

MEASUREMENT OF FAT AND MUSCLE IN OBESE SUBJECTS BY ULTRASOUND

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The amount and distribution of body fat influences morbidity and mortality (Bjorntorp 1987; Seidell et al.1987). The two main techniques for assessing fat distribution are the measurement of subcutaneous fat by skinfold calipers and by girth measurements, including the waist to hip ratio. We have used B (brightness) mode ultrasound as an alternative method of measuring subcutaneous fat. A (amplitude) mode ultrasound has been widely used in animals but is difficult to apply to humans. B mode ultrasound shows tissue interfaces clearly. Unlike calipers, ultrasound can measure any depth of fat and can also measure underlying muscle. In a preliminary study we found that the repeatability of skinfold measurements with ultrasound and calipers was similar in lean subjects, but skinfold calipers fail in obesity. The validity of measurements with ultrasound is better than with calipers, which may measure only part of the subcutaneous fat layer.

We have now used calipers and ultrasound to take repeated measurements of subcutaneous fat at three body sites, on 17 female subjects attending a weight control group. In ten of the subjects, the fat thickness was so great at one or more of the sites that we were unable to measure with calipers. Ultrasound failed at one site in one subject. We have used a site over the lower abdomen to measure both fat and underlying muscle in addition to biceps and triceps. The results of caliper and ultrasound measurements are shown in the table.

Site	Tissue	Calipers		Ultrasound		Correlations between Calipers and Ultrasound Measurements		
		n	Mean (mm)	n	Mean (mm)	n	r	P
Triceps	Fat	14	27.1	14	19.4	14	0.74	0.01
	Muscle			17	22.0			
Biceps	Fat	17	21.3	17	13.5	17	0.82	0.01
	Muscle			17	29.4			
Abdomen	Fat	8	30.7	8	26.4	8	0.74	0.05
	Muscle			16	10.2			

The mean abdominal subcutaneous fat thickness for 16 subjects was 38.3 mm (range 18 - 61.5). In only 8 subjects could skinfold calipers be used on the abdomen. Repeatability was satisfactory for all measurements.

The data presented here will be compared with the results of follow-up measurements to find the changes in distribution and thickness of subcutaneous fat following weight loss and also to demonstrate the changes that have occurred in muscle thickness.

BJORNTORP, P. (1987). *Proc. Nutr. Soc. Aust.* 12:11.

SEIDELL, J.C., DEURENBERG, P., and HAUTVAST, J.G.A.J. (1987). *Wld Rev. Nutr. Diet.* 50:57.

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