

Clinical Assessment of the Subtalar Joint

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Letter to Editor

The ankle joint complex is unique among the lower limb joints, as it has no comparable mechanical analog unlike the hip being compared to a ball and socket and the knee being compared to a sloppy hinge [1]. The ankle joint complex is described as having two hinges the talocrural and the sub talar.

The sub talar joint assumes special significance in that it facilitates movement on uneven terrain, balancing on uneven surfaces, allows standing with feet wide apart, walking uphill and other agility activities by virtue of its simultaneous rolling movement in the coronal plane [1,2].

Knowledge of the normal sub talar joint function during gait, its position and range of movement in health and disease is crucial for assessment and management of many foot and ankle conditions.

However, assessment of the subtalar joint in isolation becomes quite difficult in an individual patient. One reason for this is that the talus has no easily palpable bony landmarks. The second is that the subtalar joint axis is oblique to all three planes in space and varies from individual to individual [3,4].

The subtalar joint axis approximately passes through the head of talus and a point in the posterolateral calcaneus. It is at an angle of 43 degrees to the horizontal in the sagittal plane and 23 degrees medial to the heel bisector line [5].

The basic tenets of musculoskeletal examination should be followed for the subtalar joint. Visual assessment of hind foot alignment is best made with the subject facing away from the examiner. The feet should be shoulder width apart and the pelvis, femur; thigh, knee tibia and calf symmetry is examined. The relationship of heel axis to the ankle joint and the lower leg alignment gives a visual impression of heel valgus or varus. The lateral rays and toes are visible in a normal foot but visualizing more toes compared to the contralateral side indicates a pathologic flatfoot deformity.

Medial tilt of the heel axis relative to the leg axis indicates a varus hind foot. This is of two types. In the first the heel is in neutral to slight valgus and the forefoot flexibility allows good ground accommodation through forefoot pronation or a plantar flexed first ray. In the second the heel is fixed in varus and the mid foot and forefoot also compensate with forefoot adduction. This leads to lateral column overload. The Coleman block test can be used to determine whether the forefoot or hind foot drives the cavo varus position [6].

A more objective way of assessing the hind foot alignment is the valgus index [7]. First described by Rose as a measure of flatfoot in children, this is a measure of medial malleolar shift or frontal plane spatial displacement of the ankle relative to the hind foot [8].

The technique involves obtaining an inked footprint on paper and projecting the position of medial and lateral malleoli on the recording paper. The foot axis and the midpoint of the intermalleolar distance are drawn. In effect the distance between the mid malleolar point and the foot bisector line is reported as a percentage of the intermalleolar distance to obtain the valgus index. The higher the valgus index, the more the valgus of hind foot or more pronated the foot. This is said to be less judgemental and more sensitive.

This clearly is not a practical method but gives a precise objective assessment. It is therefore more useful in research rather than for assessment in a clinic setting.

Various researchers have reported the range of movement in the subtalar joint. Isman and Inman have reported a minimum of 20 and a maximum of 60 degrees [9]. The hind foot movement has contribution from the midfoot joints namely the talonavicular and the calcaneocuboid joints. Stiffness of one of these can affect the movement of the other. The easiest and most practicable method of assessing the subtalar joint movement would be to apply a rotatory force to the calcaneum in the coronal plane. This, however, may not be the most accurate.

A more accurate method would be to assess this with the patient prone with the knee in 135-degree flexion. This brings the subtalar joint axis close to the horizontal plane. The heel is then inverted and everted with the range of motion assessed with a gravity goniometer or level [6]. A finger should be placed on the lateral process of the talus to see whether there is any tibiotalar movement.

Root et al., have described assessment with the use of a goniometer [10]. With the patient prone a posterior leg bisector and a heel bisector lines are drawn. The angle between these is measured with a goniometer for maximum inversion and eversion. Here the zero position is taken as where the above two lines are parallel. However, this may not correspond to the neutral position of the subtalar joint. Therefore although the total range of movement is obtained the restriction of one of them in isolation may not be picked up. Elveru and co-workers in their series found that the heel bisector line is not helpful as the soft tissue is mobile over the os calcis [11]. They suggest a similar method but by using the leg bisector alone.

Most authors report that the total range of movement is split between inversion and eversion in a 2:1 ratio. However, the subtalar joint neutral position should be identified and used as the reference. The American Academy of Orthopaedic Surgeons manual states that the ST Jt neutral position is where the longitudinal midline of the leg and heel are parallel [12]. But this clearly will not hold true in a subject with a deformed hindfoot as in varus the heel may have to be everted to bring to neutral as per the above criteria. The converse holds true in a plano valgus foot.

Root et al., stated that the subtalar joint neutral position is characterized as the position where the plantar plane of the forefoot will lock parallel to the plantar plane of the hind foot when the mid-tarsal joints are fully pronated. These authors also proposed that the neutral position would be at 33.3% of total ROM from the fully pronated position.

Bailey et al., conducted a tomographic study of 15 healthy young adult feet to look in to this [13]. Images were taken with ST neutral (by palpating for talonavicular joint congruency) and maximal inversion and eversion. Although they found that the neutral position was 36.2% of the range from maximum eversion the range was 5 to 71%. Therefore the 2:1 inversion eversion becomes invalid. Identifying the neutral position clinically still is not easy. Wernick and Langer's method of palpating or head of talus congruency is possibly the most practical [14].

Based on this Elveru et al., propose that the subtalar joint neutral position is the position of the subtalar joint where the following two conditions are met :

With the patient positioned prone, the forefoot is passively pronated and the ankle dorsiflexed until a soft end feel is encountered and

The head of the talus cannot be palpated or is felt to extend equally at the medial and lateral border of the talo navicular joint [11].

We feel that once the neutral position is identified the range of inversion and eversion can be assessed with a goniometer using the leg bisector line as reference.

In spite of the host of imaging modalities at our disposal there is no substitute to a good clinical examination. It is important to keep this simple and reproducible.

Subtalar joint pathology is quite common in any foot and ankle practice. In spite of this assessment methods are still quite crude and information regarding this is still sparse in orthopaedic literature. Most methods described are not reproducible in a daily clinic setting. More accurate and reliable methods must be developed before outcomes and subsequent conclusions based on subtalar joint assessment can be accepted from clinical literature.

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