Clinical Risk Factors for Osteoporosis in Type 1 Diabetes

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OBJECTIVES

Introduction: Type 1 diabetes secondary osteoporosis is an underdiagnosed condition and there are few studies that addressed the topic of clinical risk factors in this context, although, for a better diagnosis and management, it is of great importance to find such predictors.

Aim: To evaluate bone mineral density and parameters of bone metabolism in patients with type 1 diabetes in comparison with a group of healthy subjects and to determine possible risk factors for osteoporosis in the context of type 1 diabetes.

METHODS

Patients:

	F	M	total
DIABETES	45	57	102
CONTROL	25	34	59

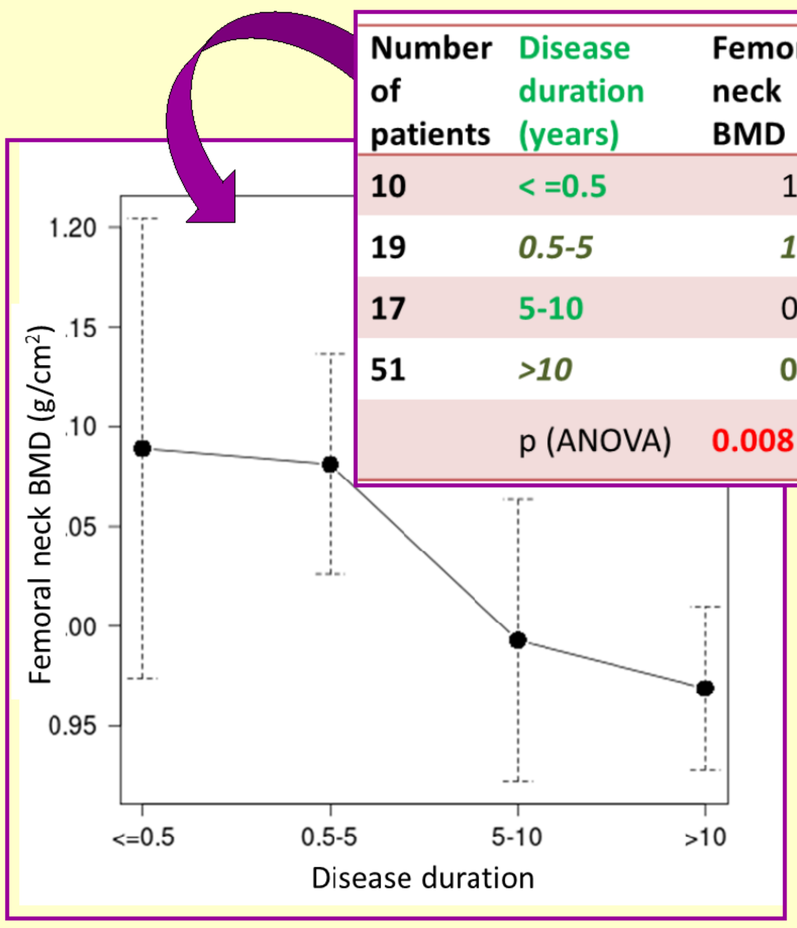
102 patients with type 1 diabetes and 59 healthy controls (pre-menopausal women and men, aged between 20 and 55 years), matched by age, sex and BMI were included in the study.

All subjects with secondary causes of osteoporosis except type 1 diabetes and diabetic patients with stage 3 nephropathy or more (GFR< 60 ml/min/1.73 m^2) were excluded.

Assessment: their ***lifestyle***, ***personal and parental history*** were evaluated with a questionnaire, ***anthropometric measurements*** were made and ***DXA osteodensitometry*** was performed. Serum ***osteocalcin***, ***intact PTH***, ***25(OH)vitamin D***, total ***calcium***, ***phosphorus*** and ***magnesium*** were determined.

RESULTS

The **risk for low BMD** (at least a Z score equal or lower than -2.0 SD at any site) was **1.2 higher in type 1 diabetes** (95% CI 0.43-3.33), however **BMD was not significantly different between patients and controls** (p=0.88 for lumbar spine and 0.56 for femoral neck).**Type 1 diabetic patients** had a **median age** of **28** and **11.5 years disease duration**. **Median HbA1c** was **8.1 %**. **BMD for a disease duration over 10 years** was **significantly lower** than that for 0.5-5 yers (p=0.008, ANOVA). **Diabetic nephropathy (stages 1 and 2) increased the risk for low BMD** and **was associated with a significant rise of PTH**. **Age** was **negatively associated with lumbar spine BMD and positively with PTH**. **BMI** was **positively associated with BMD at all sites**.



Number of patients	Disease duration (years)	Femoral neck BMD	Total hip BMD	L1-L4 BMD
10	< =0.5	1.09	1.10	1.19
19	*0.5-5*	*1.08*	1.06	1.15
17	5-10	0.99	1.00	1.12
51	*>10*	0.97	1.00	1.15
	p (ANOVA)	0.008	0.174	0.597

+ = positive association;

- = negative association;

0/empty = no association;

• = statistically significant ($p<0.05$);

• = borderline significance(p between 0.05 and 0.1) ;

Individual testing/cumulative testing of the factors;

Factor		L1-L4 BMD/ Z score	Femoral neck BMD/ Z score	Total hip BMD/ Z score	Osteocalcin	PTH
• Age		-/-			0/+	+/+
• Sex	M		+/0	+/0	0/+	
	F			0/-		
• BMI		+/+	+/+	+/+	-/-	
• Disease duration			-/-	-/-		
• Diabetic nephropathy (stages 1 and 2)			-/0			+/+
• Physical activity		+/0			+/+	
• Coffee consumption					-/-	0/-
• Alcohol consumption		-/-				

CONCLUSIONS

The *most important predictors for osteoporosis* in our study were **type 1 diabetes duration (over 10 years)** and the presence of **diabetic nephropathy**. **Age towards the upper limit** of inclusion (i.e. **55** years old) or **low BMI** values (low/low normal) may complete an indication for performing DXA in type 1 diabetic patients. Long-term lifestyle measures that we found to be *protective for osteoporosis* were: **avoiding coffee and alcohol** consumption, **regular exercise** and an **optimal metabolic control of diabetes**.

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