Effect of Desensitizing Patch for Dentin Hypersensitivity

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Objective: This study is to compare a new hyperesthesia reliever patch with other conventional ones in the market and thus to provide a preliminary support for potential commercialization of a convenient product.

Methods: The sample includes 47 adults individuals who reported hypersensitivity teeth. We selected the most painful hypersensitivity teeth based upon self-reporting from the participants, checked their conditions in the eyes, and then implemented cold test and electric pulp tests. We conducted and recorded the test results four times — pre-patching, a day, three days, and six days after patching. On the sixth day, this study surveyed participant satisfaction.

Results: We observed no statistically significant difference between groups in VRS score in the cold test. However, average score for the Experiment 2 declined similarly as that for the Positive Control Group did. In contrast to the pre-patching period, the average score declined after the first day for the Experiment 2 and the Positive Control Group (p < 0.05); it fell down after three days for the Experiment 1 (p < 0.01).

Conclusion: It is estimated that there are pain relieving effects in the Experiment 2 as in the Positive Control Group. In the future, we need to recruit more participants, expand the test duration, and run studies with placebos. Moreover, we need to investigate whether there are any differences between toothpastes, mouthwashes, and new patches under research for intraoral application with greater duration for earlier effectiveness.

Keywords: patch type, dentin hypersensitivity, dentin desensitizing agents

Introduction

As the average life span is extended, the prevalence rate of periodontal disease, gingival recession, attrition and cervical abrasion, which are mainly seen in elderly patients, is increasing in patients of varying ages, as seen in the dental field [1]. It may be the cause of dentin hypersensitivity, and other problems which may include reasons for the loss of enamel, acidic foods, periodontal surgery, occlusal trauma, manipulation of periodontal instruments, and the use of tooth whitening programs [2]. In this respect, dentin hypersensitivity is a common clinical manifestation that manifests itself as a chemical, temperature, tactile, or osmotic stimulation of the enamel defect or the exposed dentin, or root surface, and is accompanied by transient painful reactions, short and sharp pain [3].

The hydrodynamic theory is one of the most widely recognized mechanisms of achene symptoms. According to this hypothesis, the pulp and the external environment are communi-
cated through the exposed dentinal tubules [4]. In this case, when multiple stimuli are applied, there are noted changes in the external fluid pressure or changes in the osmotic pressure in the external environment which can increase the flow of tissue fluid in the dentinal tubules, causing the effect of mechanical reactions to the nerve fibers in the pulp, resulting in pain as experienced by the participant. For this reason, based on the hydrodynamic theory, most dentin hypersensitivity treatments have been attempted to work to physically block the dentinal tubule to prevent migration of the dentinal tubule fluid, or to suppress the excitement of the sensory nerves in the pulp of the stimulus [5]. Orchardson and Gillam [6] said that the method of closure of the dentinal tubules is an effective treatment to control pain by reducing the permeability of the dentin.

The dentinal fluid is present in the dentinal tubule and consists of minerals and proteins. Zinc chloride is known to be an effective component of dentin hypersensitivity relief, and works by clotting the proteins and the blocking dentinal tubules. Agarwal et al. [7] reported that the use of zinc chloride and potassium ferricyanide solutions result in a protein precipitation of Tom's fiber. The Isabel et al. [8] study reported that the strontium chloride and zinc chloride were protein precipitant, and formed a closed membrane that caused the denaturation of an odontoblast, thereby blocking the migration of the dentinal tubule fluid and closing the dentinal tubule.

If symptoms of dentin hypersensitivity are felt, symptoms can be alleviated by using the dentifrice, mouthwashes, and gels, etc., which can be visited by a dentist or treated with dentin, or added with various medicines that can be used as a dentin hypersensitivity treatment agent. Lee [9] suggests that the self-management method can be simple and continuous, and that patients are also able to use dentin hypersensitivity relief toothpaste when considering the time and cost of having to go back to the dentist to have relief from these problems experienced with dentin pain. Walters [10] said that toothpastes containing dentin hypersensitivity mitigating ingredients are simple, cost effective and the most common way for a patient to manage the self-relief aspect of prevention of dentin pain. However, these toothpastes have a limited amount of time to contact the teeth, and because of their low abrasion power, it may be difficult to effectively manage dental plaque when compared to general toothpastes. This may worsen dentin hypersensitivity symptoms by widening the diameter of the dentinal tubules. In particular, Kawasaki et al. [11] study reported that the untreated group widened the diameter of the original dentinal tubule by 390% after 3 weeks of use of these products, and decreased by more than 20% in the group with toothpaste use alone for the management of dentin pain in a patient study or polled review.

Although many studies have been carried out so far, it is expected that there is a need for continuous and easy research on the effective medicines that can be used easily by patients themselves, whereby and in a short period of time they will be able to relieve the symptoms cost effectively, in addition to using toothpaste, and mouthwash solutions and gels for this purpose.

The patches containing zinc chloride used in this study are thought to be superior to the dentin hypersensitivity relieving effect, as they work by increasing the application time as applied to the teeth during the patient self-administration of this product. Also, it is compared with the commercially available patches based on potassium oxalate as a main component, and evaluated and presented as basic data for commercialization of a pain relief option for patients experiencing dentin pain issues.

Materials and Methods

1. Subjects and materials

1) Subjects

This study was conducted to evaluate a group of 47 dentin hypersensitivity adults aged 20 years or older who agreed to participate in the study, and who signed the written consent of the subject and the consent form for the subject, as required under the IRB regulation of the Dankook University.

Patients were summarily excluded from the study who are noted to have: systemic disease, who are pregnant, who are wearing a pacemaker, other electronic devices (internal defibrillators, insulin pumps, etc.) in the body, or those who have personally attached an electronic monitoring device. Applying the use of Holland et al.'s research [12], the use of dentin hypersensitivity treatments were used in the last 6 weeks by the patients, such as with the following patient conditions: abutments of fixed or removable prosthesis, teeth with fully implanted metal tubes, widely restored teeth, restored teeth to the test site, and teeth with heavily caries were also excluded from the study.

2) Materials

The experimental group 1 used a dentin pain management material which contained Zinc Chloride as the main component, and it is noted that the experiment group 2 used a material that contained Zinc Chloride and Tocopherol Acetate. The main component of the positive control is Potassium Oxalate, which was manifested in the use of a product called Crest Sensi-stop Strips (P&G, Cincinnati, OH, USA), which is currently being marketed in the United States for the purpose of relieving dentin hypersensitivity.

In the experimental group 1 and 2 and the positive control group, there was a difference in the method of removing the attached patches. However, since it is the only product sold in
Korea and abroad in patch form, it is used to compare the degree of effectiveness of achieving a difference in the method of removing the attached patches.

2. Methods

For the clinical trials submitted to the Planning Authority, the Dankook University Bioethics Committee (IRB) offered approval, which was conducted after the study permit approval (DKU 2015-03-008).

1) The subjects selected teeth

The subjects were asked to select the most uncomfortable area of the dentin hypersensitivity symptom that they experienced with dentin pan, and the teeth were visually inspected to confirm that they fit the teeth condition of the subject. The patients were also asked to select another tooth if the condition was not met upon the initial inspection of the teeth.

2) Degree of dentin hypersensitivity test and evaluation

If the tooth surface was wiped clean with gauze before the test, the measurement interference caused by dental plaque or food residue was removed. Next, the cold test and electric pulp test (EPT) were performed to determine and gauge the degree of dentin hypersensitivity of the participant’s teeth. The cold test are shown in figures which highlight the extent to which the patient was applied for 2 seconds on the tooth surface an ice stick, which was used to determine the patient’s feeling of the discomfort on the tooth, and a determination and measurement of the VRS (verbal rating scale) assessment [13,14]. The VRS was scored on a 3-point scale, but when there was no pain, when the stimulus was recognized, it was recorded as a 0 point. When the pain was felt by the participant for more than 10 seconds, it was recorded as 3 points. Five minutes later, the electric pulp test was performed on the participant’s tooth, to prevent the two stimuli from overlapping. When the subject felt a stimulus or felt discomfort and hold his/her hands up, the measurer took his/her finger off the device button and recorded the figure that corresponded to the pain measurement. The average value of these statistics was obtained after two times through this exercise.

3) Explain how to use the patch and precautions

The participants were given guidance on how to use the patch and its precautions as it was attached to the boundary between the teeth and the gums for 3-5 seconds. At that time, the participant was able to release the finger and complete the use of the patch. Because the patch is likely to fall from a dry tooth surface, moisture such as saliva is useful once a day in a state that was to assist the patch to attach, as sustained for 10 minutes. Ten minutes later, the test group 1 and 2 were removed with a toothbrush without toothpaste, and the positive control group was able to manually remove the patch. Only the provided toothbrush and toothpaste were used for the same experimental conditions in both groups.

4) Degree of dentin hypersensitivity retest and evaluation

After 1, 3, and 6 days of use, the degree of dentin hypersensitivity was checked again by the same method and on the 6th day, the questionnaires were distributed and the participant satisfaction surveys were conducted and recorded.

5) Statistical analysis

The Window IBM SPSS ver. 21.0 program (IBM Co., Armonk, NY, USA) was used and the significance level was noted at 0.05. The difference between the groups was analyzed by means of a one way ANOVA, and the change of the numerical value according to the period of each group was analyzed by means of the repeated measured ANOVA, along with the paired-t test that was performed to analyze the difference in the interval. The noted satisfaction with the questionnaire was confirmed whether or not the difference between each group was created through a cross analysis within the study.

Results

Table 1 summarizes the results of the VRS changes. Chiefly, there was no statistically significant difference between the

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Base</th>
<th>After 1 day</th>
<th>After 3 days</th>
<th>After 6 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>16</td>
<td>2.13 ± 0.59</td>
<td>1.91 ± 0.46</td>
<td>1.47 ± 0.22**</td>
<td>1.06 ± 0.66**</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>16</td>
<td>2.44 ± 0.63</td>
<td>1.97 ± 0.53*</td>
<td>1.34 ± 0.47**</td>
<td>0.91 ± 0.88**</td>
</tr>
<tr>
<td>Positive control</td>
<td>15</td>
<td>2.40 ± 0.63</td>
<td>1.97 ± 0.61**</td>
<td>1.33 ± 0.62**</td>
<td>0.97 ± 0.72**</td>
</tr>
</tbody>
</table>

*Values are presented as number only or mean ± standard deviation. *p < 0.05 by paired-t test. **p < 0.01 by paired-t test. *p-values are determined by one way ANOVA analysis among groups.
three groups, but the mean value was 2.44±0.63 before the start of study group 2, 1.97±0.53 after 1 day, 1.34±0.47 after 3 days, 0.91±0.88 after 6 days, and the positive control group was reduced in a similar pattern as before the start of 2.40±0.63, 1 days after 1.97±0.61, 3 days after 1.33±0.62, 6 days after 0.97±0.72. Moreover, there was a significant difference in the VRS values according to the duration of each group in all three groups. Compared to the before use, the experimental group 2, the positive control group showed a significant decrease from day 1 (p<0.05), and the experimental group 1 decreased after 3 days.

The electric pulp test was summarized as shown in Table 2. Notably, there was no statistically significant difference between the three groups, but the mean value of electrical resistance values at 1 day, 3 days, and 6 days after use increased gradually. It is important to note that in the experimental group 1, the mean value was changed from 9.75±3.15 before use to 11.06±4.57 after 6 days, whereas in the experimental group 2, the mean value more changed from 9.56±5.18 before use to 13.56±7.57 after 6 days. There was no significant difference in the electrical resistance values of the experimental group 1 as compared to before use. Significantly, the experimental group 2 showed a significant difference after 6 days and the positive control group after 3 days (p<0.05).

The results of the questionnaire are shown in Table 3-6, and there is no statistically significant difference as noted at this time. The experimental group 1, 11 (68.8%) and the experimental group 2, 12 (75.0%) were similar to the positive control group in evaluating the degree of dentin hypersensitivity relaxation before and after patch use high response rate. It is noted that regarding the evaluation of the satisfaction of the improvement effect, in the experimental group 2, 6 (37.5%) responded ‘2 days’ to the evaluation of the mitigation effect. On the other hand, 7 (43.8%) of the experimental group 1 and 5 (33.3%) of the positive control group showed high response rate on ‘3 days’. In the experimental group 2, 10 (62.5%) were satisfied with ‘satisfaction’, but in the experimental group 1 and the positive control group, eight of the participants answered ‘normal’, therefore the rate was noted as higher. Compared with the toothpaste previously used, the noted participant degree of satisfaction with the degree of symptom improvement had shown a 50% higher response rate to the ‘satisfaction’, in the same manner as the experimental group 1, 2 and the positive control group.

### Table 2. Change in results of electric pulp test

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Base</th>
<th>After 1 day</th>
<th>After 3 days</th>
<th>After 6 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>16</td>
<td>9.75±3.15</td>
<td>8.56±2.85</td>
<td>10.63±3.34</td>
<td>11.06±4.57</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>16</td>
<td>9.56±5.18</td>
<td>9.75±4.55</td>
<td>10.63±5.40</td>
<td>13.56±7.57*</td>
</tr>
<tr>
<td>Positive control</td>
<td>15</td>
<td>7.93±3.77</td>
<td>9.00±4.34</td>
<td>13.53±8.78*</td>
<td>13.67±7.30**</td>
</tr>
<tr>
<td>p-values*</td>
<td></td>
<td>0.307</td>
<td>0.933</td>
<td>0.661</td>
<td>0.842</td>
</tr>
</tbody>
</table>

Values are presented as number only or mean±standard deviation. *p<0.05 by paired-t test. **p<0.01 by paired-t test. p-values are determined by one way ANOVA analysis among groups.

### Table 3. Recognition test for dentin hypersensitivity

<table>
<thead>
<tr>
<th>Group</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>11</td>
<td>68.8</td>
<td>4</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>12</td>
<td>75.0</td>
<td>4</td>
</tr>
<tr>
<td>Positive control</td>
<td>12</td>
<td>80.0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>74.5</td>
<td>11</td>
</tr>
</tbody>
</table>

No significant difference at chi-square analysis. 2: relaxed, 3: same, 4: increased symptoms.

### Discussion

Dentin hypersensitivity is a symptom which means the expression frequently encountered in oral care areas that do not have a cure, yet have been developed to a satisfactory state for the relief of the patients. It is noted that this condition occurs in 1/7 of adult patients and is common in canine or premolar labial oral cavity areas of the mouth [15].

The hydrodynamic theory is the most commonly accepted mechanism of development for the management of this condition and to test for this issue in the patient [4]. When an external stimulus is applied to the affected areas, the movement of the fluid in the dentinal tubule causes the affected capillary action in the dentinal tubule, which causes pain to the patient by stimulating the nerve endings. The Absi et al. [16,17] reported that the number of dentinal tubules exposed per unit area in dentin hypersensitivity teeth was increased by about 8 times, whereby it is noted that the diameter was about 2 times, and the amount in the dentinal tubules was larger. On the basis of this, efforts to reduce the permeability by closing the dentinal tubule have been made to help patient manage the self-relief of this problem and manage their dentin pain at home (instead of having to go to the dentist office which is a costlier remedy).

Grossman [18] suggests that ideal dentin hypersensitivity
Table 4. Assessment of when to feel the desensitizing effect

<table>
<thead>
<tr>
<th>Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Experiment 1</td>
<td>2</td>
<td>12.5</td>
<td>1</td>
<td>6.3</td>
<td>7</td>
<td>43.8</td>
<td>1</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>3</td>
<td>18.8</td>
<td>2</td>
<td>12.5</td>
<td>6</td>
<td>37.5</td>
<td>1</td>
</tr>
<tr>
<td>Positive control</td>
<td>3</td>
<td>20.0</td>
<td>2</td>
<td>13.3</td>
<td>3</td>
<td>20.0</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>17.0</td>
<td>5</td>
<td>10.6</td>
<td>10</td>
<td>21.3</td>
<td>13</td>
</tr>
</tbody>
</table>

No significant difference at chi-square analysis. 0: no change, 1: after 1 day, 2: after 2 days, 3: after 3 days, 4: after 4 days, 5: after 5 days, 6: after 6 days.

Table 5. Satisfaction rating for desensitizing effect

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Experiment 1</td>
<td>0</td>
<td>0.0</td>
<td>7</td>
<td>43.8</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>1</td>
<td>6.3</td>
<td>10</td>
<td>62.5</td>
</tr>
<tr>
<td>Positive control</td>
<td>0</td>
<td>0.0</td>
<td>7</td>
<td>46.7</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>2.1</td>
<td>24</td>
<td>51.1</td>
</tr>
</tbody>
</table>

No significant difference at chi-square analysis. 1: very satisfied, 2: satisfied, 3: normal, 4: unsatisfied.

Table 6. Comparisons with other products, evaluation of degree of improvement

<table>
<thead>
<tr>
<th>Group</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Experiment 1</td>
<td>8</td>
<td>50.0</td>
<td>7</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>10</td>
<td>62.5</td>
<td>6</td>
</tr>
<tr>
<td>Positive control</td>
<td>9</td>
<td>60.0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>57.4</td>
<td>19</td>
</tr>
</tbody>
</table>

No significant difference at chi-square analysis. 2: satisfied, 3: normal, 4: a little unsatisfied.

Emollients and methods should not be irritating to the pulp, have no pain when applied, should be readily available, have a rapid onset of action, have a long-term effect, and have no coloration. We agree with this assessment and include this guideline in our direction and guidance for patient at home relief of dentin pain.

If dentin hypersensitivity occurs, we strongly recommend an initial visit to the patient’s dentist for treatment, or if at home pain relief is to be attempted, the patient should thereby use a toothpaste or mouthwash solution with the active ingredients meant to alleviate these types of symptoms. In the case where the symptoms are mild, the patients will prefer to use the easy, convenient and more economical self-help tools and products at home to alleviate these symptoms. The Son et al. [19] study noted that the patient’s dentin pain could occur again without recurrent oral effective home environment, although this will be mitigated by treatment of dentin hypersensitivity in the professional dental office. Cho and Chun [20] stated that the use of toothpaste with medicines can be widely used safely in this case, because it can be self-treated without being expensive. The Sharma et al. [21] study reported that LADS (listerine, mouthwash) was more effective at occluding the open dentinal tubules than the use of other dentin hypersensitivity emollients. However, it is noted that the dentifrice and mouthwash have limited application time, and are limited in applying drugs intensively to specific oral sites, where it may be difficult to achieve the symptom relief within a short time as a result of these limitations. Therefore, it will be necessary to continue research efforts and study on how to make the patient develop an easier opportunity to use and increase the application time to the teeth for these application purposes.

The Curzon [22] study attempted to increase the residence time of fluoride in the oral cavity by adding fluoride to the slowly dissolving glass pellet. By this same token, the Jang et al. [23] study found that the use of fluoride tape, a newly developed fluoride delivery system, is likely to be used effectively in the treatment of dentin hypersensitivity.

This study is a review of a chloride of zinc-containing material intended for the use of patients with dentin hypersensitivity. There were 47 people who complained of dentin hypersensitivity and who were given a symptoms patch (the experimental group 1), and a patch containing the zinc chloride and tocopherol acetate (the experimental group 2) to apply once daily 10 mi-
nutes to attach to the affected areas. The study made measurements of the relief from the patch, as compared to the symptoms shown by a patch containing potassium oxalate which is sold to an existing effect (the positive control group), and determined the evaluation of a commercialized proposal as a basis for recommended use of the patch by patients for pain relief of these symptoms. To assess the degree of dentin hypersensitivity, the degree of hypersensitivity after a cold test was measured by the use of a VRS (verbal rating scale). Then, the electric pulp test was carried out and the numerical results were recorded. After 1, 3, and 6 days of use, the level of dentin hypersensitivity was thereby retested and evaluated. The Kim [24] study noted that the electric pulp test would be useful in evaluating the treatment outcome of dentin hypersensitivity. The Tarbet et al. [25] study similarly reported that these measured correlations were significant with both electrical and cold stimulation methods, and were useful to determine the degree of dentin hypersensitivity, and electrical stimulation as distinguished to a greater degree from the placebo effect, than noted with cold stimulation.

The results showed that there was no significant difference between the groups in the cold test and the electric pulp test in the participants. For this reason, it was confirmed that dentin hypersensitivity was alleviated due to the difference according to the group period compared to the before use of the patch product. In the cold test, the VRS values of the experimental group 2 were significantly decreased from day 1 after, using the same positive control group, and the experimental group 1 was significantly decreased after 3 days. Moreover, in the case of the electric pulp test, it was confirmed that the electric resistance value was significantly increased from 3 days in the positive control group to 6 days in the experimental group 2. On the other hand, there was no significant difference in the experimental group 1. Significantly, in the experimental group 2 there is contained the ingredients of tocopherol acetate, which promotes blood circulation in the gums, and can enhance the periodontal health of a patient with the use of vitamins that are effective in the prevention of the advance of gingivitis and periodontal disease [26]. The Schäfer et al. [27] study has shown that the new dentifrice containing tocopherol acetate and sunflower oil (vitamin F) are clinically comparable to the positive control group with a dental plaque index and to improve the condition of the gums. In this study, dentin hypersensitivity was effectively mitigated by comparing the effects of dentifrice containing UDCA and tocopherol acetate, to minimize dentin exposure by inhibiting phosphate and gingival recession [19]. Based on the fact that dentin hypersensitivity symptoms may occur 47% of the time due to gingival recession, it seems that the experimental group 2 has experienced a better mitigation effect in the experimental group 2, than the experimental group 1 [28]. In the questionnaire consisting of 4 items for the subjective satisfaction evaluation of the subjects, two items were evaluated better than the positive control group in this study.

In the present study, the experimental group 2 is effective in mitigating dentin hypersensitivity, and it is considered that the commercialized product will receive a satisfactory result at the time of clinical application. But in this experiment, since the number of research subjects was limited by a small amount, more research would be needed to increase the number of study subjects in the future, and the duration of the experiment, as well as resetting the placebo group for the most accurate results in future planned experiments.

In addition, it is necessary to study whether there is a difference between the dentifrice and mouthwash solution in patches, which are used and developed to increase the application time in the oral cavity, and to see the effect in a shorter period of time. Also, we note a need for further research on whether the patch as a dentin hypersensitivity relief tool holds its ideas as a sustainable relief for pain management in this case.

**Conclusion**

To evaluate the effect of dentin hypersensitivity palliative patch on dentin hypersensitivity as compared with the existing commercial products available in Korea, 47 adult patients who agreed to participate in the study were tested. The degree of dentin hypersensitivity before the experiment was evaluated by cold test and electric pulp test. The patch was used once a day for 10 minutes. The degree of dentin hypersensitivity was reevaluated on the 1st, 3rd and 6th day by the same method. On the 6th day, as a result of the satisfaction survey by the questionnaire, the following conclusions were obtained and reviewed as significant for the study data.

1. As a result of VRS changes in the cold test using an ice stick, there was no statistically significant difference between the groups, but the average value of the experimental group 2 was found to be reduced to a level similar to the positive control group. It is noted that as compared with before use, the experimental group 2, the positive control group showed a significant decrease from day 1 (p<0.05), and the experimental group 1 decreased after 3 days (p<0.01).

2. As a result of the electric resistance value change of Electric Pulp Test (EPT), there was no statistically significant difference between groups, but it was confirmed that the average value gradually increased. Chiefly, as compared with before use, the experimental group 2 showed a significant difference on day 6 from the positive control group on day 3 (p<0.05).

3. As a result of the questionnaire, there was no statistically significant difference between the groups, but in all three groups
for the relief of symptoms it was recognized that the response ‘can feel relaxed’ was a noted response after the use of the patch. With this in mind, the cognitive time in Day 2 and 6 (37.5%) was higher in the experimental group 2, than in the positive control group. The satisfaction with the improvement effect was higher in the positive control group than in the ‘normal’ group, while the experimental group 2 was higher in ‘satisfaction.’ The comparative satisfaction with the use of other products was noted as ‘satisfied’ in all three groups.

These results suggest that the experimental group 2, rather than the experimental group 1, may be effective in reducing dentin hypersensitivity similar to the positive control group in this case.

References


