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EVALUATION OF PAIN DURING RAPID MAXILLARY EXPANSION TREATMENTS: A REVIEW

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Abstract

Objective: to evaluate pain perception during rapid maxillary expansion treatments considering the type of activation protocol, the type of anchoring, the gender and the age association with perception of pain.
Materials and methods: rating of six studies from 2000 to 2017 featuring in literature
Results: patients reported perception of pain especially during the first week of treatment. There aren't
significant differences in the type of anchoring and considering the type of protocols and the age and gender association there are conflicting results.

Introduction

Pain is a complex experience, which includes sensation evoked and reaction to noxious stimuli, that varies
from one individual to another, thus objective quantification of pain is difficult. It is dependent upon factors such as age, gender, individual pain threshold, the magnitude of the force applied, present
emotional state and stress , cultural differences and previous pain experiences(3). Perception of pain is a common effect during an orthodontic treatment, especially when the forces of appliance are transmitted
to skeletal structure, like during a rapid maxillary expansion. Human and animal studies have shown that
when sutural tissues are expanded rapidly, highly vascular disorganized connective tissue of an inflammatory nature is created, which results in the perception of pain(9-10- 11). Rapid maxillary expansion
is a common orthodontic procedure used to treat maxillary arch constriction and posterior cross-bite by opening the mid-palatal suture. Its first application, in the year 1860 (12)is attributed to the dentist Angell
and after encountering initial sceptcism, it was recommended to his many positive effects (7). Nowadays,
more than 90%of orthodontists offer this procedure as a treatment option in primary, mixed or permanent dentition (7). Rapid maxillary expansion utilizes large forces to produce maximum orthopedic repositioning with minimum orthodontic movement(3). During RME, strong transverse forces are created that are transmitted to the skeletal structures via anchoring teeth(3). To minimize the dental side effect, which likely increase the risk of relapse, skeletally anchored RME appliance have been introduced(2). The Hyrax appliance is the most common type of RME appliance. It features an expansion screw that is attached to two or four teeth that is usually activated once or twice daily for about 2 to 4 weeks. The expansion force varies depending on the activation protocol; a single activation of the screw produces approximately 3 to 10 pound of force(13 -3). Clinicians are aware that children may report undesirable side effects during the expansion phase, such as pain, nonpening of the suture and oral ulceration(7) and according to Timmis (12)
three factors are crucial to success of RME: the appliance's design, patient age and the suture opening. In the most of studies evaluated the visual analogue scale was used to measure pain after activation of appliance. The VAS is one of the most commonly used tools to asses pain intensity and has been shown to
be a valid and reliable method of measuring discrete pain as well as being a sensitive, simple, reproducible and universally accepted method of assessing pain. It consisted of a 100 mm line with clearly defined end points. One end of the line was labeled "no pain" and the other was labeled "most intense pain imaginable" and weighted at both ends by small pictograms representing "happy" and "sad" faces. The patients should sign on this line the intensity of pain perceived. Another system to evaluate the intensity of pain is verbal scaling, but verbal reporting may be distorted by situational influences in the form of interviewer bias and experimenter demand(3).

The aim of this review is to evaluate the perception of pain during rapid maxillary expansion considering
the activation protocols, the different anchoring of RME and the gender and age association, by the rating
of studies showed in literature.

Methods

It was realized a search on Pubmed of studies, from 2000 to 2017(1-2- 3-5- 6-8), thah showed the perception
of pain during rapid palatal expansion treatment using key-word like "pain in RME treatment" and "rapid maxillary expansion and pain". However, have been selected six studies that describe and quantified the intensity of pain of patients during the active phase of rapid maxillary expansion treatment. In all the
studies evaluated the quantification of pain was carried out by using VAS or a specific questionnaire to asses pain intensity. A systematic review has been realized, considering the type of activation protocol, the
different anchoring of RME, the gender and the age association with the perception of pain.

Discussion

By the result of the studies evaluated is possible to assert that pain is a common symptom during the rapid
maxillary expansion, usually during the early phases of expansion. Needleman et al. (6) showed that 98% of children reported at least some pain during RME and the highest levels of pain were reported during the
first 10 turns of screw, with the greatest intensity during the first six turns and a steadily decreasing amount of pain thereafter. This finding is in agreement with Halicioglu et al. that showed the highest level
of pain between first 5 and 10 activation and also in agreement with another study(8) that founded all the discomfort confined to the first week after cementation of the device. Gecgelen et al. showed that the
maximum number of patients reporting pain were at days 3 and 4 of treatment and after day 5 the
percentage of patients reporting pain was gradually reduced. Cleall et al.(9) reported that the mid-palatal suture widened very soon after the application of pressure in the rhesus monkey. As expansion continued,
less disruption of the mid-palatal tissues occurred with each progressive turn of the screw. That
observation may explain the decrease in reported pain by the patients. The decreasing trend in reported
pain may also be explained by the fact that patients may become more comfortable with the procedure
and thus the fear and anxiety of turning the appliance may be lessened with each turn.
According to the activation protocols, there are results in contrast: Baldini et al.(1) showed that patients who received two activations/ day reported a significantly higher pain than subjects who received only one
activation/day, but in another study(5) there wasn't any significantly difference between the activation
protocols in pain's perception.
According to the type of anchoring, Feldmann et al. in a recent study (2), showed that there were no
significant differences in pain and discomfort during the first week of RME treatment between the patients who received a conventional banded hyrax expander and patients with a hybrid hyrax expander with two miniscrew implants attaching the expander to the palate surface. The site with the highest scores in both group of patients was the first maxillary molars, which is logical because the appliances are connected to
the molars and because the expansion pattern during RME results also in dentoalveolar expansion,
including dental tipping. Although there were no significant differences between the group, patients with
the conventional hyrax appliance generally scored higher pain. This could explain why the center of applied
force induced by each activation is closer to the mid-palatal suture in the hybrid RME than the conventional
appliance, which might relieve and minimize the magnitude of the force distributed to the dentition and so
patients in the hybrid group experienced less pain and assigned lower scores.

Perception of pain is dependent upon factors such as gender, age and individual pain threshold. Medical pain threshold are similar between genders, indeed some studies (2-5- 8) didn't show any gender-related differences in the perception of pain. Conversely, others studies (1-3) showed that female are more sensitive to pain than male. This could be explained why perception of pain intensity is subjective and can be influenced by anxiety levels which generally are higher in female than male. As far as the age concerned, some studies (1-2)have reported that older patients are more sensitive to pain than younger,
because with increasing age, interdigitation of the mid-palatal suture increases, meaning that somewhat higher forces era required to induce expansion and consequently more pain is perceived. However in others studies (3-6- 8) no age-related differences were found.

Conclusion

Perception of pain during rapid maxillary treatment is a common symptom reported by patients especially in the first week of treatment and precisely during the first 10 activation of the screw. It is important to provide exact instruction and information of this effect to obtain the best compliance and adaptation by patients treated.

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