Dxa-Derived Body Composition Barrel Index Increases Over the Long Term with Limited Correlation to Early Changes

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Background

A "barrel" body composition profile (BCP) defined by the total body DXA-derived Z-%trunk_fat >0 and Z-limb_fat/h² < 0 has been associated with total and specifically cardiovascular 10 - year mortality in an age (>20 years) and gender stratified study population (N = 324) from Malmö, Sweden. (see figure, adapted from: Preventive Cardiology, 2004;7:109-115.) We found an additional association with total mortality for an index of "sarcopenia" that defines a third body composition axis of "soft" (Z-limb_lean/h² < 0) versus "hard" (Z-limb_lean/h² ≥ 0).

Introduction

We now report results of 10-year follow-up total body scans on 128 surviving members of the original cohort all of whom were initially scanned at baseline and about 2 years later. There were 52 men and 76 women, ranging in age at baseline from 19-76 years (mean 45.4 + 16 years).

Methods

To quantify the observed changes in BCP we defined soft barrel index = Z-%trunk_fat - Z-lmb_fat/h² - Z-lmb_lean/h² .This represents the projection of the patients body composition profile onto the "soft barrel" direction (1,-1,-1), ie. the extent to which the patient has features of a soft barrel, and has been shown to correlate with 10-year mortality.

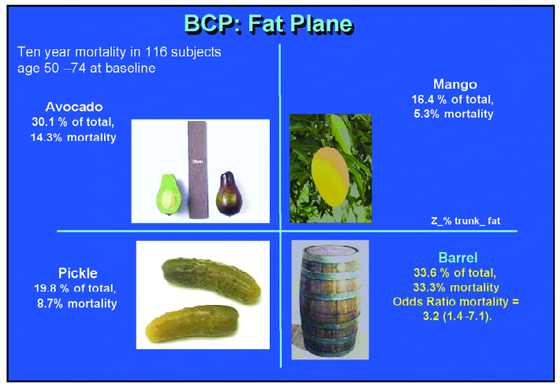

Figure: Two axis body composition profiles based on % of fat in trunk and height correction limb fat, data from 10-year follow-up of normal population sample, Malmo, Sweden.

Results

Correlation coefficients for soft barrel index:

Index at scan 3 vs. index at scan 1
r = 0.76 (p < .01)

Index at scan 3 vs. index at scan 2
r = 0.70 (p < .01)

Index Change between scans 2-3 vs. Index Change between scans 1-2
r = -0.58 (ns)

These results indicate that while barrel profile tends to run true there is no direct relationship between short and long-term change toward barrel features.

Initial cohort incidence of barrel profile is highest in the 50-70's

Age	Barrel yes	Barrel no	%
18-29	20	59	25
30-39	21	80	21
40-49	28	73	28
50-59	39	81	33
60-69	39	76	34
70-79	43	70	38
80-89	23	59	28

Barrel classification:

Scan 1	Scan 2	Scan 3	
		Barrel	Nonbarrel
Yes	Yes	14	1
Yes	No	8	5
No	Yes	13	6
No	No	24	56
Significance for change over time		**p= 0.34**	**0.59**

Among the subjects incidence of barrel increased over time

 # barrels at Scan 1 = 28 (23%)
 # barrels at Scan 2 = 34 (28%)
 # barrels at Scan 3 = 59 (49%).

Of the 80 non-barrel subjects on scans 1 and 2 we found 24 (30%) were barrels by scan 3, indicating that this condition can be acquired.

For those initially classified barrel on at least one of the initial scans, 25% (12/47) were non-barrel on scan 3, indicating that this condition is reversible.

However, subjects who were barrels on both initial scans largely remained barrels on scan 3 (14/15- 93%), indicating that once established, the soft barrel condition tends to persist.

Conclusions

Our results extend our observations on possible clinical utility of total body DXA for risk factor assessment. Although we have previously shown that analysis of scans can predict mortality, the present results support the need for serial scans over time to optimize risk assessment.

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