-60*
A	04	02	02	
B	18	02	10	06
C	08	01	04	03
Total	**30**	**05(25%)**	**16(48%)**	**9(27%)**

Table 4: Time of operation for ankle fractures.

Time of operation	*No. of cases*	*Percent*
Within 24-48 hours	20	70
Within 1 week	07	21
Within 2 week	02	06
Within 1 month	01	04

The right ankle was involved in 20 cases and left in 10 cases, and most patients injured their ankle during road traffic accident (Table 5).

Table 5: Type of injury and distribution of cases.

Type of injury	*No. of cases*	*Percent*
Road traffic accident	15	51
Fall from height	02	06
Slip on ground or steps	06	28
Sports injury.	05	15

Technique of operation

Under general anaesthesia and pneumatic tourniquet control, standard hockey stick or straight lateral and anteromedial incision were used. For third malleolus we used posterolateral approach of Gatellier and Chastang. After cleaning up the soft tissue structures, reduction and internal fixation were performed. The spiral fracture of lateral malleolus was fixed with an interfragmentary screw and a neutralization plate (1/3 tubular plate) applied on the posterior border or lateral surface of fibula. The transverse avulsion fracture of the medial malleolus in type B and C was fixed either with a malleolar screw and k-wire or with a tension band wire Fig-1a,b and Fig-2a,b. The vertical fracture in type A adduction injury was fixed with two small cancellous screws. If the deltoid ligament was torn it was held together with unabsorbable stitches. Usually in type C fracture the position of the fibula was temporarily secured to tibial notch by a transyndesmotic screw. Sometime a posterior tibial fragment (third malleolus) was avulsed by the strong posterior ligament. If this fragment was more than 25% of tibial articular surface, it might need to be fixed with lag screw passed anteroposteriorly through a stab wound over the lower end of the tibia (Fig-2a, b).

After operation a short leg cast was applied to rest the ankle until the swelling subsided. When repair of soft tissue structures was needed ankle exercises were delayed for 3-4 week. The leg was elevated for one week. Drains were removed on second or third day. Ankle exercises were started as early as pain allowed by bivalving cast. Antibiotics were given per-operatively and for 48-72 hours postoperatively. The cast was removed between fourth to tenth day and active mobilization was continued until a full range of movement was obtained. In type C fracture if transyndesmotic screw was used weight bearing was delayed till the screw was removed at 6-8 week. All fractures were united in 10-12 weeks and implants were removed after one year time.

RESULTS

Of the 30 fractures treated by operation, all patients were available for assessment for periods ranging from one to two years. All these patient started walking independently at 8-12 weeks. At the follow up clinic the fractures were graded according to criteria recommended by Meyer (1980), who used pain, loss of range of movements and radiological signs for assessment Tables 6-8.

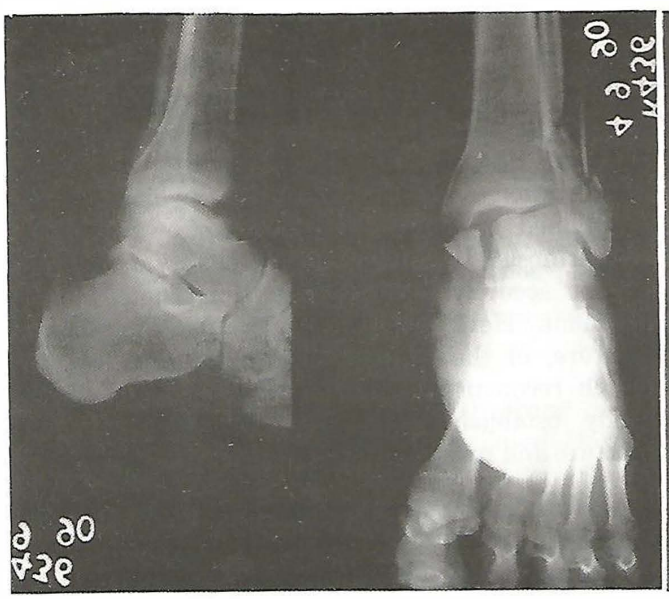

Fig. 1a: Type B ankle fracture.

Fig. 2a: Type C ankle fracture (Trimalleolar fractures).

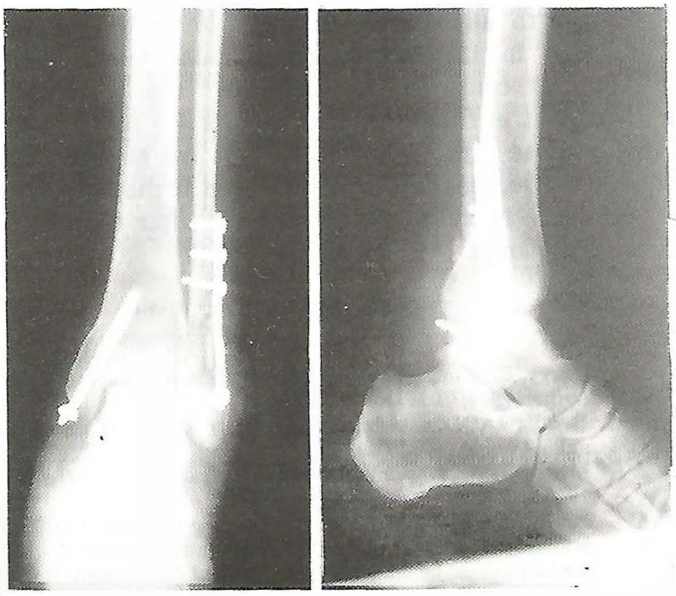

Fig. 1b: Type B ankle fracture fixed with malleolar screw and 1/3 tubular plate.

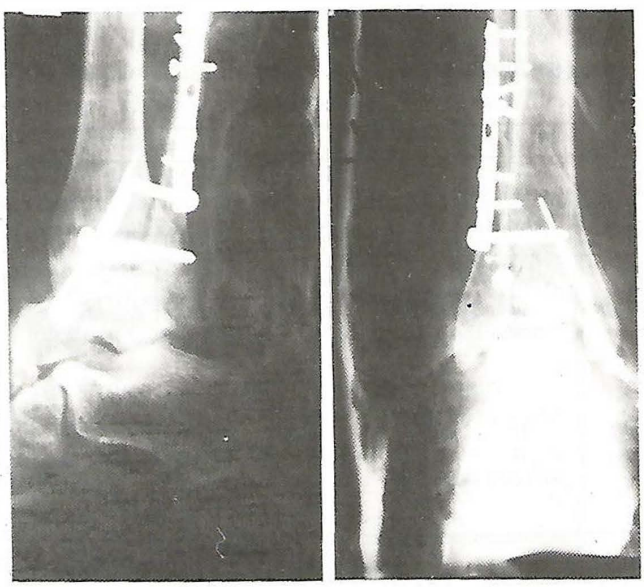

Fig. 2b: Type C ankle fracture fixed with malleolar scew, 1/3 tubular plate and transyndesmotic screw.

The objective score was given according to the loss of movement of the ankle and subtalar joints combined. The radiological grading was given according to incongruity, instability of ankle mortice and subsequent degenerative changes. In summary 80 percent of cases reviewed had good or excellent scores in all respects. The type A fracture had an especially high score, about 90 percent of the patient had a good or excellent ankle in all respects after operation.

Complication

The wound infection rate was 3 percent, these were all superficial, and responded to simple treatment. Two patients developed necrosis of skin which was superficial and did not require skin grafting. The fracture healed in all cases, thanks to the rigid fixation.

Table 6: Pain score.

Type	No. of cases	No pain	Pain on strenous exercise	Pain on exercise	Constant pain
A	4	4	0	0	0
B	18	16	1	1	0
C	8	5	1	1	1
	100%	85%	06%	06%	03%

Table 7: Loss of movement of fractured ankle.

Type	No. of cases	Normal	< 15 °	15-30 °	>30 °
A	4	3	1	0	
B	18	13	2	2	1
C	8	5	1	1	1
	30(100%)	21(75%)	04(12%)	03(9%)	02(6%)

Table 8: Radiological score.

Type	Number of cases	Normal	Calci-fication of ligament	Non-union malunion	AO changes
A	4	4	0	0	0
B	18	16	0	0	2
C	8	5	0	0	3
	30(100%)	25(85%)			5(15%)

DISCUSSION

As early as 1775 Percivall Pott Stressed the great importance of fibula as a support in the ankle region[4]. Recent studies have shown that as much as 20% of the upward force is taken by the lateral malleolus in the stance phase of walking. Both the length of the fibula and its freedom to rotate on its own axis have to be guaranteed in the treatment of malleolar fracture. Ramsey and Hamilton[5] noted that a shortened and externally rotated lateral malleolus as a result of fracture may lead to future degenerative changes[6,7].

Weber[8] stated that higher the fibular fracture, the more extensive was the damage to the tibiofibular ligaments and instability of the ankle mortice. He later developed a clear and useful classification of fracture type which clearly mentioned the pathology of tibiofibular syndesmosis[9]. It is always unsatisfactory if the fibula is not securely fixed to the tibial notch by its ligament. Here lies the importance for type C fracture, of the temporary transyndesmotic screw which reconstitutes the syndesmosis. Our present study established operative treatment of ankle fracture and result agree well with AO experience.

CONCLUSION

The best result of treatment of ankle fracture are achieved by open reduction and rigid fixation. Absolute anatomical reduction is essential to prevent post traumatic arthrosis. The fixation must be rigid enough to allow early exercise so as to prevent stiffness in the ankle and subtalar joints. This requires considerable skill in the operative treatment of fractures. Our results are comparable with those other large series but we believe that even better results can be achieved if the operative technique is more precise and the after treatment more dynamic.

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