Review Article

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Advanced body Composition Assessment: From body Mass Index to Body Composition Profiling

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ABSTRACT

This paper includes a quick overview of common non-invasive techniques in addition to a more in-depth analysis of a body composition assessment method. a technique for figuring out composition using quantitative MRI and using fat as a reference. For whole-body measures of adipose tissue (AT), often known as fat, and lean tissue (LT), DXA and quantitative MRIs show excellent agreement, with linear correlations of 0.99 and 0.97 and coefficients of variation (CV) of 4.5 and 4.6% for fat (calculated from AT) and LT, respectively. With a CV of more than 20%, visceral adipose tissue showed much lower agreement. Because of its ability to assess ectopic fat, muscle volumes, and muscle AT infiltration, as well as its speed, quantitative MRI is made possible.

Keywords: Body, Mass, Composition.

INTRODUCTION

The human body, as well as the bodies of all other creatures, is made up of the following four molecules:

Proteins and minerals are frequently ingested in decreasingly large proportions. The majority of the human body, as well as the bodies of all other creatures, are made up of water, fat, proteins, and minerals, usually in that order of decreasing numbers.1Skeletal muscles are also of considerable importance to research, and the balance between the energy-consuming muscles and the energy-storing fat compartments is, of course, highly relevant to understanding the metabolic balance of the body. Fat serves as the body's long-term energy store. Comparing body composition measurement techniques requires separating fat (triglycerides) from AT, which consists mainly of water and only approximately 80% fat. Proteins and minerals.[5] Fat can be present in other organs like the liver and skeletal muscle in addition to AT, which is where the majority of body fat is stored.

This paper includes a quick overview of common non-invasive techniques in addition to a more in-

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depth analysis of a body composition assessment method. A technique for figuring out composition using quantitative MRI and using fat as a reference.

MATERIALS AND METHODS

This investigation was conducted in the plastic surgery division of a tertiary care centre after gaining approval from the departmental ethical committee.[5,6] Written informed consent was given by the patient. The age range for eligibility was 40 to 69. All of the provided MRI images could be used to analyse the VAT, ASAT, and both thigh muscles. based on the quality requirements that were agreed upon. The BMI ranged from 16.4-54.3, with a mean of 26.2kg/m2.

The MR images were evaluated using AMRA Profiler. The body's AT and LT were measured from the level of the thigh muscles to the top of vertebrae T9. The LT is defined as the volume of soft tissue minus the volume of AT.[4] subjects were positioned supine while GE Healthcare's GE-Lunar iDXA (Madison, Wisconsin, USA) gathered whole-body DXA data. The GE iDXA automatically segments a region to estimate VAT with the lower border at the top of the iliac crest and its height set to 20% of the distance from the top of the iliac crest to the base of the skull.[7] A linear model was estimated by linear regression between the MRI and DXA findings because the DXA and MRI studies evaluate different entities (fat and LT mass vs AT and LT volume, respectively), and they do not cover the same portion of the body.[8,9]

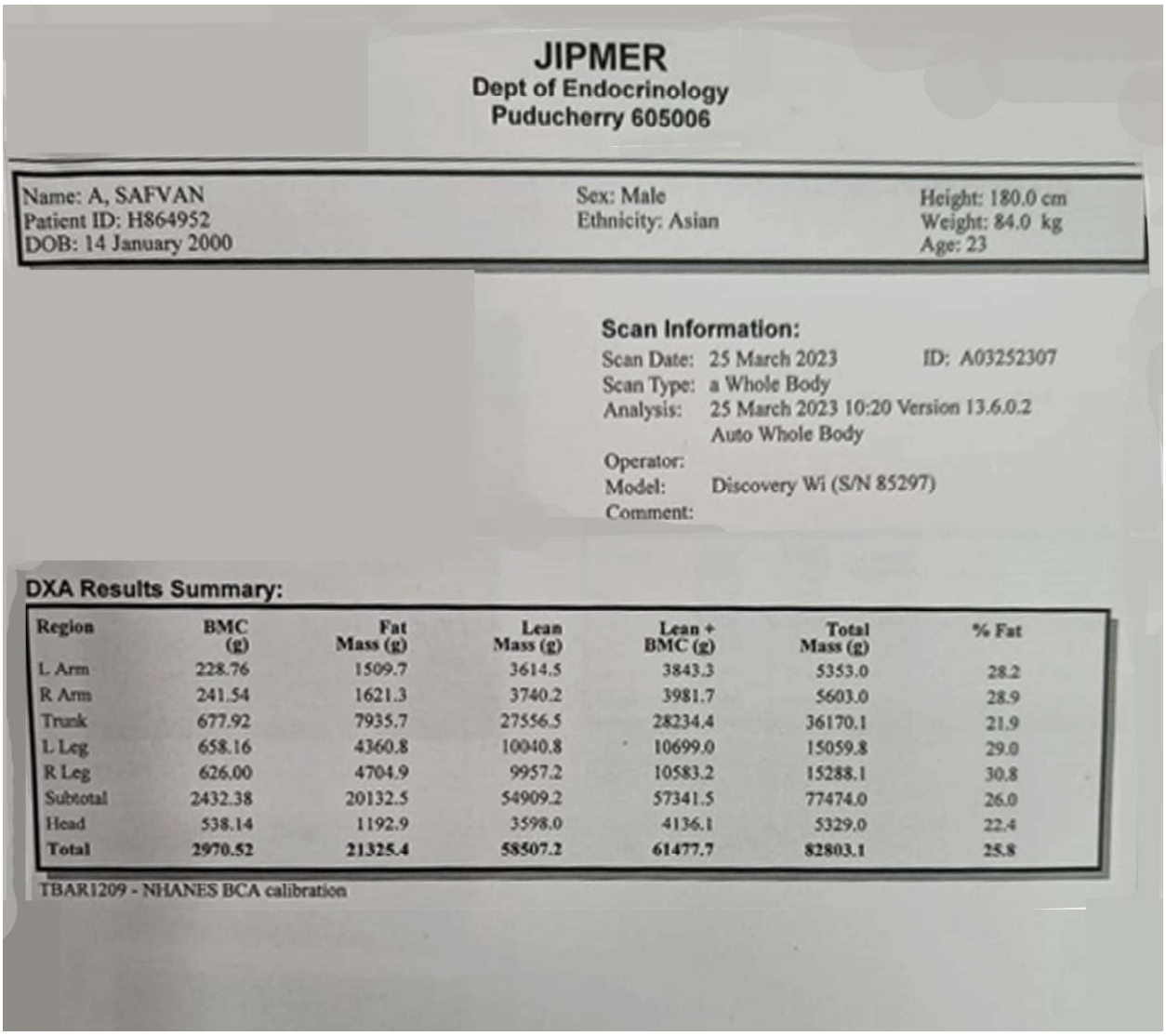
RESULTS

DXA techniques have shown remarkable accuracy and great repeatability when compared to MRI for whole-body evaluations.[11] The prediction of whole-body fat and LT from MRI correlates well with DXA after linear adjustment, but less so for VAT. Although DXA and MRI-derived VAT had a great correlation (r=0.97), the agreement after a linear transformation was significantly lower than it was for body LT and total body fat.[12] In terms of "gross body adipose tissue," Silver et al. found great correlation between fat water MRI and DXA without any appreciable bias, but for "total trunk adipose tissue" as well as for total and trunk lt[13], there was a considerable negative bias (MRI-DXA). The prediction of whole-body fat and LT from MRI correlates well with DXA after linear adjustment, but less so for VAT. Although DXA and MRI-derived VAT showed a great correlation (r=0.97), the agreement after a linear transformation was significantly lower than it was for body LT and total body fat14. Silver et al. found strong correlation between fat water MRI and DXA with no significant bias for "gross body adipose tissue," but substantial negative bias (MRI-DXA) for "total trunk adipose tissue" as well as for total and trunk lt.[15] DXA has an advantage over MRI in that it can measure both bone mass and mineral density simultaneously. When comparing different technologies, precision and accuracy are important considerations. But precision can be quite challenging.

Comparison of capabilities of different techniques for body composition analysis

Total Fat	Yes	yes	yes	yes	Yes
Total Lean Tissue	Yes	yes	yes	yes	Yes
VAT	No	no	approximate	yes	Yes
Volume of Individual Muscles	No	no	no	yes	Yes
Diffuse Fat Infiltration	No	no	no	yes	Yes
Without-Ionizing Radiation	Yes	yes	No(low)	no	Yes

ADP, air displacement plethysmography; BIA, bioelectrical impedance analysis; DXA, dual energy absorptiometry; VAT, visceral adipose tissue



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Name: A, SAFVAN
Patient ID: H864952
DOB: 14 January 2000

Sex: Male
Ethnicity: Asian

Height: 180.0 cm
Weight: 84.0 kg
Age: 23

Scan Information:

Scan Date: 25 March 2023 ID: A03252307
Scan Type: a Whole Body
Analysis: 25 March 2023 10:20 Version 13.6.0.2
Auto Whole Body
Operator:
Model: Discovery Wi (S/N 85297)
Comment:

DXA Results Summary:

Region	BMC (g)	Fat Mass (g)	Lean Mass (g)	Lean + BMC (g)	Total Mass (g)	% Fat
L Arm	228.76	1509.7	3614.5	3843.3	5353.0	28.2
R Arm	241.54	1621.3	3740.2	3981.7	5603.0	28.9
Trunk	677.92	7935.7	27556.5	28234.4	36170.1	21.9
L Leg	658.16	4360.8	10040.8	10699.0	15059.8	29.0
R Leg	626.00	4704.9	9957.2	10583.2	15288.1	30.8
Subtotal	2432.38	20132.5	54909.2	57341.5	77474.0	26.0
Head	538.14	1192.9	3598.0	4136.1	5329.0	22.4
Total	**2970.52**	**21325.4**	**58507.2**	**61477.7**	**82803.1**	**25.8**

TBAR1209 - NHANES BCA calibration

Fig. 1: DXA scan of whole body

CONCLUSION

LT and AT can be measured in a variety of ways throughout the body. DXA and MRI are equally precise and accurate since they have excellent agreement when translated linearly. Additionally, ectopic fat, such as liver fat, and diffuse AT infiltration in muscles can both be precisely and directly assessed by MRI (Figure 1).16. Rapid MRI scanning protocols and efficient image analysis techniques have made it possible to describe a person's body composition profile more thoroughly from just one test. MRI is now a viable option for sophisticated body composition analysis.

Conflict of Interest: None declared.

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