University Journal of Dental Sciences

CHANGES IN UPPER AIRWAY DIMENSIONS IN EXTRACTION CASES OF CLASS II DIVISION 1 MALOCCLUSION WITH BIMAXILLARY PROTRUSION

Research Paper

[1]Arbab Anjum, [2]Aditi Gaur, [3]Arina Arif, [4]Mohd Tariq
[1,4]Dept. of Orthodontics, Dr. Z. A. Dental College, AMU, Aligarh.
[2]Private Practice, Mumbai.
[3]Dept. of Conservative Dentistry, K. D. Dental College, Mathura.

ABSTRACT: Aims: To evaluate the changes in upper airway after first premolar extractions in Class II division 1 patients.

Methods and Material: Pre treatment and Post treatment lateral cephalograms of 20 Class II division 1(ANB =5^0, FMA = 31^0) patients were used in the present study. Patients were treated by extraction of all four first premolars. Airway dimensions were evaluated using lateral cephalograms. A paired t-test was used to analyse the data and observe the difference between the subjects.

Statistical analysis used: paired t-test

Results: The mean change in the upper incisor position at the end of the treatment was 6.3+4.3mm which was statistically significant. The change in lower incisor position was 1.05mm, however the change was not statistically significant. There was a statistically significant change in maxillary incisor angulation with a mean change of 1.4 degree. The mean change in lower incisor angulation was 4.3 degrees which was statistically significant. The mean difference of upper airway area between pretreatment and post treatment was 1.13mm^2 and for lower airway was 0.015mm^2. both values were statistically insignificant

Conclusions: All four first premolar extractions did not affect the airway dimensions.

Key-words:
upper airway area,
lower airway area,
premolar extractions.

Source of support : Nil
Conflict of interest : Nil

INTRODUCTION:

. Obstructive sleep apnoea is associated with reduced upper airway dimensions.[1] Skeletal factors, such as a retrognathic maxilla, mandible and hyper divergent growth patterns can lead to narrowing of the anteroposterior dimensions of the airway.[2] Cases with class II malocclusion are associated with retrognathic mandible and thus such cases may have narrow airways.[3] Cases with retrognathic mandibles are associated with posterior positioning of hyoid bone which could also affect the airway dimensions.[4] Previous studies have implicated the change in airway dimensions in growing cases of class II division 1 malocclusion.[5] Management of Class II division 1 malocclusion with bimaxillary protrusion in non growing patients often involves extraction of all four first premolars.[6] The treatment goal in such cases is to retract the incisors resulting in decrease in soft tissue convexity.[7] Previous studies have evaluated the effect of four premolar extractions on airway in Class I malocclusion cases with bimaxillary protrusion. It is important to evaluate the effects of all four first premolar extractions in Class II division I cases as the change in incisor position and the soft tissue parameters could affect the position of the tongue and thus alter the upper airway. The present study aims at evaluating the change in upper airway in non growing Class II division 1 cases that had undergone four premolar extractions as a part of orthodontic treatment.

METHODS AND MATERIAL:

All subjects were obtained from the existing patient database of the Department of Orthodontics and Dentofacial

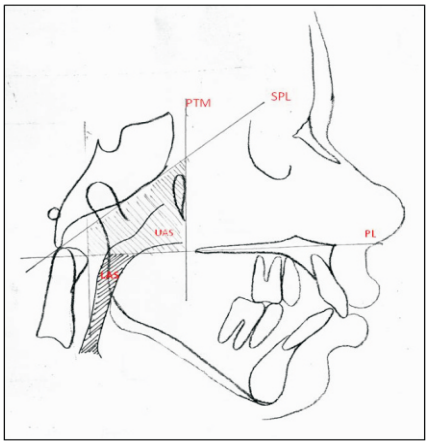
Orthopaedics, Dr. Z.A. Dental College, Aligarh, U.P.,India. The study design was retrospective in nature .so no separate ethical clearance was taken for the study

Patients with medical histories of craniofacial defects, pharyngeal pathology and/or nasal obstruction, snoring, obstructive sleep apnea, adenoidectomy, and tonsillectomy were excluded. From the selected records 20 patients treated with the removal of all four premolars were selected. All the 20 cases had a Class II division 1 malocclusion with ANB > 4°, were treated with fixed orthodontic treatment and had good occlusion at the end of treatment. The lateral cephalograms were obtained and traced, and measurements were recorded by an experienced operator. The reference points and lines used in analysis were plotted, all lateral cephalometric tracings were scanned (Perfection V700 Photo scanner; Epson, Long Beach, Calif, USA), and output images were directly converted into a portable document format (PDF) in 1:1 ratio to the input. The nasopharyngeal and oropharyngeal areas were measured and analyzed using software (PDF XChange Viewer, Version 2.5 202, Tracker Software Products, Chemainus, BC, Canada) designed for Microsoft Windows, (version 2007, Redmond, WA, USA). The variables evaluated were FMA, U1-SN, L1-MP, upper airway, lower airway dimension(McNamara's airway analysis), upper airway area and lower airway area. The variables evaluated are shown in Figure 1.

FIGURE 1

Assessment of upper airway and lower airway .

SPL(sphenoid Line),PL(Palatal Line) ,Upper Airway Area(UAS) And Lower Airway Area(LAS)



RESULTS:

Statistical analysis was performed using the Statistical Package for Social Science (SPSS) computer software (SPSS 17.0, SPSS Inc, Chicago, Ill).

The changes in the skeletal parameters, dental parameters and airway were evaluated using a paired t test.

Cephalometric Parameters : Change in upper incisor position and inclination was observed in all cases with a mean of 6.38mm and 1.48^0. Lower incisors were retracted by 1.05 mm and were retroclined by 4.33^0.(P> .05) (Table 1)

Nasopharyngeal Airway: Paired t test showed no significant difference between the Pre treatment and Post treatment upper airway area(P> .05) (Table 1).

Oropharyngeal Airway: No significant difference was revealed between the Pre treatment and Post treatment values of oropharyngeal airway (P > .05) (Table 1).

TABLE 1

Pre and post treatment cephalometric variables in class II div 1 patients treated by extractions of all 1st premolars

CEPHALOMETRIC PARAMETER	PRE TREATMENT	POST TREATMENT	DIFFERENCE	SIGNIFICANCE
ANB	5.77±1.8	5.27±1.9	0.5	0.024*
FMA(	31±5	31±6.6	-0.4	0.647
U1-NA(mm)	9.5±4.75	3.1±2.5	6.3	0.00*
U1-NA(°)	33±8.3°.	18.3±6.7°.	15.48°.	0.00*
L1-NB(mm)	7.7±2.7	6.7±5.07	1.05	0.282
L1-NB(°)	33.7±5.2°.	29.4±5.5°.	4.3°.	0.007*
UA	0.68±0.14	0.67±0.15	0.012	0.589
LA	0.49±0.12	0.53±0.16	-0.038	0.334
UAS	15.95±5.8	17.08±4.4	-1.13	0.375
PAS	6.9±2.4	6.9±2	-0.015	0.986

DISCUSSION: The present study focused on evaluation of airway changes in non growing Class II cases which had undergone all four first premolar extractions. Narrowing of upper airway has been associated with obstructive sleep apnoea.[8] In cases with premolar extractions, incisor retraction could result in reducing the tongue volume thus affecting the upper airway dimension.

The results of our study showed no reduction in the cross sectional area of the upper airway. Previous researches have failed to conclude the effect of bicuspid extractions on the pharyngeal airway dimensions.

Zhang et al conducted a preliminary study evaluating changes in upper airway using cone beam computed tomography[.9] They showed that although there was significant retraction of incisors, there was no change in the volume and cross sectional area of the airway.

Hu et al reported in a systematic review that all first premolar extractions followed by large retraction of anterior teeth could lead to narrowing of upper airways.[10] Also, mesial movement of molars may increase the space for tongue thus enlarging the upper airway dimensions.

Contrary findings were demonstrated by Chen et al who

showed large incisor retraction in adult bimaxillary patients resulted in narrowing of airway.[11]

Wang et al reported the effect of premolar extraction in bimaxillary patients. The study showed reduction in pharyngeal airway size after the extraction of all four first premolars.[12]

In a study, conducted by Germec-Cakan et al, in nonextraction and extraction cases treated with minimum or maximum anchorage, it was shown that the superior airway space and the middle air way space were increased significantly in the minimum anchorage group. The middle airway and the inferior airway space were reduced significantly in maximum anchorage group. It was suggested that the mesial molar movement might have increased the posterior tongue space and thus resulted in increase of thesuperior and middle airway dimensions in minimum anchorage cases.[13]

In the present study the selected individuals were Class II cases which were finished in Class I occlusion upon the completion of orthodontic treatment. Thus, the extraction of premolars did not result in change in airway dimensions.

CONCLUSION : In the orthodontic management of Class II cases by All four first premolar extractions there was no significant difference between the Pre treatment and Post treatment upper airway and oropharyngeal airway area.

REFERENCES:

1. Guilleminault C, Lee JH, Chan A. Pediatric obstructive sleep apnea syndrome. Arch PediatrAdolesc Med 2005;159:775-85.
2. CraigCE. The skeletal patterns characteristic of Class I and Class II, Division I malocclusions in norma lateralis. Angle Orthodontist 1951;21:44-56.
3. Iwasaki T, Saitoh I, Takemoto Y, Inada E, Kanomi R, Hayasaki H, et al. Evaluation of upper airway obstruction in Class II children with fluid-mechanical simulation. Am J Orthod Dentofacial Orthop 2011;139:e135-45.
4. Valiathan M, El H, Hans MG, Palomo MJ. Effects of extraction versus non-extraction treatment on oropharyngeal airway volume. Angle Orthod. 2010;80:1068–1074.
5. Al Maaitah E, El Said N, Abu Alhaija ES. First premolar extraction effects on upper air way dimension in bimaxillary proclination patients. Angle Orthod. 2012 Sep;82(5):853-9. doi: 10.2319/101711-646.1. Epub 2012 Feb 27.
6. Guo Y, Han X, Xu H, Ai D, Zeng H, Bai D. Morphological characteristics influencing the orthodontic extraction strategies for Angle's class II division 1 malocclusions. Prog Orthod. 2014;15:44.
7. Bills DA, Handelman CS, BeGole A. Bimaxillary dentoalveolar protrusion: traits and orthodontic correction. Angle Orthod. 2005;75:333–339.
8. Edwards BA, Eckert DJ, Jordan AS.Obstructive sleep apnoea pathogenesis from mild to severe: Is it all the same?Respirology. 2017 Jan;22(1):33-42.
9. Zhang J, Chen G, Li W, Xu T, Gao X.Upper Airway Changes after Orthodontic Extraction Treatment in Adults: A Preliminary Study using Cone Beam Computed Tomography.PLoS One. 2015 Nov 20;10(11):e0143233.
10. Hu Z, Yin X, Liao J, Zhou C, Yang Z, Zou S. The effect of teeth extraction for orthodontic treatment on the upper airway: a systematic review.Sleep Breath. 2015 May;19(2):441-51.
11. Wang Q, Jia P, Anderson NK, Wang L, Lin J.Changes of pharyngeal airway size and hyoid bone position following orthodontic treatment of Class I bimaxillary protrusion. Angle Orthod. 2012 Jan;82(1):115-21.
12. Chen Y, Hong L, Wang CL, Zhang SJ, Cao C, Wei F, Lv T, Zhang F, Liu DX. Effect of large incisor retraction on upperairway morphology in adult bimaxillary protrusion patients.Angle Orthod. 2012 Nov;82(6):964-70.
13. Germec-Cakan D, Taner T, Akan S. Uvulo-glossopharyngeal dimensions in non-extraction, extraction with minimum anchorage, and extraction with maximum anchorage. Eur J Orthod. 2011;33(5):515–520.

CORRESPONDING AUTHOR:

Dr. Arbab Anjum

Department of Orthodontics

Dr. Ziauddin Ahmad Dental College

Aligarh Muslim University

Aligarh

Email : arbab.anjum@gmail.com