Difference in Pain Perception Between Banded and Bonded Hyrax during Rapid Palatal Expansion

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Abstract

Objective: The aim of the study was to compare pain experience during rapid palatal expansion using two different types of palatal expanders (banded and bonded hyrax). Material and methods: A total of 37 patients (22 girls and 15 boys) with age range 6-13 years for boys and 7-13 years for girls. Banded and bonded hyrax were compared for pain perception during a three-day follow up. Results: No statistically significant difference was found when comparing the two different expanders. Overall, the pain was mild to moderate. Conclusion: We found no difference in pain perception when comparing banded and bonded Hyrax expanders.

Keywords: expansion, RPE, Pain and Hyrax

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1. Introduction

Correction of posterior crossbite is the most common reason for transverse treatment. The prevalence of crossbite ranges from 7% to 23% and is not greatly different between girls and boys.

It is recommended to treat posterior crossbite in the mixed dentition. If treatment is postponed until adulthood, skeletal maxillary expansion might be difficult and painful. In mature patients surgical assistance might be indicated to allow for palatal expansion. Although treatment can be employed in the primary dentition, cooperation may be lacking in very young children, and unsatisfactory results or relapse can occur necessitating retreatment in the mixed dentition. [3,4]

A Hyrax jackscrew appliance is the most common appliance employed for transverse expansion of the midpalatal suture. On activation, the initial force from the screw will tip and translate maxillary molars laterally until the speed of screw activation exceeds the speed of dental root movement. Beyond that point, the force generated by the Hyrax will increase dramatically until it is greater than the resistance offered by the maxillary skeletal articulations, the suture will separate, and skeletal expansion will begin.

There are two types of Hyrax expanders; banded and bonded. The banded hyrax consists of four bands; two in the premolars and two in the molars. The bands are connected to a screw in the middle of the palate via a heavy wire extensions that are adapted to follow the palatal contours (Figure 1). The main advantage of this expander is that it does not irritate the palatal mucosa and is easy to clean. It is capable of providing sutural separation within a very short period of time. Each activation of the screw produces approximately 0.2 mm of lateral expansion. [5]
This appliance is constructed with an acrylic coverage over the posterior segments, instead of bands. The acrylic coverage is bonded directly to the teeth (Figure 2). The bonded appliance has become increasingly popular because of its advantages. It can be easily cemented during the mixed dentition stage, it reduces posterior teeth tipping and extrusion. The buccal capping limits molar extrusion during treatment and, therefore improves the vertical control. [6]

It has been reported that pain is one of the most common reasons why patients discontinue orthodontic treatment. Palatal expansion is one of the procedures that cause pain during orthodontic treatment. The aim of the study was to compare pain experience during rapid palatal expansion using two different types of palatal expanders (banded and bonded hyrax).

2. Material and Methods

Ethical approval was taken from Qassim Regional Dental Center in Qassim region, Saudi Arabia. A total of 37 patient (22 girls and 15 boys) with age range 6-13 year for boys and 7-13 years for girls. The sample was randomly selected from Qassim Regional Dental Center and subjects were asked to participate in the study after consent form were signed by the patients’ parents.

The inclusion criteria was unilateral or bilateral posterior crossbite with constricted maxilla and age at diagnosis of 6-14 years, with dental stage in the early, late mixed dentition, or permanent dentition. The exclusion criteria was for patients who had any medical problem, cleft lip and palate or age younger than 6 years and older than 14 years.

The patients were divided into two age groups (group A >=10 years, group B <10 years). Both banded and bonded hyrax were used in the study. The appliances were randomly chosen for the patients using 19.0 (SPSS Inc., Chicago, IL, USA) statistical software package. A person who was blinded was asked to do the randomization for appliance selection. The banded Hyrax group consisted of 20 patient (12 girls and 8 boys) and the bonded Hyrax group consisted of 17 patient (10 girls and 7 boys).

Both expanders were activated two quarter turns per day (0.5 mm) until the palatal cusps of the maxillary first molars contacted the buccal cusps of the mandibular first molars. One orthodontist treated the cases in this study. The questionnaires were collected back from the patients a week after the appliance cementation. All statistical analyses were performed with SPSS for Windows version 19.0 (SPSS Inc., Chicago, IL, USA) statistical software package.

3. Results

The overall response rate was 100%. Data is displayed in mean and standard deviation. Comparison between groups using independent t-tests at significance level P<0.05 was done. The overall pain perception during rapid palatal expansion was low.

When comparing pain perception during rapid palatal expansion between male and female subjects, no statistically significant difference was found at P 0.093, 0.62, 0.30 for the first, second and third day of expansion respectively. The mean score for pain perception was mild to moderate for both male and female (Table 1).

The patients were divided into two age groups (group A >=10 years, group B <10 years). There were no significant difference in pain perception when the age groups were compared for the second and third day. Patient who were older than ten years old had greater pain perception on the first day of hyrax activation at P 0.041 (Table 2).

When comparing the types of expanders, there was no statistically significant difference between banded and bonded hyrax expanders (Table 3).

### Table 1. Difference in pain perception between banded and bonded Hyrax

| Expander     | Gender | N  | Mean | Std. Deviation | P value |
|--------------|--------|----|------|----------------|---------|
| Bonded Hyrax | Male   | 15 | 1.20 | 0.86           | 0.081   |
|              | Female | 22 | 1.77 | 1.066          |         |
| Banded Hyrax | Male   | 15 | 1.40 | 0.50           | 0.610   |
|              | Female | 22 | 1.50 | 0.67           |         |
| Bonded Hyrax | Male   | 15 | 1.27 | 0.59           | 0.334   |
|              | Female | 22 | 1.09 | 0.42           |         |

### Table 2. Difference in pain perception between the two age groups (group A >=10 years, group B <10 years)

| Age       | Expander N Mean | Std. Deviation | P value |
|-----------|-----------------|----------------|---------|
| >=10 24   | 24 1.29         | 1.042          | 0.041   |
| <10 13    | 13 2.00         | 0.816          |         |
| >=10 24   | 24 1.42         | 0.654          | 0.566   |
| <10 13    | 13 1.54         | 0.519          |         |
| >=10 24   | 24 1.25         | 0.532          | 0.150   |
| <10 13    | 13 1.00         | 0.408          |         |

### Table 3. Difference in pain perception between banded and bonded Hyrax

| Expander     | N  | Mean | Std. Deviation | P value |
|--------------|----|------|----------------|---------|
| Banded Hyrax | 20 | 1.40 | 1.046          | 0.369   |
| Bonded Hyrax | 17 | 1.71 | 0.985          |         |
| Banded Hyrax | 20 | 1.40 | 0.598          | 0.129   |
| Bonded Hyrax | 17 | 1.53 | 0.624          |         |
| Banded Hyrax | 20 | 1.25 | 0.444          | 0.191   |
| Bonded Hyrax | 17 | 1.06 | 0.556          |         |
4. Discussion

Ninety-seven percent of the patients reported at least some pain during Hyrax activation, this was in agreement with other studies. [8] Pain intensity levels reported in our study were low overall. In our study, the results show that pain was felt more on the first day and decreased gradually in the second and third day but was not at a statistically significant level. Needleman found that the highest levels of pain were reported during the first 10 turns with the greatest intensity during the first 6 turns and a steadily decreasing amount of pain thereafter. [8] The decreasing trend in reported pain could be explained by the fact that children may become more comfortable with the procedure.

Although some studies have reported that girls report more pain and discomfort than do boys [9,10], we found no major gender differences in experienced pain intensity and discomfort in this study.

In this study, children older than 10 years of age were no more likely to report more pain during RPE compared to children 6-10 years of age. Studies assessing pain and its association with age are conflicting.

Feldmann and Bazargani reported that age was positively correlated with overall pain and discomfort. [11] According to Needleman young children reported no less pain than older children. [8] Some laboratory studies suggest that sutural expansion should be more easily performed in younger children, thus potentially causing less pain and reducing the need for pain medication.

We found no difference in pain perception when comparing banded and bonded Hyrax expanders. It has been reported that banded hyrax is more hygienic than the bonded type on long term evaluation.

The main advantage of this expander is that it does not irritate the palatal mucosa and is easy to clean [5].

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