ORIGINAL ARTICLE

LABIAL GINGIVAL RECESSIONS AND THE POST TREATMENT PROCLINATION OF MANDIBULAR INCISORS

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Background: Labial gingival recessions are a common periodontal condition characterized by the apical migration of the gingival margin, which can impact dental aesthetics and health. The proclination of mandibular incisors following orthodontic treatment has been implicated as a contributing factor to the development or exacerbation of such recessions. This study investigates the relationship between post-treatment incisor proclination and the occurrence of labial gingival recessions to perform clinical strategies for minimizing periodontal complications. Objectives were to evaluate the relationship between the mandibular incisor's proclination and the emergence of gingival recession. **Methods:** After obtaining ethical committee approval, this prospective cohort study was conducted at the Department of Orthodontics, Frontier College of Dentistry from March 2019 to March 2024, involving 180 participants that met the inclusion criteria and followed up after one year. Assessments included clinical crown height measurements, gingival recession presence, and cephalometric analysis. Crown heights were measured on plaster models at TS, T0, and T5 with an electronic caliper. Recessions were noted at T5 if the labial cement enamel junction was exposed. Cephalometric radiographs marked specific landmarks to assess incisor inclination at TS, T0, and T5. Participants were grouped based on post-treatment incisor inclination: <95°, 95°–100.5°, and >100.5°, with further analysis focusing on the non-proclined (<95°, N=60) and proclined (>100.5°, N=60) groups. **Results:** The mean age of all the patients were 36.99±10.7 years. The mean elevation in clinical crown heights from T0 to T5 for mandibular incisors showed a range of 0.79 to 0.87 mm in the non-proclined group and the proclined group, respectively, with no significant P-value. The mean increase in clinical crown heights for the lower incisors post-treatment (from T0 to T5) varied from 0.58 mm to 1.32 mm in the Proclined group and 0.64 mm to 0.89 mm in the non-proclined group **Conclusion:** It was concluded that the inclination of mandibular incisors did not pose an elevated risk for the occurrence of gingival recession during a five-year observation period when compared to non-proclined teeth.

Keywords: Gingival recession; Proclination; Cemento Enamel Junction (CEJ)

Citation: Zahid H, Ahmad N, Ijaz F. Labial Gingival recessions and the post treatment proclination of mandibular incisors. J Ayub Med Coll Abbottabad 2024;36(4):788–92.

DOI: 10.55519/JAMC-04-13588

INTRODUCTION

Gingival recession is the condition characterized by the exposure of the tooth roots, resulting from the displacement of the gingival (gum) tissue away from the tooth crown. This leads to a lower positioning on the tooth and the potential exposure of the root surface.[1] The cemento-enamel junction (CEJ) is the area where the enamel on the crown meets the cementum on the root of the tooth. It is more commonly observed in older individuals compared to younger ones.[2] Localized gingival recession and the subsequent exposure of the tooth roots can pose aesthetic concerns for patients.[3] The appearance of longer teeth and exposed roots can impact the overall harmony and aesthetics of the smile.[4] The exact etiology of gingival recession may has not been identified however several predisposing factors have been identified.[1] These factors can contribute to the development or exacerbation of gingival recession. Chronic gum inflammation (gingivitis or periodontitis) is a significant contributor to gingival recession. Brushing the teeth too vigorously or using a toothbrush with hard bristles can contribute to the abrasion of gum tissue and enamel, leading to recession.[5] Malocclusion, genetic, tobacco use and trauma are also the most common causative factors.[6] Changes in the shape of the dental arch can indeed result in incisor proclination. The dental arch refers to the curved alignment of the teeth in the upper and lower jaws.[7] If there are alterations in the size or shape of the dental arch, it can impact the positioning of the teeth, including the incisors. Incisor proclination specifically refers to the forward movement or inclination of the incisor teeth.[8] The main aim of the present study is to evaluate the

relationship between the mandibular incisor's proclination and the emergence of gingival recession. The study can contribute valuable insights to dental practitioners, assisting in optimizing treatment approaches to achieve both proper tooth alignment and gingival health.

Objective of the study was to evaluate the relationship between the mandibular incisor's proclination and the emergence of gingival recession.

MATERIAL AND METHODS

The study was designed as a cohort study and conducted at the Department of Orthodontics, Frontier College of Dentistry. A non-probability purposive sampling technique was employed to recruit patients for participation. The inclusion criteria consisted of individuals aged between 18 and 40 years, with fully erupted mandibular incisors prior to treatment and no apparent incisal edge wear. Participants were required to have labial gingival recessions in the mandibular incisors, varying in severity, and must have undergone orthodontic treatment involving the proclination of mandibular incisors. Both male and female individuals were included in the study. Exclusion criteria encompassed participants with severe periodontal disease, pregnant women (due to the potential impact of hormonal changes on gingival health), those who had previously undergone orthodontic treatment specifically for labial gingival recessions, individuals with poor-quality dental casts, especially in the gingival margin area, smokers or tobacco users, and individuals diagnosed with Diabetes Mellitus

After the approval of hospital ethical committee, this prospective cohort study was conducted in the Department of Orthodontics, Frontier College of Dentistry from March 2019 till March 2024. An informed consent was obtained from all enrolled patients, duly signed by the patients and the researcher. The purpose of the study was explained to all participants, and assurances were provided regarding the confidentiality and security of their data. Total of 120 individuals were enrolled after fulfilling the inclusion criteria. All the patients were followed after 1,2,3,4 and 5^{th} year and the data were noted in a predesigned questionnaire. Three categories of evaluations were conducted to assess post-treatment changes: 1. Clinical crown height measurements, 2. Evaluation of gingival recession site presence and clinical crown heights were determined by measuring the distances between the incisal edges and the deepest points of the curvature of the vestibulo-gingival margins. Plaster models of all mandibular incisors were created at TS, T0, and T^5, and measurements were conducted by a single investigator using an electronic caliper with a precision of 0.01 mm. Each tooth's recession at the pre-treatment stage (TS) was individually assessed on plaster models by two calibrated observers, who then provided a Yes or No classification. At the five-year mark after treatment (T5), the assessment focused on identifying gingival recessions in the lower incisors. Any instance of an exposed labial cementoenamel junction resulted in the notation of a recession, categorized as "Yes." Lateral cephalometric radiographs captured at TS, T0, and T5 were utilized to outline specific landmarks, including the incisal edge (ie) and apex (ap) of the lower incisor, Menton (the lowest point of the mandibular symphysis), and Gonion (the most inferior posterior point of the mandibular angle). The angle formed by the line connecting, Menton and Gonion landmarks and the line joining the incisal edge and apex (ie-ap) was employed to approximate the incisor inclination at each of the specified time points.

The sample was split into three groups of similar size based on the mandibular incisors' post- treatment inclination with respect to the mandibular plane (Inc_Incl at T0):

1. Inc_Incl < 95°,
2. Inc_Incl ≥ 95° and ≤100.5°, and
3. Inc_Incl > 100.5°.

For the purposes of the subsequent analysis, only patients with Inc_Incl < 95° (non-proclined group, N = 60) and those with Inc_Incl > 100.5° (proclined group, N = 60) were included.

For statistical analysis SPSS Version 25 were used. The results for all Quantitative variables: age, will be expressed as mean ± standard deviation. Frequency and percentage will be presented for qualitative data. Chi square test was used for comparison between both groups. The relationship between the degree of proclination and age, gender, and group classification were determined using multiple linear regression analysis.

RESULTS

The mean age of all 120 patients was 36.99±10.7 years. 2 increase in clinical crown heights for mandibular incisors from T0 to T5 varied from 0.79 to 0.87 mm, respectively, with a non-significant P-value. In both groups the number of male patients were 31 (51.7%) and 35 (58.3%) while the female patients were 29 (48.3%) and 25 (41.7%) respectively. In our study 18 (66.7%) and 9 (33.3%) patients underwent extraction treatment in non-proclined and proclined group respectively. 42 (45.2%) and 51 (54.8%) patients underwent non-extraction treatment in non-proclined and proclined group respectively. The lower incisors' mean rise in clinical crown heights from T0 to T5 varied between 0.58 mm and 1.32 mm in the Proclined group and 0.64 mm and 0.89 mm in the non- Proclined group following treatment. There were statistically significant variations in the crown height increases for every tooth. According to the results of the regression analysis, there was no significant difference in the clinical crown heights of lower incisors between the independent factors.

Table-1: Mean age of all enrolled patients (n=120)

Variable	
Age (Years)	36.99±10.7

Table-2: Distribution of patients on the basis of gender and treatment alternative of both groups

	Non-Proclined	Proclined	*p*-value
Gender			0.46
Male	31 (51.7%)	35 (58.3%)	
Female	29 (48.3%)	25 (41.7%)	
Treatment			0.04
Extraction	18 (66.7%)	9 (33.3%)	
Non extraction	42 (45.2%)	51 (54.8%)	

Table-3: Characteristics of the patients of both groups

	Non-Proclined	Proclined	*p*-value
Age at Ts	12.5 (0.87)	12.3 (0.76)	0.18
Age at T0	15.5 (0.85)	14.4 (0.76)	0.00
Treatment time (Ts to T0)	3.11 (1.02)	2.18 (0.98)	0.00
Time from Ts to T5	5.43 (1.01)	5.60 (0.99)	0.36
Inc_Incl at Ts	90.5 (2.61)	98.8 (5.52)	0.00
Inc_Incl at T0	91.5 (3.26)	106.2 (2.68)	0.00
Inc_Incl at T5	91.7 (3.34)	106.4 (2.58)	0.00

Table-4: The increase (in mm) of mean clinical crown height of lower incisors after treatment (from T0 to T5)

Tooth No	Non Proclined	Proclined	*p*-value
Tooth 31	0.46 (0.03)	0.71 (0.05)	0.00
Tooth 32	0.87 (0.0.3)	1.32 (0.37)	0.00
Tooth 41	0.67 (0.05)	0.58 (0.05)	0.00
Tooth 42	0.89 (0.04)	0.92 (0.03)	0.001

Table-5: Results of regression analysis

Tooth No.	Proclined	*p*-value
Age at TS	0.200	0.07
Gender	-0.189	0.30
Proclined group	6.293	0.42

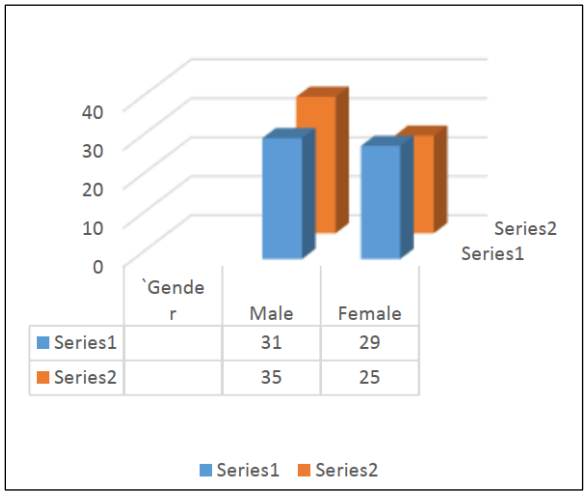

Figure-1: Frequency of gender in both groups

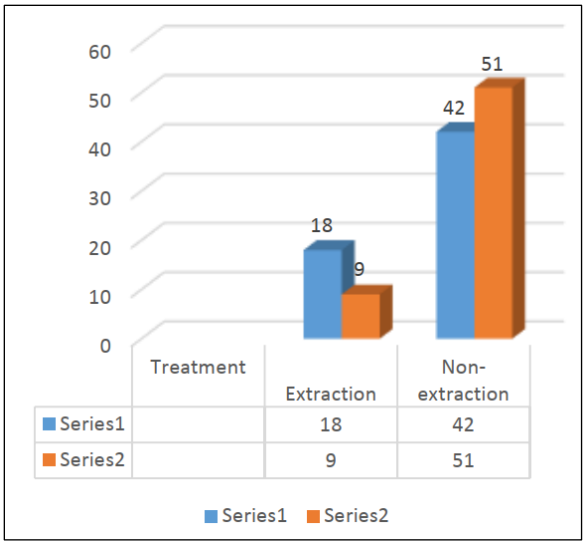

Figure-2: Frequency of extraction/non-extraction in both groups

DISCUSSION

The traditional approach in orthodontics often involved the extraction of certain teeth to create space and align the remaining teeth. But orthodontics is currently witnessing a growing tendency where an increasing number of patients undergo treatment without the need for tooth extraction.

In 1986, it was more common for orthodontic patients in the USA to undergo extraction of teeth as part of their treatment plan. This approach was often used to address issues such as crowding in the mouth. However, by 2008, there was a notable decrease in the percentage of orthodontic patients undergoing extractions.[9] This change is likely associated with advancements in orthodontic techniques. The present study was conducted in order to evaluate the relationship between the mandibular incisor's proclination and the emergence of gingival recession. Gingival recession refers to the exposure of the roots of the teeth due to the loss of gum tissue, leading to the lowering or pulling back of the gum line.

The present study finding could have implications for orthodontic treatment planning and may suggest that achieving a proclined position of the lower incisors may not be a significant risk factor for gingival labial recession. The incidence of recession sites in individuals with mandibular incisors that were proclined at the end of treatment was comparable to those whose mandibular incisors maintained a relatively constant inclination throughout both treatment and the retention phase. There was no difference in the average increase of clinical crown heights between

the proclined and non-proclined groups. In all teeth increase of mean clinical crown height of lower incisors after treatment (from T0 to T5) have a significant *p*-value of ≤0.05. A number of studies support our finding.[10–13]

When compared to non-proclined teeth, proclination of mandibular incisors did not appear to increase the likelihood of gingival recession developing over the course of a five-year observation period, according to a study by Anne-Marie Renkema *et al.*[13] In the findings of our study, we did not identify any elevated risk for the development of gingival recession during a five-year observation period when comparing it to non-proclined teeth. This finding means that after a five-year observation period, there was no evidence to support the idea that the proclination of mandibular incisors was associated with an elevated risk of developing gingival recession.

In other words, individuals with mandibular incisors that were proclined did not experience a higher likelihood of gingival recession compared to those with non-proclined teeth during this specific observation period. This finding may indicate that the proclination of mandibular incisors did not emerge as a significant factor contributing to gingival recession over the specified five-year timeframe. Ruf *et al.*[10] evaluated the impact of Herbst appliance therapy on the development of gingival recession in teenagers in Class II. Proclining lower incisors by nearly 9° did not raise the likelihood of recession, according to the authors' findings. Neither the incidence of recession sites nor the maximal proclination (16 participants; mean = 16.4°) nor the minimal proclination (17 participants; mean = 2.7°) differed significantly between the subgroups in terms of crown height. The incisors' end-of-treatment inclination in relation to the mandibular plane, however, was not disclosed by the authors, therefore it is only reasonable to conclude that the incisors were excessively inclined following treatment. In the present study all participants maintained consistent retention throughout the entire post- treatment duration. We specifically chose individuals with bonded retainers due to a prevailing practice among orthodontists favoring retention methods that do not rely on patient compliance. A number of studies have shown that prolonged use of fixed retention has a restricted impact on periodontal health.[14–16]

CONCLUSION

The proclination of lower incisors at the treatment's end did not seem to have an impact on the occurrence of labial gingival recession or changes in clinical crown heights within this group of patients.

AUTHORS' CONTRIBUTION

HZ: Conception and design, literature search and write up. NA: Acquisition of data, analysis and interpretation. FI: Analysis interpretation and proof reading

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Submitted: July 12, 2024	*Revised: November 19, 2024*	*Accepted: November 24, 2024*

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