

MEASUREMENT OF SUBCUTANEOUS ADIPOSE TISSUE CONTENT IN HUMANS

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The contribution of fat to the total body composition in humans can be estimated using an empirical relationship between measurements of skinfold thickness and body density (Durnin and Womersley, 1974). Alternatively, magnetic resonance imaging (MRI) provides an opportunity to measure adipose tissue and study its distribution in detail. Thus, subcutaneous adipose tissue, important as a source of insulation during cold water immersion, can be measured directly. The thickness of the subcutaneous adipose tissue layer is very variable and, therefore, some measurement sites may be more representative of overall adipose tissue content than others. This paper describes a study to determine which skinfold thickness sites can be used to provide reliable estimates of total and subcutaneous adipose tissue content based on MRI data.

Twenty four males and 26 females had 12 or 13 images taken of horizontal body sections from the level of the calf up to the thoracic inlet. The areas of adipose tissue, subcutaneous and total, shown on these images were measured electronically and used to calculate the adipose tissue content as a percentage of body mass. Skinfold thicknesses were also measured at 12 sites on each subject and equations developed by stepwise regression to predict total and subcutaneous adipose tissue content.

The equations best predicting total and subcutaneous adipose tissue used a combination of 4 skinfold thicknesses suitably weighted. Addition of further skinfold thickness values did not improve the accuracy although each of the 4 measurements included made significant contributions. Prediction of subcutaneous adipose tissue content was rather better than the prediction of total adipose tissue content.

Equations have been derived based on MRI data that allow total and subcutaneous adipose tissue content to be estimated from skinfold thickness measurements made at 4 sites. The ability to predict the amount of subcutaneous adipose tissue in this way has application in the prediction of survival time in cold conditions or other situations where surface heat loss is being studied.

DURNIN, J.G.V.A., WOMERSLEY,, J. (1974). Body fat assessed from total body density and its estimation from skinfold thickness: measurement on 481 men and women aged 16 to 72 years. B. J. Nutr., 32, 77-97.