

Clinical Study of Natural Recovery of Altered Sensation after Minor Dental Surgery

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• Abstract

Purpose: The aim of our study was to evaluate natural recovery of neurologic injury after minor dental surgery based on subjective neurologic evaluation.

Materials and Methods: From December 2005 through July 2009, 30 patients from Seoul National University Bundang Hospital were identified as having been treated with minor dental surgery. The patients were composed of 12 men and 18 women, with a mean age of 50.6 years. The median duration of this study was 62 weeks.

Results: The patients were treated by implants (17 cases), tooth extractions (6 cases), bone grafts (4 cases), inferior alveolar nerve transpositions (2 cases) and periodontal surgery (1 case) prior to the occurrence of altered sensation. Areas of altered sensation after minor surgery included the lip (36.7%), chin (30.0%) and tooth (21.7%), and at final follow-up, there was no change of ranking. Altered sensations expressed by patients included numbness (33.3%), discomfort (22.9%), relieving sense (14.6%), tingling (14.6%) and itching (14.6%). There was no change of ranking of altered sensation at the last follow-up. Patients experienced the altered sensation always (47.8%), during tactile stimulation (26.1%), when chewing food (13.0%), and talking (13.0%). Mean visual analogue scale (VAS) was 3.43±2.84 for pain and 6.64±2.72 for paresthesia. VAS of pain was decreased significantly between the first visit and the end of follow-up, and paresthesia also showed a significant difference.

Conclusion: Altered sensations may occur at any time after minor dental surgery, but we observed that natural recovery of altered sensation occurred as time went on.

• Key word : Sensation disorder, Oral surgery, Natural recovery

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Introduction

The number of lawsuits due to nerve damage occurring during third molar extractions and implant surgeries are increasing recently. In many occasions, altered sensation caused by direct and indirect damage of the sensory nerve after minor dental surgeries such as the extraction of an impacted tooth, implant surgery, and periodontal surgery is inevitable. And this can happen even when there is no sign of nerve damage. Sensory nerve damage is accompanied by various symptoms including paresthesia, anesthesia, hypoesthesia, hyperesthesia, and neuropathic pain and it is sometimes difficult to strictly differentiate such phenomena. So, recently the term “altered sensation” is often applied¹⁻³⁾ and is also used in this study.

The major cause of inferior alveolar nerve and lingual nerve damage is mandibular third molar extraction, which accounts for more than 50% of the occasions⁴⁾. It is reported that in cases of third molar extraction, permanent damage occurred for 3.6% of the patients and temporary damage for 8%⁵⁾. Other causes are local anesthetic injection, endodontic treatment, orthognathic surgery and implant surgery. As the number of implant surgery and endodontic treatment increases recently, the incidence of inferior alveolar nerve damage is also increasing⁶⁾. A related study shows that 17% of patients reported altered sensation after implant surgery and sensory recovery did not occur in 6.5% of the patients, even in one year after the surgery⁷⁾.

In most cases, the altered sensation recovers naturally with time, otherwise dysesthesia accompanied by numbness or pain in the lower lip, chin, or gingiva, and discomfort in phonation or mastication can be found in those without recovery. Such symptoms cause major problems in sensitive patients and can result in serious legal issues when sufficient preoperative explanation was not done. So the natural recovery and the subjective evaluation on the recovery of altered sensation following minor dental surgery are of clinical importance and were the objects of this study.

Materials and Methods

The subjects of this study were 30 patients who had received conservative treatment including medication and physical treatment at our hospital with the chief complaint of altered sensation following various minor dental surgeries that had been conducted at private dental clinics and the department of oral and maxillofacial surgery of Seoul National University

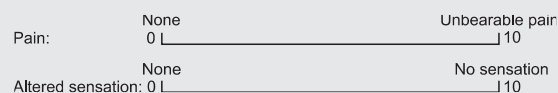


Figure 1. 10 cm visual analogue scale for pain and altered sensation.

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Bundang Hospital from December 2005 to July 2009. There were 12 males and 18 females with a mean age of 50.6 years. A total of 30 cases of minor dental surgeries preceded the altered sensation including 17 cases of implant surgery, 6 cases of tooth extraction, 4 cases of bone grafting, 2 cases of inferior alveolar nerve transposition, and 1 case of periodontal surgery. The majority of cases were implant surgeries and tooth extractions.

The subjective evaluation sheet for altered sensation included items concerning age, gender, and the conducted minor dental surgery, and also items on the subjective evaluation and presence of disturbance in function. The location of altered sensation, expressions for the altered sensation, when the altered sensation occurs, and limitations in behaviors due to altered sensation were investigated based on the subjective evaluation sheet. The patients completed the evaluation sheet at their first visit and at the end of the observation period. The mean observation period was 62 weeks after their first visit.

A 10 cm visual analog scale (VAS) was used for the subjective evaluation of the intensity of pain and altered sensation (Fig. 1). SPSS 12.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis of the VAS results. Wilcoxon signed rank test was done and the results were considered statistically significant when $P < 0.05$.

Results

At the first visits of the patients, the locations of altered sensation following minor dental surgeries were, in order of the number of occurrences, lips, chin, teeth and the same results were obtained for the final observation visits (Table 1). Altered sensation was mostly expressed as numbness or unpleasant sensation and remained the same at the final observation visit (Table 2). At both of the first visits and the final observation visits, most patients answered that altered sensation occurs consistently, and other patients answered that altered sensation occurs when the location was contacted by a hand (Table 3).

Table 1. Area distribution for altered sensation after minor surgery

	First visit (%)	Last follow-up (%)
Lip	36.7	37.5
Chin	30.0	31.3
Tooth	21.7	10.4
Tongue	5.0	6.3
Cheek	1.7	6.3
Etc	5.0	8.3

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Table 2. Type of altered sensation

	First visit (%)	Last follow-up (%)
Numbness	33.3	31.4
Discomfort	22.9	25.5
Alleviated	14.6	17.6
Tingling and burning	14.6	13.7
Itching	14.6	11.8

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Table 3. Factors inducing altered sensation

	First visit (%)	Last follow-up (%)
All the time	47.8	44.2
Tactile stimulus	26.1	25.6
Chewing food	13.0	16.3
Talking	13.0	14.0

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At the first visits, the behavior that was most disturbed due to altered sensation was masticating followed by talking, while, at the final observation visits, it was talking followed by masticating, drinking, and swallowing (Table 4).

The VAS results of pain and altered sensation were 3.43 ± 2.84 at the first visits and 1.97 ± 1.98 at the final observation visits for pain and 6.64 ± 2.72 at the first visits and 4.33 ± 3.04 at the final observation visits for altered sensation, showing that both of pain and altered sensation decreased with time. The differences of VAS values for pain and altered sensation were statistically significant between the first and final observation visits (Table 5).

Discussion

Hypoesthesia, paresthesia, and dysesthesia may occur as an altered sensation following neurologic injury¹⁾. Hypoesthesia

Table 4. Actions impaired by altered sensation

	First visit (%)	Last follow-up (%)
Chewing food	38.9	33.3
Swallowing food	8.3	3.3
Drinking	13.9	13.3
Talking	38.9	50.0

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Table 5. VAS for pain and altered sensation during follow-up

	First visit		Last follow-up		P
	Mean	SD	Mean	SD	
Pain	3.43	2.84	1.97	1.98	.012*
Altered sensation	6.64	2.72	4.33	3.04	.003*

VAS: visual analogue scale, SD: standard deviation.

P-values calculated with Wilcoxon signed rank test

*: statistically significant difference (P<0.05)

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is simply the loss of sensation, while paresthesia is a state of heightened sensory function with abnormal sensation such as tingling or itching. Dysesthesia is different from paresthesia in that dysesthesia accompanies discomfort or pain. Pain due to neuroma pain, allodynia, hyperalgesia, hyperpathia, or anaesthesia dolorosa is example of dysthesia⁸⁾. Patients use subjective expressions to describe the altered sensation and have difficulty in expressing with exact terms. So symptoms such as hypoesthesia, paresthesia, and dysthesia may all be expressed with a term "altered sensation"⁹⁾.

Minor dental surgeries that are mostly associated with nerve damage are mandibular third molar extraction, implant surgery, endodontic treatment, and periodontal surgery. Twenty-three of the 30 patients (76.7%) that complained of altered sensation in this study had implant surgery or tooth extraction before the occurrence of altered sensation. However, since the subjects of this study were enrolled among those who had visited the hospital with a chief complaint of altered sensation, the incidence of altered sensation among the total number of implant surgeries or extractions done during the study period was not investigated. Previous studies report that, after mandibular third molar extraction, altered sensation occurred due to the inferior alveolar nerve damage accounted for 0.4%⁹⁾ to 8.4%¹⁰⁾ and altered sensation occurred due to the lingual nerve damage accounted for 0%¹¹⁾ to 23%¹²⁾. The possibility of permanent damage of inferior alveolar nerve or lingual nerve increases in case of a horizontally impacted tooth, so Rood and Shehab⁵⁾ suggested that evaluating the relationship between

the mandibular third molar and inferior alveolar nerve canal on radiographs is a good method to assess the risk of nerve damage following extraction. Altered sensation due to lingual nerve damage may occur with lingual flap elevation, incompetent instrumentation, and lingual plate fracture. Occasionally, infection, hematoma formation, swelling, or block anesthesia of the inferior alveolar nerve may also cause lingual nerve damage, and the cases of injuries directly caused by rotary instruments have been reported¹³.

Regarding other factors related to altered sensation, Tay and Go¹⁴ reported that male gender has higher risk of altered sensation, however, some studies report complications are more frequent in females¹⁵. The incidence of altered sensation after implant surgeries was higher in diabetic patients¹⁶, and it is recommended that extraction should be avoided in patients aged 24 or older. The dental local anesthetics prilocaine and articaine are associated with a higher incidence of altered sensation compared to lidocaine¹⁷. The persistence of peripheral sensory nerve damage is affected by the degree of damage, patient's age, duration of damage, and the distance between the cell body and the site of damage. So it is recommended to take appropriate measures during the first 4 months following the damage.

Numerous previous studies concerning the recovery of altered sensation show that altered sensation is temporary and usually recovers within 6 months. The total observation period of this study was approximately 15 months from the first visit to the final observation visit. However, considering the cause of altered sensation, the time between the occurrence of altered sensation and hospital visit, and irregular visits of the patients, it is difficult to conclude that this period is the recovery period. Many studies report that active recovery takes place in the first month following nerve damage¹⁸, and other study shows that 85-94% of the recovery occurs within 8 weeks¹⁹. It is reported that 81% of inferior alveolar nerve damage due to block anesthesia recovered within 2 weeks after the damage²⁰ and the recovery period for inferior alveolar nerve transposition and lateralization were 5.7 and 3.8 weeks, respectively²¹. The prognosis for natural recovery is better for the inferior alveolar nerve compared to the lingual nerve and 96% of the inferior alveolar nerve damage and 87% of the lingual nerve damage following mandibular third molar extraction naturally recovered within 4 to 8 weeks²². However, a study reports that full recovery is difficult if altered sensation persists for 6 to 9 months²³; and it should be considered permanent nerve damage when the patient complains of numbness even after 2 years of observation.

Hirsch and Bränemark²¹ suggested classifying the causes of nerve damage due to implant surgery into four groups; direct mechanical damage, compression of the nerve and blood vessels, hematoma formation within the nerve canal due to intra-canal blood vessel damage, and osteoma formation. Compression of the trabecular bone caused by the fixture during implant installation can cause functional disturbance of the nerve²⁴ and it has been reported that clinician carelessness is more related with nerve damage compared to incompetent implant procedures²⁵. The incidence of inferior alveolar nerve damage due to implant surgery is known to be 0 to 40%²⁰. Ryu and Kwon²⁶ reported that nerve damage results in 39.1% of tooth extractions and 24.6% of implant surgeries while incomplete sensory recovery is more common after implant surgery (25.3%) than tooth extraction (14.3%).

The areas of altered sensation that patients complained most from the first visit to the last visit were, in order of the number of occurrences, lips, chin, and teeth. This may be due to the fact that the majority of patients visit the hospital for implant surgery or tooth extraction, which are directly associated with the inferior alveolar nerve and lingual nerve. Another study reports that altered sensation after implant surgery was most frequent in the lips and chin followed by the gingiva and tongue and that 78% of the patients complained of altered sensation within a week after the first stage of implant surgery²⁷. Numbness was the most common form of altered sensation, and talking, drinking, and eating were limited by altered sensation²⁷. Also, in this study, the forms of most complained altered sensation were, in order of the number of occurrences, numbness and unpleasantness. If these forms of altered sensation could be explained to a patient before the procedures, the patient would feel less anxiety, even when complications concerning nerve damage actually occur. Ellies and Hawker²⁷ reported that women more commonly complained of altered sensation after implant surgery compared to men and explained that although it is unclear why this occurs, it may be due to the fact that women have smaller mandibles and have increased bone resorption due to hormonal changes related to aging. It is recommended to have at least 2 mm safety distance between the nerve canal and implant to avoid nerve damage and using BioOss (Geistlich, Schweitz, Switzerland, pH 8.4) adjacent to the nerve bundle should be avoided.

Since recovery period of sensory nerve dysfunction is different among patients, natural recovery occurs in some cases while permanent disturbance remains in others. Quantitative methods to evaluate nerve dysfunction include pinprick, pressure, electric stimuli, two-point discrimination, and somatosensory

evoked potential²⁸). However, some state that the patient's subjective evaluation is a more valuable index in assessing the presence of post-surgical nerve damage compared to the aforementioned quantitative methods³.

The results of this study are expected to provide useful information for both of the clinicians and patients in understanding the location, daily life disturbance and natural recovery of altered sensation following minor dental surgeries. The shortcoming of this study is the small sample size that limits drawing meaningful results and the large variance in observation period among the patients ranging from 3 months to 1 year that caused difficulty in comparing the natural recovery pattern with time passage. In future studies, the correlation of objective and subjective measuring methods for altered sensation should be additionally assessed and an objective and

systemic criteria concerning the recovery of altered sensation should be established based on observations up to 1 to 2 years after surgery.

Conclusion

This study evaluated the natural recovery of altered sensation following minor dental surgery based on subjective evaluation sheets completed by patients. The frequent locations of altered sensation were lips and chin and the sensation was mostly described as numbness and an unpleasant sensation. Talking and masticating were reported to be disturbed by the altered sensation, but the intensity of pain and altered sensation significantly decreased with the passage of time.

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