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COMPARISON OF PAIN EXPERIENCED DURING FIXED ORTHODONTIC TREATMENT USING SUBJECTIVE PAIN QUESTIONNAIRES VERSUS OBJECTIVE SALIVARY PAIN BIOMARKERS – A PROSPECTIVE STUDY

By

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ABSTRACT

BACKGROUND: Conventionally, the degree of pain was assessed subjectively using many pain scales. Assessing pain with biomarkers would benefit the clinician for appropriate pain diagnosis and management. Several pain related molecular biomarkers were detected in saliva. It was recently discovered that several new isoforms of Brain Derived Neurotrophic Factor (BDNF) and Calcitonin Gene Related Peptide (CGRP) were found in saliva. These could be the biomarkers for the detection of pain. There is no reported literature till date which identified biomarkers to assess orthodontic pain. This study is the first effort to objectively assess pain during the orthodontic therapy.

OBJECTIVES: To evaluate the presence and concentration of salivary pain biomarkers CGRP and BDNF at various stages of the orthodontic treatment and comparing between the subjective pain scales namely Numerical Rating Scale (NRS), Visual Analogue Scale (VAS), Verbal Rating Scale (VRS) and McGill Pain Questionnaire (MPQ).

MATERIALS & METHODS: Consented patients (n = 40) undergoing orthodontic therapy, having moderate crowding with pre-molar extraction were recruited in the study. The whole unstimulated saliva was collected and stored at -80°C until further analysis. Levels of CGRP and BDNF in salivary samples was assessed by ELISA Kit available commercially. ELISA was performed at different time intervals (0,24,48,72 and 168 hrs). Analysis of ELISA optical density (OD) value was done using 4 – parameter logistic regression curve analysis. A single consolidated questionnaire constituting the condensed case history and following subjective pain scales namely NRS, VAS, VRS and MPQ was administered to each subject during each sample collections time period.

RESULTS: There was an evidence of presence of physiological pain biomarkers BDNF and CGRP in saliva during the fixed orthodontic therapy from our study since the Regression (R^2) value was more than 0.9. The statistical tests for the comparison of various subjective scales like NRS, VAS, VRS and MPQ suggested that the distribution of all subjective pain score variables is significantly different between every time point which is statistically significant ($p<0.0001$). There is significant difference between objective pain score namely CGRP and BDNF over time points ($p<0.0001$). Comparison between subjective and objective pains scores at 48hrs and 72hrs showed that BDNF concentration was correlating with NRS and VAS ($p=0.003$) respectively.

CONCLUSIONS: There was a positive correlation between molecular pain biomarker BDNF concentration with all conventional pain scales namely VAS, VRS, NRS and MPQ assessed. From our study results we can consider BDNF as a better molecular pain biomarker in saliva than CGRP.

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KEYWORDS: Orthodontic Pain; Biomarkers; Saliva; Pain questionnaire; Fixed orthodontic therapy; Enzyme Linked Immunosorbent Assay (ELISA).