

Impedance ratio as a measure of water shifts.

(De Lorenzo A, Andreoli A, and Deurenberg P)

Department of Human Physiology, University Tor Vergata, Rome, Italy.

Total and segmental body compositions (left arm and left leg) were measured by bioelectrical impedance analysis at 5 and 100 kHz and by dual-energy X-ray absorptiometry (DXA) in 14 healthy young males (body mass index, mean $\pm$ SD, 23.5 $\pm$ 2.7 kg/m²) every 20 min for a period of 100 min. During the measurements the subjects remained in the supine position on the examination table, except for the time between the last two measurements, where they got up to walk around.

This study focuses on the impact of orthostatic fluid shifts on impedance ratios in body segments and the total body.

After 20 min of lying supine lean tissue (DXA) was slightly but significantly lower for the total body and the left leg, but all other consecutive DXA measurements at different times did not differ.

Total body impedance and leg impedance increased during the time the subjects were in the recumbent position.

Impedance changes in the leg were more pronounced than in the total body, and at 5 kHz the changes were more pronounced compared to 100 kHz.

After the subjects got up the impedance values again decreased.

Impedance ratios (Z_5/Z_{100}) increased for both the leg and to a lesser extent for the total body during the time lying supine, but again decreased after getting up.

The results of this study indicate a fluid shift from the legs to the trunk after lying supine and show that this fluid shift is mainly extracellular water. DXA measurements were not able to detect these changes, probably because the magnitude of these changes is below the detection level for lean tissue with DXA methodology.

The observations have important implications in the interpretation of impedance measurements in the clinical situation when measurements are made in patients who have been reclining for some time.