Assessment of the effectiveness of the manufactured chemo-mechanical caries removal on caries removal

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ABSTRACT

Background: Chemo mechanical caries removal systems has been discussed as an alternative to conventional caries removal. This study assesses the efficacy of a chemo- mechanical caries removal technique in caries removal.

Material and methods: Forty five decayed extracted human teeth were used in the present study. After initial opening through the enamel, different concentrations of the chemo-mechanical caries removal solution were placed in the cavity and excavation of the caries was performed.

Results: After probing and visual inspection, with the use of the DIAGNOdent caries detecting device, and after histological examination, the concentrations of 0.5% and 0.7% were shown to be equally effective in removal of caries and more potent than the 0.2% concentration.

Conclusion: 0.5 % concentration of the manufactured chemo- mechanical caries removal is the optimal concentration that can be used in dentinal caries removal.

Keywords: Chemo-mechanical caries removal. (J Coll Dentistry 2005; 17(2):1-4 )

INTRODUCTION

In every field of dentistry, an awareness of the importance of preserving tooth tissue, combined with a patient-friendly approach, is becoming self-evident. It has been shown that invasive operative treatment often leads increasingly to further invasive treatment. Wherever possible the tissue should be preserved, invasive treatment should be kept to a minimum and natural tissue replaced with artificial substitutes only when it is absolutely unavoidable (1).

Chemo mechanical caries removal systems (CMCR) have been discussed as an alternative to conventional caries removal with round burs in a slow-speed hand piece, with Chemo mechanical caries removal, sound and carious dentine are clinically clearly separated, which means that only the cario’us tissue is removed, no sound tooth substance is sacrificed or damaged unnecessarily, the restoration is smaller, the remaining tooth substance is not weakened by the loss of sound tooth structure and the life of the tooth is not compromised and the cavity is no deeper than necessary, which means that there is less risk of harming the pulp (2).

According to the question about the effectiveness of (CMCR) this study assessed the efficacy of the new developed chemo-mechanical caries removal in caries removal.

MATERIALS AND METHODS

Forty five decayed human teeth extracted from different patients were used in the present study. The reason for extraction is for orthodontic purpose and for periodontal disease. The carious lesions were detected at routine dental visit. All lesions were opened, without enamel coverage and carious dentin was easily accessible through the cavity openings. None of the cavities extended into the pulp, and then the teeth were stored at 37°C in a water thermostat inside an incubator.

The teeth were numbered and assigned to one of three groups; each group consisted of 15 teeth (10 as test teeth and 5 as control teeth). Three bottles were prepared from each concentration; each bottle was use for 5 teeth from each group. The three bottles have the same color which is, orange (one of them contain amino acid + normal saline which is used as control material).

The blind technique was used in this test. The chemo-mechanical caries removal solution was prepared by mixing the powder of amino acid with the different concentrations of the sodium hypochlorite. The three concentrations that were used in this study were A: 0.2%, B: 0.5%, and C: 0.7%.

The three bottles that were prepared from each concentration have the same color. One of
them contains a control material (amino acid + normal saline). When these samples were ready they were placed in a porcelain jar.

Caries excavation was performed using the three concentrations by handling it using spoon excavator according to caries volume. Each concentration was used for each group as mentioned below.

A: 0.2%: A1=5 teeth, A2=5 teeth, A3=5 teeth
B: 0.5%: B1=5 teeth, B2=5 teeth, B3=5 teeth
C: 0.7%: C1=5 teeth, C2=5 teeth, C3=5 teeth

The hand excavation was performed until the cavity was considered free of caries. The most common criteria for determining that a cavity is free from caries are the color & surface texture of the dentine and the fact that a sharp probe does not catch (3), the use of DIAGNOdent caries detecting device (4), and finally the histological examination (5). The excavation procedure was timed from the first application of the chemo-mechanical caries removal until the cavity was considered caries free, and the time ranged between 7-20 minutes.

After the treatment the material was washed with water and air stream & the teeth were stored in water thermostat in 37°C to start the test to see the presence or absence of caries.

RESULTS

The results of probing and visual inspection of 0.2 %, 0.5 %, 0.7 % (CMCR)

A1 and A3 is regarded as a control group for the statistical analysis of the experimental group of 0.5 % concentration and experimental group 0.7 % concentration.

Analysis of the data is needed to examine the difference between different pairs of group, hence the data was analyzed statistically by applying the student-T-test that showed in table 1.

The results of the DIAGNO dent of 0.2 %, 0.5 %, 0.7 % (CMCR)

The result showed that 0.5%, 0.7% (CMCR) were effective in removing carries in group B & C. in spite of 0.2 % (CMCR) did not remove all the carries in group

The results of the histological examination of 0.2 %, 0.5 %, 0.7 % (CMCR):

In the histological examination also the result showed that 0.5%, 0.7% (CMCR) were effective in removing carries in group B & C. in spite of 0.2 % (CMCR) did not remove all the carries in group

### Table 1: T-test between each two groups in probing and visual inspection.

<table>
<thead>
<tr>
<th>Groups</th>
<th>T-value</th>
<th>Significant Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A1+A3) &amp; (B2+B3)</td>
<td>6.128</td>
<td>H.S</td>
</tr>
<tr>
<td>(B2+B3) &amp; (C1+C3)</td>
<td>0.00</td>
<td>N.S</td>
</tr>
<tr>
<td>(A1+A3) &amp; (C1+C3)</td>
<td>6.128</td>
<td>H.S</td>
</tr>
</tbody>
</table>

### Table 2: T-test between each two groups in DIAGNOdent test.

<table>
<thead>
<tr>
<th>Groups</th>
<th>T-value</th>
<th>Significant Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A1+A3) &amp; (B2+B3)</td>
<td>6.332</td>
<td>H.S</td>
</tr>
<tr>
<td>(B2+B3) &amp; (C1+C3)</td>
<td>0.00</td>
<td>N.S</td>
</tr>
<tr>
<td>(A1+A3) &amp; (C1+C3)</td>
<td>6.332</td>
<td>H.S</td>
</tr>
</tbody>
</table>

Figure 1: Histogram showing the mean of the control group (A1+A3), 0.5 % concentration experimental group (B2+B3) and 0.7 % concentration experimental group (C1+C3) in probing and visual inspection.
Figure 2: Histogram showing the mean of the control group (A₁+A₃), 0.5 % concentration experimental group (B₂+B₃) and 0.7 % concentration experimental group (C₁+C₃) in DIAGNOdent test.

Table 3: T-test between each two groups in the histological examination

<table>
<thead>
<tr>
<th>Groups</th>
<th>T-value</th>
<th>Significant Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A₁+A₃)&amp;(B₂+B₃)</td>
<td>9.00</td>
<td>H.S</td>
</tr>
<tr>
<td>(B₂+B₃)&amp;(C₁+C₃)</td>
<td>0.00</td>
<td>N.S</td>
</tr>
<tr>
<td>(A₁+A₃)&amp;(C₁+C₃)</td>
<td>6.194</td>
<td>H.S</td>
</tr>
</tbody>
</table>

Figure 3: Histogram showing the mean of the control group (A₁+A₃), 0.5 % concentration experimental group (B₂+B₃) and 0.7 % concentration experimental group (C₁+C₃) in the histological examination

DISCUSSION

0.2% concentration group:
It is shown that there is no significant difference in caries removal between the experimental group and the control group in all the tests that have been done in the efficacy assessment of this concentration. Therefore, this study has shown that at a concentration of 0.2% of the (CMCR) no caries have been removed (enamel and dentinal caries).

As far as our knowledge, there are no available data concerning the efficacy assessment of caries removal at such concentration.

0.5% concentration group
It has been shown that there is highly
significant difference in caries removal between this group and the control group in the entire test that has been done in the efficacy assessment of this concentration. Nevertheless, there was no significant difference in caries removing when comparing 0.5% (CMCR) and 0.7% (CMCR).

REFERENCES