

Role Of Transfibular Ankle Arthrodesis With Rigid Internal Fixation In Management Of Posttraumatic Ankle Arthritis

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ABSTRACT: Background: Ankle arthrodesis is major surgery need good experience. Decision of ankle fusion should be taken after exhaustion of the all other treatments methods. We aimed to evaluate the function and radiological outcome of patients with ankle arthrodesis who are operated upon in Zagazig university hospitals for post-traumatic ankle arthritis.

Patients and methods: 18 patients ranging from 26 to 60 years suffering from post-traumatic ankle arthritis were included and underwent Trans fibular Ankle Arthrodesis with Rigid Internal Fixation. Patients followed up post-operatively in outpatient clinic according to their planned visits for assessment of functional and radiological outcomes. Assessment of functional outcomes and pain was done through American Orthopedic Foot and Ankle Society (AOFAS) scale.

Results: The mean Preoperative AOFAS score was 46.89 (± 3.69 SD) with range (40-52) while the mean Postoperative AOFAS was 74.44 (± 10.20 SD) with range (56-90). There were 5 (27.8%) with moderate pain and 13 (72.2%) with severe pain while post-operatively there were 5 (27.8%) with no pain, 10 (55.6%) with mild pain, 1 (5.6%) with moderate pain and 2 (11.1%) with severe pain. There were 15 (83.3%) with average healing time (12 weeks) and 3 (16.7%) were delayed (12-24 weeks). According to complications, there was 1 (5.6%) case with Wound sepsis, 1 (5.6%) with Post-operative deformity and 2 (11.1%) were Non-union.

Conclusion: Ankle arthrodesis is gold standard operation for late stage painful ankle arthritis in well planned and selected patients. Trans fibular ankle arthrodesis achieves a high rate of union and good functional outcome on follow up.

Keywords: Transfibular Ankle Arthrodesis with Rigid Internal Fixation; Posttraumatic Ankle Arthritis; screw fixation; fibular graft; Foot and Ankle Society scale

1. INTRODUCTION:

For the treatment of patients with end-stage ankle osteoarthritis, ankle arthrodesis has been considered as a standard treatment for a long time. Although total ankle arthroplasty has emerged as a promising option for patients with ankle osteoarthritis, ankle arthrodesis is still a viable option because it has merits of better pain relief and a lower revision rate in spite of sacrificing the tibiotalar joint motion (1,2) conservative treatment is the firstline of treatment for painful degenerated ankle.

For end-stage ankle arthritis which does not improve with conservative treatment, there are multiple surgical interventions for its treatment. Ankle arthrodesis is the most prevalent choice (3) Painless mobilization is the formal goal of ankle arthrodesis. Ankle arthrodesis eliminates pain and deformity of the degenerated joint (4).

While fusion of the joint may reduce pain and symptoms of the right patient, there are some contraindications. Patients unable to be fit for surgery because of medical problems, such as poor nutritional status or uncontrolled diabetes, should not be taken to surgery. The peripheral vascular status must be evaluated and the patient should know the harmful effects of smoking on healing progress. Bone infection is also a contraindication to ankle fusion with internal fixation, and other fixation methods as external fixation may be allowed (5)

Multiple different forms of ankle arthrodesis have been documented in the literature, including open and arthroscopic ankle arthrodesis. Also, there are several approaches for ankle arthrodesis, but the most widely used approaches are the anterior approach and the lateral transfibular approach.

Rate of fusion was found to be similar in each approach (6, 7).

In this study, we was assess the clinical and radiological results of the lateral transfibular approach under the hypothesis that the fusion rate of the transfibular approach would be high because of the additional stability with autogenous bone grafting or onlay graft using the distal fibula. The aim of this study is to evaluate the outcome in patients suffering posttraumatic ankle arthritis by using the transfibular ankle arthrodesis with internal rigid fixation.

2. PATIENTS AND METHOD:

A prospective study carried out on 18 patients with post-traumatic ankle arthritis and were operated at Zagazig University Hospital, by transfibular ankle arthrodesis with rigid internal fixation with history of ankle joint trauma. Patient with infection, vascular disease or diabetes mellitus were excluded from this study. An oral consent was gained from all participating patients to publish their data.

Post-operatively patients were put in non-weight bearing below knee cast at least 12 weeks up to 24 weeks. Patients used walking aids for 12 to 24 weeks period.

Follow up of healing and other bony abnormalities was done by scheduled ankle and foot plain X-rays (standing AP and lateral views). Plain x-rays of ankle were done weekly in outpatient clinic till fusion occurs, Then monthly x-rays were done till sixth month. In case of delayed or non-union, monthly x-rays were done till ninth month postoperatively.

Patients followed up post-operatively in outpatient clinic according to their planned visits for assessment of functional and radiological outcomes. Assessment of functional outcomes and pain was done through American Orthopedic Foot and Ankle Society (AOFAS) scale. The preoperative coronal deformities (Varus or valgus alignment) were measured from the standing anteroposterior views determining the longitudinal axis of the tibia and the axis of the talus, defined by a line drawn through the talar shoulders. Normally, the tibial axis is perpendicular to the axis of the talus and any deviation from this neutral position is considered to be a coronal malalignment (varus or valgus) (8).

Preoperative lateral weight bearing radiographs were used to assess alignment in the sagittal plane. The "sagittal alignment angle" is the angle between the longitudinal axis of the tibia and the axis of the talus, defined by a line drawn from the inferior aspect of the posterior tubercle of the talus to the most inferior aspect of the talar neck. The normal mean angle is considered to be 106 degrees, with the ankle in neutral position (8).

The anteroposterior tibiotalar alignment was quantified by measuring the tibial-axis-to-talus ratio. Tibiotalar ratio (TT ratio): A talar reference line is drawn parallel to the floor from the

posterior talar point to the anterior talar. The distal tibial axis divides the talar reference line into anterior and posterior segments. The TT ratio is the ratio of the length of the posterior segment of the talus to the longitudinal talar length, expressed as a percentage. The normal TT ratio is considered to be $34.8\% \pm 3.8\%$ in ankles without osteoarthritis ankles and $37.1\% \pm 11.6\%$ in ankles with osteoarthritis (9).

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent.

3. RESULTS:

The eldest patient was 60 years old in this study and the youngest was 26 years old (Mean \pm SD 40.56 ± 11.33), 8 patient were males (44.4%) and 10 were females (55.6%), 6 right side ankle and 12 left sidewith BMI mean \pm SD (30.0 ± 6.44).Six patients (33.3%) had ankle injury as a result of road traffic accident, and twelve patients (66.7%) were patients with history of ankle injuries due to fall from height.

The mean Preoperative AOFAS score was 46.89 (± 3.69 SD) with range (40-52) while the mean Postoperative AOFAS was 74.44 (± 10.20 SD) with range (56-90).five of our patients achieved excellent results, four patients achieved very good results, seven patients achieved good results and two patients got poor results.

There were 5 (27.8%) with moderate pain and 13 (72.2%) with severe pain while post-operatively there were 5 (27.8%) with no pain, 10 (55.6%) with mild pain, 1 (5.6%) with moderate pain and 2 (11.1%) with severe pain. There was high statistically significant difference between the studied cases preoperatively and post-operatively as regard Pain.(Fig.1)

The average preoperative deviation from the neutral tibiotalar alignment in the frontal plane (Varus or valgus) was 12 ± 9.2 (range 0 to 40) degrees. Postoperative alignment in the frontal plane was brought to accepted measures with mean degrees $0.8(\text{valgus}) \pm 1.5$ (range Varus 3 to valgus 5).

The "sagittal alignment angle" measured from the lateral radiographs ranged from 94 to 117 degrees (mean 104.3 ± 4.9) degrees preoperatively. Postoperative radiographs of the ankle in the sagittal plane was satisfactory with a mean sagittal alignment angle 105.7 ± 5.3 (range 95 to 114) degrees (Table 1). There were 15 (83.3%) with average healing time (12 weeks) and 3 (16.7%) were delayed (12-24 weeks). According to complications, there was 1 (5.6%) case with Wound sepsis, 1 (5.6%) with Post-operative deformity and 2 (11.1%) were Non-union. (Fig. 2)

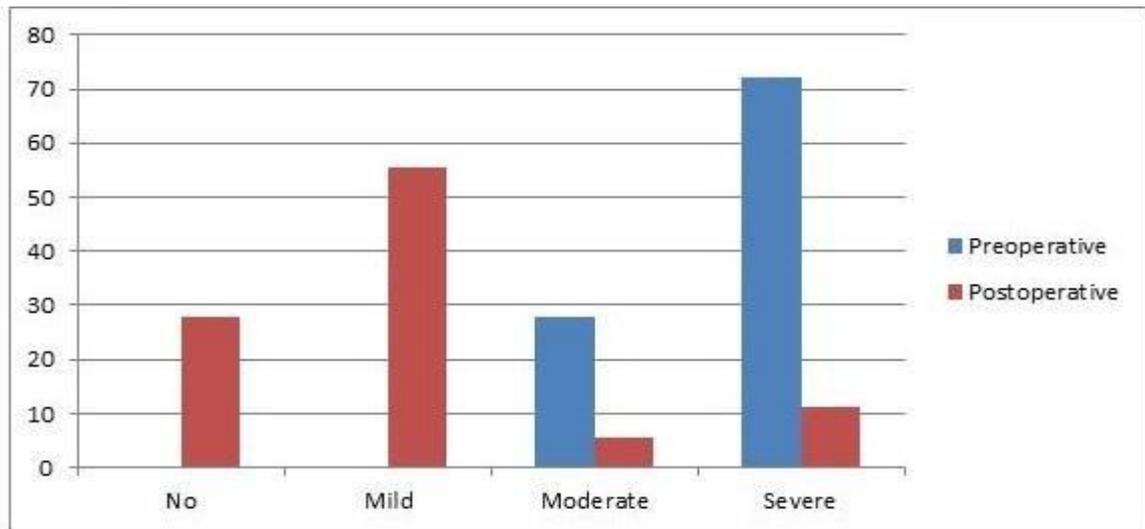


Fig (1): Comparison between preoperative and postoperative pain Table (1): Comparison between preoperative and postoperative deformity.

A- Tibiotalar alignment in the frontal plane				
Preoperative deviation from neutral (varus or valgus)		Postoperative alignment	Wilcoxon	p
Mean degrees	12 ± 9.2	0.8(valgus) ± 1.5	37.617	<0.001*
Range degrees	0 - 40	Varus3 – valgus5		
B- Sagittal alignment angle				
	Preoperative	Postoperative	t	p
Mean degrees	104.3 ± 4.9	105.7 ± 5.3	0.823	0.416
Range degrees	94 - 117	95 - 114		
C- Tibio-talar ratio				
Mean percentage	29.1 ± 2.7	35.2 ± 2.8	6.653	<0.001*
Range percentage	19 - 38	22 - 39		

t: Paired-t test Wilcoxon: Wilcoxon test

P: p value for comparing between the studied groups

*: Statistically significant at $p \leq 0.05$

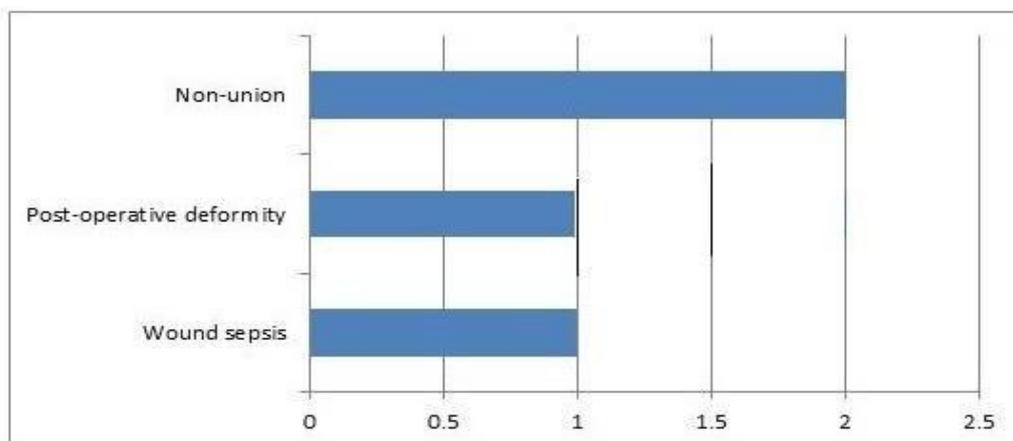


Fig (2): Distribution of the studied cases according to post-operative different parameters.

4. DISCUSSION:

Ankle arthrodesis is the chief surgical option for treatment of ankle arthritis. In spite of good results of ankle arthrodesis surgeries there is an ongoing discussion in the orthopedic community whether ankle arthrodesis should be the treatment of choice for end stage of ankle osteoarthritis in all patients. **(10, 11).**

Post-traumatic ankle arthritis is great problem all over the world affecting the national economics and society. it is disabling disease with great health burden to the patients and their families. The vast majority of affected patients are productive age group. Ankle arthritis with pain is chronic disease, which forced patients to cease some of their life's daily activities, sports and hobbies. Ankle arthrodesis is a difficult decision for both physicians and patients, therefore patients seeking medial advices and taking medications for long period of time before ankle fusion to avoid surgery, this may increase chances of complications and co-morbidities latter on in post-operative period **(12; 13)**

As pain is a good indicator for functional assessment in ankle arthrodesis, it is associated with painful restriction of movements at the joints and affecting patient's normal mobilization. Pain considered as major issue in this study, and categorized it in 3 groups; mild, moderate or severe. Pain was highly reduced with statistical significant difference (p value <0.001).

In this study eleven patients (61.1%) with severe pain pre-operatively became pain free or complained mild pain after 3 months duration, and only two patients (11.1%) complained the same severe pain even after 6 months of follow up. In five patients (27.8%) with moderate pain symptoms four patients (22.2%) became pain free within 3 months period, or complained mild pain. With only one patient (5.6%) complained moderate pain for more than 6 months post-operatively. These results gave good indicator for function evaluation of studied patients in this research. Pain in the majority of patients is improved gradually, been more in initial post-operative months and keep decreasing over following months.

Postoperative radiographs in the frontal plane revealed accepted alignment without marked coronal deformities (varus or valgus). In the sagittal plane, radiographic position was satisfactory with a mean sagittal angle 105.7

± 5.3 (range 95 to 114) degrees which is close to the normal angle of 106 degrees. Also, the anteroposteriortibiotalar alignment was quantified by measuring the tibio-talar ratio from the lateral preoperative and postoperative radiographs. Three patients had anterior subluxation of the talus under the tibia preoperatively with a T:T ratio less than 25.5%, one of them still complained anterior subluxation of the talus with a T:T ratio 22% and the other two patients got a normal T:T ratio (29 and 35) %. In 15 ankles, not associated with sagittal tibiotalar malalignment, the mean T: T ratio was altered from 29.1 ± 2.7 to 35.2

± 2.8 , indicating posterior translation of the talus under the tibia. This is desirable as it creates a plantigrade foot aligned with the mechanical axis of the limb. These results revealed that transfibular ankle arthrodesis allows for deformity correction which has a significant correlation with the functional results. In evaluation of patients' activities according to AOFAS score. The mean preoperative AOFAS score was 46.89 (± 3.69 SD) with range (40-52) while the mean Postoperative AOFAS was 74.44 (± 10.20 SD) with range (56-90). AOFAS score was improved with statistical significant difference (p value <0.001) Boer et al obtained a mean of 70 points in this regard **(14).**

Hamett et al. (15) obtained an average of 63 points. Chou et al. found a mean of 66 points. In this study, the mean score by AOFAS' criteria was 73.5 points.

Only two patients (11.1%) remained with severe pain post-operatively achieved low AOFAS score.

In this study, there were two patients (11.1%) developed non-union, one patient (5.6%) of them was associated with deep infection. Implant was removed and the patient was planned for revision surgery after infection eradication and the other patient was given chance for OPD clinic follow up for assessment of healing progress before final decision regarding revision.

In this study there was one patient (5.6%) developed bony deformity with anterior displacement of the talus under the tibia. In the series of **Boer et al.**

(16) there was only one patient of deformity complication. Same patient in Boer et al series had sensory loss on the dorsum of the foot and radiolucency at the nail entry point. **Niinimäki et al.** (17) reported 15% of complications in 34 patients, four post-operative infections (two patients in need of implant removal) and one case of venous thromboembolism. **Smith et al.** (18) reported 20% of nonunion complications and related this occurrence to smoking.

In this research only one patient (5.6%) developed deep infection which necessitate implant removal. Patient was planned for ankle arthrodesis revision surgery after infection eradication. Patient satisfaction with the results of procedures was also one criterion assessed in this study; when compared with data in the literature, 83.3% among the patients in this study were satisfied with results. **Chou et al.** (19) found 87% satisfaction with the post-operative result. In their series, **Hammett et al.** (15) reported 82% satisfaction. **Boer et al.** (16) reported 92% satisfaction of their patients. **Niinimäki et al.** (17) obtained 90% satisfaction.

Walking surface having major effect on gait, patients found difficulty to walk properly on uneven surface. Muscle wasting are noticed in all patients due to cast and disused limbs for long duration as most patients are put on cast for long period of time ranging from 12 to more than 24 weeks. All patients used walking aids during post-operative period for 12 to 30 weeks.

The use of transfibular ankle arthrodesis allows good visualization of the degenerated cartilage, correction of ankle deformity, supplies additional and local bone graft and allows stable fixation in two planes.

The disadvantages of this procedure are the extensive dissection and difficult conversion of the fused ankle to total ankle replacement.

The limitations of this study are the relatively small sample size and short duration of follow up.

Conflict of Interest: No conflict of interest.

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