Syndrome X

Endocrine and metabolic consequences of obesity
What is obesity?

- BMI greater than 30 kg/m$^2$
- Incidence greater than 30% of population and growing in size
Obesity as a consequence of

- Excessive food intake
- Inappropriate food choices
Obesity as a consequence of

- Inadequate physical activity
- Hormonal effects
- Bioenergetic effects
Health risks of obesity in men

- Arthritis
- Diabetes
- Hypertension
- Gall stones

Health risks of obesity in women

- Arthritis
- Diabetes
- Hypertension
- Cancer
- Gall stones

Sources:
Inactivity and CHD risk
Health risks of obesity

■ depend on fat patterning
■ android ("apple") has higher risks
■ gynoid ("pear") has lower risks
Android pattern of obesity
Gynoid pattern of obesity
Android obesity and insulin resistance

- Reduced glucose tolerance
Android obesity and insulin resistance

Insulin oversecretion
Android obesity and insulin resistance

- Reduced glucose utilization
Android obesity and insulin resistance

- Reduced glucose utilization

![Graph showing relationship between SSPG (mg/dl) and WHR with correlation coefficient r = 0.60 and p < 0.01.](image-url)
Android obesity and insulin resistance

- Reduced glucose metabolism
Android obesity and insulin resistance

- Reduced capacity of insulin to suppress hepatic glucose production
Android obesity and insulin defects

- Insulin oversecretion is a function of obesity independently of its pattern
Android obesity and insulin defects

- Insulin clearance is reduced
Insulin oversecretion and resistance in aging

- Aging is often associated with obesity
- Reduced insulin-induced glucose uptake is seen both in aged and obese
- This is due to reduced peripheral sensitivity to insulin, principally in the muscle
Insulin oversecretion and resistance in aging

- Aging is often associated with obesity
- Oversecretion of insulin is seen in both aged and obese
- High fasting plasma insulin
Insulin defect acts on portal vascular bed

- Insulin concentration is high in the portal circulation due to insulin oversecretion
Insulin defect acts on portal vascular bed

- High insulin acts on the visceral adipose tissue causing increased visceral adiposity
Insulin resistance of android obese

- Resides in skeletal muscle
- Muscle is insensitive to insulin
Insulin resistance of muscles in the android obese

- Deficient glucose uptake
- Deficient glycogen synthesis
Insulin resistance affects lipid metabolism

- Adipose LPL hypoactive because adipose tissue is insulin resistant
- Lower LDL receptor binding
Development of syndrome X

- Peripheral insulin resistance
- Insulin oversecretion
- More insulin resistance
Role of androgens in android obesity

- Reduced levels of SHBG, the high-affinity binding protein for androgens
Role of androgens in android obesity

- Reduced levels of SHBG, the high-affinity binding protein for androgens
- Increased free androgen titers
Exercise counteracts syndrome x

- Fat loss
- Increased insulin sensitivity
- Reduced blood pressure
- Reduced plasma lipids
Exercise and increased insulin sensitivity

- Acute increase in sensitivity
- Associated with glycogen depletion, increased GLUT-4 and glucose uptake
Exercise and reduced plasma lipids

![Graph showing plasma triglyceride levels post-exercise](image)
Android obesity and muscle fiber types

- Higher proportions of fast anaerobic fibers
- Training increases conversion to red fibers
Endurance training counteracts obesity
Endurance training counteracts hyper-tension
Endurance training counteracts

- plasma lipids
Endurance training counteracts glucose intolerance
Endurance training improves glucose disposal
Obesity

- Major health problem
- Results from inappropriate life-style choices
- Can be reduced and its risks attenuated with aerobic exercise and better dietary choices