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UTILITY OF BED SIDE SUBCUTANEOUS FAT MEASUREMENT IN METABOLIC SYNDROME

Medicine

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ABSTRACT

It is now known that visceral adipose tissue has got good correlation with metabolic syndrome. But accurate measurement of visceral adipose tissue needs expensive investigative modalities. So we propose to study the subcutaneous fat thickness using simple bed side tests in different areas of the body and to correlate them with metabolic syndrome. Subcutaneous fat thickness were measured at biceps, Triceps, Infrascapular, Suprailiac and mid thigh. Subcutaneous fat thickness of 125 cases of metabolic syndrome as defined by latest IDF (International diabetic federation) were compared with 125 age matched controls without metabolic syndrome. The regional skin fold thickness values were significantly higher in the metabolic syndrome group when compared to the controls. Among those suprailiac, thickness had the most significant correlation.

KEYWORDS

Metabolic syndrome, Sub cutaneous fat, Body mass index

Introduction:
Metabolic syndrome consists of raised blood sugar, abdominal obesity, high cholesterol, and high blood pressure. Visceral fat tissue has good correlation with metabolic syndrome. (Goodpaster B,2003). Abdominal subcutaneous fat measured using magnetic resonance imaging and CT was also found to correlate strongly with insulin resistance. (Abate N,1994). Accurate measurement of this visceral fat tissue requires expensive investigations. In this background we want to study the subcutaneous fat thickness using simple bed side tests and to study its relation with metabolic syndrome.

Aim:
To study the relationship of subcutaneous fat distribution with metabolic syndrome in adults.

Methodology:
125 cases of metabolic syndrome as defined by the latest IDF criteria were studied. They were compared with 125 age matched persons without metabolic syndrome. Exclusion criteria: Known cases of hypervolaemic states such as cardiac failure, nephrotic syndrome and hypoalbuminaemia. Endocrine disorders such as hypothyroidism, cushings's syndrome were excluded. The study was cleared by the local institutional ethics committee. Informed consent was obtained from all the subjects. The diagnosis of metabolic syndrome was made as per the latest IDF definition as follows: They must have central obesity (defined as waist circumference ≥ 90cms for men and ≥ 80cms for women). PLUS any two of the following four factors: (i)Raised Triglyceride level: ≥ 150mg/dl (1.7 mmol/L), or specific treatment for this lipid abnormality. (ii)Reduced HDL cholesterol: < 40 mg/dl (1.0mmol/L) in males and < 50 mg/dL (1.3mmol/L) in females, or specific treatment for this lipid abnormality. (iii) Raised blood pressure: ≥ 130 mm of Hg or diastolic BP ≥ 85 mm Hg, or treatment of previously diagnosed hypertension. (iv) Raised fasting Plasma glucose (FPG) ≥ 100 mg/dl (5.6 mmol/L), or previously diagnosed type 2 diabetes. Subcutaneous fat thickness were measured in 5 areas (Triceps, Biceps, Infrascapular, Suprailiac and Mid thigh) using digital fat thickness caliper (Digital fat track caliper). Study included a thorough history, physical examination including Anthropometry and blood investigation which included Fasting blood sugar, Fasting lipid profile, ECG, Renal function test. Statistics: It was done by comparing cases with controls. Student unpaired T test and X square tests were used. P value < 0.05 was considered significant.

Results:
A total of 125 cases of metabolic syndrome and 125 controls were studied. In the group of cases: 60% were males and 40% were females. Mean age was 50.40 ± 6.8 years. All were diabetic with average duration of 6 ± 2 years. 28.7% were hypertensive with average duration of 7± 3 years. Mean BMI was 25.26 ± 3.94 kg/m^2 . Mean waist-hip (W/H) ratio was 0.97±07. BMI > 30 was seen in 15% patients and BMI (25-30) seen in 30.6% patients. W/H ratio was abnormal in 90% patients. 36% had micro and macrovascular complications.

In the group of controls: 68% were males and 32% were females. Mean age was 47.77 ±5.1 years. 18% were diabetics with average duration of 5±1 year. 6% were hypertensive with average duration of 4 ± 1 yr. Mean BMI was 23.33 ±2.7 kg/m^2 . Mean W/H ratio was 0.84 ±0.13. BMI > 30 in 7% patients and BMI (25-30) in 10 % patients. W/H ratio was abnormal in 24% patients.

Table 1: Comparison of measurements between cases and controls

	Group	Mean	Std Deviation	T
W/H (Waist-hip ratio)	Controls Cases	0.84 0.97	0.13 0.07	10.15 P=.001
WC(Waist circumference)	Controls Cases	81.57cm 92.52cm	5.89 6.02	15.91 P=.001
TC(Triceps thickness)	Controls Cases	3.49mm 5.50mm	.61 1.14	8.99 P=.001
BC(Biceps thickness)mm	Controls Cases	2.76mm 4.44mm	.51 1.07	7.31 P=.001
IS(Infrascapular thickness)	Controls Cases	4.46mm 7.45mm	.65 1.35	10.32 P=.001
SI(Suprailiac thickness)	Controls Cases	6.34mm 11.72mm	.85 2.53	20.63 P=.001
MT(Mid thigh thickness)	Controls Cases	5.08mm 8.98mm	.81 1.52	13.61 P=.001

Discussion:
In people with high blood sugars multiple risk factors usually come together which is now known as metabolic syndrome. These metabolic abnormalities when they occur together in the same individual create a substantial additional cardiovascular risk over and above the sum of risk associated with each abnormality individually. Even before the blood sugars are high enough to be diagnosed with diabetes mellitus the components of metabolic syndrome confers an increase in cardiovascular mortality rate (Sattar N,2003). In our study anthropometric measuremens such as BMI and W/H ratio were found to be statistically significant. But predictive value of BMI itself was not good because in the metabolic syndrome group only 45% had abnormal BMI and in the control group 17% had abnormal BMI. In another study from India, BMI was normal in about 40% of metabolic syndrome cases (Gupta R,2007). In our study BMI was normal in 55% of metabolic syndrome cases. In our study the mean W/H ratio was 0.97 in people with metabolic syndrome and 0.84 in people without metabolic syndrome. In another study, they found a W/H ratio of 0.94 in the metabolic syndrome group and 0.89 in the control group (Jasminder Singh,2016). Although increased BMI and W/H ratio were significantly associated with the occurrence of metabolic syndrome, W/H ratio had a better predictive value. In our study the metabolic syndrome group had a waist circumference of 92.52 cms. In another study in India they found a waist circumference of 95 cms in people with metabolic syndrome (Pratyush DD,2012). Regional skin fold thickness differed between the two groups which was statistically significant. But predictive value of each measurement was different. Suprailiac skinfold thickness had the best correlation, followed by mid

thigh , Infrascapular, biceps and then triceps. Similar observations were made in another study by using CT scan (Goodpaster B,2003). Another study which used CT scan and DEXA scan to measure fat thickness also found positive correlation between metabolic syndrome and regional subcutaneous fat distribution. (Smith SR,2001).

Conclusion:

Among the skin fold thickness, supra iliac measurement had high correlation with metabolic syndrome. The observation of normal BMI in 55% of metabolic syndrome cases further emphasizes the importance of regional fat distribution in metabolic syndrome rather than total body weight.

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