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Bariatric Surgery Alters Fibroblast Growth Factor 21 and Angiotensin-converting Enzyme 2/ Angiotensin (1-7) Axis in Patients with Morbid Obesity

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Objectives: Recent studies showed that the fibroblast growth factor 21 (FGF-21) and angiotensin-converting enzyme 2 (ACE2)/Angiotensin 1-7 (Ang 1-7)/Mas axis of the renin-angiotensin system counteract to the negative role of Ang II in various disease. In this study, we examined FGF-21, ACE2, Ang (1-7), and Ang II in obesity and its change after bariatric surgery.

Methods: We prospectively enrolled obese patient (n=12) who performed bariatric surgery and age-sex matched healthy volunteers (HVs) (n=12 each). Serum FGF-21, Ang II, ACE2, and Ang (1-7) levels were measured by enzyme-linked immunosorbent assay kits. We measured also FGF-21, Ang II, ACE2, and Ang (1-7) 6 months after bariatric surgery in obese patients.

Results: FGF-21, Ang II and ACE2 levels were significantly higher in obese patients compared with HVs ($p = 0.034$, < 0.001, and $p = 0.020$, respectively) and decreased after bariatric surgery ($p = 0.002$, 0.005, and 0.020, respectively) (Figure 1). There was no significant difference in Ang (1-7) levels between obese patients and HVs ($p = 0.887$). Weight reduction surgery did not change Ang (1-7) levels in patients with obesity ($p = 0.480$). However, changes in Ang (1-7) levels were positively correlated with changes in body mass index (BMI) after surgery ($R^2 = 0.580$, $p = 0.048$) (Figure 2).

Conclusions: FGF-21 and ACE2 were upregulated in patients with obesity and they are reduced after bariatric surgery. A decrease in BMI after bariatric surgery was associated with the decrease in Ang (1-7).

Figure 1. Changes in FGF-21, Ang II, ACE2, and Ang (1-7) levels after bariatric surgery. Data were analyzed by *Mann-Whitney and **Wilcoxon matched-pairs signed rank tests. ACE2, angiotensin-converting enzyme 2; Ang (1-7), Angiotensin 1-7; Ang II, angiotensin II; FGF-21, fibroblast growth factor 21; HV, healthy volunteers.

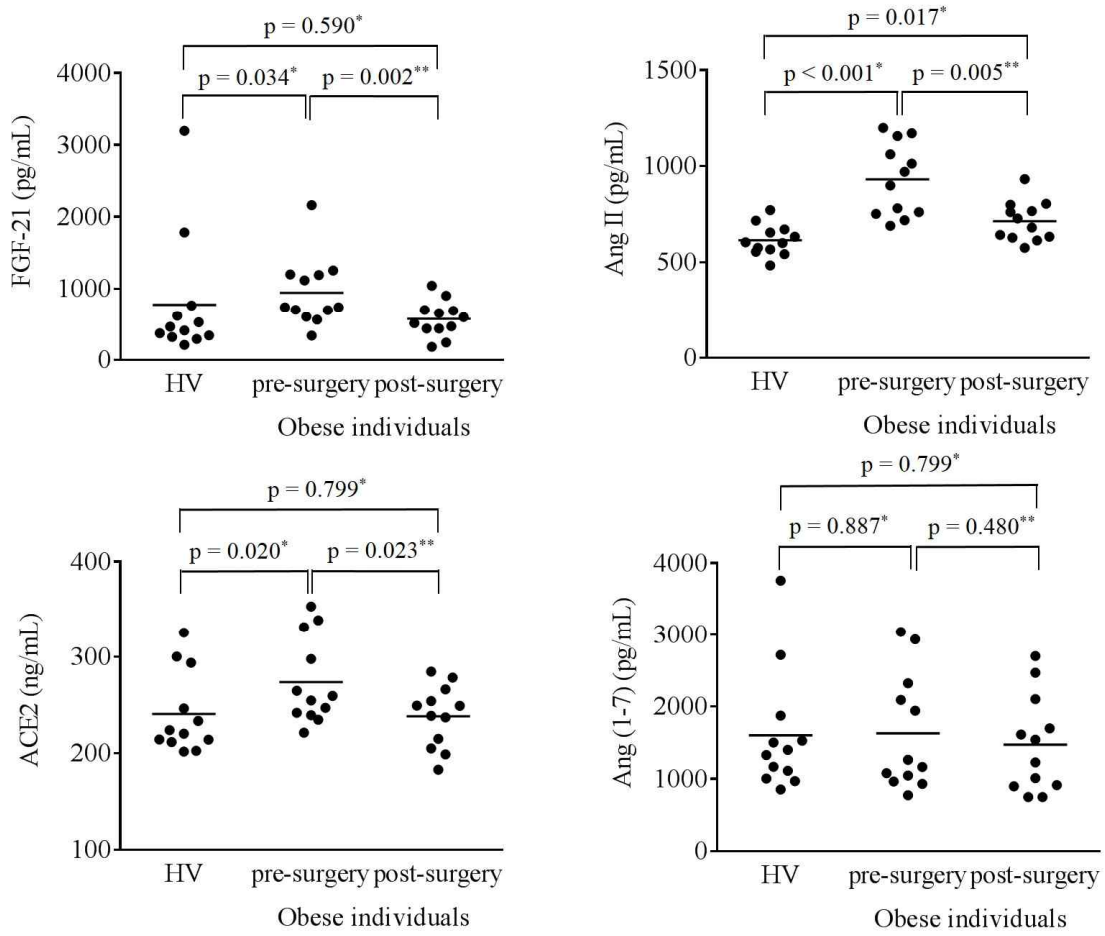

Figure 2. Relationships among changes in FGF-21, Ang II, ACE2, Ang (1-7) levels and BMI after bariatric surgery. Data were analyzed by Spearman's rank correlation coefficient. ACE2, angiotensin-converting enzyme 2; Ang (1-7), Angiotensin 1-7; Ang II, angiotensin II; BMI, body mass index; FGF-21, fibroblast growth factor 21.