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Paediatric Orthodontics Part 1: Anterior open bite in the mixed dentition

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Abstract

The correction of anterior open bite in the mixed dentition: treatment or over-treatment?

Early treatment of the anterior open bite is a common, widespread treatment, which involves sometimes multiple clinical procedures: active orthodontic treatment and correction of the dysfunctional habits with a large waste of financial and biological costs. Therefore, also considering the significant possibility of self-improvement in the pre-pubertal phase, active early treatment should not aim to the active correction of the AOB, but only to other aspects of the malocclusion and to the interception of dysfunctional habits.

KEYWORDS Anterior open bite; Dysfunctional habits; Orthodontic treatment.

Introduction

Anterior open bite (AOB), or lack of contact of incisors, is one of the most challenging malocclusion to treat. The cause of an anterior open bite is generally multifactorial due to a combination of skeletal, dental and soft tissue issues.

Anterior open bite (AOB) is widespread among young children, with prevalence ranging from 17% to 18% of children in the mixed dentition [Kasparaviciene et al., 2014; Tausche et al., 2004; Silvestrini-Biavati, 2016]. When associated with sucking habits, the prevalence increases to 36.3% [Cozza et al., 2005]. A tendency towards self-improvement from the deciduous to the late mixed dentition is expected during pre-pubertal growth [Worms et al., 1971; Phelan et al., 2014], and it is demonstrated that, if AOB persists during the cranio-facial pubertal growth spurt, it hardly ever self-corrects or even worsens [Phelan et al., 2014]. Thus, in the one hand, it seems indicated to treat the AOB early and to intercept the dysfunctional habits that, if removed early enough, become likely to promote optimal development of the masticatory system. On the other hand, if there is a chance that the anterior open bite will self-correct during growth, all or many of the treatments proposed during the deciduous and mixed dentition should be considered as over-treatment.

Literature review

After more than 50 years of investigations, the extensive literature concerning the early treatment of AOB still is controversial and covers a wide variety of therapeutic approaches [Fränkel and Fränkel, 1983; Kiliaridis et al., 1990; Ngan et al., 1992; Erbay et al., 1995; Sankey et al., 2000; Almeida, 2005; Pedrin et al., 2006; Defraia et al., 2007; Giuca et al., 2008; Quinzi et al., 2018; Giuntini et al., 2008; Doshi and Bhad, 2011; Cerruto et al., 2018]. Retrospective controlled trials (CT) and CCT studies suggested that the combination of different treatment modalities is effective, such as the use of a functional appliance, the bite block, cribs and the high pull headgear in younger subjects.

The above treatments seem effective for the correction of dentoalveolar and skeletal open bite. However these results must be viewed with caution, because the studies showed important methodological limitations and did not reach a quality level sufficient enough to draw any

evidence-based conclusions.

To the best of our knowledge [Lentini-Oliveira et al., 2014; Pisani et al., 2016; Feres et al., 2017] there are only two systematic reviews that assessed the evidence regarding the early management of AOB [Erbay et al., 1995; Almeida, 2005]. In addition, treatment protocols aiming to eliminate bad oral habits were only superficially considered in those reviews, as only 12 had untreated matched subjects as control group and in all untreated AOB groups described in those articles a spontaneous improvement was observed as well (a 75% self-correction) [Phelan et al., 2014].

Discussion

Diagnosis and the definition of the anterior open bite in the mixed dentition are the first issues to be discussed. Indeed one possible explanation for the high prevalence of open-bite from canine to canine at age 7 to 9 is the incomplete eruption of the incisors. Diagnostic criteria for anterior open bite in the mixed dentition should be standardised.

The main conclusion of all meta-analyses and literature reviews is that "randomised controlled trials (RCTs) with rigorous methodology should be adopted to elucidate the interventions for treating anterior open bites". RPCT are considered among the highest level of investigation, but, once again, the few RPCT available did not provided knowledge not previously available from retrospective studies and CTs. In addition, there is no sense in designing a PRCT to compare two different treatment modalities to correct AOB in the mixed dentition, when there is a significant probability that the negative overbite will self-correct during growth in the pre-pubertal phase. The only control group that should be considered is a group of non-treated growing subjects.

Often the literature focuses the statistical aspect rather than the clinical significance and means rather than variations.

Myofunctional issues, such as incompetent lips, tongue thrust, tongue posture, speech therapy, and so on are often overestimated biases, unsupported by scientific evidence and their relevance as aetiological factors or main target of the orthodontic treatment should be questioned in the contest of the cost-benefit ratio. For example: how much efforts are behind the attempt (almost always ineffective) to correct tongue thrust? Is it worthwhile during mixed dentition?

The last point is "diagnosis". We can assume that 80% of AOB could self-correct during the mixed dentition stage [Worms et al., 1971; Phelan et al., 2014], but 20% does not and these are the AOB difficult to treat if the goal is to obtain a stable result [Lopez-Gavito et al., 1985; Greenlee et al., 2011]. Thus it is crucial to early select and identify these patients, with persisting AOB after the transition to the pubertal phase, in order to plan a detailed retention strategy after the active correction of the open bite. This is another reason not to perform any active correction of the open bite during the mixed dentition: when we do it, we will also perform retention. If retention is used between the first and the second phase it will make it more difficult to recognise the "real" AOB patients, that is the patients who, after the treatment in permanent dentition, need a long term detailed retention strategy. In other words, the main clinical problem related to the active correction of the AOB with appliances during the mixed dentition is the risk of overcorrection, coupled with the retention phase that follows. The biological cost of retention between the first and the second phase can be very high: it will burn the compliance of a likely phase two in the permanent dentition and it will mask the severity of the open bite.

Conclusion

The diagnostic criteria for anterior open bite in the mixed dentition should be standardised and further investigated.

Randomized controlled trials (RCTs) with rigorous methodology and a non-treated control group should be carried on to elucidate not only the treatment modalities, but also the need for treatment of the AOB during the mixed dentition and the pre-pubertal phase.

No treatment should be performed to correct minimal (1–3 mm) AOB in the mixed dentition. Only some other malocclusions should be treated early when needed (i.e. posterior cross bite, mandibular shift etc.) [Rosa, 2012, 2016].

Before planning for correction of the AOB in the mixed dentition, other aspects— including tolerability, cost, and patients satisfaction—should be taken into consideration.

The correlation between open bite and sleep-disordered breathing may be investigated together with otorhinolaryngologists or other sleep professionals. In addition to the cephalometric measurements, masticatory, swallowing, respiratory functions, maxillary and mandibular growth, as well as facial analysis should be evaluated to test the validity of the interventions.

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