

# **Risk Factors for Fractures - a link between metabolic bone disease and cardiovascular disease**

Akademisk avhandling

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av

Leg. läk. Penelope Trimvou

Fakultetsopponent: Professor Karl Obrant,  
Ortopedkliniken, Skånes Universitetssjukhus, Lunds Universitet, Malmö

Avhandlingen baseras på följande delarbeten:

- I. Trimvou P, Landin-Wilhelmsen K, Odén A, Rosengren A, Wilhelmsen L. **Male risk factors for hip fracture – a 30-year follow-up study in 7,495 men.**  
*Osteoporos Int 2010;21:409-416.*
- II. Trimvou P, Odén A, Simonsson T, Wilhelmsen L, Landin-Wilhelmsen K. **High serum cholesterol is a long term cause of osteoporotic fracture.**  
*Osteoporosis Int 2010;22:1615-1620.*
- III. Trimvou P, Bosaeus I, Bengtsson B-Å, Landin-Wilhelmsen K. **High correlation between quantitative ultrasound and DXA during 7 years of follow-up.**  
*Eur J Radiol 2010;73:360-364.*
- IV. Trimvou P, Lindahl A, Lindstedt G, Oleröd G, Hansson P-O, Odén A, Wilhelmsen L, Landin-Wilhelmsen K. **Stroke should be regarded as a risk factor for fracture - a 13-year follow-up study in men and women.**  
*Submitted.*
- V. Trimvou P, Lindahl A, Lindstedt G, Oleröd G, Wilhelmsen L, Landin-Wilhelmsen, K. **Secular trends in sex hormones and fractures in men and women.**  
*Submitted.*



UNIVERSITY OF GOTHENBURG

# **Risk Factors for Fractures - a link between metabolic bone disease and cardiovascular disease**

**Penelope Trimpou**

Institute of Medicine at Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, 2011

## **ABSTRACT**

**Introduction:** Fractures and cardiovascular disease (CVD) are a burden to society, as they result in high morbidity and mortality in both men and women.

**Aim:** The aim was to study prospectively modifiable risk factors for fractures in the general population and to possibly identify a link between metabolic bone disease and CVD.

**Methods:** Three population-based cohorts of both men and women were studied, with a follow-up time ranging from 13 to 30 years. Two methods of bone assessment, Quantitative Ultrasound (QUS) and Dual energy X-ray Absorptiometry (DXA), were compared during 7 years. Lifestyle factors, serum hormones and lipids, QUS and pharmacological treatment were studied in relation to future fractures, which were X-ray verified.

**Results:** A 30-year follow-up study of 7495 men, aged 46-56 years at baseline, showed that a high degree of physical activity during leisure time but not at work, high occupational class and high body mass index (BMI) were protective against hip fractures; whereas smoking, tall stature, age, interim stroke and dementia increased the risk. A 20-year follow-up of 1396 men and women, aged 25-64 at baseline, showed that previous fracture, smoking, coffee consumption and lower BMI each increased the risk of fracture, independently of age and sex. The gradient of risk for serum total cholesterol to predict fracture increased over time. A 13-year follow-up of 1616 men and women, aged 25-64 at baseline, showed that stroke, high age, female sex and physical inactivity during leisure time predicted fracture independently of other factors. Low QUS and use of tranquilizers predicted fracture in both genders. QUS correlated well with DXA. Secular trends were seen when men and women aged 35-64 in 1995 were compared with subjects of similar age in 2008, i.e., 13 years apart. The fracture incidence increased, with a higher proportion of vertebral fractures among postmenopausal women in 2008. Lower HRT use, lower serum oestradiol, and greater fall risk exposure due to more physical activity during leisure time in 2008, may explain the results. Serum total and free testosterone were lower in men in 2008 but the fracture incidence was unchanged. Serum total cholesterol and triglycerides were lower in men and women in 2008 compared with subjects of similar age in 1995.

**Conclusions:** Physical inactivity, smoking, high cholesterol and stroke were independent modifiable risk factors of fracture, indicative of a link between metabolic bone disease and CVD. Secular trends were seen in sex hormones and blood lipids in both genders, and in women, secular trends were also seen with regard to fracture type and incidence.

**Keywords:** Risk factors, general population, physical activity, sex hormones, cholesterol, stroke, fracture.

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[pinelopi.trimpou@vgregion.se](mailto:pinelopi.trimpou@vgregion.se)