

Skeletal muscle triglycerides and central visceral adiposity predict insulin sensitivity in lean, young, healthy subjects from two ethnic groups

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It is becoming clear that relative insulin resistance is common in certain ethnic groups where the prevalence of type 2 diabetes is higher than that of European Caucasians. Central obesity and skeletal muscle triglycerides have been shown to be strongly associated with insulin resistance. The present study was designed to determine if centrally distributed fat deposition (visceral/subcutaneous fat) and intramyocellular lipid (IMCL) were able to predict differences in insulin sensitivity assessed by the euglycemic hyperinsulinemic clamp in young, lean, healthy subjects. The two groups (8 European Caucasians and 6 SE Asians: 7 male, 7 female) were matched for age ($22.3 \text{ y} \pm 4.4$) (mean \pm SD), BMI ($23.0 \text{ kg/m}^2 \pm 1.7$), waist circumference, birth weight ($> 2.75 \text{ kg}$) and current diet. IMCL of soleus muscle was measured by proton magnetic resonance spectroscopy (MRS) and abdominal fat by magnetic resonance imaging (MRI) of the abdomen.

Insulin sensitivity (M value) determined by the clamp test averaged $1.44 \pm 0.18 \text{ mmol/min/m}^2$ (mean \pm SEM) in the Caucasian group ($n = 8$) and $0.79 \pm 0.11 \text{ mmol/min/m}^2$ in the SE Asian group ($n = 6$). The Caucasian group was therefore 1.8 times more insulin sensitive than the SE Asian group ($p = 0.012$). A multiple linear regression (where the independent variables were soleus IMCL, visceral fat area, gender and ethnic group) showed that the M value could be predicted by ethnic group ($p = 0.001$), soleus IMCL ($p = 0.015$) and visceral fat area of the abdomen ($p = 0.047$). The model was able to explain 79% (R^2) of the variance in the M value. When we controlled for the effects of ethnic group in the model, soleus IMCL and abdominal visceral fat accounted for 21% ($p = 0.015$) and 12% ($p = 0.047$) of the variance in the M value respectively.

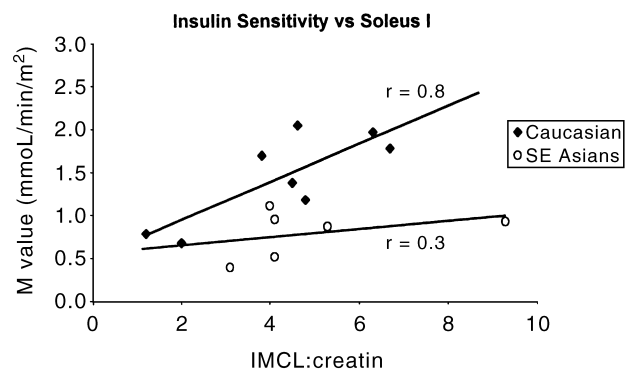


Figure 1. Relationship between insulin sensitivity (M value) and soleus IMCL content in two ethnic groups.

Our study suggests that predisposition to insulin resistance is evident even in young, lean, healthy individuals of SE Asian origin and that while ethnic group appears to explain a large part of the variance in insulin sensitivity, both skeletal muscle triglycerides and abdominal visceral fat content may also play a significant role. While the mechanisms responsible for this relationship remain unclear, these findings may lend support to ethnically determined differences in insulin sensitivity and fat distribution even in young, lean, healthy subjects.