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Clinical and field methods to estimate body fat content

Simpler, although less accurate than the preceding techniques, are determinations of subcutaneous fat by:

- **Skinfold thickness**
- **Circumferences**
- **Bioelectrical Impedance**
- **Obesity by clinical complications**
- **Obesity by body fat distribution**
- **Obesity by adipose cells morphology**
- **Conclusions**

Skinfold Thickness.

Harpenden Caliper

Determination of Body fat by means of calipers dates from early 50 S.

Calipers are inexpensive and portable. Measurements are easy to perform, and are quite acceptable to patients **(37-38- 128- 141-142-191- 234- 327- 328-329- 373- 435-489)**

The technique does not a require a very trained Personnel, and can be performed on a daily basis, "pinching" the subcutaneous fat layer located beneath the skin by means of a special caliper.

Several studies were reported assessing the relationship between body fat and skinfolds. For example, data from the Honolulu Heart Program concluded that the risk of developing coronary disease is greater for those with a higher subscapular skinfold thickness at any level of BMI Body Mass Index.) (134).

Some studies report an acceptable correlation between skinfold thickness and body fat. These reports concluded that it is possible to estimate body fatness from the use of skinfold calipers **(191)**.

There are, however, several problems that should be considered when using skinfold. One of them is the fact that interobserver variations are considerable. On the other hand, a report from Bray and coworkers has found greater interobserver differences among skinfold measurements taken

on obese subjects than on lean subjects **(191)**

The other problem is that not always body fat maintains a good correlation with skinfolds.

Despite all its limitations, skinfold may yield valuable data concerning trends in fatness over time within individuals.

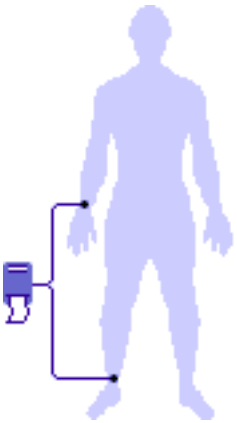
- **Circumferences**

Tape measurement

Circumference measurement is a method that can be compared to Skinfold and Densitometry, as far as acceptability by patients, ease, and accuracy is concerned **(38-39-72)**.
It seems that the method is less subjected to interobserver errors than skinfold thickness, even in obese patients.
The most valuable use of circumference measurements might be in the field of estimating of body fat distribution **(195)**
It is therefore possible to characterize obese patients based on the ratio of circumferences of the abdomen (or waist) to the gluteal region. the so-called Waist-to-Hip Ratio (WHR) Any cipher close to 1 forewarns a greater risk for death, strike and ischemic heart disease. Conversely, a ratio below to, or close to 0.8 decreases the risks for such diseases **(152-266-268-518-520)**

Therefore individuals with abdominal obesity are at a greater risk than those displaying gluteofemoral obesity.

- **Bioelectrical Impedance (BIA)**



BIA

Bioelectrical impedance works on the principle that resistance is inversely proportional to total body water, when an electrical current (75 MHz) is applied through several electrodes placed on body extremities.

Impedance has been shown to correlate very well with total body water assessed by more sophisticated methods **(190-192-282-305-344).**

The device to estimate body fat by Densitometry is light-weighted, and can be performed on a daily basis. They are portable, the technique is easily reproducible and easy to use. The method is quite acceptable to patients **(4)**.

Electrodes are placed distal to right extremities (Arm and lower limbs) and homolateral (right half of the body **(129-131).**

When regression equations are used including weight, height, age, and sex, correlation of

Densitometry with lean body mass as determined by underwater weighing are near 0.96 It can, therefore, be used outside the Laboratory settings to assess with great accuracy body composition **(116-283-452-506)**.

- **Obesity by clinical complications.**

Obesity could also be defined as a sort of interrelationship between body weight and complications arisen from body weight. This procedure seems more coherent as far as the urgency for a medical treatment has to be considered.

Thus, an individual showing a BMI of 23%, but hypertense should be treated more imperatively than a 30% BMI with no clinical complications in his History. Individuals displaying the android type of body fat distribution could be included in this category.

Several studies suggest a strong association between Body fat distribution body weight, and high blood pressure, the same correlation observed in hypertensive subjects showing and abdominal type of body fat distribution.

It has been observed that even near-normal weight individuals may exhibit these complications despite being slightly overweight.

- **Obesity by body fat distribution.**

It was probably Morgagni who described for the first time the android type of obesity in a woman, who had "virile aspectu et valde obesa." . Later Marañon in Spain and Pende in Italy described respectively hyperstenic and hypostenic obesities.(90).

But was Jean Vague who unquestionably suggested for the first time that body fat distribution and clinical complications, obesity can be split in two categories: Android and Gynoid or the so-called "Pear and Apple-shaped obesities," depending on the anatomical site where fat is more preponderant **(123-124-125-257- 426- 472- 473-474- 475- 476- 477- 478- 480- 481- 482)**.

In the android type of obesity, fat is mainly located in the truncal area (upper body , nape of the neck, shoulder, supraumbilical abdomen.) When it appears in the female population , they show signs of virilization (hirsutism, more developed musculature) **(124-125-167-277-502)**

Gynoid obesity, by contrary, displays a female aspect in the subjects (Rounded Hips, more fat located in the upper part of the body, buttocks, thighs, subumbilical abdomen). Muscular mass is less developed. Women displaying the android type of obesity are subjected to similar complications than males with android overweight

Diabetic and arterial risks for the cases of android obesity are multiplied by a factor or 6 or 20 when compared to gynoid obesity **(250-285- 306-309-336-346-359-371-416-417-486)**

These study matches very well with those showing that blood pressure, gout, several types of cancer were closely associated to a central distribution of fat.

Compared to males, female populations showing the "gynoid" type of obesity exhibit more body fat as estimated by Densitometry , but are in turn less prone to metabolic complications **(503)**.

- **Obesity by adipose cells morphology**

Excess fat can be stored in an increased number of adipocytes, or in enlarged fat cells. These two different conditions have been formerly described as hyperplasthic obesity respectively **(49-50-51-52-53-54-84-198-218-223-335-403-404-432)**

It was found that enlarged fat cells were highly associated to elevated plasma insulin levels, type 11 diabetes mellitus, endogenous hypertriglyceridaemia and essential hypertension. **(49-50-51-279-280).**

Hypertrophic obesity was therefore related to metabolic aberrations,. whereas hyperplastic obesity was found in early-onset obesity with enlarged visceral organ. It shows a good correlation between fat cell number and total body cell mass **(48-81)**.

Subcutaneous fat layer of young women in the gluteal and femoral regions is mainly due to an increase in cell number (hyperplastic), whereas the abdominal type of obesity correspond to the Hypertrophic type **(49-50-51-52)**

In women displaying the gynoid type of obesity, fat cell size is smaller in the abdominal region when compared to the femoral area, whereas there is no such difference in men throughout the life span. The female pattern of body fat distribution is maintained with increasing obesity and age

These different fat depots are subjected, as we will see later, to different metabolic regulations. where sex hormones play an important role in body fat distribution.

- **Conclusions**

A considerable body of References estimate that normal body fat percentages are 15-20 per cent in men and 20 to 25 per cent in women. any cipher exceeding these standards is considered obesity. Therefore, and based on Body fat, we could define Obesity as a body fat content of above 30 per cent for women and 25 per cent for men.

Circumference is apt to determine the WHR (Waist to Hip Ratio). A cipher close to (or above) 1 is closely related to clinical complications. Densitometry is a valuable and accurate diagnostic tool, apt to be used in the daily practice.

Regardless the method selected to classify Obesity, all of them concur to a point: Excessive body fat (whether the subject is obese or not according to **Height/Weight Tables**) is the common denominator to all of them.

We could therefore define Obesity as an accumulation of excessive body fat, well over the daily metabolic requirements of facultative energy storage in the form of tryglicerides.

Together with environmental factors heredity plays a determinant role in the genesis of this surplus accumulation of body fat.

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Important notice

You will find three different options related to bibliographical references:

- Those corresponding to the reports on hCG and obesity. File size: 17 KB.
- The comprehensive list related to the review article on obesity and adipose tissue metabolism, plus the reports on hCG and obesity.
  The size of this page is 314 KB (521 References). Due to this file size, you may:

  A. Download the comprehensive list : .ZIP Format
  B. Browse the entire content in HTML format
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Importante:

Existen dos páginas de referencias bibliográficas:

- La correspondiente al trabajo de revisión sobre obesidad , metabolismo del tejido graso, (el tamaño de ésta es de 314 KB) y
- Aquellas relacionadas con el uso de la hCG en la obesidad.

  Usted puede descargar:

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  Momentáneamente Usted puede sólo acceder a la versión en Inglés del trabajo, dado que fue redactado en dicho idioma en su forma original. Próximamente estará disponible en las dos versiones (español - inglés). Gracias por su comprensión.

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The oral hCG
(Human Choriogonadotropin)
Research Clinic

Metropolitan Life Weight Tables

Women

Height (feet/inches)	Small Frame	Medium Frame	Large Frame
4'10"	102-111	109-121	118-131
4'11"	103-113	111-123	120-134
5'0"	104-115	113-126	122-137
5'1"	106-118	115-129	125-140
5'2"	108-121	118-132	128-143
5'3"	111-124	121-135	131-147
5'4"	114-127	124-138	134-151
5'5"	117-130	127-141	137-155
5'6"	120-133	130-144	140-159
5'7"	123-136	133-147	143-163
5'8"	126-139	136-150	146-167
5'9"	129-142	139-153	149-170
5'10"	132-145	142-156	152-173
5'11"	135-148	145-159	155-176
6'0"	138-151	148-162	158-179

Weights at ages 25-59 based on lowest mortality weight in pounds according to frame (in indoor clothing weighing 3 lbs., shoes with 1" heel)

Men

Height (feet/inches)	Small Frame	Medium Frame	Large Frame
5'2"	128-134	131-141	138-150
5'3"	130-136	133-143	140-153
5'4"	132-138	135-145	142-156
5'5"	134-140	137-148	144-160
5'6"	136-142	139-151	146-164
5'7"	138-145	142-154	149-168
5'8"	140-148	145-157	152-172
5'9"	142-151	148-160	155-176
5'10"	144-154	151-163	158-180
5'11"	146-157	154-166	161-184
6'0"	149-160	157-170	164-188
6'1"	152-164	160-174	168-192
6'2"	155-168	164-178	172-197

6'3"	158-172	167-182	176-202
6'4"	162-176	171-187	181-207

Weights at ages 25-59 based on lowest mortality weight in pounds according to frame (in indoor clothing weighing 3 lbs., shoes with 1" heel)

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