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Supramalleolar Osteotomies: Biomechanical Background and Clinical Results
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Background: Several studies have shown that supramalleolar osteotomies are a valuable treatment option for early to midstage asymmetric osteoarthritis of the ankle joint. Earlier reports showed that surgical realignment can reduce signs of OA and may postpone fusion or replacement surgery. Still, no biomechanical data on the effect of supramalleolar osteotomies has been published and clinical data on the outcome of this procedure is sparse. We report on an ex vivo study on the effect of supramalleolar osteotomies on the ankle joint and present the outcome of 142 patients who underwent surgical realignment of the ankle.

Materials and Methods: In 18 cadaver specimens the center of force and peak pressure in the ankle joint was measured with Tekscan© 5033 pressure sensors after a supramalleolar varus or valgus deformity had been created. Two groups were assessed: (A) isolated supramalleolar tibial deformity; (B) additional fibular osteotomy. Clinically, 142 patients were evaluated prospectively and underwent clinical and radiological examination 41 months (12 to 159 months) after a supramalleolar osteotomy.

Results: For isolated supramalleolar deformities our ex vivo model showed a significant paradox shift in the first group towards posterolateral for varus deformities and an anteromedial transfer for valgus deformities (p<0.05). In the group with the osteotomized fibula a significant transfer towards anteromedial for varus deformities and towards posterolateral for valgus deformities was observed (p<0.05). Clinically, reduction in radiographic signs of osteoarthritis was mainly found in patients with stage 2 and stage 3 osteoarthritis. Thirty-eight percent of the patients improved from preoperative stage 2 to stage 1 and 43% of the patients improved from preoperative stage 3 to stage 2. The AOFAS hindfoot score and the visual analogue scale for pain improved significantly (p < 0.05). Radiological presentation of the neighbouring joints was found to improve significantly in a majority of cases (p<0.05). Eight ankles (6%) were converted to a total ankle replacement with similar short term outcomes as in primary arthroplasty.

Discussion: Biomechanically two essentially different groups of varus and valgus deformities of the ankle joint need to be distinguished. The first group is an isolated frontal plane deformity and the second group is a frontal plane deformity with an associated impaired containment of the ankle mortise.

The outcome of the patients treated with a supramalleolar osteotomy supports the strategy of performing realignment surgery in early to mid-stage OA. However, analysis of our own clinical data revealed that preoperative planning and determination of the underlying cause of asymmetric OA in the ankle joint is very demanding and therefore prediction of the result of corrective measures may be difficult.