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Understanding Orthodontic Relapse- The Impact of Oral Musculature on Treatment Outcomes: A Literature Review

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Abstract

Orthodontic relapse has been an ongoing challenge that orthodontic practioners encounter. Despite having fixed or removable orthodontic retention, teeth can still move to unfavourable positions. As hard tissues respond to pressure, the oral musculature play an important role in in orthodontic retention. The literature reviews have revealed that orthodontic treatment in conjunction with orofacial myofunctional therapy to correct undesirable oral habits can be an effective measure to reduce orthodontic relapse.

Keywords

Orthodontic relapse; Oral musculature; Oral habits; Open-bite; Abberant tongue function; Orofacial myofunctional therapy.

Introduction

The aim of orthodontic treatment is to achieve reasonable orthodontic alignment of teeth. Upon completion of treatment, although with a retention protocol, maintaining the desired long-term orthodontic results can be challenging [1]. Relapse or failed orthodontic treatment outcomes are malocclusions that have been treated but not corrected. Orthodontic relapse is defined as returning to an undesirable state, although not exactly like prior to treatment, and often, it is distinctly different. Waldron believed that the functional retention of an orthodontic case is the most critical phase of the treatment [2].

The dental arches are confined by the balance between the buccal and labial musculature, opposing the powerful muscle of the tongue [2]. Although bone is hard and rigid, the ever- changing tissue is plastic as it responds to the pressure of surrounding soft tissues. Pressure habits, which are unintentional pressures on bone can change its form and move teeth in that bone [3]. The occurrence of relapse is significant enough to investigate its causes and review current retention protocols. This article reviews relapse in post-orthodontic treatment patients and the effectiveness of retreatment in conjunction with myofunctional treatment.

Methodology

An electronic database search using PubMed, and Google Scholar were screened for relevant papers without restriction on the year of publication. The keywords applied to the search included: “orthodontic treatment”, “orthodontics”, “relapse”, combined with “oral musculature”, “tongue thrust”, “aberrant tongue function”, and “orofacial myology”. The papers were selected based on reading the article and determining its relevance.

Abberant tongue function

Wreidt et al. studied nineteen patients for a minimum of two years post-treatment of fixed orthodontic appliances and bimaxillary osteotomy correction of open bite. A reduction in open bite of more than 1mm after the completion of orthodontic treatment was considered a relapse. Orthodontic plaster models, lateral cephalograms and questionnaires were assessed in this study. Of the 19 patients, 6 patients had open lip posture, 2 with parafunction, 16 had tongue thrust impressions, and 4 had an infantile swallowing pattern. More than half of the patients had completed peri-operative logopaedic exercise therapy to correct aberrant habits. These patients presented with nasal breathing, no allergies and no sucking habits beyond the age of three were reported. All but one patient presented with a stable dentition and 5 presented with crossbite. Although 12 patients did not exhibit a vertical relapse, overbite relapse was evident in 7 patients. None of the patients had a relapse of an open bite large enough to warrant a second surgery. The presence of an isolated maxillary anterior or mandibular posterior inclination at the at the beginning of the treatment had a high possibility of relapse. A vertical relapse was more likely in patients with residual functional issues such as mouth breathing, an immature swallow pattern, anterior tongue thrust, lip dysfunction and open mouth posture. The risk of vertical relapse increased when there were narrowing of the upper and lower posterior dental arches and when there was an increase of Jarabak’s ratio due to surgical intervention and/or facial axis angle. The correction of functional treatment in combination with orthodontic treatment was found to be beneficial to patients for better long-term

results. [4] Figures 1 and 2 shows lateral cephalogram and intra-oral photographs of a patient from pre-orthodontic treatment to long-term follow up.

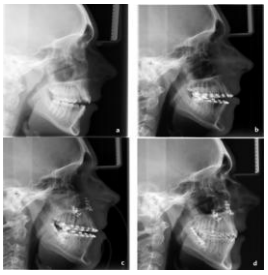

Figure 1: Lateral Cephalogram. A: start of treatment, b: pre- operative (surgical), c: immediately post-operative, d: end of orthodontic treatment [4].

Figure 2: Intra-oral photograph. e: start of treatment, f: pre- treatment, h: long term operative, g: end of orthodontic follow-up [4].

Low tongue and open mouth posture

A case study by Gracco et al. on a 27 year old male, with an anterior open bite relapse after previous orthodontic treatment, had low tongue posture due to mouth breathing, and positioning anteriorly at rest and during swallowing. The patient also reported difficulty with nose breathing. The patient was retreated orthodontically to correct open bite with an overcorrection, placing the maxillary incisal margin 3mm below the edge of the mandibular incisors. The brackets followed a customised arch-wire sequence and intermaxillary elastics were used to achieve bite closure. The patient was referred to an ear, nose and throat specialist for bilateral turbinectomy and maxillary sinus clearing after 10 months of orthodontic treatment. Cone beam computed tomography 5 months post-surgical intervention showed patency in upper airway.

Orthodontic treatment was completed in 19 months, where the goals of treatment were achieved. The success of this treatment comprised of a multidisciplinary approach, where the cause of the relapse was addressed. The airway obstruction resulted in the unfavourable position of the tongue, causing the patient's bite to open. When the airway obstruction was resolved, intervention to correct oral habits created improved orthodontic retention for the patient [5].

Figure 3: Pre-orthodontic retreatment [5].

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Figure 4: Post-orthodontic retreatment [5].

Figure 5: 3 years and 5 months post-orthodontic retreatment [5].

Orofacial Myofunctional Therapy with Orthodontic Treatment

A cohort study by Smithpeter & Covell consisted of 76 subjects with anterior open bite referred for orofacial myofunctional therapy (OMT) at various stages of orthodontic treatment after relapse (before, during and after). 27 subjects received OMT with orthodontic treatment or retreatment and 49 subjects were the control who had a history of orthodontic treatment with open-bite relapse. Initial and final examinations for all subjects included reviewed patient histories, measurement of open bite, intra- oral photographs, and assessment of oral physiological characteristics, swallow patterns of the tongue, and tongue position at rest, oral habits and speech articulation errors. The experimental group was selectively given exercises to normalise the orofacial musculature at rest, swallowing, eating, drinking and speaking. The exercises were dependent on the severity of aberrant patterns. The time between OMT completion and follow up in the experimental group (6 years, 2 months) was longer than the time between active orthodontic treatment and OMT examination in the control group (3 years, 11 months). 17 of 27 subjects had no measurable relapses, 9 had 1mm relapse and 1 had 4mm relapse. 74% of the control group had oral habits, and the experimental group was reduced to 0 from 55%. 82% of the control group had speech errors which were retained, and the experimental group has speech errors that were reduced from 90% to 26%. Tongue posture and swallow patterns had been corrected at the final evaluation for all subjects in the experimental group. The results of subjects that were treated with orthodontics and OMT were statistically significantly where relapse was less than the control group who were treated with orthodontics alone. Oral habits can contribute to forward tongue rest posture and tongue thrust swallows, whereby the correction changed the anterior tongue rest posture from low to either alveolar or palatal.

Neither the correction or retention of speech deficits influenced the results of relapse. The correction of tongue resting posture and aberrant swallow patterns reduced the risk of orthodontic relapse, therefore orthodontic treatment with OMT is beneficial in closing and maintaining open bites [6].

Discussion

When treating orthodontic patients, we must consider the constitution of successful treatment where orthodontic alignment is stable, and what aids long-term retention. We must also consider what can possibly contribute to relapse [2].

Smithpeter & Covell found that overbite stability was greater in younger subjects [6]. Younger patients experiencing rapid growth and during orthodontic treatment, they hold minimal disturbances to axial positioning, leading to fewer relapses. Additionally, orthodontic treatment during growth phase is considered guiding growth, rather than correcting mature hard tissue structures [2].

The correction of oral habits such as open mouth posture, low tongue posture, aberrant swallow patterns and aberrant tongue functions can be part of successful long-term orthodontic retention, although an assessment and treatment of airway obstructions should be conducted first. Wreidt et al. ensured that patients were nasal breathers, Gracco et al. cleared airway obstructions during the treatment, and Smithpeter & Covell assessed for nasal patency prior to treatment [4,5,6]. This protocol as part of orthodontic assessment is crucial as causes of oral habits can result from airways obstructions; therefore, the success of treatment prior to OMT is dependent on airway patency prior to myofunctional correction. There were limited articles which addressed orthodontic relapse associated to oral habits and the oral musculature even though the oral musculature play an important role in the balance of the dental arches. Prospective or retrospective cohort studies on orthodontics in conjunction with OMT can be used to assess the prevalence of relapse where findings of stable results can contribute to the protocol of long-term retention of orthodontic results.

Furthermore, the three studies concentrated on the relapse of open bites, however considerations of other forms of relapse such as crowding of teeth, space opening, and other hard tissue changes with respect to the oral musculature can be studied. Common cases of relapse such as crowding of the lower anterior teeth is due to the collapse of the anterior component of the arches due to anterior forces of the orbicularis muscle the anterior drive of the buccal segments create rotation of the mandibular incisors. Therefore, orthodontic correction alone without having sufficient muscle tone of the oral musculature and muscles of facial expression, can increase the possibility of orthodontic relapse. The success of orthodontic treatment is the stability of results. The profession overall has struggled with orthodontic stability; however, the success of orthodontic treatment and planning is to consider all factors to reduce the number of retreatment cases [2].

The oral musculature not only affects orthodontic retention, but it also affects an individual's overall health through sub-optimal mastication. Mouth breathing during mastication has a decreased masticatory effect chewing cycle is required to meet optimal masticatory efficiency [7]. In cases of mouth breathing and especially with nasal obstruction, respiratory and masticatory functions compete with the oral function [8]. Ideally, mastication occurs in the oral cavity and respiration occurs through the nasal passages and pharynx [9]. When mouth breathing occurs during mastication, it creates an interference as it decreases the duration of tooth contact and force of occlusion. Furthermore, this masticatory pattern can result in extrusion of posterior teeth, creating a clockwise rotation in the mandible [8].

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Conclusions

1. The oral musculature affects the stability and retention of orthodontic treatment.
2. Correction of oral habits in conjunction with orthodontic treatment can create stability in retention.
3. The aetiology of dental malocclusion is multifactorial and requires treatment by multidisciplinary team.
4. Oral habits and airway assessment should be considered as part of orthodontic diagnosis and treatment planning.
5. Orthodontic results appear stable when treatment is during growth phase.

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References

1. Klaus K, Xirouchaki F, Ruf S. (2020) 3D Analysis of Unwanted Tooth Movements Despite Bonded Orthodontic Retainers: A Pilot Study. BMC Oral Health. 20(1):308.
2. Huckaba GW. (1952) The Physiologic Basis of Relapse.A Review of the Literature. Am J Orthod. 38(5):335-50.
3. Klein ET. (1952) Pressure Habits, Etiological Factors in Malocclusion. Am J Orthod. 38(8): 569-87.
4. Wriedt S, Buhl V, Al-Nawas B. (2009) J Orofac Orthop. 70(4): 318-26.
5. Gracco A, Perri A, Siviero L, Bonetti AG, Cocilovo F. (2015) Multidisciplinary Correction of Anterior Open Bite Relapse and Upper Airway Obstruction. Korean J Orthod. 45(1):47-56.
6. Smithpeter J, Covell D. Relapse of Anterior Open Bites Treated with Orthodontic Appliances with and Without Orofacial Myofunctional Therapy. Am J Orthod Dentofacial Orthop. 137(5):605-14.
7. Nagaiwa M, Gunjigake K, Yamaguchi K. (2016) "The Effect of Mouth Breathing on Chewing Efficiency. Angle Orthod. 86(2):227-34.
8. Daimon S, Yamaguchi K. (2009) Changes in Respiratory Activity Induced by Mastication During Oral Breathing in Humans. J Appl Physiol. 116(11):1365-7.
9. Matsuo K, Palmer JB. (2009) Coordination of Mastication, Swallowing and Breathing. Jpn Dent Sci Rev. 45(1):31–40.