

Functional anatomy and imaging of the foot*

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SUMMARY

The foot is constituted from a series of small bones making a segmented structure with multiple joints, likened to a dome, in contact with the ground in three points: posteriorly the calcaneal tuberosity; anteriorly and medially the head of 1st metatarsum, and anteriorly and laterally the head of 5th metatarsum. In fact, each foot presents a semi-arch whose base is represented by the lateral border and the summit by the medial border of the foot. The foot has been likened to a half-dome, so that when the medial borders of the two feet are placed together, a complete dome is formed. In the foot are present two longitudinal arches: the medial consists of the calcaneus, the talus, the navicular, the three cuneiform bones and the first three metatarsal bones. It is more arcuated and elastic than the lateral, that consists of the calcaneus, the cuboid and the 4th and 5th metatarsus. This is flattened and in contact with the ground. We can identify two transverse arches between longitudinal arches, extending from the medial to the lateral borders of the foot: the first is a lancet dome, between midfoot and forefoot, at the tarsometatarsal joint level; it consists of the bases of the metatarsal bones and the cuboid and the three cuneiform bones; the second is a flat dome, in correspondence of forefoot, at the metatarsophalangeal joint level; it consists of the bases of the proximal phalanges of the fingers and the head of five metatarsal bones. Longitudinal and transversal arches are supported from: the shape of stones of the structure (foot bones); the long and short plantar ligaments, larger and stronger than the dorsal ligaments, tie together the lower edges of the bones; a beam (the plantar aponeurosis and the plantar muscles and tendons) connecting the ends of the bridge effectively prevents separation of the pillars and consequent sagging of the arch; the maintenance of the arch depends on multiple support (ligaments, tendons of extrinsic muscles of the foot) suspending the arch from a cable above the level of the bridge.

In this manner, we obtain a "functional unit" with two important aims: to support the body weight (static foot), and to serve as a lever to propel the bodies forward in walking and running (dynamic foot).

Imaging techniques are able to provide further data on functional anatomy of the foot; in particular, these techniques show the bones structures, ligaments, muscles and tendons, taking part to the arch setting. Routine x-ray examinations precise information about the bone-shape and their relationship. The short and long ligaments, the tendons and the suspending the arch from above are instead successfully valuable using ultrasonography, CT and MR.