

# **Bone remodeling in men with type 2 diabetes: is it just the same thing as in women?**

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## **Background and aim**

**The mechanisms of reducing the bone mineral density (BMD) in men with type 2 diabetes are poorly understood.**

**The aim of our study was to determine the relationships between the markers of bone remodeling and BMD in men with type 2 diabetes.**

## **Materials and Methods**

**The study included 59 men with type 2 diabetes, from 50 to 75 years of age.**

**BMD and T-score were determined by dual-energy X-ray absorptiometry.**

**A serum levels of parathyroid hormone , free testosterone, osteocalcin, osteoprotegerin, sclerostin, and urinary excretion of C-terminal telopeptides of type I collagen (CTX-I) were determined by ELISA.**

**Control group comprised of 20 healthy subjects with normal BMD, matched by sex and age.**

# Clinical and laboratory characteristics of type 2 diabetic men with normal and decreased BMD

Parameter	Normal BMD (n=30)	Decreased BMD (n=29)	P
Age, years	60.5 (57; 65)	64 (59; 69)	0.04
Body mass index, kg/m <sup>2</sup>	30.8 (29.4; 33.6)	29.1 (28.1; 32.1)	0.1
Duration of diabetes, years	11.0 (6.0; 15.0)	13.0 (9.0; 20.0)	0.1
Hemoglobin A1c, %	8.26 (7.25; 9.16)	8.17 (7.23; 8.99)	0.7
eGFR, ml/min/m <sup>2</sup>	73.5 (67; 85)	71 (63; 86)	0.7
25-OH-vitamin D, ng/mL	17.0 (14.9; 18.5)	17.3 (15.5; 18.5)	0.4
Parathyroid hormone, pg/mL	47.7 (32.8; 62.0)	56.3 (47.5; 90.2)	0.7
Free testosterone, pg/mL	7.0 (5.7; 9.7)	6.1 (4.8; 8.4)	0.08
T-score, smallest	-0.2 (-0.5; 0.3)	-1.6 (-1.9; -1.2)	<0.001
FRAX total	3.9 (3.3; 4.3)	4.8 (4.2; 6.7)	<0.001
FRAX hip	0.1 (0.1; 0.2)	0.7 (0.4; 1.0)	<0.001

Data are presented as medians (25; 75 percentiles). The significance of differences was estimated by the Mann-Whitney test.

eGFR - estimated glomerular filtration rate, BMD – bone mineral density, FRAX total - ten-year risk of major low-energy fractures, FRAX hip - ten-year risk of hip fractures

## Results

A reduced BMD was revealed in 29 patients, including 4 individuals with osteoporosis and 25 subjects with osteopenia.

In men with type 2 diabetes, compared with the control group, a decrease in serum osteocalcin and urinary excretion CTX-I was detected, while the concentrations of osteoprotegerin and sclerostin were elevated. There were no significant differences in the studied parameters of bone remodeling between patients with normal and reduced BMD (Tab. 1).

## Tab.1 Serum concentrations of bone remodeling markers in men with type 2 diabetes compared to control

Parameter	Patient groups			P 1-2	P 1-3	P 2-3
	Normal BMD (n=30) (group 1)	Decreased BMD (n=29) (group 2)	Control (n=20 ) (group 3)			
Osteocalcin, ng/mL	11.2 (7.6; 14.7)	10.9 (7.8; 13.3)	18.9 (16.2; 24.0)	0.3	<0.001	0.03
Osteoprotegerin, pg/mL	22.4 (20.2; 29.9)	21.1 (18.6; 25.7)	15.9 (14.1; 24.5)	0.3	0.01	0.01
Sclerostin, pmol/L	31.5 (21.4; 56.5)	31.6 (22.1; 42.7)	23.0 (17.5; 27.1)	0.2	0.01	0.03
CTX-I, ng/mmol	203.0 (116.8; 282.5)	238.4 (149.1; 331.0)	465.0 (276.4; 639.0)	0.5	<0.001	0.01

Data are presented as medians (25; 75 percentiles). The significance of differences was estimated by the Mann-Whitney test.

CTX-I - C-terminal telopeptides of type I collagen

Shown is a positive correlation of free testosterone and of the lumbar spine T-score ( $r=0.28$ ,  $p=0.03$ ). In turn, parathyroid hormone (PTH) showed a negative relationship with the femoral neck T-score ( $r=-0.29$ ,  $p=0.002$ ).

In stepwise multivariate regression analysis, sclerostin was the most significant predictor for lumbar spine T-score ( $\beta=0.496$ ,  $R^2=0.23$ ,  $p=0.00007$ ), the level of PTH influenced the femoral neck T-score ( $\beta=-0.29$ ,  $R^2=0.26$ ,  $p=0.005$ ).

## Conclusions

- The obtained results suggest that the bone remodeling in men with type 2 diabetes is reduced due to the inhibition of osteoblastogenesis and decrease in the bone formation and resorption.
- Therefore, the mechanisms of osteoporosis in men with type 2 diabetes may be different from those in postmenopausal diabetic women.