THE INFLUENCE OF OBESITY ON ORTHODONTIC TOOTH MOVEMENT (A CLINICAL STUDY)

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Abstract

Obesity is a global public health problem, arising from the interaction between behavioural, environmental and genetic factors. The implications of obesity on orthodontic treatment included orthodontic treatment plan, less cooperation, longer duration and more health-related problems. However no data exists in relation to orthodontic tooth movement (OTM) in obese patients, from either a clinical or biochemical perspective.

The aim of this project was to study the influence of obesity on OTM by measuring (1) The rate of tooth movement and the time taken to achieve completion of tooth alignment using fixed orthodontic appliances in normal weight and obese patients; (2) The effect of obesity on orofacial pain response during the early stages of orthodontic treatment with fixed-appliances; and (3) The effect of obesity on the biochemical changes in unstimulated whole mouth saliva (UWMS), gingival crevicular fluid (GCF) and blood with and without orthodontic treatment.

Different biomarkers were detected including (1) Obesity-related biomarkers such as adiponectin, leptin and resistin; (2) Tissue remodelling biomarkers such as Matrix metalloproteinase-8 (MMP8), Matrix metalloproteinase-9 (MMP9) and their inhibitor (TIMP-1); (3) Bone remodelling biomarker such as Receptor Activator of Nuclear Factor Kappa B Ligand (RANKL); and (4) Inflammation biomarker such as Myeloperoxidase (MPO) and C-reactive protein (CRP).

Two main studies were conducted in this thesis:

The *first* study is a cross sectional study in which UWMS, GCF and blood were collected from normal weight and obese adults (18-45 years) without orthodontic treatment. Same samples were collected from a matched number, age and gender of normal weight and obese patients have fixed orthodontic appliance with 0.019 x 0.025 – inch stainless steel archwire in upper and lower arches. The rationale behind this study is to detect the effect of obesity and/or orthodontic treatment on the levels of the selected biomarkers in different bio-fluids.

The *second* study is a prospective study in which data was collected from 12-18 years old normal weight and obese patients at 4 time-points: (T1) prior to treatment at the normal records appointment; (T2) 1 hour following placement of the fixed appliance; (T3) 1 week following placement of the fixed appliance; and (T4) at the end of alignment stage

(0.019 x 0.025 – inch stainless steel archwire in the lower arch). The responses to orthodontic treatment were assessed in different ways: (1) Rate of tooth movement using dental study casts (T1, T3, T4); (2) Pain and discomfort using a self-reporting questionnaire (1st week); and (3) Biochemical assay of markers in UWMS, GCF and peripheral blood (T1, T2, T3, T4).

The data of this study presented that the rate of OTM was significantly higher in obese patients compared to normal weight, and obese patients needed less time to achieve tooth alignment compared to normal weight, but this was non-significant. Obese patients experience higher mean pain than normal weight patients accompanied by higher consumption of analgesics. Alongside, GCF was more likely to express biochemical changes during OTM compared to UWMS and blood, with GCF-levels of leptin, resistin, MPO and RANKL were significantly different between obese and normal weight patients and associated with observed rates of OTM.