Strong Association of Sagittal Abdominal Diameter with Traditional Variables for Cardiovascular Disease Risk

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ABSTRACT

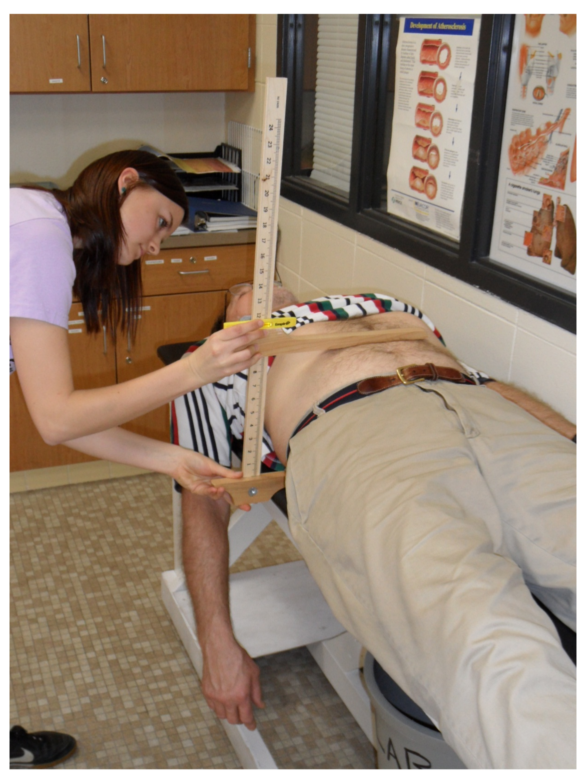
Purpose: Recent research suggests that abdominal height, measured as sagittal abdominal diameter (SAD) in either supine or standing position, reflects visceral fat and is associated with cardiovascular (c-v) disease risk. Thus, adding SAD to other common indexes of adiposity (e.g. BMI, waist and hip girth, body fat %) may provide better prediction of disease risk. The purpose of this study was to determine: 1) the feasibility of using SAD as a measure of abdominal obesity in young and older adults, and 2) the degree of association between SAD and other anthropometric and traditional c-v risk variables. **Methods:** Thirty-two subjects (23 female, 9 male; age 19-70) participated in the study. Each completed a health history questionnaire and a basic health assessment which included height, weight, BMI, waist and hip girth, resting blood pressure and heart rate, 3-site skin folds, and blood lipids and glucose. SAD was measured in both supine and standing positions, with a large, square wooden caliper midway between the iliac crest and the lowest palpable rib, after normal exhalation. In subjects age 36 and older, correlation coefficients were determined between adiposity measures and the Framingham score (risk of a c-v incident within the next 10 yrs). **Results:** Reliable measurement of SAD was quickly learned. Standing SAD measurements were ~5 cm greater than supine. Supine SAD was higher (P<0.05) in the older (24.1 ± 5.3) vs. younger subjects (17.6 ± 2.5). This increase with age was similar to that of waist girth, waist/hip ratio, and BMI. In the older group, both standing and supine SAD significantly correlated with the Framingham score (0.59, 0.54), and was better than waist (0.51), body weight (0.47), and BMI (0.24). Similarly, in the total population SAD was more strongly correlated than were waist, weight, and BMI with other risk factors not included in the Framingham score (e.g. triglycerides, glucose, and HDL). **Conclusion:** SAD was easily measurable with an inexpensive caliper in both young and older adults. The strength of the associations with c-v disease risk in this small study group suggest that SAD is as good or better than the commonly used risk assessment variables, both anthropometric and metabolic. Future studies in larger sample size will be needed to confirm the importance of SAD in basic health assessments.

INTRODUCTION

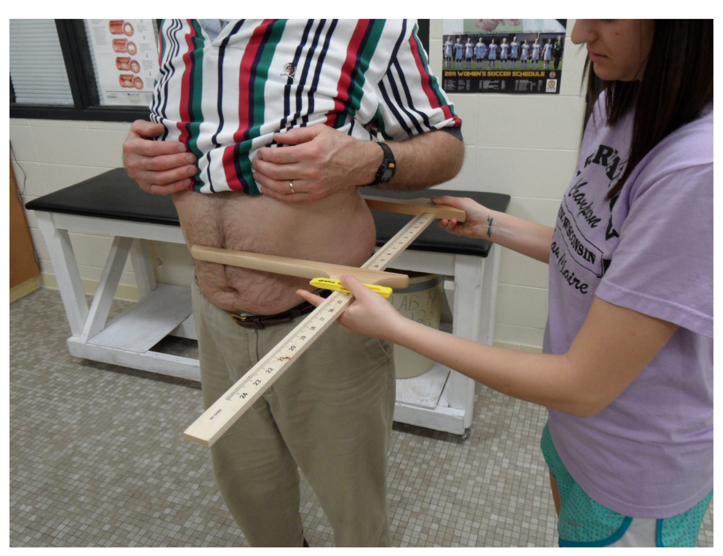
- MRI and DEXA scans can accurately assess visceral fat, but are usually unavailable or prohibitively expensive
- In addition to BMI, skinfolds, and waist girth, sagittal abdominal diameter (SAD) is a simple measure which may add another dimension to the assessment of abdominal obesity
- If SAD measurements are indeed easy and inexpensive, then adding SAD to other common measures of body composition may provide a better understanding of visceral adiposity and resultant CVD risk

AIM

The purpose of this study was to determine: 1) the feasibility of using SAD as a measure of abdominal obesity in young and older adults, and 2) the degree of association between SAD and other anthropometric and traditional CVD risk variables



Supine SAD



Standing SAD

METHODS

Subjects

- 32 adults (9 men, 23 women) age 19-70 years
- All subjects provided written informed consent according to the IRB guidelines of the University of Wisconsin – Eau Claire.

Cardiovascular Disease Risk Assessment

- Health history questionnaire
- Body composition via height, weight, waist and hip girths, BMI, and fat % from 3-site skinfolds
- Fasting plasma lipid and glucose concentrations using a Cholestech LDX System
- Resting systolic and diastolic blood pressure and heart rate
- Framingham Risk Score

Sagittal Abdominal Diameter

- Supine and standing sagittal abdominal diameter (SAD) was assessed at end expiration, using a wooden sliding caliper placed midway between the lowest rib and iliac crest as shown below
- Measurements of SAD were repeated three times
- Subjects instructed to fast for at least 2 hours and wear comfortable clothes

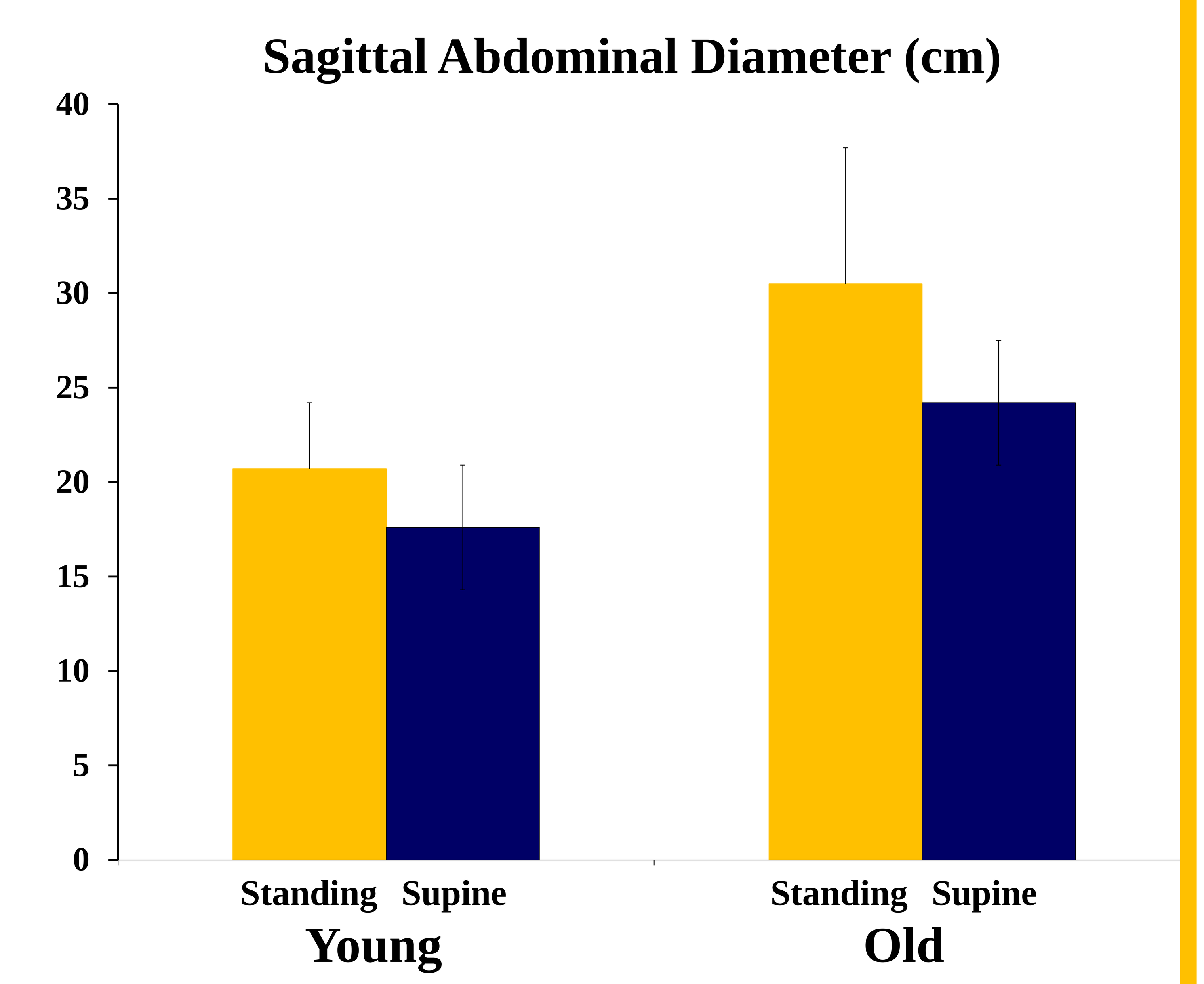
Pearson correlation coefficients between indexes of adiposity and CVD risk factors

	Old (36 and over)					Young (35 and Younger)				
	Standing SAD	Supine SAD	Umbilicus Waist Girth	BMI	Weight	Standing SAD	Supine SAD	Umbilicus Waist Girth	BMI	Weight
Age	0.47	0.40	0.46	0.30	0.32	-0.04	-0.10	-0.02	-0.04	0.11
SBP	0.51*	0.46	0.50*	0.51*	0.58*	0.52*	0.61*	0.51*	0.52*	0.57*
DBP	0.34	0.30	0.34	0.39	0.39	0.60*	0.61*	0.59*	0.60*	0.56*
TC	0.43	0.46	0.48	0.51*	0.32	0.25	0.14	0.23	0.20	0.16
HDL	-0.36	-0.39	-0.27	-0.07	-0.30	-0.42	-0.59*	-0.52*	-0.49	-0.48
LDL	0.55*	0.61*	0.51*	0.46	0.47	-0.16	-0.22	-0.13	-0.18	-0.19
FBG	0.43	0.48	0.30	0.21	0.35	0.51*	0.55*	0.61*	0.65*	0.54*
TRI	0.53*	0.58*	0.44	0.41	0.39	0.76 *	0.79 *	0.71*	0.65*	0.73 *
Framingham Score	0.59*	0.54*	0.51*	0.24	0.47	-----	-----	-----	-----	-----

SUBJECT DATA

Variables	Total Group (n=32)	Young (n=16)	Old (n=16)
Age, years	39.1 ± 18.7	22.3 ± 3.4	55.9 ± 10.4*
Resting Heart Rate, bpm	70 ± 11	70 ± 12	69 ± 10
SBP, mmHg	118 ± 12	115 ± 8	122 ± 14
DBP, mmHg	76 ± 9	74 ± 8	77 ± 9
Height, cm	170.7 ± 7.9	168.6 ± 6.0	172.8 ± 9.0
Weight, kg	87.7 ± 24.5	74.6 ± 18.1	100.8 ± 23.4*
BMI, kg/m²	30.0 ± 7.4	26.1 ± 4.8	33.8 ± 7.6*
Umbilicus WG, cm	97.9 ± 19.1	86.6 ± 11.0	109.1 ± 19.1*
Hip Girth, cm	109.6 ± 13.9	104.6 ± 10.7	114.7 ± 15.1*
Waist/Hip Ratio	0.90 ± 0.10	0.80 ± 0.10	0.95 ± 0.10*
Body fat %	27.7 ± 6.7	28.4 ± 4.7	26.7 ± 8.3
Standing SAD, cm	25.6 ± 7.5	20.7 ± 3.5	30.5 ± 7.2*
Supine SAD, cm	20.9 ± 5.3	17.6 ± 2.5	24.2 ± 5.3*
Total CHOL, mg/dL	174 ± 33	177 ± 38	170 ± 30
LDL, mg/dL	104 ± 28	103 ± 31	104 ± 26
HDL, mg/dL	50±15	57±12	43±15*
Trigycerides, mg/dL	130 ± 98	115 ± 80	143 ± 112
Total/HDL Ratio	4.0 ± 1.9	3.6 ± 1.9	4.4 ± 1.8
Glucose, mg/dL	102 ± 37	90 ± 8	113 ± 50

*P < 0.05 Old versus Young via independent sample T tests



SUMMARY AND CONCLUSIONS

- SAD was easily measurable with an inexpensive caliper in both younger and older adults
- The strength of the associations with CVD risk in this small study group suggest that SAD is as good or better than the commonly used risk assessment variables, both anthropometric and metabolic
- Standing SAD was approximately 3 cm larger than supine in the younger group and 6 cm higher than supine in the older group
- Our data support the previous suggestions that SAD is one more important variable in the assessment of body composition and CVD risk

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