Effects of metabolic control on bone mineral density and markers of bone remodeling in adult patients with Type 1 Diabetes Mellitus

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OBJECTIVES

Type 1 diabetes mellitus (T1DM) is associated with reduced bone mineral density (BMD) and increased bone turnover. However, data regarding the influence of glycemic control on bone are limited. The aim of this study was to evaluate BMD and bone remodeling markers in patients with T1DM in relation to changes in glycemic control.

METHODS

We studied: - 107 patients with T1DM (Group-D) (mean age: 34+8.1 years, M/F: 48/59)
- 95 healthy controls (Group-C) matched for age, sex and body mass index (BMI)
Patients in Group-D were re-examined after one year follow-up (FU)

- In both groups were measured:
- Glycated hemoglobin (HbA1c)
- Lumbar spine (LS) and femoral neck (FN) were determined by dual energy X-ray absorptiometry (DXA)
  (Hologic Discovery QDR Series Densitometer, Hologic Inc., Bedford, MA)
- Bone resorption assessed by β-crosslaps
- Bone formation assessed by serum levels of type 1 procollagen total N terminal propeptide (TP1NP)
  (Elecsys 1010/2010/MODULAR ANALYTICS E170)

➤ Fifty patients from Group-D re-examined after a year and had the same measurements as baseline

- <u>BMD changes at LS more than 3% and at FN more than 6% were considered to be significant</u>

RESULTS

Results of group D and C at baseline

Anthropometric characteristics

	D	C	p-value
N	107	95	0.083
Sex (M/F)	48/59	45/50	
Age (y)	34+8.1	34.8+7.9	0.091
Duration of DM (y)	15.1+7.4	-	
BMI (kg/m²)	23.2+2.2	23.1+1.9	0.096
WC (cm)	94.5+9.6	92.9+8.7	0.24
HbA1c (%)	8.2+1.3	5.1+0.4	0.023

Blood tests

	D	C	p-value
β-crosslaps	317.6+9.3	322.1+8.7	0.071
TP1NP	47.4+5.1	48.9+4.6	0.067

LS BMD by DXA

	D	C	p-value
Total BMD (g/cm²)	1.024 0.201	1.052 0.143	0.041
Total z-score	-0.3+1.5	1.0+1.5	0.032
Total T-score	-0.3 1.6	0.9 1.7	0.024

FN BMD by DXA

	D	C	p-value
BMD FN (g/cm²)	0,696 0,121	0,898 0,112	0.042
Z-score FN	-0.1+1.4	1.4+0.8	0.041
T-score FN	-0,1+1,5	1,4 1,0	0.038
BMD Total (g/cm²)	0.743+0.132	0.967+0.098	0.044
Total Z-score	0.0+1.5	1.5+0.9	0.043
Total T-score	0.0+1.3	1.6+0.7	0.046

At baseline:

➤ Positive correlation was observed between the age of patients and Z-score at both LS and FN (r=0.32, p=0.023 and r=0.24, p=0.018, respectively)

➤ The early-onset of T1DM was positive correlated with Z-score at both LS and FN (r=0.17, p=0.044 and r=0.29, p=0.021, respectively)

➤ Patients with lower BMI showed a lower Z-score of both LS and FN (r=0.27, p=0.031 and r=0.28, p=0.022, respectively)

➤ Negative correlation was observed between LS BMD and HbA1c (r=-0,21, p=0,041)

At Group D, after one year (FU):

➤ Group-D**R**: 36/50 patients had >0.5% **reduction** in HbA1c
➤ Group-D**S**: 8/50 had about the **same** HbA1c
➤ Group-D**I**: 6/50 had >0.5% **increase** in HbA1c

❖ **DS** and **DI** were small in number of patients to reach a safe and reliable conclusion

At Group-DR was observed the following changes:

	Baseline	1 year FU	Change
BMD LS (g/cm²)	1.024 0.201	1.058+0.207	**3,3%**
BMD FN (g/cm²)	0,696 0,121	0.739+0.128	**5,6%**
TP1NP	47.4+5.1	49.2+5.4	**p=0,043**

CONCLUSIONS

✓ T1DM is associated with reduced BMD
✓ However, improvement of glycemic control appears to ameliorate BMD and bone turnover and could help to stabilize the bone mass in these patients
✓ Identifying the factors that affect bone in patients with T1DM can help to improve the health of their bones

References

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