

## Hallux valgus correction using Scarf-Osteotomy leads to shortening of the first metatarsal

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**Introduction/Purpose:** In hallux valgus deformity less weight can be borne by the first ray which may lead to transfer metatarsalgia and lesser toe deformities. Depending on the exact configuration of the bone cuts during the scarf procedure, an iatrogenic shortening of the first metatarsal may occur which may diminish weightbearing ability of the first ray as well, causing transfer metatarsalgia. The aim of the present study was therefore to determine preoperative and postoperative changes in length of the first metatarsal by using different methods of measuring metatarsal length.

**Methods:** A consecutive series of 118 feet in 106 patients (89% female, 11% male) was enrolled, who underwent correctional osteotomy (Scarf- with/without Akin-Osteotomy) from May 2015 to July 2017 at a single institution. Patients, who underwent additional shortening osteotomy of the metatarsals, were excluded. Average age at the time of surgery was 51 years (range, 14 to 83 years). Pre- and postoperative angle measurement of hallux valgus- and intermetatarsal angle was assessed at between six weeks and three months postoperatively on standardized weight-bearing radiographs in dorsoplantar plane. We also identified early complications in hallux valgus surgery. An assessment and comparison of different methods of measuring metatarsal length (length of first metatarsal, ratio first to second metatarsal, Coughlin method) postoperatively was performed to identify the amount of shortening with this technique.

**Results:** Hallux valgus angle was statistically significant reduced by an average of 18.6° (28.3° preoperatively to 9.7° postoperatively,  $p < 0.001$ ), intermetatarsal angle by 7.7° (12.8° to 5.1°,  $p < 0.001$ ). Measuring the length of the first metatarsal, in all three methods a statistically significant reduction of the first metatarsal length could be detected. Mean absolute shortening of 1.8 mm was measured ( $p < 0.001$ ). The ratio of the first metatarsal to the second metatarsal averaged -0.03 ( $p = 0.02$ ). The mean relative lengthening of the second metatarsal, using the method described by Coughlin, was 0.42 mm (from 4.51 to 4.89 mm,  $p < 0.001$ ) on average. Of those three methods, the Coughlin method showed the highest correlation. 6 minor complications were observed (5%).

**Conclusion:** In the current study we could demonstrate a significant reduction of hallux valgus angle and intermetatarsal angle with hallux valgus correction using Scarf-/Akin-Osteotomy, with a low complication rate. However, statistically significant shortening of the first metatarsal could be detected as well. Further research is required to improve and establish a hallux valgus correction technique without shortening of the first metatarsal.