Effect of Adipokines on Post-Dental Implant Inflammation Levels

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Background

We have recently demonstrated that overweight and obese patients exhibit higher levels of local inflammation following oral implant surgery compared to patients with a healthy weight (Theken, et al. 2022). However, the biological mechanism underlying the influence of body weight on inflammation and wound recovery following implant surgery is unknown.

Adipokines, specifically leptin and adiponectin, are produced by subcutaneous fat and adipose tissues and have been linked to obesity levels (Leal, et al. 2013). Previous studies identified that obese patients typically have higher leptin levels and lower adiponectin levels in their plasma, and leptin and adiponectin can regulate inflammatory responses (Thanakun, et al. 2017).

Given the current prevalence of oral implant surgery as a treatment for missing teeth, understanding the impact of obesity-related factors such as leptin and adiponectin on inflammation levels and post-surgical recovery could inform better patient care.

Methods

The subjects were 30 adult patients who received one or two dental implants. Patients with confounding pre-surgical conditions were excluded.

Blood, urine, and GCF samples, and subjects' demographic data were collected from the patients prior to surgery (t=Baseline), and after the surgery (t=0, 1, 2, 4, 6, 24, 72 hours). Subjects were assigned to Naproxen Sodium Group and Acetaminophen Group in a double-blind, randomized manner.

Local inflammation levels was accessed by quantifying proinflammatory cytokines IL-8 and IL-1β in GCF using ELISA for all time points. Leptin and Adiponectin levels were quantified using ELISA at baseline and t=24 hours.

Statistical significances were assessed using a two-way analysis of variance (ANOVA). Correlations were computed utilizing Spearman's correlation coefficient.

	BMI <25 kg/m² (n=12)	BMI >25 kg/m² (n=18)
Men/Women	6/6	12/6
Age (years)	42.48 ± 16.6	48.61 ± 11.4
Naproxen Sodium/Acetaminophen	7/5	8/10
Number of Implants		
1 implant	10	15
2 implants	2	3
Bone Grafting		
Yes	1	2
No	11	16
Length of Surgery (minutes)	70.82 ± 29.0	83.61 ± 35.0

Table 1. Demographic Data of Subjects

Results

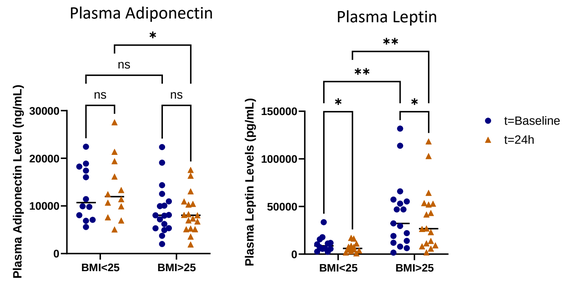
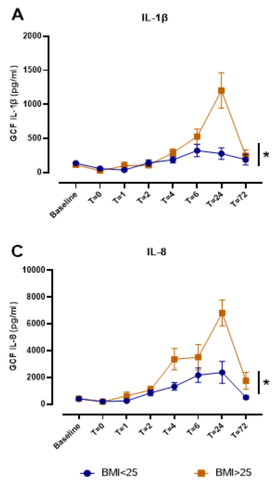
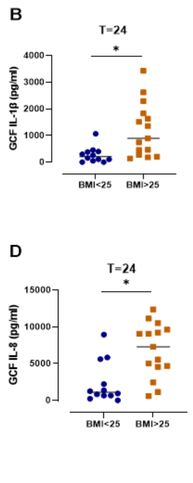
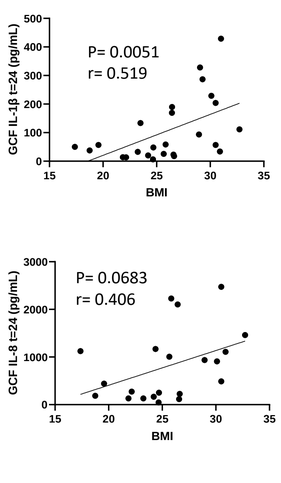


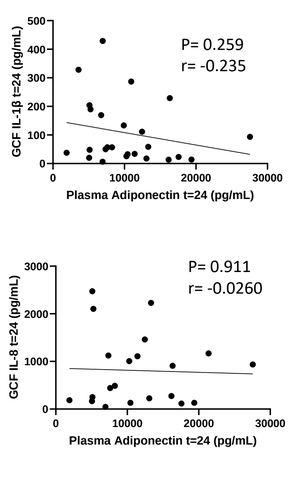
Fig 1. Plasma Adipokine Levels at Baseline and 24 Hours Grouped by BMI Levels

- No statistically significant differences were noted in the levels of adipokines and leptin influenced by gender.
- Treatment groups did not exert a substantial effect on the levels of adipokines and leptin.
- While the treatment group did exert an influence on pain scores, it did not induce significant effect on inflammation levels. Participants subjected to the naproxen sodium reported comparatively lower mean pain scores.
- BMI levels did not significantly impact pain scores.
- Impact of BMI on inflammation levels were detected locally (in GCF) but not systemically (in plasma).









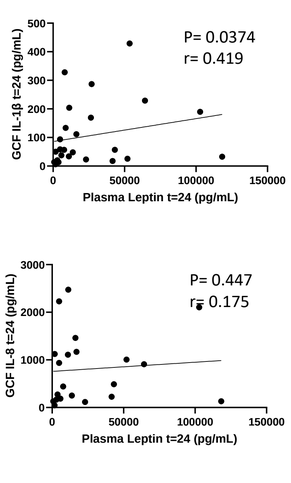


Fig 2. Changes in GCF Cytokine Levels Over Time Grouped by BMI Levels

Fig 3. Correlation Graph of GCF Cytokine and BMI Levels

Fig 4. Correlation Graph of GCF Cytokines and Plasma Adipokine Levels at 24 hours

Conclusions and Future Work

- BMI levels was a factor that significantly affected the post-implant local inflammation level. Subjects with higher BMI(>25 kg/m²) demonstrated higher levels of local inflammation compared to those with lower BMI(<25 kg/m²), with the peak difference observed 24 hours after the surgery. Significant positive correlation between IL-1β and BMI was observed.
- Subjects with higher BMI was associated with lower adiponectin 24 hours post-surgery and elevated baseline and post-surgery leptin. There was also a significant reduction in plasma leptin levels from baseline to 24 hours post-surgery.
- Subsequent research objective will be centered on utilizing cell culture and scratch assay to mimic the intricate wound healing process *in vitro*. Physiological levels of adiponectin and leptins will be added as stimulants to monitor the inflammatory responses across varying adipokine concentrations. The study will aid in understanding of the cellular mechanisms underlying the observed effects of BMI on post-implant inflammation, with the potential to provide better tailored treatments to patients.

References

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The work was supported by grants from College Alumni Society Undergraduate Research Grant and Bayer Pharmaceuticals, LLC.