

## **Ankle Arthrodesis Using a Vertical Steinman's Pin in a Severely Osteopenic Bone.**

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**Background:** Ankle arthrodesis is generally considered the gold standard for the treatment of a painful arthritic ankle not responding to conservative treatment. The goal is to eliminate pain and achieve a stable plantigrade foot. There are over 30 different methods of ankle fusion to date. We utilized a technique of placing one smooth Steinman's pin across the ankle joint after excising the articular cartilage and aligning the joint in patients with severely osteoporotic bone where screws did not have good purchase.

**Methods:** A retrospective study was undertaken of patients done ankle fusion between 2007 and 2010 at PCEA Kikuyu Hospital. Biodata, indications for surgery, complications, and functional as well as radiological outcome were analyzed.

**Results:** Thirty three patients were evaluated, 17 males and 16 females. The age of the patients ranged from 11 to 80 years (mean 50). Ankle arthrodesis was done for ankle arthritis in most cases. Follow up period ranged from 2 to 5 years (mean 3 years and 2 months). At 12 weeks postoperatively 31(94%) joints were fused clinically and radiologically. The two (6%) cases of non-union required revision surgery with bone grafting and screw fixation. However one of these patients declined further surgery. There was one case of pin site infection and one case of cellulitis. According to the Mazur ankle score at final follow-up, 22 patients (67%) had excellent results, 8 (24%) good, 2 (6%) fair and 1(3%) poor results.

**Conclusion:** Ankle arthrodesis using a vertical Steinman's pin is a reliable technique in low resource settings and in patients with severely osteoporotic bone.

**Key Words:** Ankle, arthrodesis, osteopenia, Steinman's pin.

### **Introduction**

Ankle arthrodesis has been successfully used for end stage arthritis of the ankle, for well over a century and is generally considered the gold standard for the treatment of a painful arthritic ankle not responding to conservative treatment<sup>1,2</sup>. The goal is to eliminate pain and achieve a stable plantigrade foot. There are over 30 different methods of ankle fusion to date and new methods continue to emerge<sup>2,3,4,5</sup>. The transcalcaneal route for ankle stabilization is not new. Sokolowski in 1958 and Childress in 1965 used a single Steinman's pin for primary stabilization of severe fracture-dislocations of the ankle joint. They both reported good ankle and subtalar motion on completion of the treatment. In 1991, Carrier and Harris reported a series of 5 patients with rheumatoid arthritis who had their ankle joints fused by inserting two Steinman pins through the calcaneum with good results<sup>6,7</sup>.

In resource poor settings, many patients present late with osteoporotic and arthritic ankles which are a challenge to manage. The use of easily available implants becomes a solution to enable this group of patients have surgery and return to their source of livelihood. However little work has been published in managing patients with osteoporotic ankle bones with arthritis in limited resource settings where there is lack of screws, plates, imaging control in theatre<sup>8, 9</sup>. Thus the technique of using a vertical transcalcaneal Steinman's pin to achieve ankle arthrodesis is suggested.

### **Patients and Methods**

A retrospective study was undertaken of patients done ankle fusion using a vertical Steinman's pin between 2007 and 2010 at PCEA Kikuyu Hospital located 20 km from Nairobi the capital city. Biodata, indications for surgery, complications, and functional as well as radiological outcomes were

analyzed. We collected 39 patients files however 6 were excluded because of inadequate available data in their files in 3 cases, 2 patients could not be contacted for final follow-up and 1 had died 2 years post surgery due to an unrelated condition. A total of 33 patients were evaluated. 17 were males and 16 females. Mean age was 50 years with a range of 11-80years. The diagnosis included 30 cases of post traumatic arthritis, 2 cases of rheumatoid arthritis and 1 case of primary osteoarthritis.

All the 33 patients had undergone open ankle fusion through an anterior approach in supine position under tourniquet control and spinal anaesthesia. Most procedures were performed by one surgeon. A single dose of antibiotics was given at the time of induction in theatre and continued for 3 days in the ward. The ankle joint was exposed and the articular cartilage excised from the tibia and talus using an osteotome or oscillating saw. In cases where the lateral malleolus prevented good reduction, it was excised. The prepared surfaces were reduced to achieve a plantigrade foot with neutral valgus-varus and neutral plantar -dorsiflexion. A 5mm Steinman pin was drilled through the calcaneum into the arthrodesis site. Foot alignment, reduction and pin position were confirmed clinically. The wound was irrigated with saline and closed in 2 layers. A well molded short leg cast was applied and the foot elevated on 2 pillows in the ward. The patient was made ambulated after 48 hours non weight bearing on operated side. Most patients were discharged on the 3rd post operative day. At 6 weeks post surgery, all the patients were evaluated radiologically and the Steinman pin removed leaving the cast intact. The patients then started partial weight bearing for 6 weeks. The cast was removed after a total 12 weeks and another radiograph taken. The patients were allowed full weight bearing thereafter.

All patients were routinely assessed at 6 weeks and 12 weeks in the outpatient clinic where clinical and radiological results as well as complications were recorded in their files. For the purpose of this study, patients were contacted and interviewed on phone. The Mazur ankle score was used during the phone interview due its easy applicability. The Mazur ankle score gives 50 points for pain, 40 points for function, and 10 points for ankle range of motion. Because patients of ankle arthrodesis, lack ankle motion the maximum score they could achieve was 90 points. Therefore a score of 80–90 was considered an excellent result, 70–79 a good result, 60–69 a fair result, and below 60 points a poor result. Data analysis was done using SPSS version 17.0. The Hospital Ethics and Research Committee approved the study.

## Results

At 12 weeks clinic follow, clinical as well as radiological union was achieved in 31 of the 33 patients (94%). There were no major deformities noted on radiographs. The Mazur ankle score done at final follow-up ranging from 2 to 5 years (mean of 3 years and 2 months) revealed 22 patients (67%) had excellent results, 8 (24%) good, 2 (6%) fair and 1 (3%) poor results.

The complications encountered included 2 cases (6%) of non-union. One patient refused any further surgery despite experiencing pain on walking short distances of about 100 metres. He contributed to the single case of poor results of the Mazur score. The other patient who had non-union underwent a repeat ankle fusion utilizing a plate and screws with cancellous iliac crest bone graft and had a successful union at 10 months after his first surgery. It is interesting to note of all the 33 patients, 2 were smokers but none of the smokers got non-union or any complications. Smoking is a well known cause of non-union in ankle arthrodesis.

One case of pin site infection was noted in a patient who returned at 12 weeks instead of 6 weeks for removal of the Steinman pin. He was treated with daily cleaning of the wound and oral antibiotics. His infection settled after 2 weeks. There was 1 case of cellulitis which was treated with oral antibiotics and resolved promptly. No cases of deep venous thrombosis were identified in our cohort.



Figure 4A



Figure 5B

**Figure 1.** A and B. Post operative Lateral and AP views of the fused ankle with Steinman's pin in situ.

### Discussion

Arthrodesis of the ankle joint using a vertical Steinman pin is a simple procedure that must be undertaken with care in order to achieve the best possible outcome. With evolved techniques and methods of fixation, ankle fusion has become a successful surgery with high fusion and patient satisfaction rates. It remains the gold standard for operative management of severe ankle arthritis with many techniques described<sup>9,10</sup>.

In our study we utilize the transcalcaneal route and passed a vertical Steinman's pin specifically in patients with osteoporosis in an attempt to overcome the challenges of osteoporotic bones and also lack of expensive equipment like x-ray machine as well as plates and screws<sup>7</sup>. In our series, we achieved a fusion rate of 94%, which is similar to a paper by Carrier and Harris who utilized 2 Steinman pins in their series of rheumatoid patients with osteopenic bones and achieved 100% fusion rate<sup>7</sup>. Our study also compares well with studies where bone was not osteoporotic where fusion rates ranged from 87-100%. Most of these studies utilized a variety of implants such as screws, plates and external fixators<sup>11,12,13,14,15</sup>. The Mazur ankle score was excellent to good in 91% of our cases which is similar to studies using imaging and better implants<sup>8,9,10,14,16</sup>. With our technique, only minor complications occurred in 2 (6%) patients and they all had an uneventful recovery. Other studies show complication rates ranging from 0-7% especially with regards to deep infection or wound healing problems. The type and magnitude of complications we encountered were few and in keeping with other studies<sup>17,18,19,20</sup>. Our study limitations included the fact that this was a retrospective study so that we could not get preoperative foot score or severity of deformity. The follow up period was also relatively short. We recommend the need for a case control study to further evaluate this technique.

### Conclusion

Ankle fusion using a vertical Steinman's pin is a reliable technique in patients with severely osteopenic bone and highly applicable in resource poor settings.

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