Effect of vitamin D_3 supplementation on bone resorption in patients with type 2 diabetes

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BACKGROUND

- The role of vitamin D supplementation on bone health in type 2 diabetes (T2D) is not known.
- The effects of vitamin D supplementation on markers of bone resorption have shown mixed results in normoglycemic adults.[1-6]
- There are scant data on how vitamin D supplementation alters markers of bone resorption in patients with T2D.
- There are no data on the effect of vitamin D supplementation on dynamic changes in markers of bone resorption after a meal.

OBJECTIVES

- To examine the effect of supplementation with 4000 IU/day of vitamin D_3 for 24 weeks on serum CTX levels during fasting and after a 75-g oral glucose tolerance test (OGTT) in patients with early, well-controlled T2D.

METHODS

- Secondary analysis from the DDM2 study (a clinical trial of D_3 supplementation in patients with well-controlled T2D) in a subset of patients managed with lifestyle (placebo [P] n=12) or vitamin D_3 [VD], n=13)
- A 180-min OGTT was performed at baseline and week 24 after supplementation with VD or P.
- Serum was collected at time 0', 15', 30', 60', 90', 120', 150' and 180'.
- Archived samples were analyzed for serum CTX level by electrochemiluminescent immunoassay at Quest Diagnostics, Inc.

RESULTS

Table 1. Baseline variables did not differ in the two groups.

Characteristics	Vitamin D (N=13)	Placebo (N=12)
Age, years	57.5 ± 7.5	61.8 ± 8.3
Female, n (%)	2 (15.4%)	5 (41.7%)
Weight, kg	90.7 ± 17.0	87.5 ± 17.3
Body Mass Index, kg/m²	29.8 ± 3.9	30.6 ± 4.3
Total 25OHD, ng/mL	24.4 ± 10.8	27.0 ± 12.8
Hemoglobin A1c, %	6.7 ± 0.8	6.7 ± 0.5
Race, n (%)		
White	9 (69.2%)	8 (66.7%)
Black or African-American	2 (15.4%)	3 (25.0%)
Asian	2 (15.4%)	1 (8.3%)
Other		
Ethnicity, n (%) Hispanic or Latino	0 (0.0%)	1 (8.3%)
Fasting CTX, pg/mL	422.9 ± 155.8	368.0 ± 141.0

Values are means ± standard deviation unless otherwise specified;

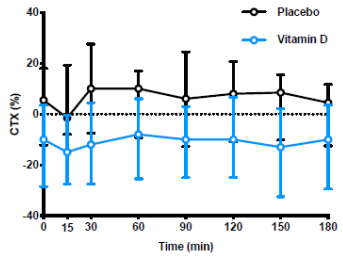
Percent (%) changes from baseline to week 24 in (a) fasting CTX and in (b) the area under the post-OGTT CTX curve (CTX_{AUC}) did not differ significantly in the two groups (**Table 2**). Adjustment for baseline CTX level did not significantly alter results (data not shown). Patterns of change during the OGTT are shown in **Fig 1**.

Table 2. Effects of 24 weeks of vitamin D supplementation on CTX.

	% Change from baseline		P value
	Vitamin D, (N = 13)	Placebo, (N = 12)	
Fasting CTX	-12 ± 27	3 ± 19	0.118
Total $AUC_{CTX\ 1\text{-}180}$	-10 ± 23	5 ± 16	0.061
Total 25OHD, ng/mL	154.0 ± 27.1	31.5 ± 28.2	0.005

Values are mean ±SEM.

Fig 1. Percent change in serum CTX during OGTT after 24 weeks of vitamin D supplementation.

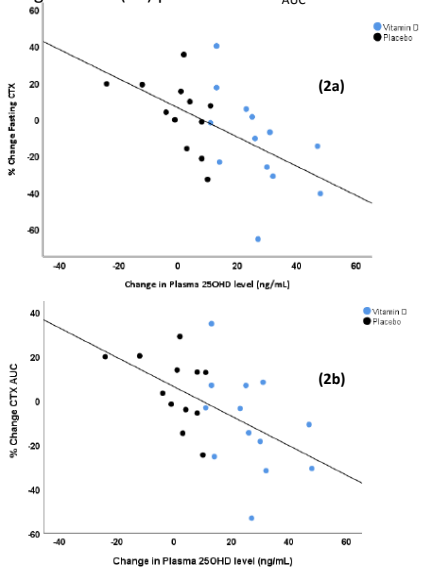


Data are medians and interquartile ranges.

RESULTS (CONT.)

In the entire cohort, change in 25OHD was inversely associated with % changes in fasting CTX (r= -0.561, p=0.004) and in CTX_{AUC} (r= -0.546, p=0.005) (**Fig 2**).

Fig 2. Associations between change in 25OHD and % changes in (2a) fasting CTX and (2b) post-OGTT CTX_{AUC}.



CONCLUSION

- Although fasting and post-OGTT CTX decreased following 24 wks. of vitamin D_3 supplementation as compared to placebo, the differences were not statistically significant in this pilot.
- Increases in 25OHD were significantly associated with reductions in fasting and post-OGTT CTX levels.

These findings suggest that improvements in vitamin D status may lower bone resorption in adults with early T2D; however, larger studies are needed to confirm these preliminary data.

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