

YOUNG DENTISTS' AWARENESS OF CHANGES IN THE FACIAL SOFT TISSUES IN PATIENTS TREATED WITH EXTRACTION OF FOUR BICUSPIDS

MANUELA ANCA POPESCU^a, FLAVIA CALBUREAN^b, OLIVIA NICOLETA POPOVICIU^a and ECATERINA IONESCU^a

^a Department of Ortodontics and Dento-Facial Orthopedics, Faculty of Dental Medicine, U. M. F. "Carol Davila",
Str. Eforie nr 4-6, Bucharest, Romania

^b Resident doctor, Orthodontics and Dento-Facial Orthopedics, year II, "Dr. Dan Theodorescu" Hospital, Bucharest, Romania
Corresponding author: Sef de Lucrari Dr. Manuela Anca Popescu, e-mail: manupopescu@yahoo.com

Received 10 August, 2014

This study aims to evaluate the expertise of young dentists on the results of orthodontic treatment. For this we have surveyed students in the final year of the dental school on aesthetic changes that occurred in the facial profile of patients treated with extraction of four bicuspids. We used a questionnaire that included a set of five questions about 12 patients who underwent orthodontic treatment with extraction of four bicuspids. Each of the 12 cases was illustrated by a pair of images (before and after treatment) and respondents had to identify changes, give grades from 1 to 10 by aesthetic criteria and express their preferences. In parallel, we performed measurements on the patients' cephalograms at the beginning and at the end of treatment using a part of the Holdaway analysis. It was noted that there is a correlation between the extent of the change after treatment and the percentage of respondents who have noticed changes in the patients profiles $p = 0.05486$. For patients in whose cases most students identified changes, notes for aesthetics were strikingly different in the end compared to the beginning $p = 0.08$. Also, there was a consistency between the scores given to the overall situation in each of the photos and preference for starting or final situation regarding upper lip or chin groove (*i.e.* if there was a high grade for the assembly at the end of treatment, the preferred situation for the upper lip and chin was also the final one).

Key words: extraction of bicuspids, aesthetic evaluation, lateral cephalometric measurements

INTRODUCTION

Orthodontic treatment involving extraction of permanent teeth is still a therapeutic modality that encounters resistance from patients or dentists outside the orthodontic specialty. Many authors have collected evidence on the appropriateness of such therapy in selected cases. This paper aims to contribute to knowledge about the aesthetic effects of treatment that included extraction of bicuspids for orthodontic purposes.

Frequency of four bicuspids extraction in orthodontic treatment varied with time¹. Proffit² found a frequency of 10% in the 50 s, 50% in the 60 s, then a decrease to the level of the late 50 s of last century. This fluctuation was due to theories about the stability of the treatments that have known both popularity and decline.

A reduction in the number of teeth along with the orthodontic treatment influences facial harmony and it is desirable that these changes are previewed to achieve ideal balance between the nose, lips and chin³⁻¹¹. Generally shorter dental arch decreases lip protrusion, but the opposite situation exists. One such example was gave by Stromboni¹² who found in his study that in some patients with skeletal Class II/1 open bite treated without extraction, lip protrusion decreased due to the tension (stretching) after a treatment which allowed facial elongation, while patients undergoing extractions reached an enjoyable aspect of the lips, which were not tensed.

The literature is replete with studies aimed at the impact of treatment with extractions on facial aesthetics. Dobroky¹³ found that 90% of patients treated with extraction of four bicuspids presented

soft and hard tissue measurements indicating an improved facial profile or maintained aesthetics after treatment. Many other studies show that it is simplistic and wrong to attribute extraction, unsatisfactory facial esthetics¹³⁻²⁰.

Orthodontists have detailed knowledge at hand that allows a consistent analysis of facial aesthetics and professional assessment of orthodontic treatment outcome. The specialist evaluation criteria are more stringent than those of patients and even those of dentists^{17,21,22}. Paquette et al²³ found that patients who have either suffered 4 bicuspid extractions or had been treated without extractions were evaluated with similar aesthetic results obtained after treatment. Bishara, in a general population study²⁴, found that patients have rated the same results in the extraction treatment group as in the group without extraction at the end of treatment and two years after the cessation of treatment. Another study²⁵ shows that orthodontists' preferences regarding the profiles resulting from the treatment are similar with dentists', but to a lesser extent with the expectations of the general population. The conclusion of the study cited is that there are differences between groups of observers' assessment and the differences between the pretreatment and post treatment profile are not very large.

This study aims to evaluate the expertise of young dentists on the results of orthodontic treatment. For this we have surveyed students in the final year of the Faculty of Dental Medicine on the aesthetic changes that occurred in the facial profile of patients treated with extraction of four bicuspids.

The hypothesis of the study is that changes of a few degrees or a few millimeters, as shown in the cephalometric analysis go unnoticed by many observers, and major changes in treatment outcome leads to sensitive aesthetic preferences.

MATERIALS AND METHODS

The study was conducted between May 15 to 30, 2014, in the Faculty of Dental Medicine, U. M. F. "Carol Davila" in Bucharest. We studied the extent to which young dentists detect facial changes produced by orthodontic treatment with extractions. For this purpose we used a questionnaire that included a set of five questions about each of the 12 cases selected (patients treated in the Orthodontics Department of the Faculty with extraction of four bicuspids). The 12 cases were each illustrated by a pair of images, before and after treatment photographs from the patients' documentation. Photos contained two instances, profile and semi profile and were limited to the anterior facial profile (Fig. 1). The study

was single-blind type as photos were arranged randomly without specifying which of the photos corresponds to which moment in treatment.



Figure 1. Before and after treatment photographic details evaluated (example).

For this article we have used the answers to four of the questions in the questionnaire: (1) a question with affirmative or negative answer to verify whether respondents identified changes in facial appearance between the two stage images for each patient; (2) an evaluation question regarding the situations in the two photos answered by scoring on a scale from one to ten; (3) a question requiring the respondents to express preference for lip appearance in one of the photos; (4) a question to assess in which of the states the lower labio-chin groove is more aesthetic. Basically the first two questions appealed to the overall sensitivity of the respondents and the other two questions focused on their expertise in soft tissue examination, gained during orthodontic courses. 113 final year students completed the questionnaire, and data were collected in a Microsoft Excel spreadsheet.

In parallel, we performed measurements on cephalograms at the start and the end of treatment for the patients included in the study. Measurements included some Holdaway analysis and were handmade on tracing paper, with ruler

and protractor by two observers; the means of the values obtained by each of the operators were recorded (Fig. 2).

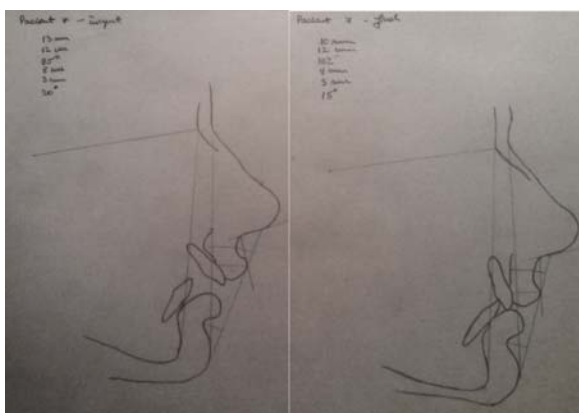


Figure 2. Before and after treatment cephalometric measurements (example).

Data gathering and interpretation was performed by sequencing, percentage calculations, arithmetic calculation of mean, Pearson correlation coefficient (R), coefficient p of R set at $p < 0.1$, graphical illustration.

RESULTS AND DISCUSSION

The measurements on lateral cephalograms and students' responses for each patient are summarized in Table 1.

The values in the above table are in millimeters and degrees representing differences between the final and start measurements for each patient.

This difference varied from zero values (e.g., patient 9), to high differences of 5° for H angle (e.g., patient 8), 19 degrees difference for nasolabial angle (i.e., patient 12), 7 millimeters difference in the thickness of upper lip at vermilion (i.e. patient 7) etc.. The objective of our study did not concern the interpretation of these differences due to treatment, but the way they are perceived by relatively skilled observers such as young dentists, and our analyzes were conducted as such.

Based on measurements on the lateral cephalograms, patients were ordered according to the magnitude of changes produced in the soft tissues after orthodontic treatment. The first criterion was the change in angle H, then changes in the thickness of the upper lip and then the harmony line spacing to the lower lip and lower groove.

Table 1

Results

	Cephalometry (differences from the beginning, at the end of treatment)						Changes noticed % of respondents	Grades difference after and before treatment	Upper lip, preference % of respondents		Inferior labial groove preference, % of respondents	
	1	2	3	4	5	6			Beginning	End	Beginning	End
Patient 1	-2	-2	4	-1	-1	-1	84.07	2.01	15.78	84.22	12.64	87.36
Patient 2	-5	-7	5	0	0.5	-2	74.34	1.68	16.87	83.13	14.45	85.55
Patient 3	0	5	-9	2	1	1	86.73	-2.06	88.77	11.23	82.30	17.70
Patient 4	-2	-2	-2	0	-3	-5	93.80	0.83	18.86	81.14	16.03	83.97
Patient 5	0	-1	-9	1	0	-2	91.15	1.03	33.00	67.00	27.45	72.55
Patient 6	-3	-1	4	-1	1	-1	92.03	2.81	2.88	97.12	5.77	94.23
Patient 7	-3	0	7	1	0	-5	93.81	2.67	5.66	94.34	5.66	94.34
Patient 8	1	0	-1	1	1	0	49.56	-0.19	60.00	40.00	51.79	48.21
Patient 9	0	0	-1	0	1.5	0	87.38	0.01	51.12	48.88	55.56	44.44
Patient 10	-4	-2	0	-1	1.5	-3	77.88	-0.60	63.64	36.36	63.64	36.36
Patient 11	-2	-1	0	-2	-1	-1	63.72	-0.38	53.52	46.48	61.11	38.89
Patient 12	-2	-1	-19	1	1.5	-1	87.61	1.24	25.25	74.75	29.29	70.71

Legend (green changes were considered favorable compared to the ideal values, red changes were considered unfavorable compared to the ideal values):

1. Thickness of the upper lip at the base (mm)
2. Thickness of the upper lip at vermilion (mm)
3. Naso-labial angle (degrees)
4. Distance from lower labial groove to H line (mm)
5. Distance from lower lip to H line (mm)
6. H angle (N'Pog' - Harmony line angle after Holdaway) (degrees)

It was noted that there is a correlation between the extent of the changes following treatment as objectified by lateral cephalometric measurements and the percentage of respondents that have noticed changes in the facial profile of the patients in the study (Table 2). This correlation is statistically significant and moderately positive, so that extreme values of the changes in radiographic measurements lead to high percentages of recognition by the respondents and vice versa (the Pearson correlation coefficient $R = 0.5664$, $p = 0.05486$).

Table 2

Correlation between after treatment changes intensity, as shown in the lateral cephalometric measurements, and the respondents' perception of them (To simplify the illustration, different results were classified by intensity into three categories: 0, + and ++)

	Measurements	Perception	Correspondence
Patient 1	+	+	yes
Patient 2	+	+	yes
Patient 3	0	+	no
Patient 4	++	++	yes
Patient 5	+	++	no
Patient 6	+	++	no
Patient 7	++	++	yes
Patient 8	0	0	yes
Patient 9	0	+	no
Patient 10	++	+	no
Patient 11	+	0	no
Patient 12	+	+	yes

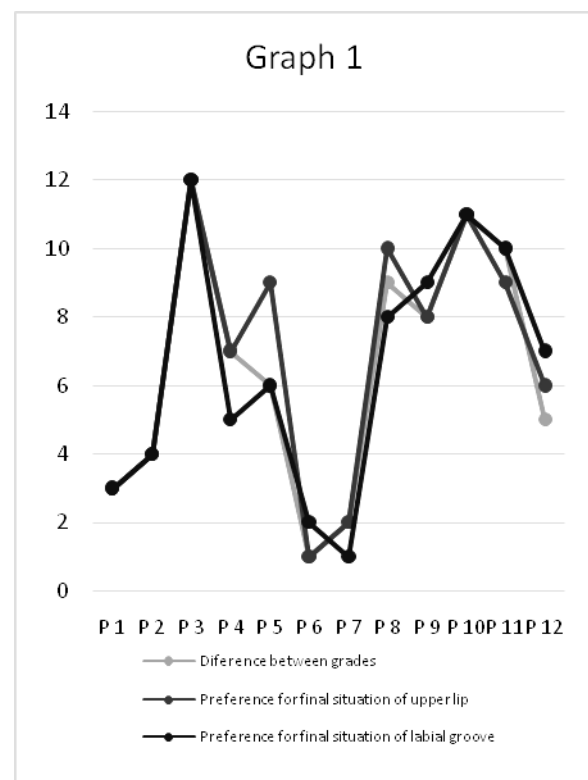
Lateral cephalometric changes in upper lip or lower lip groove could not satisfactorily be ranked for the 12 patients on their intensity for proper comparison with respondents' preference for the appearance of these structures at the beginning or end of treatment. Instead, there was a consistency between the scores given to the overall situation in each of the photos and preference for early or final situation regarding upper lip or labio-chin groove (i.e. if respondents ranked a higher grade for the overall situation at the end of the treatment the preference questions for the upper lip and lower labial groove situation was for their final state, and vice versa).

Graph 1 illustrates this finding, showing how the hierarchies of the grades difference and preference for upper lip and lower groove expressed by the respondents correspond for each patient.

We have already shown that in patients in whom the treatment produced soft tissues changes of higher amplitude (measured in degrees and millimeters), a higher percentage of respondents have noticed these changes. We have calculated if

the difference between the scores given for the beginning and end of treatment was also consistent with the extent of the changes measured and the percentage of respondents who identified them. In relation to the extent of the changes there was a negative correlation of the difference between notes, $R = -0.392$, but not statistically significant: $p = 0.6323$.

The correlation between the percentage of people who have noticed changes on photos and the difference between the two grades given for each case was close, moderately positive: $R = 0.5232$, with a low coefficient of determination, $R^2 = 0.2737$, $p = 0.08$.



Graph 1. Preference for initial / final aspect of the soft tissue profile.

CONCLUSIONS

The results of our study have shown that young doctors observe facial changes due to orthodontic treatment with extractions, even when changes are discreet, but significantly more if more important changes occur. The way in which respondents valued the aesthetic results of the treatment is consistent with the magnitude of changes, as when final grades differed more from initial grades the lateral cephalometric changes were more

extensive. Preference for final or initial position of the contour of the upper lip and lip groove matched appreciation by rating the overall situation, i.e. where the rate was higher for the final overall position, the preferred situation for the particular cases of the upper lip and groove labio-chin was also the final one.

REFERENCES

1. Peck H.; Peck S., Frequency of tooth extraction in orthodontic treatment, *Am J Orthod*, **1979**, 76, 491-496
2. Proffit W. R., Forty-year review of extraction frequencies at a university orthodontic clinic, *Angle Orthod*, **1994**, 64, 6, 407-414.
3. Bowman S.J.; Johnston Jr, L. E., The Esthetic Impact of Extraction and Nonextraction Treatments on Caucasian Patients, *Angle Orthod*, **2000**, 70, 1, 3-10.
4. Eunkoo K.; Gianelly A.A., Extraction vs Nonextraction: Arch Widths and Smile Esthetics *Angle Orthod*, **2003**, 73, 4, 354-358.
5. Boley J. C.; Pontier J. P.; Smith S.; Fulbright M., Facial changes in extraction and nonextraction patients, *Angle Orthod*, **1998**, 68, 6, 539-546.
6. Jamilian A.; Ghasemi M.; Gholami D.; Kaveh B., Changes in facial profile during orthodontic treatment with extraction of four first bicuspid *Orthodontic Waves*, **2008**, 67, 4, 157-161.
7. Moseling K. P.; Woods M. G., Lip Curve Changes in Females with Bicuspid Extraction or Nonextraction Treatment, *Angle Orthod*, **2004**, 74, 1, 51-62.
8. O'Brien K. et al Early treatment for Class II malocclusion and perceived improvements in facial profile *Am J Orthod Dentofacial Orthop*, **2009**, 135, 580-585.
9. Ramos A.L.; Sakima M.T.; Ary dos S. P.; Bowman S. J., Upper Lip Changes Correlated to Maxillary Incisor Retraction – A Metallic Implant Study, *Angle Orthod*, **2005**, 75, 4, 499-505.
10. Talas M.F.; Talas L.; Baker R.C., Soft-tissue profile changes resulting from retraction of maxillary incisors, *Am J Orthod Dentofacial Orthop*, **1987**, 91, 5, 385-94.
11. Holdaway R.A., A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I, *Am J Orthod*, **1983**, 84, 1, 1-28.
12. Stromboni Y., Facial aesthetics in orthodontic treatment with and without extractions, *Eur J Orthod*, **1979**, 1, 3, 201-6
13. Dobrocky OB; Smith RJ, Changes in facial profile during orthodontic treatment with extraction of four first bicuspid, *Am J Orthod Dentofacial Orthop*, **1989**, 95, 220-230.
14. Bishara,S. E., Cummins, D.M., Jakobsen, J.R., Zaher, A.R., Dentofacial and soft tissue changes in Class II, Division 1 cases treated with and without extractions, *Am J Orthod Dentofacial Orthop*, **1995**, 107, 1, 28-37.
15. Dias, P.,F., Gleiser R. Orthodontic concerns of brazilian children and their parents compared to the normative treatment need, *Journal of Oral Science*, **2010**, 5 (21), 101-107
16. Janson G; Fuziy A; de Freitas MR; Castanha Henriques JF; de Almeida RR., Soft-tissue treatment changes in Class II Division I malocclusion with and without extraction of maxillary bicuspid, *Am J Orthod Dentofacial Orthop*, **2007**, 132, 6, 729-729.
17. Livas C.; Delli, K, Subjective and objective perception of orthodontic treatment need: a systematic review, *Eur J Orthod*, **2013**, 35, 347-353.
18. Luppapanornlarp, S., Johnston Jr., L. E. The effects of bicuspid-extraction: A long-term comparison of outcomes in "clear-cut" extraction and nonextraction Class II patients, *Angle Orthod*, **1993**, 63, 4, 257-272.
19. Spalj,S., Slaj, M., Varga,S., Strujic, M., Slaj, M Perception of orthodontic treatment need in children and adolescents, *Eur J Orthod*, **2010**, 32, 387-394.
20. Young, T. M., Smith, R. Effects of orthodontics on the facial profile: A comparison of changes during nonextraction and four bicuspid extraction treatment, *Am J Orthod Dentofacial Orthop*, **1993**, 103, 5, 452-458.
21. Stenvik,A., Espeland, L., Linge. B. O., Linge L., Lay attitudes to dental appearance and need for orthodontic treatment, *Eur J Orthod*, **1997**, 19, 1, 271-277.
22. Awaisi Z. H., Asad S., Mahmood A., Patient Perception regarding Impact of Orthodontic treatment, *Pakistan Oral & Dental Journal*, **2011**, 31, 1.
23. Paquette, D. E., Beattie, J. R., Johnson, L. E. A long-term comparison of nonextraction and bicuspid extraction edgewise therapy in "borderline" Class II patients, *Am J Orthod Dentofacial Orthop*, **1989**, 95, 3, 220-230.
24. Bishara,S. E., Jakobsen, J.R., Profile changes in patients treated with and without extractions: Assessments by lay people, *Am J Orthod Dentofacial Orthop*, **1997**, 112, 6, 639-644.
25. Almeida-Pedrin RR, Guimarães LBM, Almeida MR, Almeida RR, Ferreira FPC. Assessment of facial profile changes in patients treated with maxillary bicuspid extraction, *Dental Press J Orthod.*, **2012**, 17,5, 131-7.