

Ozone Treatment of Pit and Fissure Caries: 6- month Results

L. ABU-NABA¹*, H. AL SHORMAN^{1*}, M. STEVENSON², E. LYNCH¹
¹Restorative Dentistry, School of Dentistry, ² Medical Statistics, Queen's University Belfast, Northern Ireland



Introduction

Fluoride may be associated with "hidden" occlusal caries which can obscure active dentinal lesions. Treatment options for these initial (non-cavitated) carious lesions range from monitoring, sealing, aiding remineralisation and minimal invasive approaches up to conventional drilling and filling. However, these treatment options are usually based on diagnostic techniques which are poorly sensitive. Ozone has been proven to halt root caries and also reverse lesions by allowing the natural remineralisation process to proceed. Disruption of the protected ecological niche of the micro-flora allows remineralisation from the saliva. Remineralised lesions are known to be more resistant to further dissolution than sound tooth surfaces. Ozone is now being investigated for the treatment of pit and fissure carious lesions (PFCLs).

Aim

This study aimed to continue to monitor PFCLs arrest, remineralisation, stabilisation or progression six months after Ozone treatment.

Materials and Methods

Patient Selection:

78 subjects, over 12 years old, were enrolled in the study who were patients attending the dental clinics, dental school, QUB. Informed consents were signed.

Lesion Selection:

A total of 208 lesions were included which met the following criteria: The carious lesions occurred on the occlusal surface and were graded 1-3 on the clinical severity index (Ekstrand, 1998) and had DIAGNOdent values equal or greater than 10. For each patient, an even number of teeth was selected and randomised into treatment and control groups. The site and severity of the lesions were recorded. Occlusal surfaces of teeth were cleaned using the Prophylflex 2® (KaVo, Germany).

The DIAGNOdent® (KaVo, Germany) peak values were recorded and then the ECM (LODE BV, Netherlands) standard scale readings were recorded four times and an average calculated.

Ozone treatment:

O₃ was delivered from the HealOzone unit (CurOzone USA), (2100 ppm O₃, 615 ml/min) through a hand piece with a silicone cup that sealed the tooth. Once sealed, the device automatically delivered the O₃ for the treatment group for 10 seconds followed by 10 seconds vacuum.

Recall:

After one and three months, patients were assessed for any adverse events after the treatment. Teeth were cleaned using the Prophylflex 2® and re-examined using the DIAGNOdent® and ECM readings, which were repeated on the same sites as previously recorded. Ozone treatment was repeated on each of these two recall visits.

Statistical analysis:

The changes in the ECM values were tested by one sample t-test of log_e m/base and 2-way analysis for block and treatment effects. The effect of the following co-variables was tested: tooth location, lesion location (mesial, central or distal) and type (pit or fissure), base line DIAGNOdent, and clinical severity classification.

Results

There were no observed or reported adverse events during the study period.

The ECM readings in the treatment group increased compared to baseline (p<0.05). The percentage of teeth that improved was 81.7% (n=58) and the mean change was 1.31 times the base line value. The control group didn't change significantly (p>0.05). The mean change was 0.763 times the base line value. Comparing both groups, the results showed that the the ECM values were significantly higher for the treatment group than for the control group (p<0.05).

The ECM change was not affected by any of these co-variables: tooth location, lesion location (mesial, central or distal) and type (pit or fissure), base line DIAGNOdent value, and clinical severity classification. In the control group and treatment group, DIAGNOdent® values showed no significant change (p>0.05) compared to baseline (p>0.05) and 75.4% teeth showed stable or improved DIAGNOdent scores in the treatment group. On the other hand there were no significant patient treatment interactions (p>0.05).

Discussion

Management of non-cavitated lesions in the dental clinic may be highly influenced by conventional diagnostic methods. Interpreting changes in the DIAGNOdent scores was difficult. There were a number of factors interacting to produce the changes at each recall visit. Both groups were possibly prone to the changes due to continuous activity of caries within the lesions, although this might be more pronounced in the control group as indicated by other diagnostic tools. This positive effect could be further complicated with incorporation of stains in the lesions during the course of a whole year activity in both groups, although it might be more pronounced in the treatment group. The immediate negative change due to the Ozone itself also further complicates the picture in the treatment group. The treatment and control groups seemed to be behaving similarly with slight DIAGNOdent changes that were better for the treatment group but were not significant.. This might be expected as DIAGNOdent was affected by the stain in the same manner (leading to an increase in it readings and scores). Only when the ECM was used, the actual change could be detected. For the treatment group, ECM readings were higher (better). Where the change in the DIAGNOdent scores were not significant at any recall visit, the ECM showed the significant difference as early as the first recall visit. The control group changes were heading not only together in the same direction, but also in a higher magnitude where most of the percentages, numbers and changes were significantly higher for the control group. The effect of stains on the control group was possible. But the combination with further deterioration of active lesions mounted up to higher readings detected by all tools.

Figure 1: mean ECM change (log_e transformed) at six months recall.

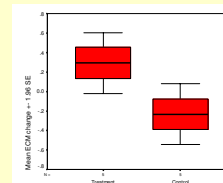
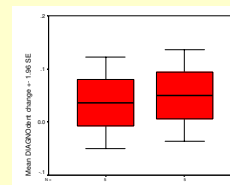


Figure 2: mean DIAGNOdent change (log_e transformed) at six months recall.



Picture 1: HealOzone unit

Picture 2: DIAGNOdent

Picture 3: ECM



Conclusions

Ozone treatment of PFCLs showed significant remineralisation at 6 months. All teeth responded similarly regardless of the tooth's or lesion's location, type, clinical severity and/or DIAGNOdent base line value.