

Comparative Evaluation of Soft Tissue Changes in Borderline Cases Treated With Extraction and Non-Extraction Modalities

¹Dr.Aarif Ansari*, PG Student, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

²Dr.Tushar Patil, HOD & Professor, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar

³Dr. Avinash Mahamuni, Professor, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

⁴Dr.Krishnakumar Jaju, Reader, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

⁵Dr. Ketan Gore, Sr. Lecturer, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

⁶Dr Snehal Pathak, Sr. Lecturer, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

⁷Dr. Rajkiran Lokhande, Sr. Lecturer, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

Corresponding Author: Dr.Aarif Ansari, PG Student, Department of Orthodontics, YCMM & RDF's Dental College, Ahmednagar.

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

The purpose of this study was to compare changes of soft tissue profile in patients treated with borderline extraction and non-extraction cases. Pre and Post treatment lateral cephalogram of 40 subjects (20 extraction & 20 non-extraction) were assessed. Carey's analysis was done to confirm the borderline samples. Pre-treatment and Post-treatment cephalogram of the borderline samples were analyzed using 6 soft tissue parameters. In which Nasolabial angle, Labiomental angle, H angle, Lip chin submental angle, upper and lower sulcus depth to H line as well as upper and lower lip to E line were evaluated for study. Although the premolar extraction group showed greater soft tissue changes with treatment, post-treatment comparisons showed that both extraction and non-extraction groups finished within the almost same soft tissue parameters. The effects of the two types of orthodontic treatment (i.e. extraction and non-extraction) on the facial soft tissues were very similar; indicating that treatment, involving the extraction of premolars, does not

have a detrimental effect on facial aesthetics provided the decision to extract is on sound basis.

Keywords: Extraction, Non-extraction, Borderline case, Soft tissue changes, cephalograph, Carey's Analysis.

Introduction

Now a day's one of the major reasons patients seek orthodontic treatment is to improve their facial appearance.¹ For more than 100 years, soon after that the practitioners recognized that orthodontic treatment can influence the patient's profile and esthetics, the extraction of teeth in orthodontics has been a matter of debate.² According to Angle maintenance of a full complement of teeth would establish the best harmony, and nature would allow this to happen through growth, development, and function.^{3,4} Angle's student Tweed on the other hand, was not pleased with the facial imbalance found in a great majority of the patients he had treated without extractions and his clinical studies led him to re-treat more than 100 of his non-extraction patients with premolar extractions.⁵ Several authors hold a strongly negative view of

extraction treatment because they believe that such therapies produce dished-in profiles, flatten the face and make the lips more retrusive thus giving the individual an older appearance.^{6,7,8,11}

According to Dewel, the challenge of orthodontic diagnosis is not in those cases that reportedly requires extraction or those that clearly do not, but in large group known as borderline cases.¹³ A case is borderline when extraction of permanent teeth is required to reach a stable and functional occlusion, but when the patient has good facial esthetics that could be disturbed by extractions. Borderline case may also be defined as the case caught in between the conflict of extraction and non-extraction.^{9,10}

So the aim of the present study is to compare soft tissue morphology changes by cephalometric measurements before and after orthodontic treatment in border line extraction and border line non-extraction cases. This study will also help to evaluate that patients treated with extraction of premolars will improve or harm the esthetics of the soft tissue profile.

Aims and Objectives

To compare soft tissue morphology changes by cephalometric measurements before and after orthodontic treatment in borderline cases treated with extraction and non-extraction modalities, and to evaluate that patients treated with extraction will improve or harm the esthetics of the soft tissue profile.

Material and methods

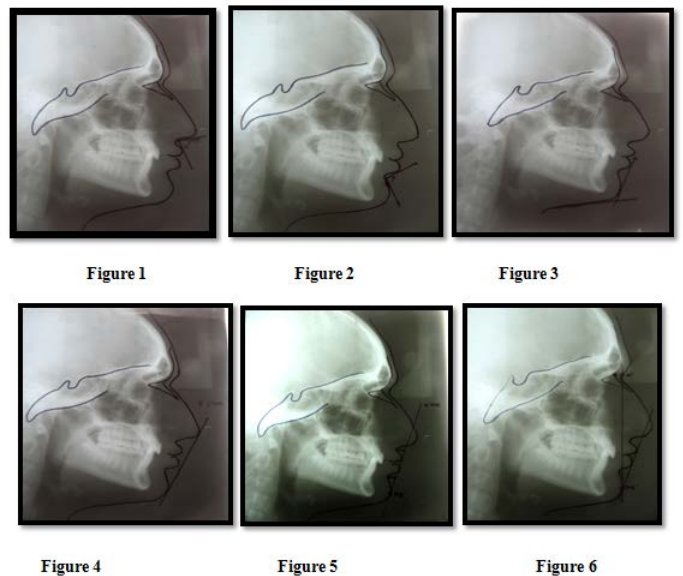
This In-vitro study was carried out in the Department of Orthodontics and Dentofacial Orthopedics, YCMM & RDF's dental college, Ahmednagar. The available records of the patient who visited Department of orthodontics for treatment purpose were used for the study. Pre- and post-treatment lateral cephalograms of 40 subjects (20 extraction & 20 non-extraction) were assessed. *Carey's analysis* was performed for selection of borderline cases.

Carey has set 2.5-5 mm Tooth-Size Arch Length Discrepancy (TSALD) as a borderline case.¹⁴ *Gust*, concluded "amount of maxillary arch length discrepancy may range from 6 to 8 mm for borderline cases."¹⁰ Patients were having either Class I or Class II skeletal relation were included. Patients having missing teeth were excluded from the study. Study consisted with (14 - 29) years patients.

Parameter

1. Nasolabial angle.(fig.1)
2. Labiomental angle.(fig.2)
3. Lip chin submental angle(fig.3)
4. E-line to upper lip(fig.4)
5. E-line to lower lip(fig.4)
6. H-line to upper sulcus depth(fig.5)
7. H-line to lower sulcus depth(fig.5)
8. H-angle(fig.6)

(Ilken Kocadereli, 2002; Alexander Jacobson,1985)^{26,27}



Statistical analysis

All the parameters were measured and analyzed by using pre-treatment and post treatment cephalometric records of patients. Mean and Standard deviation were calculated. T-test were performed to test the significance of difference (P value) between the change values.

Table 1 : Borderline Non extraction cases

Sr no	Parameters	Mean		SD		T-value	P-value
		Pre	Post	Pre	Post		
1	Nasolabial angle	91.10	99.10	16.15	16.35	2.50	0.0214
2	Labiomental angle	103.65	104.25	17.19	19.52	0.18	0.8576
3	Lip chin submental angle	122.85	120.45	12.27	11.60	1.23	0.2330
4	E – line to upper lip	-1.30	-2.10	2.49	2.65	1.84	0.0802
5	E – line to lower lip	0.55	-0.10	2.28	2.40	1.57	0.1312
6	H-line to upper sulcus Depth	-7.40	-6.60	1.98	2.66	1.24	0.2286
7	H-line to lower sulcus depth	-5.25	-4.90	1.55	1.97	0.77	0.4451
8	H-angle	19.25	17.35	5.17	4.44	2.84	0.0401

Table 2 : Borderline Extraction group

Sr no	parameters	mean		SD		T-value	P-value
		pre	post	pre	post		
1	Nasolabial angle	90.90	94.50	12.15	8.49	1.91	0.0704
2	Labiomental angle	107.30	109.40	19.16	18.88	0.49	0.6259
3	Lip chin submental angle	133.70	129.00	10.87	11.64	2.10	0.0490
4	E – line to upper lip	-0.25	-2.45	3.16	2.84	5.77	1.461
5	E – line to lower lip	2.65	0.80	2.83	2.69	5.28	4.217
6	H-line to upper sulcus Depth	-8.75	-6.70	3.06	2.83	3.79	0.0012
7	H-line to lower sulcus depth	-4.80	-4.80	2.09	1.51	0	1
8	H-angle	21.25	17.65	5.52	5.13	2.5320	6.60

Result

Parameters	Borderline extracted	Borderline non-extracted
Nasolabial angle	Not significant	Significant
Labiomental angle	Not Significant	Not Significant
Lip-chin submental angle	Significant	Not Significant
Upper lip and lower lip E line	Significant	Not Significant
	Significant	Not Significant

Upper and lower sulcus depth in H line	Significant	Not Significant
	Not Significant	Not Significant
H angles	Significant	Significant

Discussion

Nasolabial angle

In the present study the nasolabial angle was increased in non extraction group in comparison to extraction group. It may be because most of the spaces in borderline extraction cases is created by second premolar extraction and utilized for crowding correction.¹³ Therefore; extraction of teeth in a borderline patient with a nasolabial angle greater than the normative values should be avoided.¹⁰ There is weak and negative correlation between nasolabial angle and maxillary incisor inclination.²⁸

Labiomental angle

In this present study extraction and non-extraction groups showed non-significant values. No significant changes occurred in pre and post treatment labiomental angle in both the groups. De Smit and Dermaut (1984) reported that a flattening of the mental fold leads to a more drastic loss of esthetics than a deepening.¹⁵

Lip chin submental angle

In the present study Lip chin submental angle significantly decreasing in extraction cases. The angle will be obtuse in patients with microgenia, excessive submental adipose tissue, and protrusive lower incisors, whereas it will be acute in Class III cases and patients with macrogenia. The nose and chin were found to be, in most cases, independent of orthodontic treatment and affected solely by growth while it was found the lips could be modified with orthodontics (Burstone, 1959; Burstone, 1958; Subtelny, 1961).^{11,16,17}

Upper lip and lower lip to E line

In the present study, borderline extraction cases shows more retraction of upper and lower lips as compared to non-extraction borderline cases. But there is no adverse

effect is seen in extraction group. Steynet al, for instance, suggested that, on average, for the same patient, the choice of which premolars to be extracted would eventually be of little consequence to the overall soft tissue facial appearance of that patient.^{18,19}

Similarly, Boley et al reported that most premolar extraction subjects in their sample commenced treatment with satisfactory facial profiles. Having been treated with extractions to enhance health and stability of the intraoral tissues, the profiles were still apparently most satisfactory.²⁰

Upper and lower sulcus depth to H line

In this present study the upper sulcus depth to H line and lower sulcus depth to H line mean values in both extraction and non-extraction fell within the pleasing normal range, as measured by the Holdaway (1983) H-line.²² According to study of S.Hazar *et al* findings showed that the sulcus inferior to the H line tended to deepen and the lower lip became retruded to the H line in the extraction group whereas the non-extraction group showed almost no change.²¹

H angle

The mean value of H angle is of 7-15° In extraction and non-extraction cases, value of H angle before and after treatment were seen to be changing significantly towards normal range value. Similar results were obtained in the study of Tian-Min Xu *et al.* (2006) which showed In extraction cases value of H angle before and after treatment were 22±4.86° and 18.37±3.81° respectively and In non-extraction group the mean changes before and after treatment were 21.12±6.55° and 17.75±5.14 ° respectively which seems to be changing towards normal range value.²³

Conclusion

From the present study it was concluded that non-extraction patients have less soft tissue changes as

compared to patients undergoing extraction treatment approach in borderline cases. But the common belief that extraction therapy negatively affects the profile was not confirmed by present finding as all pre-operative and post-operative measurement fell within the pleasing normal ranges.

The important conclusion off overall study is that: The upper and lower lips were more retrusive in extraction groups as compared to non-extraction groups, on which parameters like H angle, lip chin submental angle, Nasiolabial angle and labiomental angle are dependent. Extraction of teeth in a borderline patient with a nasolabial angle greater than the normative values should be avoided. Therefore; precise treatment planning is a must for borderline cases to provide best possible esthetics and stability of the results to the individual.

References

1. Dimitrios Konstantonisa, 2012. The impact of extraction vs nonextraction treatment on soft tissue changes in Class I borderline malocclusions. *Angle Orthod.*, 82:209–217.
2. Bishara SE, Cummins DM, Jakobsen JR. The morphologic basis for the extraction decision in Class II, Division 1 malocclusions: a comparative study. *Am J Orthod Dentofacial Orthop.* 1995;107: 129–135.
3. Angle EH. *Malocclusion of the Teeth and Fractures of the Maxillae.* 6th ed. Philadelphia, Pa: SS White Dental Mfg Co; 1900: 15–23.
4. Angle EH. *Malocclusion of the Teeth.* 7th ed. Philadelphia, Pa: SS White Dental Mfg Co; 1907.
4. Tweed CH. *Clinical Orthodontics.* Vol 1. St Louis, Mo: Mosby; 1966:31–82.
5. Angle EH. 1907. *Malocclusion of the teeth.* SS White Dental Mfg Co, Philadelphia.
6. Calvin SC. 1920. The principles of retention in orthodontia. *Am J Orthod Dentofac Orthop* Nov: 3-34.

7. Tweed C. 1953. Evolutionary trends in orthodontics, past, present, and future. *Am J Orthod.*, 39:81–108
8. Buchin ID. Borderline extraction cases: Facial esthetics and cephalometric criteria as the determinants in the extraction decision. 3. *J Clin Orthod* 1971;5:481-91.
9. Dhiman S, Maheshwari S. A dilemma in orthodontics: Extractions in borderline cases. *J Adv Clin Res Insights* 2015;2:36-39.
10. Burstone C. 1959. Integumental contour and extension patterns. *Angle Orthod.*, 9:93–104.
11. Ricketts RM. 1968. Esthetics, environment, and the law of lip relation. *Am J Orthod.*, Apr;54:272–89.
12. Dewel BF. Second premolar extraction in orthodontics. Principle procedures and case analysis. *Am J orthod.* 1995;41(2):107-20.
13. Carey CW. Diagnosis and Case Analysis in Orthodontics. *Am J Orthod Dentofac Orthop* 1952;38:149-61
14. De Smit A. and Dermaut L. 1984. Soft-tissue profile preferences. *Am J Orthod.*, 86:67–73.
15. Burstone C. 1958. The integumental profile. *Am J Orthod.*, 44:1–25.
16. Subtelny J. 1961. The soft tissue profile, growth, and treatment changes. *Angle Orthod.*, 31:105–22.
17. The Effects of Commonly Prescribed Premolar Extraction Sequences on the Curvature of the Upper and Lower Lips Christopher J. Wholley *Angle Orthodontist*, Vol 73, No 4, 2003
18. Steyn CL, du Preez RJ, Harris AMP. Differential premolar extractions. *Am J Orthod Dentofacial Orthop.* 1997;112:480–486.
19. Boley JC, Pontier JP, Smith S, Fulbright M. Facial changes in extraction and nonextraction patients. *Angle Orthod.* 1998;68:539–546
20. Serpil HAZAR Sercan AKYALIN, Hayal BOYACIOĞLU. 2004. Soft Tissue Profile Changes in Anatolian Turkish Girls and Boys Following Orthodontic Treatment With and Without Extractions. *Turk J Med Sci.*, 34;171-178.
21. Holdaway RA. 1983. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I. *Am J Orthod.*, Jul;84:1–28.
22. Comparison of extraction versus nonextraction orthodontic treatment outcomes for borderline Chinese patients. Tian-Min Xu,^a Yan Liu,^b Min-Zhi Yang,^b and Wei Huang^b *American journal of orthodontics and dentofacial orthopedics* 129(5):672-7 · June 2006
23. Comparative evaluation of soft tissue changes in Class I borderline patients treated with extraction and nonextraction modalities Aniruddh Yashwant V.1, Ravi K.2, Edeinton Arumugam
24. Comparison of extraction versus nonextraction orthodontic treatment outcomes for borderline Chinese patients. Tian-Min Xu, Yan Liu, Min-Zhi Yang and Wei Huang *Am J Orthod Dentofacial Orthop.*, 2006;129:672-7
25. Ilken Kocadereli, 2002. Changes in soft tissue profile after orthodontic treatment with and without extractions. *Am J Orthod Dentofacial Orthop.*, 122:67-72.
26. Alexander Jacobson. Radiographic cephalometry: from basic to videoimaging. 1985.
27. Jan A, Rehman H, Taifur N, Bangash AA. Correlation between nasolabial angle and maxillary incisor inclination. *Pak Armed Forces Med J.* 2015 Dec;65(0):236-39.