REVISTA DE ODONTOLOGIA DA UNESP

ORIGINAL ARTICLE

Rev Odontol UNESP. 2017 May-June; 46(3): 184-188
Doi: http://dx.doi.org/10.1590/1807-2577.18916

 - ISSN 1807-2577

Interference of mouth breathing with orthodontic treatment duration in Angle Class II, Division 1

Interferência do modo respiratório na duração do tratamento ortodôntico Classe II, divisão 1 de Angle

Jéssica Antunes RODRIGUES[a], Bianca Núbia SOUZA-SILVA[b], Sílvia Elaine Zuim de Moraes BALDRIGHI[c], Luiz Renato PARANHOS[b], Carla Patrícia Hernandez Alves Ribeiro CÉSAR[b]*

[a]Universidade Metodista de São Paulo, São Bernardo do Campo, SP, Brasil
[b]UFS – Universidade Federal de Sergipe, Lagarto, SE, Brasil
[c]UFS – Universidade Federal de Sergipe, São Cristóvão, SE, Brasil

Resumo

Introdução: Diversos fatores podem interferir no tratamento ortodôntico, sendo importante verificar quais podem prejudicar o seu sucesso. **Objetivo:** Comparar a duração do tratamento ortodôntico entre respiradores orais e nasais em indivíduos com má oclusão de Angle Classe II, divisão 1. **Material e método**: Trata-se de um estudo observacional analítico, que utilizou prontuários de pacientes ortodônticos, compreendendo o período de 1999 a 2009, de uma Instituição de Ensino Superior do Estado de São Paulo. Os dados foram analisados pelas variáveis: idade, sexo, modo respiratório (oral ou nasal) e tempo de tratamento (inicial e final). Os pacientes foram pareados por idade e pelo tratamento utilizado. Para a análise dos dados utilizou-se o teste ANOVA (p<0,05). **Resultado:** A amostra foi composta por 36 indivíduos, sendo 16 do sexo feminino (10 respiradores nasais e 6 orais) e 20 do masculino (8 respiradores nasais e 12 orais), com idades entre nove e 15 anos (média:13,02). Quanto ao tempo de tratamento ortodôntico, os respiradores nasais permaneceram entre 27 e 74 meses (média 39,61) e os orais entre 29 e 50 meses (média 36,66), sem diferenças estatisticamente significativas entre os grupos de estudo. **Conclusão:** O modo respiratório alterado não foi uma variável que interferiu no tempo de tratamento na amostra do estudo.

Descritores: Má oclusão; respiração bucal; tratamento ortodôntico.

Abstract

Introduction: Several factors can interfere with orthodontic treatment, and it is important to verify which ones may hinder its success. **Objective**: To compare the duration of orthodontic treatment between nasal and mouth breathers with Angle Class II, Division 1 malocclusion. **Material and method**: This is an analytical observational study which used the records of orthodontic patients cared at a higher education institution in Sao Paulo state, Brazil, between 1999 and 2009. Data from the following variables were analyzed: age, gender, breathing mode (nasal or oral breathing), and treatment duration (beginning and end). Patients were matched for age and treatment used. The ANOVA test was applied to analyze the study data at 5% significance level (p<0.05). **Result**: The study sample consisted of 36 individuals, 16 female (10 nasal breathers and six mouth breathers) and 20 males (eight nasal breathers and 12 mouth breathers), aged nine to 15 years (mean age=13.021). As for orthodontic treatment duration, individuals in the nasal breathing group remained between 27 and 74 months (mean duration=39.61) under treatment, whereas treatment of individuals in the mouth breathing group lasted between 29 and 50 months (mean duration=36.66). No statistically significant differences were observed between the study groups. **Conclusions**: We conclude that the variable altered breathing mode does not interfere with treatment duration.

Descriptors: Malocclusion; mouth breathing; orthodontic treatment.

INTRODUCTION

In addition to favoring the growth and adequate development of the craniofacial complex, nasal breathing is essential for proper muscular and functional action of the stomatognathic system[1]. In contrast, oral breathing presents multifactorial etiology, either due to obstruction of the upper airways or habits that cause air to pass through the mouth[2]. Such a respiratory mode may alter the growth of maxillary bones with a decrease in their transverse dimension[3], reduce the tone of the orofacial muscles (especially the lower lip

and the tongue[4]), modify the usual posture of lips and tongue[4], in addition to causing morphological changes in the hard palate[5].

Depending on the obstructive etiological factor of the upper airways, different mandibular positions may occur - more anterior in patients with palatine tonsil hypertrophy when compared with that of individuals with pharyngeal tonsil hypertrophy, confirmed by cephalometric analysis[6].

The specific scientific literature also reports interference in dental occlusion, and some of the studies on prevalence of malocclusions in oral breathers tend to show that Angle Class II malocclusion is greater than[7-10] Class I[11,12].

Although some authors have verified that respiratory mode can have an effect on the morphological characteristics of the face and on dental occlusion, further studies analyzing whether the altered breathing mode interferes with orthodontic treatment duration are still needed. Therefore, the objective of this research was to answer the following clinical question: Does the altered respiratory mode influence the duration of orthodontic treatment in individuals with Angle Class II, Division 1 malocclusion? To this end, a study was designed to compare the orthodontic treatment durations between oral and nasal breathers, as explained ahead.

MATERIAL AND METHOD

Ethical Criteria

The present study was previous approved by the Human Research Ethics Committee of the aforementioned Institution (CEP: 3575096-10; CAAE: 0101.0.214.000-10).

Sample

This is an analytical, observational, retrospective study based on secondary data obtained from medical records of the Orthodontic Clinic of the "Universidade Metodista de São Paulo", located in the municipality of São Bernardo do Campo, São Paulo state, Brazil, between January 1990 and December 2009.

In view of the varied intervention procedures proposed in the Orthodontic Clinic, patients were matched for age, same treatment used before selection, and same facial type and pattern and degree of maxillary protrusion or mandibular atresia. Therefore, when the degree of malocclusion was described in the medical record, it was also considered. In order to achieve a reliable pairing of the study participants, dental development was also analyzed by radiographic inspection, considering that this variable could interfere with the results obtained. Thus a final sample of 40 possible pairing documents was obtained after analysis of 1544 medical records.

Only individuals with Angle Class II, Division 1 malocclusion, identified by an orthodontist specialized in the area, whose score in the clinical examination referred compulsory orthodontic treatment were included in the study. All participants had to have undergone orthodontic treatment for this alteration on a regular basis and been discharged owing to therapeutic success. The medical record had to present a clinical diagnosis of the patient's respiratory mode.

Exclusion criteria comprised patients reported as non-collaborators; who were absent more than three consecutive times during the treatment period, analyzing the frequency form of each participating individual; and with concomitant alterations to the malocclusion target of the research, such as an open bite (anterior, lateral, or anterolateral) and facial asymmetry. Individuals with history of orthodontic treatment previous to that conducted at the institution of data collection, as well as those who underwent surgical treatment, e.g., tonsillectomies, were also excluded from the study sample.

In order to compose the sample, two examiners (JAR and CPHARC), independently searched for medical records and, subsequently, compared the selection obtained. In case of discrepancy between the selections made by the examiners, the medical record in question was separated and discussed between the examiners who decided, by consensus, whether or not to include it in the sample.

Procedures

Clinical speech-language pathology evaluation of the respiratory mode was conducted by a speech-language therapist with expertise in the area, who was responsible for the screening and speech-language assessments of the hospital sector, according to Bianchini et al.[2]. Mode of breathing was considered adequate (Nasal Breathing Group - NB group) when the patients' lips were occluded at rest and exclusive nose respiration was used with a possibility of labial sealing ≥3 minutes, measured by a digital chronometer, TIMEX manufactured (T5K491SR/TI Manaus, AM, Brasil). Assessment of nasal airflow should present symmetry; it was measured using the Altmann millimeter nasal mirror. Respiration mode was considered altered (Mouth Breathing Group - MB group) when the patients' lips were open at rest and breathing occurred through the mouth, or when patients breathed through the nose and the mouth simultaneously, but without nasal obstruction. In both cases nose use capacity was <2 minutes, indicating a decrease or asymmetry of nasal airflow, evaluated by the Altmann millimeter mirror. Chin muscle tension in an attempt to seal the lips was not used as a criterion of classification due to the malocclusion target of this study, considering that the use of compensatory musculature for lip sealing, in this case the mentual muscle, is common in these cases.

Regarding utilization of the Altmann millimetric mirror, the environment was free of air-conditioning and the examiners remained standing while the individuals assessed were sitting with their feet resting on the floor and their heads up straight. The mirror was positioned below the patient's nose, centered at the height of the anterior nasal spine. Nasal respiration was measured by marking the haze area with a blue marker pen on the mirror. The measures were then recorded by transparency on special millimeter paper sheets alike the mirror.

In addition to breathing mode, the following variables were analyzed: age, gender, and dates of beginning and end of orthodontic treatment. The time between beginning and end of treatment was calculated in months. If the treatment had lasted for months and days, those which exceeded eighteen days were converted into one more month. Treatment plan was divided into treatments with and without dental extractions.

Data Analysis

For comparison of the described variables, the ANOVA parametric test was used for two sample populations with respect to the breathing mode (adequate - nasal respiration or altered - oral respiration). Data were analyzed at a significance level of 5% ($p<0.05$) and confidence intervals of 95%. Normality of this statistical model was assessed using the Kolmogorov-Smirnov test, which verified normality of the data, ensuring the application of ANOVA.

RESULT

The study sample was composed of 36 individuals, 16 females (10 NB and 6 MB) and 20 males (8 NB and 12 MB), aged 12 to 15 years (mean age=13.02); participants in the Nasal Breathing Group (NB) were aged nine to 15 years (mean=13.25) and individuals in the Mouth Breathing Group (MB) were aged 10 to 15 years (mean=12.80).

With respect to orthodontic treatment duration, individuals in the NB group remained between 27 and 74 months (mean duration=39.61) under treatment, whereas treatment of individuals in the MB group lasted between 29 and 50 months (mean duration=36.66); no statistically significant differences were observed between treatment durations ($p=0.748$). As no statistical difference was found between the groups with regard to respiratory mode, the variable treatment duration was analyzed based on the need or not for extraction of dental elements, which also did not show statistically significant difference ($p=0.641$).

All individuals in the study sample used extraoral orthodontic appliances (EOA) combined with the use of fixed orthodontic appliances (Edgewise).

DISCUSSION

The impact caused by upper airway obstruction results in changes in facial growth[2]; posture, including lips and tongue[4]; architecture and morphology of the maxilla[3], hard palate[5], and mandible[6]; and consequently, in dental occlusion[7-12], justifying the interest and need for intervention in altered respiratory mode by several health professionals such as speech-language pathologists, physiotherapists, and dental surgeons, in partnership with otorhinolaryngologists and pediatricians.

Cunha, Mendes[13] suggested that multidisciplinary actions be taken as early as possible because of the amplitude of the systemic and developmental changes that can be caused by oral breathing.

Prevention programs should occur preferably during the deciduous teething phase in order to reduce malocclusions, preventing them from becoming more complex. Orthodontics has assistance protocols for collective health which include, among other aspects, the altered respiratory mode[14].

Nevertheless, it is worth noting that even with early referral to Otorhinolaryngology and elimination of the obstructive factor, oral breathing can still remain. The permanence of oral breathing hinders the stability of orthodontic treatment and can cause recurrence - a fact that preoccupies both orthodontists and speech-language pathologists.

The study sample was formed by convenience based on the previously outlined criteria. Of the 1544 medical records analyzed, only 36 were eligible for pairing, considering that the procedures adopted can vary significantly regarding correction of the anteroposterior relationship between the maxilla and the mandible with the use of combined techniques and methods, e.g., with or without extraoral traction or dental extraction; using different wires and brackets, functional orthopedics of the jaws, and differential phases along the treatment; beginning with functional orthopedics and ending with fixed appliances; in addition to surgical intervention (orthognathic surgeries).

In the present study, all patients underwent the treatment protocol with extraoral (EOA) and fixed (Edgewise) appliances, which, as suggested in the literature[15], favored significant improvements in the maxillomandibular relationship, restricting the anterior displacement of the maxilla and distalizing the maxillary molars, acting in their resistance center, although indicated for molars with complete root formation[16]. All participants of this study were within the age range of nine to 15 years, an age at which the first permanent maxillary molar has already erupted and presents root with complete formation, a fact that allowed the choice for this treatment protocol for the patients cared in the Orthodontic Clinic of this research. According to Freitas et al.[17], Interlandi HeadGear (IHG) occipital traction EOAs and conjugated EOAs provide good results when patients collaborate.

Other orthodontic appliances may be used in the treatment of Angle Class II, Division 1 malocclusion, e.g., Balters' bionator, which is used for correction of mandibular deficiency. The literature suggests its use also associated with patient collaboration. This appliance is considered functional because it modifies the posture of the mandible in relation to the maxilla[18], potentiates mandibular growth and restricts maxillary development[19], in addition to being inexpensive, space-saving, and of easy preparation[20]. Satisfactory results have been observed with its utilization in Angle Class II, Division 1 malocclusions[21]. In this study, patients using other treatment strategies were excluded to avoid interference of this variable with analysis of the results.

Scientific research in Orthodontics has been concerned with describing the duration of treatment, as well as its limitations based on the choice for a particular orthodontic appliance.

According to the literature consulted[15,17,19,20,22], duration of orthodontic treatment ranged from 16 to 48 months (mean=31.62); this mean value is similar to those observed in this study (39.1 months for the NB group and 35.8 months for AB group), but no studies comparing whether or not respiratory mode was a factor that could affect treatment duration have been found.

In the present study, the variable breathing mode did not seem to influence treatment duration, considering that no statistically significant differences were found between them.

Another variation in the orthodontic treatments of this study was the utilization or not of exodontics, considering that success in the treatment of Class II malocclusion without extractions is determined by the growth pattern presented by the patient and not by the appliance used or the technique employed[23]. Patients with a

long face pattern may need a surgical procedure after conventional orthodontic treatment.

Researchers[24] compared patients who underwent treatment with and without dental extraction and observed that those who did not have elements extracted showed shorter treatment duration compared with those who did, but without statistically significant differences, corroborating the findings of the present study.

Other factors may interfere with treatment, such as age, severity of malocclusion, professional conduct, treatment protocol adopted, and patient collaboration, and it is worth noting that extraoral appliances require greater patient collaboration. In the investigated sample, all cases used this mechanics, and it is important to emphasize that only patients who were willing to collaborate with the orthodontic treatment were included in this study.

After analysis of different variables that interfere with orthodontic treatment of Angle Class II, Division 1 malocclusion, it was possible to verify, by the comparison between the groups, that altered respiratory mode and the need for extractions did not seem to have influenced the duration of treatment, although dental extractions, regardless of the patient's respiratory mode, tended to interfere with this group of patients, with shorter duration for the group without extractions (mean of 34 months compared with for the group which required extractions, whose mean was 40 months).

The diverse array of procedures was a great challenge for the comparison of orthodontic treatment duration; it was necessary to outline the possible parameters of comparison. Therefore, in order to allow pairing, if a nasal breathing patient was submitted to the use of fixed appliance without the need for extraction and the treatment had been successful, it was necessary to find another oral breathing patient who had undergone the same procedures.

However, it is worth noting that despite the successful completion of orthodontic treatment, one of the limitations of this study was the impossibility to assess the stability achieved and the possibility of recurrence - important factors to be analyzed when dealing with oral breathers.

Further studies should be conducted with larger samples and longitudinal follow-up to elucidate the influence of breathing type on malocclusion, growth, and craniofacial development, so that maintenance of the success obtained in orthodontic treatment could be verified, especially in cases in which the patient maintains the altered respiratory mode.

CONCLUSION

We conclude that the variable altered breathing mode does not interfere with orthodontic treatment duration in the group investigated. Further studies with larger samples should be conducted to ratify the results obtained.

REFERENCES

1. McNamara JA. Influence of respiratory pattern on craniofacial growth. Angle Orthod. 1981 Oct;51(4):269-300. http://dx.doi.org/10.1043/0003-3219(1981)051<0269:IORPOC>2.0.CO;2. PMid:6947703.
2. Bianchini AP, Guedes ZCF, Vieira MM. Estudo da relação entre a respiração oral e o tipo facial. Rev Bras Otorrinolaringol. 2007 Ago;73(4):500-5. http://dx.doi.org/10.1590/S0034-72992007000400008.
3. Lione R, Buongiorno M, Franchi L, Cozza P. Evaluation of maxillary arch dimensions and palatal morphology in mouth-breathing children by using digital dental casts. Int J Pediatr Otorhinolaryngol. 2014 Jan;78(1):91-5. PMid:24300946. http://dx.doi.org/10.1016/j.ijporl.2013.09.028.
4. Andrada e Silva MA, Marchesan IQ, Ferreira LP, Schmidt R, Ramires RR. Postura, tônus e mobilidade de lábios e língua de crianças respiradoras orais. Rev CEFAC. 2012 Jun;14(5):853-60. http://dx.doi.org/10.1590/S1516-18462012005000002.
5. Berwig LC, Silva AMT, Côrrea ECR, Moraes AB, Montenegro MM, Ritzel RA. Dimensões do palato duro de respiradores nasais e orais por diferentes etiologias. J Soc Bras Fonoaudiol. 2011 Dez;23(4):308-14. PMid:22231050. http://dx.doi.org/10.1590/S2179-64912011000400004.
6. Franco LP, Souki BQ, Cheib PL, Abrão M, Pereira TB, Becker HM, et al. Are distinct etiologies of upper airway obstruction in mouth-breathing children associated with different cephalometric patterns? Int J Pediatr Otorhinolaryngol. 2015 Feb;79(2):223-8. PMid:25563906. http://dx.doi.org/10.1016/j.ijporl.2014.12.013.
7. Harari D, Redlich M, Miri S, Hamud T, Gross M. The effect of mouth breathing versus nasal breathing on dentofacial and craniofacial development in orthodontic patients. Laryngoscope. 2010 Oct;120(10):2089-93. PMid:20824738. http://dx.doi.org/10.1002/lary.20991.
8. Nunes WR Jr, Di Francesco RC. Variation of patterns of malocclusion by site of pharyngeal obstruction in children. Arch Otolaryngol Head Neck Surg. 2010 Nov;136(11):1116-20. PMid:21079167. http://dx.doi.org/10.1001/archoto.2010.187.
9. Fonseca MK, Freitas LMA, Pithon MM, Souza RA, Coqueiro RS. Problemas respiratórios versus padrões facial e dentário em crianças brasileiras da região Nordeste. Ortodontia. 2012 Mar-Abr;45(2):136-42.
10. Phrabhakar RR, Saravanan R, Karthikeyan MK, Vishnuchandran C. Sudeepthi. Prevalence of malocclusion and need for early orthodontic treatment in children. J Clin Diagn Res. 2014 May;8(5):ZC60-1. http://dx.doi.org/10.7860/JCDR/2014/8604.4394. PMid:24995247.
11. Schwertner A, Nouer PRA, Garbui IU, Kuramae M. Prevalência de maloclusão em crianças entre 7 e 11 anos em Foz do Iguaçu, PR, Brasil. RGO. 2007 Abr-Jun;55(2):155-61.
12. Souki BQ, Pimenta GB, Souki MQ, Franco LP, Becker HM, Pinto JA. Prevalence of malocclusion among mouth breathing children: do expectations meet reality? Int J Pediatr Otorhinolaryngol. 2009 May;73(5):767-73. PMid:19282036. http://dx.doi.org/10.1016/j.ijporl.2009.02.006.
13. Cunha TMA, Mendes CMC. Implicações sistêmicas e conduta clínica da síndrome do respirador bucal: revisão da literatura. Rev Ciênc Méd Biol. 2014 Set-Dez;13(3):388-92. http://dx.doi.org/10.9771/cmbio.v13i3.12953.

14. Hebling SRF, Pereira AC, Hebling E, Meneghim MC. Considerações para elaboração de protocolo de assistência ortodôntica em saúde coletiva. Ciênc. Saúde Coletiva. 2007 Ago;12(4):1067-78. http://dx.doi.org/10.1590/S1413-81232007000400028.

15. Henriques RP, Henriques JFC, Almeida RR, Freitas MR, Janson G. Estudo das alterações decorrentes do uso do aparelho extrabucal de tração occipital na correção da má oclusão de Classe II, 1ª divisão. Rev Dent Press Ortodon Ortop Facial. 2007;12(4):72-83. http://dx.doi.org/10.1590/S1415-54192007000400009.

16. Henriques JFC, Henriques RP, Pieri LV, Freitas MR, Janson G, Almeida RR, et al. Tratamento da má oclusão de Classe II, 1ª divisão, com 3 tipos de AEB (Splint maxilar modificado, IHG e KHG) – revisão sobre efeitos e modo de ação. Rev Clín Ortodon Dental Press. 2007 Out-Nov;6(5):92-101.

17. Freitas MR, Beltrão RTS, Freitas KMS, Vilas Boas J, Henriques JFC, Janson GRP. Um tratamento simplificado para correção da má oclusão de classe ii, divisão 1 com mordida aberta: relato de um caso clínico. Rev Dental Press Ortodon Ortop Maxilar. 2003 Maio-Jun;8(3):93-100.

18. Bionator de Balters O-FC. Rev Dent Press Ortodon Ortop Facial. 1998 Nov-Dez;3(6):70-95.

19. Melo ACM, Gandini LG Jr, Santos-Pinto A, Araújo AM, Gonçalves JR. Avaliação cefalométrica do efeito do tratamento da má oclusão Classe II, divisão 1, com o bionator de Balters: estudo com implantes metálicos. Rev Dent Press Ortodon Ortop Facial. 2006 Jun;11(3):18-31. http://dx.doi.org/10.1590/S1415-54192006000300004.

20. Minervino BL, Raveli DB, Sakima MT, Martins LP, Chiavini PCR, Dinelli TCS. O aparelho de Balters no tratamento da Classe II, 1ª divisão. Relato de um caso clínico. Rev Dental Press Ortodon Ortop Maxilar. 1999 Maio-Jun;4(3):30-6.

21. Almeida-Pedrin RR, Pinzan A, Almeida RR, Almeida MR, Henriques JFC. Efeitos do AEB conjugado e do Bionator no tratamento da Classe II, 1ª divisão. Rev Dent Press Ortodon Ortop Facial. 2005 Out;10(5):37-54. http://dx.doi.org/10.1590/S1415-54192005000500006.

22. Freitas JC. Má oclusão Classe II, divisão 1, de Angle com discrepância ântero-posterior acentuada. Rev Dent Press Ortodon Ortop Facial. 2009 Abr;14(2):131-43. http://dx.doi.org/10.1590/S1415-54192009000200015.

23. Rodrigues M. Tratamento da má oclusão de Classe II sem extração com prescrição Straight-wire e Braquete Tip- Edge em caninos. Rev Dent Press Ortodon Ortop Facial. 2002 Maio-Jun;7(3):43-63.

24. Souza FAJ, Gregolin PR, Scanavini MA, Mandetta S, Siqueira DF. Análise oclusal de pacientes com má oclusão de classe II, tratados com extrações de 4 molares. Rev Odonto. 2008 Jul-Dez;16(32):72-81. http://dx.doi.org/10.15603/2176-1000/odonto.v16n32p72-81.

CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

*CORRESPONDING AUTHOR

Carla Patrícia Hernandez Alves Ribeiro César, Departamento de Fonoaudiologia, UFS – Universidade Federal de Sergipe, Rua Laudelino Freire, 184, 2º andar, Centro, 49400-000 Lagarto - SE, Brasil, e-mail: carlacesar@globo.com

Received: August 17, 2016
Accepted: May 16, 2017