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Review Article

Non-orthodontic intervention and non-nutritive sucking behaviours: A literature review

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Abstract Anterior open bite (AOB) is one of the most complex malocclusions to manage. AOB is caused by either by skeletal, genetic or environmental factors. Numerous treatment options are currently utilised to manage AOB. These vary from non-invasive behavioural shaping to orthodontic and surgical interventions. This paper reviews the available orthodontic and non-orthodontic interventions used in the management of AOB. The literature review was carried out using the PubMed search engine from the first of January 2000 to the first of June 2017. Two major keywords (open bite and anterior open bite) were used in addition to 23 minor keywords in the review. AOB is one of the most complex malocclusions to treat with high relapse rates. Long term outcome in treatments of patients with AOB was substantially low. Relapse rates were not taken into consideration for some of the literature reviewed. Despite limitations of the literature, it is recommended that orofacial myofunctional therapy (OMT) and non-orthodontic intervention (NOI) be used in conjunction as an effective treatment option for Anterior Open Bite.

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Introduction

Dental occlusion is simply defined as the relationship between maxillary (upper) and mandibular (lower) teeth when they approach each other during mastication and at resting position. For over a century, issues relating to dental occlusion have been widespread controversies. Such controversies have impacted on the health of the oral cavity at varying degrees, commencing with orthodontic matters during childhood and proceeding to occlusal evaluations of adult patients in general dental practise. Furthermore, the necessity to carry out complex

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restorative dentistry demands critical thinking to establish optimum results. Restorative dentistry is the restoration of a tooth to or close to its original form by means of metallic, porcelain, synthetic, resin or inlay materials. In addition, patients whose masticatory system has developed pain and dysfunction (temporomandibular disorders, TMDs), there seems to be a high likelihood that their problems would be assessed and managed with some occlusal concept [1].

Anterior open bite (AOB) is defined as the lack of contact between upper and lower anterior (front) teeth when all other teeth are in maximum intercuspation, such as in close contact. Descriptions of this bite vary among different authors and researchers. Several dental practitioners have defined an open bite to be present when there is less than an average overbite, while others believe an edge-to-edge relationship between anterior teeth to be an open bite. In addition, many postulate that a certain degree of openness must be present to classify the bite as open or that there is a lack of overlap of the anterior teeth in centric occlusion [2–4]. Due to varying definitions of open bite, the occurrence of reported cases also varies. In turn, this variation alters statistics representing the frequency of this malocclusion in the population.

The open bite must be evaluated as a deviation in the vertical relationship of the maxillary (upper) and mandibular (lower) dental arches. There should, therefore, be a certain lack of contact in the vertical direction between opposing segments of teeth. The open bite is usually present in the anterior region from the cuspids (canines) to the incisors, hence the name anterior open bite (AOB) [5]. There are two categories of the open bite, skeletal and dental. The craniofacial features constantly linked with the skeletal open bite are increased mandibular plane angle and gonial angle, with a long anterior facial height and an overall increased facial height as well as a retrognathic mandible with palatal plane anteriorly tipped upwards [5–11].

On the other hand, the dental open bite is generally accompanied by normal craniofacial configurations, with incisors that are proclined and under-erupted anterior teeth as well as a normal molar height with thumb-sucking or other oral habits [2]. The majority of open bites contain both dental and skeletal characteristics [2]. While dental open bites can be treated with orthodontic or behaviour shaping strategies, the skeletal open bite requires a more complex approach combining orthodontic and orthognathic surgical procedures to reach function, aesthetics and stability [12,13] (Fig. 1).

Given the above definitions, the prevalence of AOB differs substantially among studies depending on how authors describe this abnormal occlusion. The word 'malocclusion' can be subjective, as the notion of 'ideal' occlusion is a rare incident and hence slight occlusal variations do not necessarily lead to specific health risks. Having said that, the anterior open bite is described as abnormal as it impacts on the patient's function, speech, mastication, future dental health risks and aesthetics [14]. Reported prevalence in the population is estimated to range from 1.5% to 11% [15–17]. Numerous factors affect the open bite, including age, gender, non-nutritive sucking habits, to mention a few. Factors such as age can impact on prevalence, as sucking habits and oral function mature with age. At the age of six, the AOB presents as low as 4.2%, while at age 14 years the

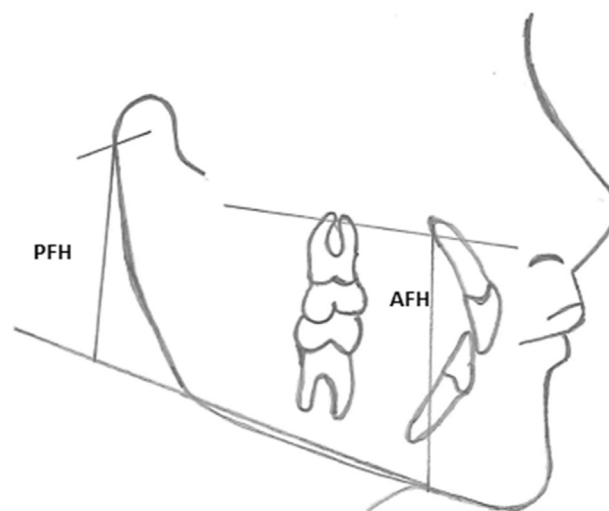


Figure 1. AFH: Anterior facial height, PFH: Posterior facial height.

prevalence declines to 2% [15]. In the American population, the prevalence detected was ethnicity-dependent with 3.5% present in Caucasian children while 16.5% in Afro-descendent children. Although the prevalence is low, the necessity to treat this malocclusion is very common with around 17% of orthodontic cases having AOB [17]. Thus dental practitioners must regard this malocclusion with care and address it accordingly [15,17].

Several etiologic factors linked with open bite have been proposed. These include genetic, anatomic and environmental factors. When taking the genetic factors into consideration, the open bite is mainly associated with patients' unfavourable growth capacity and heredity [11,18,19]. A detailed family history as well as radiographic and cephalometric analyses are hence necessary to identify whether there is a genetic factor present [20]. The anatomic factor includes size and position of the tongue has been suggested to affect both the dental and skeletal factors [21]. Furthermore, macroglossia, which is an unusually enlarged tongue, has also been proposed to influence AOB [22]. Reports identify that in individuals with AOB, a strong relationship between the angle of the mandible plane, mandibular ramus height, or the maxillary anteroposterior dimension and front section of the dorsal surface of the tongue movement during swallowing [23]. In addition, several anatomic ailments including enlarged tonsils and/or adenoids, swollen nasal turbinates and nasal septums that are deviated may impact on normal upper respiratory nasal function [24]. Consequently, due to upper airway obstruction, mouth-breathing can take place and, in turn lead to AOB; however, a direct link has not yet been proven [25]. Moreover, the resorption of the mandibular condyle has similarly been recognised as aetologic of AOB. There are several systemic and local conditions that result in mandibular condylar resorption. Systemic connective tissue or autoimmune diseases that can produce condylar resorption include psoriatic arthritis, systemic lupus erythematosus, rheumatoid arthritis, scleroderma, ankylosing spondylitis and Sögren syndrome [26]. On the other hand, local factors include infection, osteoarthritis, reactive arthritis, traumatic injuries and avascular necrosis [26].

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