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### **The effect of a low-carbohydrate diet on bone turnover.**

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#### **INTRODUCTION:**

Low-carbohydrate diets have become popular as weight loss techniques. These diets are high in protein, saturated fats, and omega-6 fatty acids. They also lead to a ketogenic state. These factors could lead to increased bone turnover. This study was designed to see whether a low-carbohydrate diet would lead to increased bone turnover in humans.

#### **METHODS:**

Thirty patients (15 study subjects and 15 controls) were recruited for this 3-month study. The 15 patients on the diet were instructed to consume less than 20 g of carbohydrates per day for the 1st month and then less than 40 g per day for months 2 and 3. Control subjects had no restrictions on their diet. The primary end point was urinary N-telopeptide (UNTx) at 3 months. Secondary end points included UNTx at 1 month, bone-specific alkaline phosphatase (BSAP) at 1 month, bone turnover ratio (BSAP/UNTx) at 1 month, and weight loss.

#### **RESULTS:**

The mean UNTx in the study subjects increased by 1.6 [95% confidence interval (CI) +/-22.8] compared with an increase of 1.9 (95% CI +/-17.6) in the controls at 3 months ( $p=0.86$ ). The mean UNTx decreased by 2.2 (95% CI +/-27.2) and 3.1 (95% CI +/-17.6) at 1 month in the dieters and controls, respectively ( $p=0.36$ ). The mean BSAP decreased by 0.53 (95% CI +/-2.96) in the dieters and increased by 0.34 (95% CI +/-2.92) in the controls at 1 month ( $p=0.27$ ). The bone turnover ratio increased by 0.08 (95% CI +/-0.81) in the dieters and by 0.05 (95% CI +/- 0.27) in the controls at 1 month ( $p=0.78$ ). The dieters lost 6.39 kg versus 1.05 kg for the controls at 3 months ( $p=0.0008$ ).

#### **CONCLUSIONS:**

Although the patients on the low-carbohydrate diet did lose significantly more weight than the controls did, the diet did not increase bone turnover markers compared with controls at any time point. Further, there was no significant change in the bone turnover ratio compared with controls.