Plantar Displacement in The Scarf Osteotomy: Correction Of Associated Midfoot Collapse Through The Windlass Mechanism: A Radiographic Study

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Introduction
Hallux valgus can be associated with midfoot collapse such as a planovalgus deformity or hypermobility of the 1st ray. The scarf osteotomy is a versatile and reproducible procedure for the correction of moderate to severe hallux valgus deformity. The longitudinal cut of the scarf osteotomy is performed parallel to the oblique plantar surface. Lateral displacement of the osteotomy also produces lowering in the sagittal plane. We hypothesised that this lowering of the metatarsal head would result in an increased windlass effect causing arch elevation and hence may result in an improvement in any associated flexible midfoot collapse.

Methods
This study compared anteroposterior (AP) and lateral weightbearing pedal radiographs. All patients had a scarf osteotomy performed for treatment of hallux valgus. The scarf technique, as described by Barouk, was used with lowering of the first metatarsal head. The Maestro cut (shortening modification) was not performed. Pre and postoperative radiographs were analysed for hallux valgus angle, intermetatarsal angle and midfoot alignment in those feet with associated midfoot collapse.

Results
Seventy-four preoperative weightbearing radiographs from 55 consecutive patients were reviewed. Forty-six females and nine males, 35 right and 39 left feet were analysed. Thirty-seven of those feet had evidence of midfoot collapse, defined as a Meary’s angle (talo-first metatarsal angle) of greater than four degrees on the lateral radiograph. The level of the midfoot break was 1st tarsometatarsal joint in two feet, naviculocuneiform joint in 29 feet, talonavicular joint in 1 foot and combined in 5 feet. There was no radiological evidence of degenerative change of the midfoot. The hallux valgus correction (improvement in HVA and IMA) was significant (P< 0.05). The lateral talo-first metatarsal angle improved from 6.9 to 4.3 degrees (P>0.05). The AP talo-first metatarsal angle remained unchanged, 7.2 degrees (P>0.05). The talonavicular coverage angle improved from 10.6 to 4 degrees (P<0.05). The AP talo–second metatarsal angle improved from 13.3 to 9.1 degrees (P<0.05). There was no direct correlation found between the amount of hallux valgus correction achieved and the amount of midfoot deformity correction seen.
Conclusion
The findings suggest that the scarf osteotomy can result in an improvement in lateral talo-first metatarsal angle, talonavicular coverage angle and AP talo-second metatarsal angle. The change in lateral talo-first metatarsal angle was not statistically significant. This may be due to the relatively small angles measured and the error associated with this or the small sample size. The AP talo-first metatarsal angle remained unchanged however its use as a measure of planovalgus is limited in the presence of a hallux valgus deformity and the change in AP talo-second metatarsal angle may be more meaningful. Following this study we would suggest that an accurately performed scarf osteotomy may improve midfoot alignment through the windlass mechanism and on occasion avoid the need for associated midfoot procedures or orthotic use. The study is limited by the sample size and accuracy of the electronic picture archive angular measurements. The midfoot deformities were presumed to be flexible from their radiographic appearance. A cadaveric study could provide further evidence.