

THE JOINTS OF THE FOOT.

Manipulations to Examine Their Mobility.

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The movements of the joints of the foot are of great clinical importance. I have been asked by numerous students to write some definite statements concerning the examination of a foot in order to determine the range of movement of the joints.

The three main articulations will be considered. These are:—

1. The ankle joint;
2. The sub-talus (sub-astragaloid) joint;
3. The transverse medio-tarsal joint.

1. *The Ankle Joint*—

This is the joint between the talus and the tibio-fibular mortice. The movements are those of flexion and extension only. The movements occur therefore about an *axis* which is horizontal and in the coronal plane and which is parallel to the floor the foot stands on and at a right angle to the tibio-fibular mortice. The average range of movement is from 60-80°, usually regarded as 10-15° less than a right angle (dorsiflexion or extension) to 50-60° more than the right angle (plantar flexion or flexion).

Method of Manipulation to Produce Movement

The leg is held and steadied with one hand, while the foot is moved up and down as extension and flexion is produced. There are two ways in which the foot may be moved.

(i) The free hand grips the forefoot with thumb and finger over the region of the metatarsal heads and the movements are produced by a force applied through both the transverse medio-tarsal joint and the sub-astragaloid joint.

(ii) The free hand grips the *os calcis*, so that thumb and finger grip on either side over a point a little below and in front of the insertion of the tendo achillis. The whole foot may thus be moved but care must be taken to see that the movement is *only about the axis of the ankle joint*. This, moreover, moves the ankle joint by a force applied through the sub-astragaloid joint alone and does not involve the transverse medio-tarsal joint.

These movements of the ankle joint by a force involving, or applied through, other joints must of course be carefully considered; some of the movement may occur at either of these other joints. The comparison of the

degree of movement obtained in the manipulation (i) and (ii) above will allow of the exclusion of the movement due to flexion and extension at the transverse medio-tarsal joint. (N.B. This movement may be quite considerable, for example, in the ballet dancer.) In the manipulation (ii) there is no movement of flexion and extension to be reckoned with at the sub-astragaloid joint.

Lateral movements of the talus in the mortice may occur in extreme plantar flexion because of the slope of the lateral articular facet of the talus. These movements are so slight that they can be discounted in dealing with the ankle joint.

2. *The Sub-taloid or Sub-astragaloid Joint.*

This is a complex joint involving all the articulations of the Talus, *except* that described at the ankle joint. This joint allows combined movements of gliding and rotation under weight bearing conditions, the talus being fixed in the tibio-fibular mortice.

The combined movements here may be individually performed *about various axes*. The resultant combination however of the movements about these axes may be taken for practical purposes as occurring about a *single axis*. The axis according to the words of Whitman can be regarded as "an axis passing through the *upper and lower part of the head of the astragalus (talus)*, downward and outward to the *outer tuberosity of the os calcis*."

Confusing issues such as inversion, eversion, abduction and adduction do not occur when *this axis* is used for testing.

Abduction and adduction of the foot occur at the sub-astragaloid *and* the transverse medio-tarsal joints combined. We must also remember that the range of movement of the sub-astragaloid joint is twice that of the transverse medio-tarsal joint. Adduction, the turning of the foot in, in relation to the leg, is usually regarded as occurring together with inversion of the sole of the foot. The terms "adduction," "inversion" and even "supination" have been used synonymously to designate this movement.

Method of Manipulation to produce Movement

The leg is held as before with the foot so that the ankle joint is at a right angle.

The free hand grips the *os calcis*. Movement is then attempted about the axis passing though the head of the talus above and medially and the lateral tuberosity of the *os calcis* below and laterally.

Inversion about this axis causes the os calcis to elevate its inner side, the sole looks inwards, the os calcis glides slightly forwards and its anterior extremity turns inwards. The forefoot is thus carried inward and downward about the head of the talus. The whole sole therefore faces inwards and downwards. The movements about this axis carry the forefoot through about 35°, 25° of inversion and 15° of eversion.

3. *The Transverse Medio-tarsal Joint.*

This articulation, sometimes described as "Choparts" joint comprises two joints, *viz.*, the calcaneo-cuboid and the talo-navicular. The movements are flexion, extension, adduction and abduction. Some rotation also occurs, but this, together with movement produced between all the other bones of the tarsus and metatarsus, may be neglected in the consideration of the movements of the other joints described here.

This joint exhibits varying degrees of mobility in different circumstances. A person with an arthrodesed ankle may become extraordinarily lax at this joint.

When the forefoot is flexed (plantar flexion) at this joint a type of claw or pes cavus is produced and when the forefoot is extended (dorsiflexion) a type of flat foot is produced.

Method of Manipulation to Produce Movements

The hind foot is held by gripping the os calcis, while the movements are produced with the free hand holding the forefoot. The thumb and fingers are respectively placed on the plantar and dorsal surfaces.

TWO UNUSUAL CASE REPORTS ILLUSTRATING INTERESTING FEATURES IN DIFFERENTIAL DIAGNOSIS.

I. by D. P. S. O'KEEFFE.

On the 9th July, 1935, at 11.20 a.m. Mr. "C," aged 43 years, an ex-miner, was admitted into Hospital and was complaining of severe abdominal pain and vomiting of bright red blood. He had been admitted through the casualty ward and his chart bore the provisional diagnosis of pneumonia.

Upon investigating the history of the condition the patient gave the following facts:

Three months previously the patient had consulted a doctor as he was complaining of bleeding from the stomach associated with indigestion and generalised abdominal pains. The doctor diagnosed the condition as gastric ulcer and treatment for this condition was carried out for three weeks. X-ray confirmation of the diagnosis was then suggested, but the patient did not report for the examination and was not seen again by his doctor.

On Friday, 5th July, that is, five days before admission, the patient developed a cough and once during the day he vomited up a large quantity of bright red blood.

On Saturday 6th he again vomited a large quantity of bright red blood and experienced severe pains in the epigastrium. These pains were cramp-like and intermittent.

On Monday 8th, at 9.30 p.m., that is the evening before admission, patient experienced a sudden severe cramp-like pain in the epigastrium. This pain was so severe that it doubled the patient up.

On Tuesday 9th, at 11.20 a.m., patient was admitted into hospital.

On inspection the patient was observed to be a well nourished adult male of sthenic build, lying propped up in bed. He was extremely dyspnoeic—so much so that it was impossible to count the respiration rate. His face, neck, arms and hands were intensely cyanosed, he was very restless indeed and obviously very ill. He spoke intelligently, but of course the dyspnoea made speech difficult.

Upon examination the patient was found to have a temperature of 95° and neither of his radial pulses could be felt. His tongue was furred and moist. Upon examination of his chest by the two resident officers his lungs were found to be quite normal. There was no visible cardiac impulse; the size of the heart was not detectable clinically; the heart sounds were very distant and the rhythm was regular. The blood pressure was S/D—75/60.

The abdomen was slightly distended and moved slightly with respiration. The abdominal wall was cyanosed and on palpation showed tenderness with marked generalised guarding, but not true rigidity. There was no localised tenderness; the liver, spleen and kidneys were not palpable. Liver dullness was present and no signs of shifting dullness could be elicited.