



PAIN PERCEPTION OF PEDIATRIC PATIENTS DURING CAVITY PREPARATION WITH Er:YAG LASER AND CONVENTIONAL ROTARY INSTRUMENTS

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ABSTRACT

Aim: The aim of the present study is to evaluate and compare the pain perception of pediatric patients during cavity preparation with the use of Erbium:YAG laser 2940 nm and conventional rotary instruments.

Methods and materials: A group of ninety 6-12-years-old patients with matched carious lesions (D3 threshold, WHO system) was divided into two equal treatment groups and treated without anaesthesia. In the intervention group the cavities were prepared with Erbium:YAG laser 2940nm and in the control group with conventional rotary instruments. At the end of the treatment each patient was asked to point the degree of its pain on the universal pain assessment tool.

Results: Participants in the laser treatment group reported significantly lower pain scores compared to participants in the control group ($p < 0.005$). The analysis of pain indicated that in the intervention group the scores obtained from the majority of cases (71.1%) were low and only one patient reported severe pain perception. In the conventional treatment group the results showed approximately equal frequency for low (40%) and moderate (42.2%) pain level.

Conclusions: The Erbium:YAG lasers produce less pain compared to the conventional mechanical preparation. They offer new and useful possibilities in restorative dentistry in pediatric dentistry and are good treatment options.

Key words: pain perception, laser treatment, pediatric dentistry

INTRODUCTION

The interaction between dental anxiety and pain suggests that people who respond fearfully to pain are at an increased risk of ending up in the so called ‘vicious cycle of anxiety’ [1, 2]. If this cycle is not broken, a severe form of dental phobia might develop [2]. Conventional rotary treatment for cavity preparation is often accompanying by pain and fear for children, although the pain may be reduced by local anaesthesia [3]. The sight of the anesthetic needle and pain associated with dental treatment are identified by pediatric patients as the most potent triggers for dental anxiety [4, 5, 6, 7, 8]. Any new technology that decreases dental pain and fear is of a great interest to both dentists and patients [9].

Dental laser treatment reduces the need for injected local anesthesia and obtains very low to null likelihood of

odontoblastic pain during carious removal. Laser therapy in pediatric dentistry is a therapy of choice for its known advantages, especially for the safety of its use and for its gentle approach with patients [9]. It has been in use for carious removal in anxious patients for more than 20 years and is a potential alternative for hard dental tissue therapy in children [10,11]. This new technology offers to the pediatric dentists new possibilities to change completely the restorative treatments.

This study seeks to evaluate and compare the pain perception of pediatric patients during cavity preparation with the use of Erbium:YAG laser 2940nm. (LiteTouch, Syneron Medical Ltd.) and conventional rotary instruments.

METHODS AND MATERIALS

A group of ninety 6-12-years-old patients (mean age = 7.42 ± 1.35 years), who met the inclusion criteria and were treated at the Department of Pediatric Dentistry in Plovdiv, Bulgaria during the period May – December 2013, was randomly divided into two equal treatment groups.

The study’s inclusion criteria were:

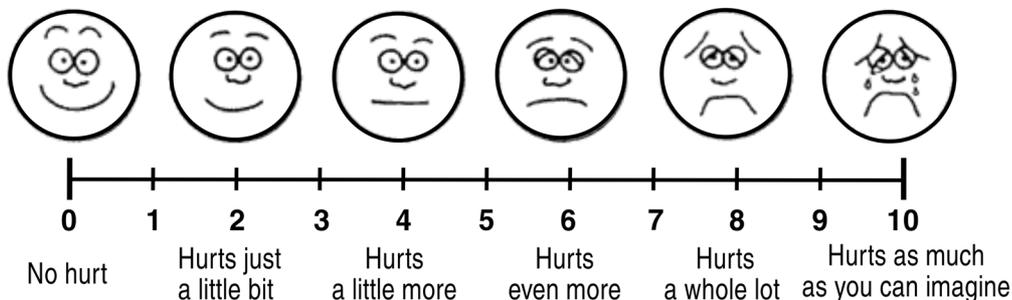
- children aged 6-12 years;
- presence of one or more dentine carious lesions (D3 threshold, WHO system), without pulp involvement or pain, located on the occlusal or proximal surface of a primary or a permanent molar;
- patients must have had no previous laser treatment of carious lesions prior the present study;
- signed informed consent form from the parent;
- native language of the child - Bulgarian;

In the first (intervention) group the cavities were prepared with with Er:YAG laser 2940 nm. Parameters and operative mode used for laser hard tissue therapy are: 200-300mJ/20Hz, water 8 for the permanent teeth and 100-200mJ/20Hz, water 8 for the primary teeth. In the second (control) group the cavities were prepared with the conventional rotary instruments – high-speed and low-speed dental handpieces. In both groups the procedures were performed without anaesthesia.

After cavity preparation and before restoration of the treated tooth the degree of pain of each child was assessed, using the universal pain assessment tool. It is a self-report instrument that comprises Wong-Baker Faces Rating Scale - a row of six representative images (icons) ranging from ‘No hurt’ to ‘Hurts as much as you can imagine’ in

combination with a visual analogue scale of 0 – 10 (Figure 1) [12]. There are six levels of pain quality and intensity marked by word descriptors. Each patient was asked to point to the face or choose the number which most closely depicted its pain perception during dental treatment.

Fig. 1. Universal pain assessment tool



The data obtained were tabulated and subjected to statistical analysis. SPSS 19.0 was used for data analyses. The level for statistical significance was set at $P < 0.05$.

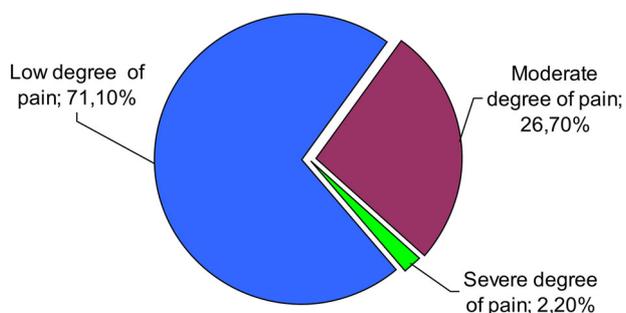
RESULTS AND DISCUSSION

Because children under 8 years old are unlikely to be reliable in recalling their pain perception during treatment, the universal pain assessment tool was used [13]. The combination of a visual analogue scale with a faces scale is considered to be a better instrument in estimating children’s attitudes and perceptions than the single use of numeric or facial scales [14].

When interpreting the results, we group the six levels of pain intensity on the universal pain assessment tool into three degrees of pain – low (level 1 and 2), moderate (level 3 and 4) and severe (level 5 and 6) pain.

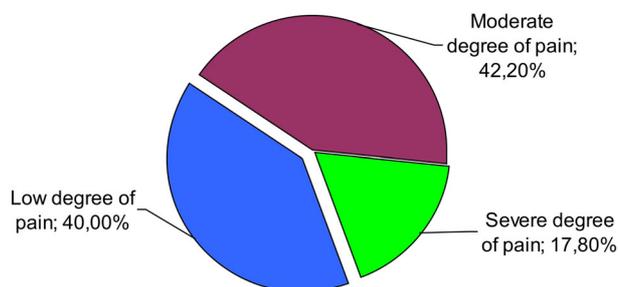
Comparing the results of the present study within the laser treatment group the proportion of children who indicates low pain degree is largest (71.1%) while the one of patients who reports severe pain perception is the lowest (2.2%). Almost one third of children (26.7%) reports moderate pain degree (graph 1).

Graph 1. Distribution of scores on the pain scale used in the intervention group



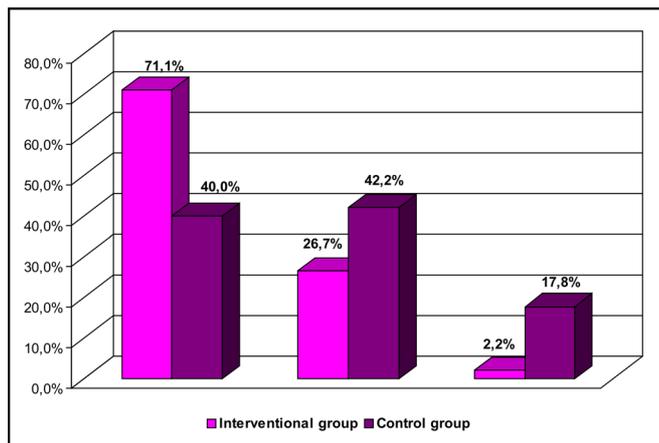
The results of our study show that within the control group the proportion of children who indicates low (40%) and moderate (42.2) pain degree are approximately equal. Almost one fifth of children (17.8%) reports severe pain perception (graph 2).

Graph 2. Distribution of scores on the pain scale used in the control group



Participants in the laser treatment group reported significantly lower pain scores compared to participants in the control group ($p < 0.005$). The single most interesting observation to emerge from the data comparison is that 33.3% of children indicate no pain at all with laser preparation, while in the control group the same portion is only 9%. While in the laser group the largest portion of children reports low pain level (71.1%), in the control group the largest one includes the patients who report moderate pain level (42.2%), (graph 3). The analysis of results concerning the two antipodal perceptions low and severe pain perception shows significant differences between the two groups ($p < 0.005$ for low degree, $p < 0.01$ for severe degree).

Graph 3. Comparison of the degrees of pain between the two groups



The data reported here appear to support the assumption that laser therapy produces less pain compared to the conventional rotary treatment during cavity

preparation. The findings from this research are in line with the prevalent results of considerable number of studies [9, 15, 16, 17, 18]. They show that the application of lasers for hard and soft tissue therapy is much more painless and comfortable for patients than the patterns of conventional treatment.

The present results are significant in at least major two respects concerning dental anxiety in children. First, laser treatment reduces the need of injected local anaesthesia and the sight of needle that is considered a specific anxiety provoking stimulus in dental setting. Second, when dental phobia already exists, the laser painless treatment will break the existing ‘vicious cycle of anxiety’ and contribute to fearless routine dental care visits.

CONCLUSIONS

The Erbium:YAG lasers produce less pain compared to the conventional mechanical preparation. It seems that this new technology poses a suitable alternative for restorative treatment in pediatric dentistry and is a good treatment option.

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