

**ANATOMICAL STUDY OF THE INVERSION MOVEMENT  
OF THE HUMAN FOOT IN POSITIONS PRIOR TO THE SWING  
PHASE OF THE STEPCYCLE**

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**Background:** In this anatomical study, the mobility of the foot with respect to the first ray was studied, especially during the inversion movement of the gait cycle (push-off phase). During walking, at the end of the stance phase, before the foot loses contact with the substrate (swing phase), the foot makes a small inversion movement while the lower leg shows external rotation. Insight in this particular movement is necessary, to better understand pathologies concerning this inversion movement such as inversion traumatism.

**Methods:** Performing a study on ten anatomical specimens of human lower legs, we carried out measurements on tracings, made of X-ray pictures of the specimens. X-rays were taken with lower legs in three subsequent positions: normal stance phase, push-off (inversion) and extreme inversion (Figure 1). In each foot, reference marks (metal screws, ‘intracortical pins’) were inserted in the first metatarsal bone at standardized positions. The metal screws are visible on the X-rays (Figure 1). Based on length changes of the projections of these screws on the X-rays, rotation angles of the first ray during push-off were calculated.

**Results:** Measurements show that in anatomical specimens at the position of push-off, the average rotation of the first metatarsal around its longitudinal axis,

measured distally, amounts  $9^\circ$ .

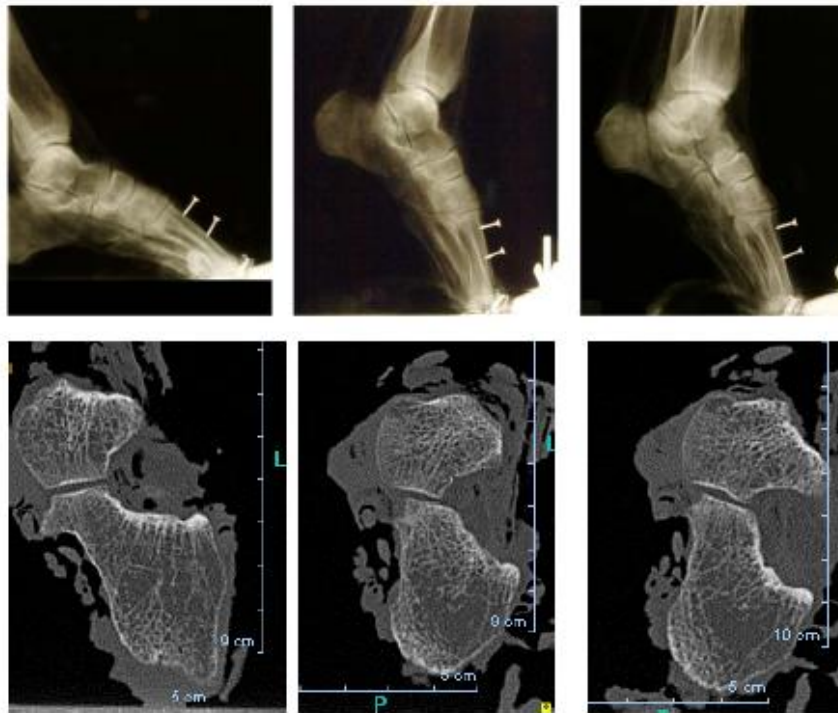


Figure 1. X-rays (upper row), and MRI-slices (lower row) of a foot specimen in the three subsequent positions described in the text.

**Conclusion:** On the basis of the present investigation it can be concluded that the first ray of the foot, measured distally at the level of the first metatarsal bone in anatomical specimens, performs a small rotation movement around its longitudinal axis during the push-off phase of the gait cycle. Further research will be needed.