

## MEASUREMENT OF LENGTH IN THE LOWER LIMB\*

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Students have always been confused when measuring length in the lower limb. The following methods are an attempt at simplification of such measurement.

When the hips are normal "True Length" is measured from the Anterior-Superior Iliac Spine to the Medial Malleolus with the patient lying down in the "Stand-at-Ease" position (Fig. 1). A line is drawn joining the two Anterior-Superior Iliac Spines. (This is an imaginary line). Two other lines are constructed (using tape measures) from each Anterior-Superior Iliac Spine to each Medial Malleolus. The angles subtended by these two "longitudinal" lines with the "transverse" line joining the two Anterior-Superior Iliac Spines are each approximately ninety degrees. With the patient in this position, comparisons of "True Length" can be made.

So long as the two angles are equal and these three lines have been drawn, "True Length" can be compared. It is quite obvious that "True Length" does not mean the actual length of the limb, which is hard to define. One might take it as the length from the centre of the hip joint to the lower border of the os calcis. Nevertheless, for ease of comparison, "True Length" has been defined as the length from the Anterior-Superior Iliac Spine to the Medial Malleolus. The "point" of the Anterior-Superior Iliac Spine is obtained by following the Inguinal Ligament upwards till one's finger meets the first bony prominence. Similarly, the Medial Malleolus is defined as the first bony prominence one encounters when one palpates upwards along the medial side of the heel.

"Apparent Lengths" are easily measured from a central point such as the Xiphisternum or the Umbilicus to the Medial Malleolus: but, not only must the limbs be parallel to each other, they must be in line with the trunk as depicted in Figs. 1 and 5.

When the patient has a fixed adduction deformity he will abduct the opposite limb so that the limbs become parallel to each other. He will also develop a scoliosis in the lumbar spine as he has to adjust his balance by bringing his shoulders over his pelvis (Fig. 2). The convexity will be in

towards the abducted side (in this case the normal side). After some years the scoliosis will become fixed.

The usual textbook instructs the student to square the pelvis (by which is meant correcting the scoliosis) before measuring "True Length". This is done by pulling down the iliac crest on the elevated (adducted) side. Obviously, when the curve is fixed, this cannot be done. The student then wonders how he should examine for "True Length". The state of the spine and the elevated pelvis can be disregarded if the following method of measurement is adopted.

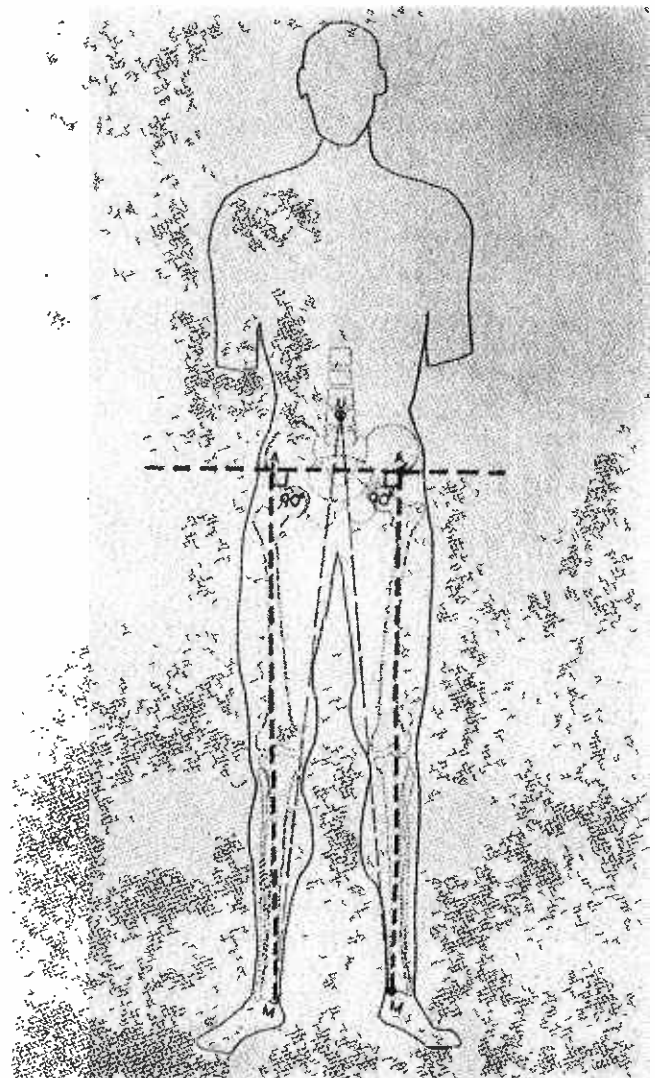


Fig. 1.

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\*In the measurement of length in the lower limb it is the difference in length on the two sides and not the actual length that matters.

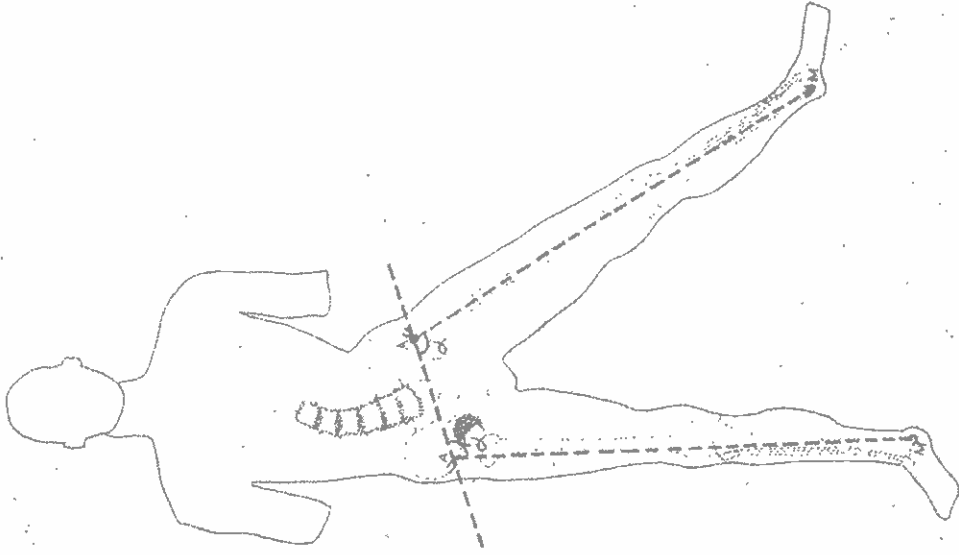


Fig. 4.

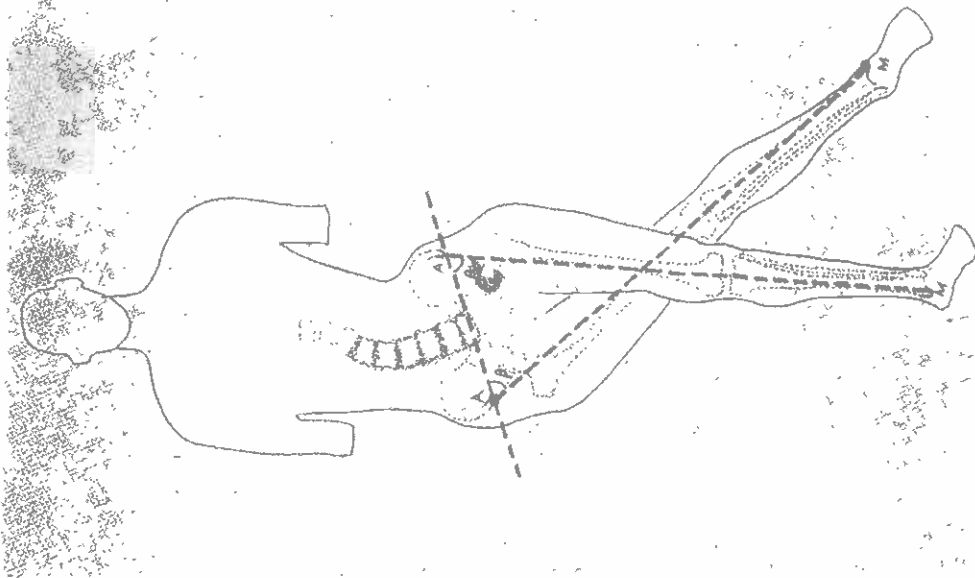


Fig. 3.

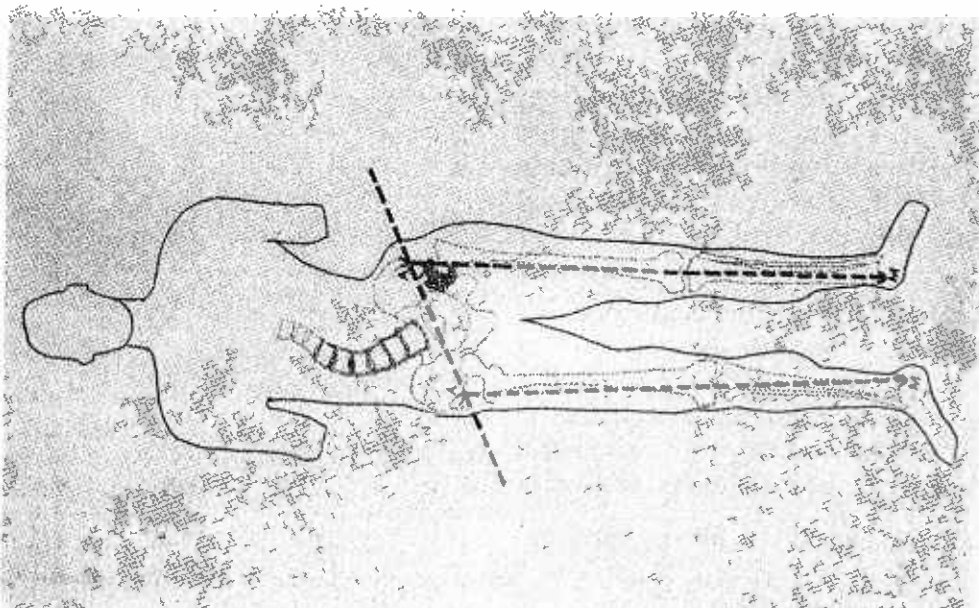


Fig. 2.

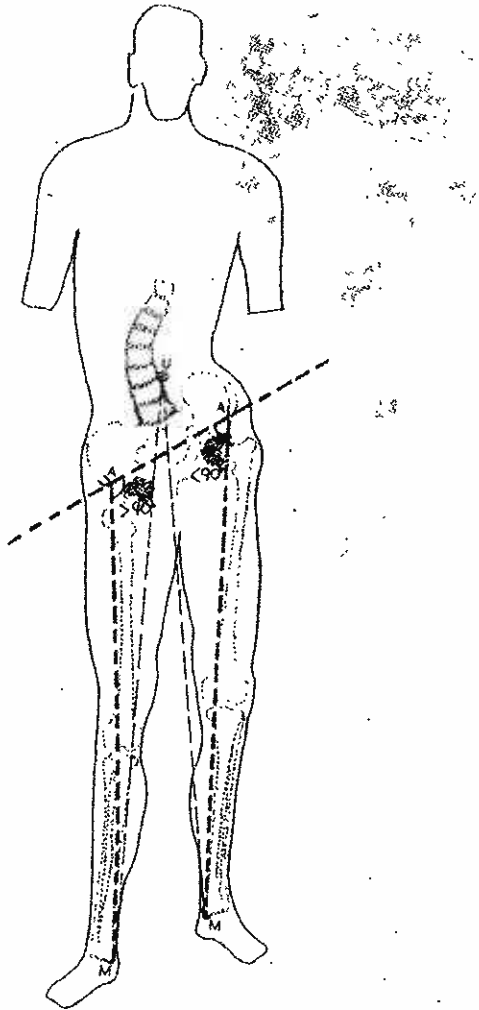


Fig. 5.

The three lines are drawn as stated before, but initially the line joining the two Anterior-Superior Iliac Spines and the line from the Anterior-Superior Iliac Spine to the Medial Malleolus of the adducted limb are drawn (Fig. 2). The angle  $\beta$  and the "True Length" on the affected side are measured. The adducted limb is now lifted up and the normal side is adducted underneath the affected side in the plane of the couch (Fig. 3). When there is no flexion deformity in addition to the adduction deformity, the normal limb is

allowed to rest on the couch in the zero position of flexion-extension by adducting the normal limb under the affected limb. (When there is a flexion deformity in addition to the adduction deformity, the opposite hip should be flexed to a degree equal to the fixed flexion deformity of the affected side, in addition to being adducted, when lengths are compared). The line A-M from the Anterior-Superior Iliac Spine to the Medial Malleolus on the normal side is drawn. (The tape is used to depict this line). The angle ( $\beta$ ) on this side is made equal to the angle ( $\beta$ ) on the adducted side. The length A-M is now measured. This is the "True Length" on the normal side which can be compared to the "True Length" measurement of the affected side.

Similarly, when one hip is abducted (Fig. 4) the angles are constructed and the normal side abducted to an equal degree to make the angles ( $\alpha$ ) equal. The "True Lengths" can then be compared once more.

If a patient has fixed adduction deformity on one side and abduction deformity on the opposite side "True Length" measurements cannot be compared (Fig. 5): viz. if one is unable to make the angles in question equal on both sides "True Length" measurements cannot be compared. However, if the limbs are parallel to each other and in line with the trunk (as in Fig. 5) "Apparent Length" measurements can be made and compared. If the limbs cannot be made parallel to each other or brought in line with the trunk so that the shoulders are squarely over the pelvis and the pelvis squarely over the feet then even "Apparent Lengths" cannot be compared.

In cases of difficulty one resorts to accurate measurements by X-rays (scanograms).

#### ACKNOWLEDGEMENT

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