Position of the Mechanical Pivot Point at Ankle Height

The aim of positioning the mechanical axis at ankle height is to achieve the highest possible congruence between the mechanical and the anatomical axis at ankle height. As an incongruence between the anatomical and mechanical axis has negative consequences for the anatomical structures and causes the orthosis to lose its function, it should occur as little as possible.

Isman and Inman identified in their study from 1969[1] a compromise of the measured joint axis of the upper ankle joint in the frontal plane (see fig. 1). The compromise axis intersects the longitudinal axis of the tibia at the same level as the distal end of the fibula. This result was confirmed in other studies (Lundberg et al.[2], Shimotori et al.[3]).

We therefore recommend positioning the mechanical axis at a height where it intersects the anatomical joint axis. In order to facilitate this, the mechanical axis is positioned in the frontal plane at the same level as the distal end of the fibula. In this position, the mechanical axis intersects all of the functional axes (anatomical axis at ankle height and longitudinal axis of the tibia) (see fig. 2).

An unintentional shifting of the orthosis and an additional load of the ligamentous apparatus are kept to a minimum through the compromise axis. Moreover, dynamic joints can perform their entire function, as no spring force is lost due to the high congruence.

The mechanical axis at ankle height is aligned to the centre of the lower leg and is parallel to the ground and perpendicular to the direction of movement taking into account the individual external rotation (fig. 3).

Depending on the footwear, it may be necessary to position the pivot point higher. This can lead to an impaired function of the mechanical joint due to the resulting movement of the orthosis.

The above-described positioning of the mechanical axis at ankle height is to be regarded as a recommendation and not as a generally accepted rule.

Fig. 1: Anatomical Axis at Ankle Height in Frontal Plane (Isman and Inman, 1969)

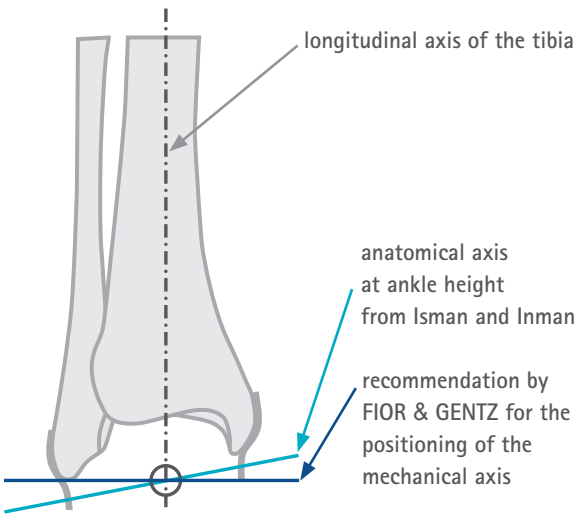

Fig. 2: Positioning Recommendation of the Mechanical Axis at Heel Height in the Frontal Plane, Mod. According to Isman and Inman, 1969 (confirmed by Lundberg, 1989 as well as Shimotori and Colleagues, 2015)

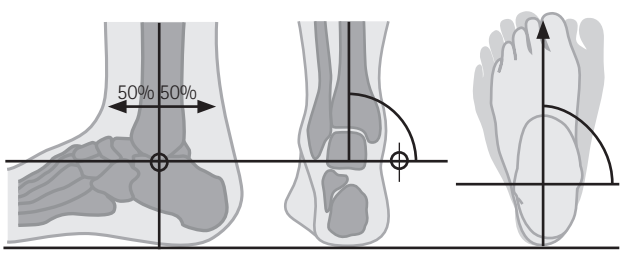

Fig. 3: Positioning Recommendation in Sagittal, Frontal and Transverse Plane

[1] Isman RE, Inman VT (1969): Anthropometric Studies of the Human Foot and Ankle. Biomechanics Laboratory University of California.

[2] Lundberg A (1989): The Axis of Rotation of the Ankle Joint. Karolinska Hospital, Stockholm and Lund University, Sweden.

[3] Shimotori D et al. (2015): Measurement of the Rotation Axis of the Ankle In Vivo. Presentation during the IPSO France.

PR2504-GB-01/2018

FIOR & GENTZ
Gesellschaft für Entwicklung und Vertrieb von orthopädietechnischen Systemen mbH
Dorette-von-Stern-Straße 5
21337 Lüneburg (Germany)
+49 4131 24445-0
+49 4131 24445-57
info@fior-gentz.de
www.fior-gentz.com