http://dx.doi.org/10.5272/jimab.2014205.631

Journal of IMAB
ISSN: 1312-773X
http://www.journal-imab-bg.org

OPEN ACCESS

Journal of IMAB - *Annual Proceeding (Scientific Papers)* 2014, vol. 20, issue 5

SUBJECTIVE ACCEPTANCE OF PEDIATRIC PATIENTS DURING CAVITY PREPARATION WITH Er:YAG LASER AND CONVENTIONAL ROTARY INSTRUMENTS

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SUMMARY

Aim: The aim of the present study is to evaluate and compare the subjective acceptance in children during hard dental tissue therapy using Er:YAG laser 2940nm and conventional rotary instruments.

Methods and materials: The study included ninety 6-12-years-old children with matched carious lesions (D3 threshold, WHO system), divided into two equal treatment groups. In the intervention group the cavities were prepared with Erbium:YAG laser 2940nm and in the control group with conventional rotary instruments, without anaesthesia. After cavity preparation patient's subjective acceptance was assessed by a questionnaire concerning primary stress triggers.

Results: The annoyance factor (vibration) was found as a stress trigger in the majority of control children (86.7%), while in the intervention group it was found in 2.2% of cases. The most anxiety provoking items in the intervention group were smell (67.7%) and taste (42.2%). The sound was found to be a stress trigger in more than half of control children (62.2%) and less than one-fifth of the children in the intervention group (15.6%). The study results showed significant difference in these items between two groups ($p< 0.001$).

Conclusions: The Erbium:YAG lasers reduce three of four stress triggers in '4S' principle - vibration, sight and sound. They are a good treatment option for fearful children since they have acceptable efficiency in treatment of pediatric anxiety disorders compared to the mechanical preparation.

Key words: laser therapy, subjective acceptance, pediatric dentistry

INTRODUCTION

Fear of drill is a principal cause of dental anxiety among children which may lead to avoidance of dental care, increasing the risk of caries development and oral diseases [1, 2, 3]. It is a multidimensional complex phenomenon, and no one single variable can exclusively account for its development [4].

Pediatric patients identify a number of specific stimuli in dental setting among which the restorative dentistry procedures deliver most potent triggers for their dental anxiety such as the sight of the anesthetic needle and the sight, sound, smell and vibration of dental handpiece and rotary dental drill, pain associated with dental treatment [5, 6, 7, 8, 9]. It has been suggested that reducing these stress-triggers is an effective procedure for managing anxious patients [4, 10].

For this reason anxious patients who must undergo restorative procedures are often managed using the '4S' rule or the so called '4S' principle [4, 10]. It is based on removing four of the major primary sensory triggers for dental anxiety when in the dental setting – sight (air turbine drill, needles), sounds (drilling), sensations (high frequency vibrations – the annoyance factor), smells, and it is used in conjunction with other measures and alternative methods to mitigate anxious behaviors and their consequences.

A range of approaches can be used and they can be mixed and matched to meet the particular needs of situation. 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 [11]. It has been in use for carious removal in anxious patients for more than 20 years [10]. Dental laser treatment reduces the need for injected local anesthesia and obtains very low to null likelihood of odontoblastic pain and the annoyance factor during carious removal. There is no smell or there is dentine ablation vapour in case of inadequate suction during cavity preparation, while the dominant physical sensation is popping (shock waves) and ablation sound. This new technology is an alternative method and offers to the pediatric dentists new possibilities to change completely the restorative treatments.

Considering the difficulty of reducing dental anxiety in children, this study seeks to evaluate and compare the subjective laser therapy acceptance and tolerance during hard dental tissue therapy in children using Er:YAG laser LiteTouch and conventional rotary instruments.

MATERIAL AND METHODS

The study was conducted on ninety 6-12-years-old children (mean age = 7.42±1.35 years). A convenience sample of children was randomly selected from patients who met the study's inclusion criteria and were treated at the Department of Pediatric Dentistry in Plovdiv, Bulgaria during the period May - December 2013.

The 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;

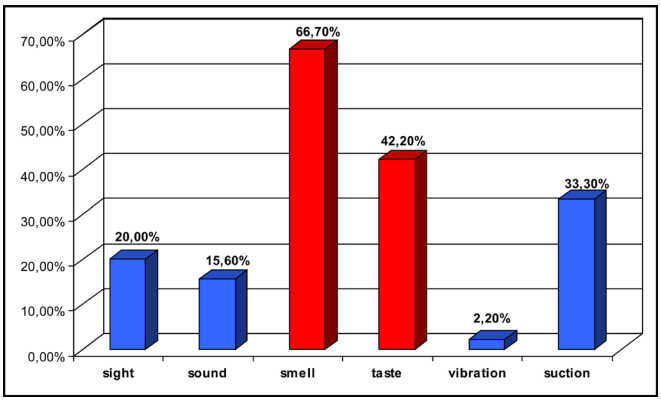
The selected children were divided into two equal treatment groups. In the intervention group the cavities were prepared with with Er:YAG laser 2940nm. Parameters and operative mode used for laser hard tissue therapy are: 200-300mJ/20Hz, water 8 for the permanent teeth and 100-200mJ/20Hz, water 8 for the primary teeth. In the 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 each patient completed a questionnaire to evaluate the subjective acceptance of laser therapy concerning the major primary stress triggers. Children were asked to rate the anxiety provoked by the sight and sound of the laser handpiece, the smell, taste, vibration sensation and discomfort of suction during the laser preparation.

RESULTS

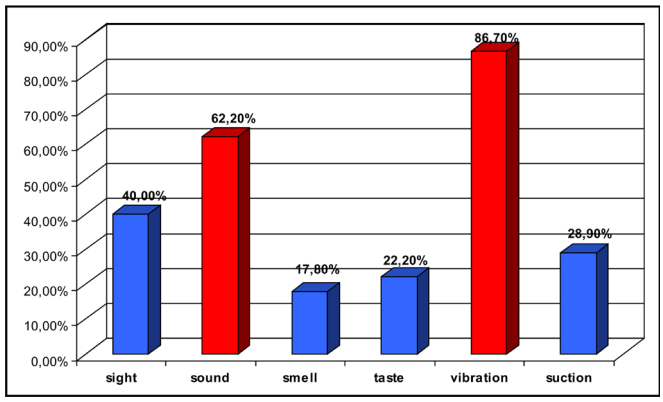
Graph 1 shows the distribution of the results concerning the investigated triggers for dental anxiety during laser cavity preparation. In the intervention group the most anxiety provoking item was smell (67.7%) which is statistically different from the other investigated items ($p<0.001$, $p<0.005$ for taste). The second factor reported as anxiety provoking one was taste (42.2%). Only one patient reported vibration sensation during cavity preparation using an Erbium YAG laser (2.2%) which demonstrated statistically significant difference compared to the other items ($p<0.001$, $p<0.01$ for sight, <0.05 for sound).

Graph 1. Prevalence of the investigated items in the laser treatment group



In the control group the patients reported as most anxiety provoking factors high frequency vibration – the annoyance factor (86.7%) and the sound of dental drill (62.2%) which are statistically different from all items ($p<0.001$ for vibration, $p<0.05$ for sound). Graph 2 shows the distribution of the results concerning the investigated triggers for dental anxiety during cavity preparation with conventional rotary instruments.

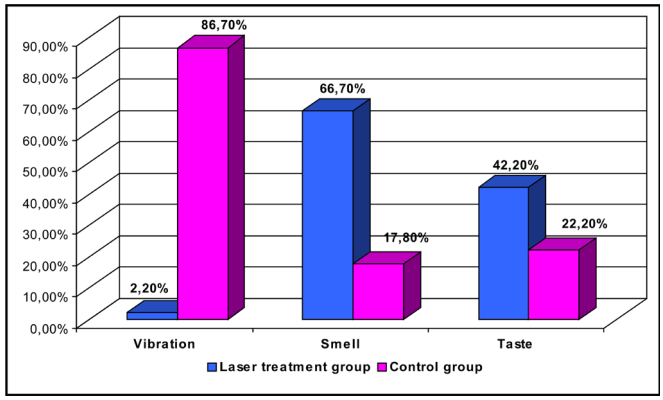
Graph 2. Prevalence of the investigated items in the conventional treatment group



When determining and comparing the stress triggers between the two treatment groups, we found differences that vary significantly.

The annoyance factor (vibration) was found as a stress trigger in the majority of control children (86.7%), while in the intervention group it was found in 2.2% of cases. The most anxiety provoking items in the laser treatment group were smell (67.7%) and taste in the oral cavity (42.2%), while in the conventional treatment group the same items were reported as anxiety provoking only by one fifth of the participants. The study results showed significant difference in these items between two groups ($p< 0.001$ for vibration and smell, $p<0.05$ for taste), (graph 3).

Graph 3. Comparison of the most anxiety provoking items between the two treatment group



DISCUSSION

The results in the laser treatment group indicate a decrease in three of four stress triggers in '4S' principle - vibration, sight and sound. Our results demonstrate that the sensation of high frequency vibrations – the annoyance factor for patients, during laser preparation is eliminated. It confirms the results of Evans et al. who found that in children over 10 years old there is a preference of laser treatment which is perceived as having less vibrations in comparison with the conventional method [12].

Yamada et al. find that the sound of dental drill has the strongest influence on the unpleasant feeling of patients

at the dental clinic [13]. Several studies have shown that fear of drill is a principal cause of dental anxiety among children and especially the sight and sound of dental handpiece [2, 3, 5, 9, 14]. Laser therapy as an alternative method for managing anxious patients reduces the effect of these two stress triggers. It is confirmed by the obtained results of our study - more than half of control children have found sound as a stress trigger, while less than one-fifth of the children in the intervention group have shown anxiety provoked by the sight and sound of the laser. The results of the present study concerning the anxiety provoked by the noise are in line with the results of a previous study that only few children consider popping sound as a stress trigger [12].

However, one stress trigger as to '4S' rule is not reduced during laser cavity preparation. Patients in our study consider smell as the most anxiety provoking factor, followed by the unpleasant taste that is produced during the laser preparation in oral cavity. On the other hand, they cannot be considered as disadvantages related only to the laser therapy because approximately 20% of the patients in the control also felt unpleasant smell and taste in their mouth.

The adequate suction needed during laser cavity preparation was found to be stressful factor by one third of the studied patients in both groups.

CONCLUSIONS

Cavity preparation with the Erbium YAG laser has a good level of subjective acceptance registered among patients. The analysis of the obtained results shows that laser therapy has acceptable efficiency in treatment of pediatric anxiety disorders compared to the mechanical preparation. It would seem to be is a therapy of choice in pediatric dentistry for managing anxious patients who must undergo restorative treatment.

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Please cite this article as: Belcheva A, Shindova M. Subjective Acceptance of Pediatric Patients during Cavity Preparation with Er:YAG Laser and Conventional Rotary Instruments. *J of IMAB.* 2014 Oct-Dec;20(5):631-633.
doi: http://dx.doi.org/10.5272/jimab.2014205.631

Received: 26/08/2014; Published online: 03/11/2014

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