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INTRODUCTION

Dental fear is a significant factor contributing to the avoidance of regular dental care. Adverse childhood dental experiences can reduce the frequency of visits to the dentist, leading to poor oral hygiene and emergency visits. Lasers have shown promise in reducing dental fear by potentially eliminating the need for local anesthesia. Previous research has shown at least 85% of Waterlase treatments do not require local anesthesia (LA).¹⁻³

PURPOSE

This study aims to evaluate if hard tissue lasers reduce the requirement for LA for dental restorations and thus reduce anxiety for pediatric patients. It is hypothesized that treatment of dental caries with hard tissues lasers will reduce the need for LA as well as dental anxiety in pediatric patients.

METHODS

IRB was obtained from WCG and approved by USC. Healthy Smiles for Kids of Orange County patients were screened for eligibility according to the inclusion and exclusion criteria at their recall visits. Inclusion criteria included: children ages 6-16, whose parent or legal guardian is able and willing to give informed consent, ASA classification 1 or 2 with at least one class I or class II lesion planned to be treated under nitrous oxide (N2O) sedation.

Control Group: Follows conventional cavity preparation steps.

Test Group: Biolase's Waterlase iPlus All-tissue laser (Er,Cr:YSGG, class IV) was used to perform pulpal anesthesia and cavity preparations. To achieve pulpal analgesia, the "rabbit" technique was used. Once pulpal analgesia was achieved, the laser tip was held 1-2 mm away from the tooth surface and moved slowly to remove caries and create the preparation. All cavity preparations were refined using a high- and/or slow-speed handpiece. The test group was not routinely given LA injections at the beginning of the appointments. However, it was available if requested or the doctor deemed it necessary to complete treatment. All cavity preparations were restored and finished identically, using conventional methods. Light-cured composite resin following the application of acid etching and bonding agents.

Patients were monitored throughout their appointments for behavioral signs of stress via blood pressure (BP) and pulse repetition rate (PR).⁴⁻⁶ Vitals were recorded at the following time points: Exam visit (T0), 2- 5 minutes before N2O at treatment visit (T1), LA injection (Control group) or Laser

analgesia (Test group) (T3), first cavity excavation (T4), first composite placement (T5) and upon completion of procedure (N2O off) (T6).

Subjective indications of stress were also recorded. Investigators observed patient behavior and rated the subjects using the Frankl Behavior Rating Scale (FBRS). A baseline score was recorded at the exam visit, which was compared to the FBRS score at the treatment visit(s). Additionally, patient self-reported anxiety level were assessed post-treatment via a multi-factor MCDAS questionnaire. For each patient, MCDAS scores were summed with a maximum possible score of 35. A score of 19 or higher indicates above average dental anxiety, and a score of 26 or higher is associated with extreme dental anxiety.⁷⁻⁸

RESULTS

A total of 55 patients enrolled in the study and 26 were seen for treatment. One patient was withdrawn from study due to a panic attack. Fifteen patients were randomly assigned to the test group and were seen for a total of 20 treatment visits, 4 of which required LA. Ten patients were randomly assigned to the control group and were seen for a total of 13 visits, 12 of which required LA (**Table 1**).

	# of Patients	# of Visits	# of Visits requiring LA
Control	10	13	12
Test	15	20	4

Table 1: Patient Demographics

The average percent change for blood pressure and heart rate *increased* from before treatment compared to vitals taken at laser analgesia, cavity preparation and filling placement for the test group. For the control group, the average percent change for blood pressure *decreased* across the time points mentioned above. However, the average percent change in heart rate only decreased for the control group for filling placement versus before treatment began (**Tables 2A-C**).

	Average % Change - Systolic BP	
	Control	Test
T1 vs T3	-1.5%	2.5%
T1 vs T4	-1.0%	4.2%
T1 vs T5	-2.0%	2.7%

Table 2A

	Average % Change - Diastolic BP	
	Control	Test
T1 vs T3	-4.1%	3.6%
T1 vs T4	-2.6%	3.0%
T1 vs T5	-1.3%	5.3%

Table 2B

	Average % Change - HR	
	Control	Test
T1 vs T3	3.2%	2.3%
T1 vs T4	3.9%	7.3%
T1 vs T5	-4.5%	2.7%

Table 2C

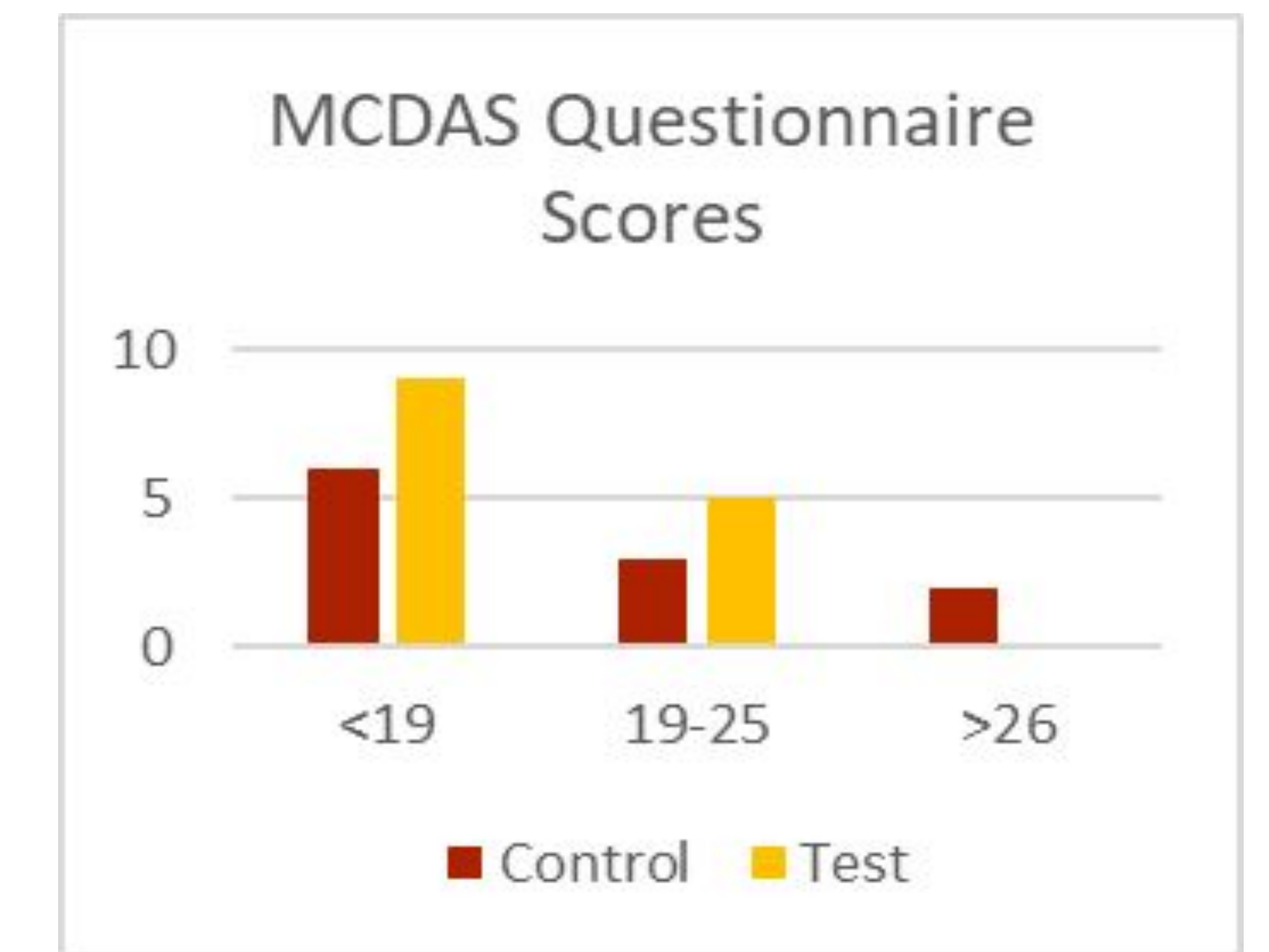


Figure 1 MCDAS Survey Scores

Three patients had a MCDAS score of 19-25 from the control group and 5 from the test group, which indicates above average dental anxiety. Only two patients (control group) had a MCDAS score of 26 or higher, indicating extreme dental anxiety (**Figure 1**).

A total 5 treatment visits resulted in a decline in FBRS score when compared to their exam visit rating, 2 of which were in the control group and 3 were from the test group.

CONCLUSIONS

In summary, 80% of patients in the test group did not have LA administered. However, more patients reported sensitivity with the laser (permanent teeth) but declined LA administration due needle phobias. Patient's vitals trended in an upward direction for the experimental group along with increased anxiety scores.

This project has been conducted in consultation with Biolase Corporation

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