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COMPARATIVE EVALUATION OF SOFT-TISSUE CHIN COMPENSATION IN SKELETAL CLASS I AND CLASS III MALOCCLUSION

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ABSTRACT

Soft tissue analysis is integral for patients undergoing orthodontic treatment. Both hard and soft tissues must be considered for harmonious facial esthetics and optimal occlusion. As there has been the latest paradigm shift from hard tissue to soft tissue and how it is affected in treatment. Visualizing only the hard tissues alone, i.e., the teeth and jaws in terms of discrepancy posed a problem which could be easily tackled in a direct manner to achieve ideal values. But soft tissue drape compounded the problem. This is due to the variability in soft tissue thickness covering the teeth and bone. Hence, the aim of the present study was to evaluate and compare soft tissue thickness in skeletal class I and class III pattern Materials and methodology-This was a retrospective study based on a university-setting wherein the lateral cephalograms of the patients who had visited saveetha dental college and hospital were retrieved. The total sample consisted of 20 lateral cephalograms. Independent t-test was carried out to evaluate soft-tissue chin thickness difference between skeletal class I and class III. Chi-square test was done to evaluate gender association. The significance level for the p-value was set at 0.05. Independent T-test reported that there was a statistically significant soft-tissue chin thickness observed between skeletal class I and class III ($p=0.02$, $p<0.05$). Chi-square test indicated that there was a statistically significant association observed in gender ($p=0.012$, $p<0.05$) Within the limitations of this study, it was concluded that there was a significant soft-tissue chin thickness observed between skeletal class I and class III. There was a statistically significant association of soft tissue chin thickness at Pog in both males and females.

KEYWORDS-

Skeletal malocclusion; skeletal class I; skeletal class III; soft tissue chin

INTRODUCTION

Soft tissue analysis is integral for patients undergoing orthodontic treatment. Both hard and soft tissues must be considered for harmonious facial esthetics and optimal occlusion. Soft tissue relationships are not considered to be one of the limitations in orthodontic treatment and also a major deciding factor producing questions in one's mind regarding success or failure of any given treatment.(Khomich, no date; Bali, 2018)(Brodsky, 1978) For appropriate diagnosis and treatment planning, cephalometric soft tissue analysis

is essential. As there has been a latest paradigm shift from hard tissue to soft tissue, it has affected the treatment planning.(Holdaway, 1983) Visualizing only the hard tissues alone, that is, the teeth and jaws in terms of discrepancy, posed a problem which could be easily tackled in a direct manner to achieve ideal values but soft tissue drape compounded the problem. This is due to the variability in soft tissue thickness covering the teeth and bone. The hard tissue measurements deviate considerably from the overlying facial form. This was observed in Class III cases, where a higher degree of dentoalveolar compensation masked the severity of the bony discrepancy. This was then reflected in the soft tissue profile.(Park *et al.*, 2018) Soft tissues play a significant factor in determining a patient's final facial profile. Many investigations have emphasized on the importance of soft tissue in determining facial aesthetics on the basis that soft tissue behaves independently from the underlying skeleton.(Abe and Loenneke, 2019) Due to the increasing acceptance of shift in paradigm, the diagnosis and orthodontic treatment planning are established predominantly by soft tissue considerations than skeletal/ dental relationships.(Ackerman, Proffit and Sarver, 1999)
Hence, the aim of the present study was to evaluate and compare soft tissue thickness in skeletal class I and class III patterns.

MATERIALS AND METHODOLOGY-

Study setting

This was a retrospective study based on a university-setting wherein the lateral cephalograms of the patients who had visited saveetha dental college and hospital were retrieved and assessed. Lateral cephalograms of mesomorphic subjects were included in the study and subjects with a previous history of orthognathic surgery were excluded from the study.

Sampling

After applying the inclusion and exclusion criteria, group A consisted of 10 case records of skeletal class I malocclusion and group B consisted of 10 case records of skeletal class II malocclusion. The sampling method carried out was randomized sampling and to minimize sampling bias, simple random sampling was carried out.

Measurement of the soft-tissue chin

The lateral cephalograms retrieved were taken using the standardized cephalostat and in a natural head position. All assessments were performed by a single investigator A.T. The sagittal relationship was assessed by ANB angle. The soft tissue thickness was measured from Pog-Pog' that is the point between bony pogonion and its horizontal projection over the vertical passing soft tissue pogonion (Pog'). All the angular and linear cephalometric measurements were made by a single investigator on randomly selected cephalograms.

Data analytics

After collection of the data from the subjects, the data was analyzed. Independent t-test was carried out to evaluate soft-tissue chin thickness difference between skeletal class I and class III. Chi-square test was done to evaluate gender association. The significance level for the p-value was set at 0.05.

RESULTS AND DISCUSSION

Fig 1- Bar graph represents the soft tissue thickness in skeletal class I and class III. X-axis represents the skeletal class I and class III and Y-axis represents the soft tissue chin thickness. Independent t-test was done to evaluate the soft tissue chin thickness in skeletal class I and III. There was a statistically significant

difference in soft-tissue chin thickness observed between skeletal class I and class III. Independent t-test p value=0.002 ($p<0.05$). Fig 2. Bar graph represents the association between gender and type of malocclusion for soft tissue chin thickness. Chi-square test was done to evaluate the association of mean soft tissue chin thickness in gender and the association was found to be statistically not significant. Chi-square test value- 2.00, df- 1, p value= 0.157 ($p>0.05$) hence, there are no gender differences in soft tissue chin thickness between skeletal class I and III malocclusion

Previously our team had conducted numerous clinical trials such as stress distribution patterns at mini-implant sites(Sivamurthy and Sundari, 2016), effects of bisphosphonate on tooth movement(Krishnan, Pandian and Kumar S, 2015), evaluation of ball headed implant(Vikram and Raj Vikram, 2017), recycling methods(Kamisetty *et al.*, 2015), study on obstructive sleep apnea(Viswanath *et al.*, 2015), quantification of intrusive/retraction forces during en-masse retraction(A. Sumathi Felicita, 2017) and comparative evaluation of bis-GMA(Samantha *et al.*, 2017). Lab animal studies such as gonial angle indicator for growth prediction(Rubika, Sumathi Felicita and Sivambiga, 2015), intrusion effects on maxillary incisors using different mechanics(Jain, Kumar and Manjula, 2014), angular photogrammetric evaluation of facial profile(Pandian, Krishnan and Kumar, 2018), confocal study studying the depth of resin penetration into enamel(Ramesh Kumar *et al.*, 2011) and orthodontic management of dilacerated central incisors(A. S. Felicita, 2017). In-vitro studies such as an apparatus designed to measure orthodontic forces(Dinesh *et al.*, 2013), orthodontic extrusion of ellis class VIII fracture(Felicita, 2018) and determination of craniofacial relation among different subethnic groups(Felicita, Chandrasekar and Shantha Sundari, 2013). Now we are focussing on epidemiological surveys, the idea for this study stemmed from the current interest in our community.

The soft-tissue thickness for every patient is an important factor to consider during the orthodontic assessment. Many times a severe skeletal problem is masked by favourable soft-tissues. As suggested by Arnett and Gunson, the patient must be positioned in a relaxed position for viewing the soft-tissue profile. They suggested that the patient must be in a relaxed lip position while evaluating the soft-tissue profile since this position demonstrates the relationship of soft-tissue to hard tissues without muscular compensation of dento-skeletal abnormalities.(Arnett and Gunson, 2005)

In the present study, a significant soft-tissue chin thickness was observed in skeletal class I and class III malocclusion.This finding is in agreement with the study conducted by Abdul et al wherein he reported that a significant soft tissue chin thickness difference among different skeletal malocclusions was observed (Jabbar *et al.*, 2016).

However, the findings of this present study are not in agreement with a study conducted by S.M Asif et al wherein it was reported that there was no significant difference in values of soft tissue chin thickness between skeletal class I and class III.(Nilendu, 2020) Similarly, statistically insignificant difference was observed between skeletal class I and class III as reported by Hasan et al.(Kamak and Celikoglu, 2012)

In this present study, the chi-square test reported that statistically significant association of soft tissue chin thickness in both males and females ($p=0.012$, $p<0.05$) and soft-tissue chin thickness was more in females. This finding is similar to the study conducted by Neslihan et al who reported that the soft tissue chin-thickness at pogonion was significant for both males and females but this was observed in high-angle cases unlike the present study.(Cezairli, 2017)

On the contrary, a study reported by Somaiah et al reported that soft tissue chin thickness was greater in men than in women but they evaluated in different growth patterns.(Khan *et al.*, 2017) Similarly, a study conducted by Anthony et al reported that the soft tissue chin thickness is statistically significantly greater in men than women.(Macari and Hanna, 2014)

Small sample size and limited availability of literature are limitations to this study. The present study was conducted on lateral cephalograms. The lateral cephalograms give a 2 dimensional view of a 3

dimensional object and distortions, differences in magnification, superimposition of bilateral craniofacial structures are major limitations of lateral cephalograms. Future scope of this study indicates that the use of CBCT will give a broader understanding of soft tissue thickness in various skeletal malocclusions.

CONCLUSION

Within the limitations of this study, it was concluded that the soft tissue chin thickness was significantly increased in females when compared to males and it was increased in class III malocclusion when compared to class I malocclusion.

AUTHOR CONTRIBUTIONS

This research study was done by combined efforts of all authors.

CONFLICT OF INTEREST

There is no conflict of interest.

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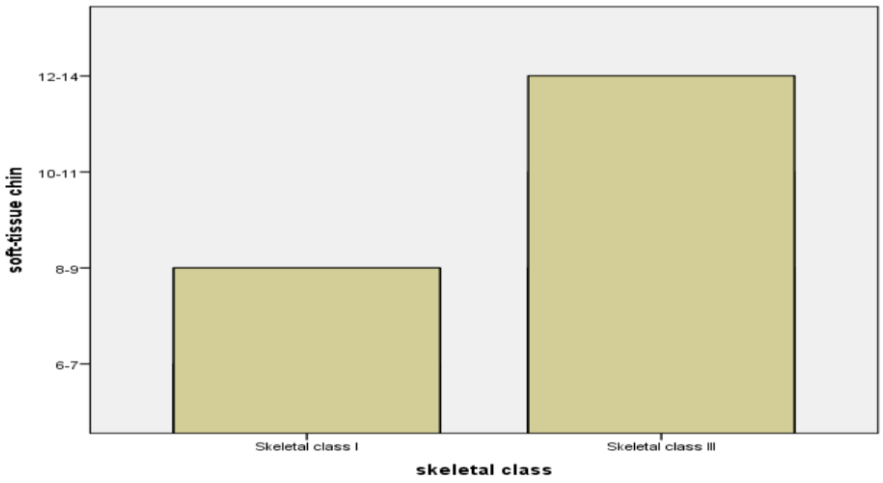

Fig 1: Bar graph represents the soft tissue thickness in skeletal class I and class III. X-axis represents the skeletal class I and class III and Y-axis represents the soft tissue chin thickness. Independent t-test p value=0.002 ($p<0.05$) hence statistically significant difference, proving soft-tissue chin thickness is increased in skeletal class III than skeletal class I.

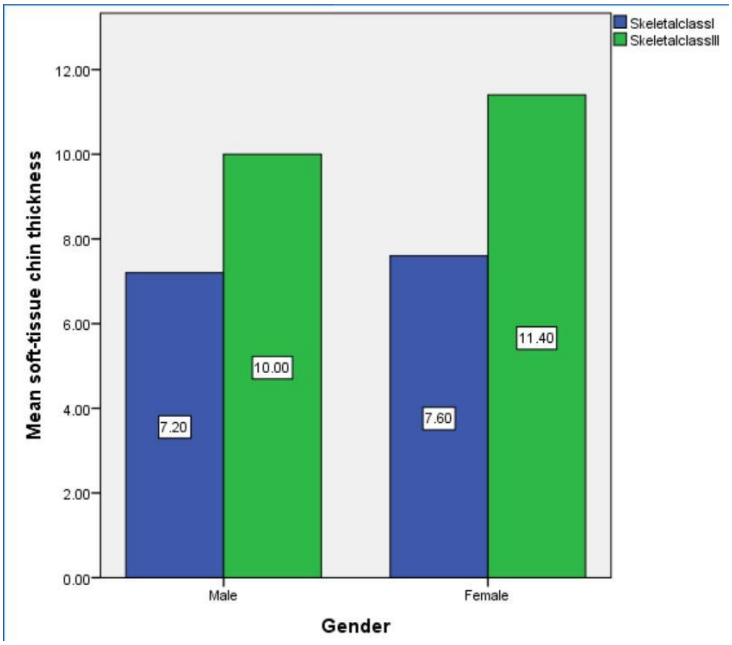

Figure 2. Bar graph represents the association between gender and type of malocclusion for soft tissue chin thickness. X-axis represents the gender and Y-axis represents the mean soft tissue chin thickness in class I and class III malocclusion.Chi-square test value- 2.00, df- 1, p value= 0.157 ($p>0.05$) Although there is a difference in soft-tissue chin thickness between both genders, the values are statistically not significant.