

# Dysesthesia after Tooth Extraction and Implant Surgery Reported by Dentists

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The purpose of this study was to analyze the nerve damage after tooth extraction and implant surgery, and to establish a predictive model for assessment and management of dysesthesia.

In this questionnaire study, the subjects chosen for this study were 276 dentists who answered the questionnaire about dysesthesia after tooth extraction and implant surgery. The analysis of the results consist of the sex and age distribution, affected site, associated symptoms, rate and duration of the recovery.

The results are summarized as follows. :

1. There were no significant difference between the sex and the dysesthesia.
2. The most common affected site was the mandibular region. In the group of the implant surgery, 100% affected the mandibular site. The tooth extraction group was 93.2% affected.
3. Pain was one of the most associated symptom with dysesthesia-46.5% of the tooth extraction and 44.8% of the implant surgery.
4. The recovery ratio was 72.3% in the tooth extraction, 71.8% in the implant surgery. Most of them, they recovered in 1~6 months.

In conclusion, most of dysesthesia may be recovered within 1 year. However, the possibility of persistent dysesthesia should not be neglected. Therefore, practitioners must discuss the possibility of nerve injury with their patients, and include this possibility in the consent forms. Various methods of monitoring recovery of sensation should be considered for objective assessment of prognosis. In addition, immediate referral to orofacial pain specialists can offer the patients an opportunity for more effective and noninvasive treatments.

Key Words : Dysesthesia, Implant surgery, Nerve injury, Tooth extraction

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## I. INTRODUCTION

Nerve damage can affect a single nerve or several nerves and result in sensory, motor, autonomic deficits in the affected region. Causes of cranial nerve damage can be classified as intracranial or extracranial. Intracranial causes include stroke, transient ischemic attack and tumors. Extracranial causes can include trauma, malignancy and infection. In addition, there may be iatrogenic causes

such as radiotherapy, chemotherapy, mandibular surgery and dental treatment.

Reported dental causes of dysesthesia include third molar extractions, surgical molar/premolar extractions, implant surgery, needle trauma following block anesthesia, periapical inflammation, denture compression of the nerve and neural injury following endodontic treatment.

Dysesthesia is defined as an unpleasant abnormal sensation, whether spontaneous or evoked. A dysesthesia should always be unpleasant and a paresthesia not, although difficulties can emerge when a patient must decide whether a sensation is pleasant or unpleasant. This altered perception may become manifest by the impairment of sensation of the nerve. Sometimes just the sensation of pain is disturbed(hyperalgesia, hypoalgesia or analgesia), while in other cases the tactile and temperature senses are affected simultaneously. All these changes can be transient or persistent depending on the degree of the irritation of the nerve.<sup>1)</sup>

Injury of the lingual or the inferior alveolar nerves sustained during removal of lower third molars in among the most common causes of litigation in dentistry,<sup>2)</sup> because the lingual nerve and inferior alveolar nerve(IAN) are at risk because of close anatomic relationships.<sup>3-5)</sup>

However, advances in dental implant technology and studies documenting predictable long-term success have led to an interest in this tooth-replacement option over the last 10 years. Reports in the literature on the incidence of such complications have been received with deep concern.<sup>6-9)</sup>

In Ellies LG and Hawker PB study,<sup>7)</sup> the prevalence of dysesthesia following mandibular implant surgery did not significantly differ from that found in the Toronto study,<sup>6)</sup> suggesting that nerve injuries during implant placement occur at a similar frequency regardless of the type of implant being placed or of the operating surgeon, and of the type of initial incision line.

There was a study about the incidence of dysesthesia after treatment of extraction.<sup>10)</sup> Kim *et*

*al.*<sup>10)</sup> studied the type of medical accident, and the questionnaire study subjected to 1,133 dentists who had been registered in the Seoul Dental association in 1997. In the medical accident cases, the number of the accidents associated with tooth extraction was 704(15.76%), and 107 cases(15.20% of 704 cases) was the experience of dysesthesia after wisdom tooth removal.

Therefore, the number of malpractice suits related to implant surgery and tooth extraction has increased significantly awards among the highest in dentistry. Dysesthesia following implant surgery or tooth extraction may result in liability claims. As a result, it seems prudent to review these cases to better understand the causes and characterization of such actions to prevent complications and reduce future litigation.

The purposes of this study were to analyze the nerve damage after tooth extraction or implant surgery evaluated by dentists, through questionnaire, to establish a predictive model for assessment and management of dysesthesia.

## II. MATERIALS AND METHODS

### 1. Subjects

The subjects for the study were 276 dentists who attended implant seminars from June to August, 2004.

### 2. Method

Questionnaires were delivered to dentists who attended implant seminars directly and returned at that time. Returned questionnaires were 276 pieces. The questionnaire consisted of 16 question(Table 1), which questions related to tooth extraction and implant surgery were 8 each, and they were answered independently. The respondents were grouped according to the following 2 yes/no type questions : 1) "Do/Did you have patients with dysesthesia after tooth extraction?" If yes, they were grouped as dysesthesia after tooth extraction.



2) "Do/Did you have patients with dysesthesia after implant surgery?". If yes, they were grouped as dysesthesia after implant surgery. The combination of the two groups might be possible. In this study, only "yes" group were analysed, except for one question about dentists' clinical experience.

### III. RESULTS

#### 1. The analysis of the respondents

276 dentists answered the questionnaire, among them, 141(51.1%) responded to the question of the years of clinical experience(Table 2). The mean year was 10.48(SD=2.80, range=2-33 years). 135 respondents who did not answer to this question were excluded from the analysis of the respondents. From this questionnaire, 108 dentists(39.1%) had dysesthetic patients after tooth extraction, and 68(24.6%) dentists answered that they had dysesthetic patients after implant surgery.

#### 2. The analysis of dysesthesia after tooth extraction

##### 1) Sex distribution of the patients

Out of 115 answers(including plural answers), there were 23 males and 38 females. The plural answers were 7. There were 54 unknown group which respondent did not describe their patients' information. Male:Female ratio was about 3:5.

Table 2. Distribution of clinical experience in questionnaire respondents

Clinical experience(year)	Number of dentists (%)
0~ 5	41 (29.1)
6~10	35 (24.8)
11~15	34 (24.1)
16~20	18 (12.8)
21~25	8 (5.7)
26~30	4 (2.8)
31~35	1 (0.7)

##### 2) Age distribution of the patients

Out of 116 answers(including plural answers), the mean age was 37.92(SD=10.53, range=15-65 years). The 51 unknown cases in which did not dictate patients' age were excluded.

##### 3) Site distribution of dysesthesia

Out of the 117 answers(including plural answers), the major site of dysesthesia was mandibular molar region, 82 cases(70.1%) out of 117. Lower lip was affected in 20 cases(17.1%), tongue was 2(1.7%), and symphysis was 1(0.9%). The unknown group in which the respondents did not describe the affected site was 5(4.2%)(Table 3).

##### 4) Associated symptoms

Out of 108 cases , there were 58 cases(53.7%) that showed associated symptom. Table 4 shows various types of associated symptoms after tooth extraction. The major symptom was pain, 33 cases(46.5%) out of 71(including plural answers). 20 cases (28.2%) were reported that discomfort was accompanied with dysesthesia. Loss of taste was 1 case(1.4%). Motor dysfunction, (for example, frequent biting of lower lip or tongue, drooling, having pieces of foods remaining on the lip without feeling them, difficulty in pronouncing certain words) were reported in 17 cases(23.9%).

##### 5) Rate and duration of recovery

Out of the 112 answers(including plural answers),

Table 3. Affected oral site distribution of dysesthesia after tooth extraction

Site	Number of patients (%)
Maxillary anterior	1 (0.9)
Maxillary molar	2 (1.7)
Mandibular anterior	4 (3.4)
Mandibular molar	82 (70.1)
Lower lip	20 (17.1)
Tongue	2 (1.7)
Symphysis	1 (0.9)
Unknown	5 (4.2)

81(72.3%) cases had recovered. No recovery was reported in 16 cases(14.3%). The mean duration of the recovery was 3.6 months(SD=2.51, range=0.5-11 months). In the recovery group, most cases recovered within 1-6 months, 42 cases(90.1%) out of 81(Table 5).

#### 6) Recommended treatment

Out of 108 cases, 39(36.1%) dentists tried some treatment for their patients, whereas 60(55.5%) dentists did not give any treatment. Table 6 shows various type

Table 4. Associated symptoms

Symptom	Number of patients (%)
Pain	33 (46.5)
Discomfort	20 (28.2)
Loss of taste	1 (1.4)
Motor dysfunction	17 (23.9)

Table 5. Rate and duration of recovery

Recovery	Duration(month)	Number of patients
Yes	0-1	6
	1-3	42
	4-6	25
	7-9	4
	10-12	4
	12-	-
No recovery		16
Unknown		15

Table 6. Recommended treatment

Prescription or treatment	Number of patients	
Yes	medication	37
	physical therapy	12
	refer to another clinics	2
	no answer	5
No	60	
Unknown	9	

of treatments which the respondent offered to their dysesthetic patients. Out of 125 answers(including plural answers), the most recommended treatment was medication, 37 cases. Out of 37 cases, steroid was recommended in 14 cases(37.8%), and vitamin was recommended in 16 cases(43.2%). In 39 cases which were grouped as "treatment" group, 5 cases with no answer were excluded.

#### 3. The analysis of dysesthesia after implant surgery

##### 1) Sex distribution of the patients

Out of 71 answers(including plural answers), there were 14 males and 14 females. The plural answers were 3. There were 43 unknown group which respondent did not describe their patients' information. Male:Female ratio was about 1:1.

##### 2) Age distribution of the patients

Out of 71 answers(including plural answers), the mean age was 50.31(SD=17.50, range=25-65 years). The 39 unknown group in which did not dictate patients' age was excluded.

##### 3) Site of dysesthesia

Of the 76 answers(including plural answers), the major site of dysesthesia was mandibular molar region, 42 cases(55.3%) out of 76 cases. Lower lip was affected in 18 cases(23.7%), mandibular anterior tooth region was 10 case(13.1%) and tongue was 6 cases(7.9%)(Table 7).

Table 7. Affected Oral site distribution of dysesthesia after implant surgery

Site	Number of patients (%)
Maxillary anterior	-
Maxillary molar	-
Mandibular anterior	10 (13.1)
Mandibular molar	42 (55.3)
Lower lip	18 (23.7)
Tongue	6 (7.9)
Symphysis	-

4) Associated symptoms

Out of 68 cases, there were 46(67.6%) cases that showed associated symptom. The major symptom was pain, 30 cases(44.8%) out of 67(including plural answers). 19 cases(28.3%) were reported that discomfort was accompanied with dysesthesia. In 17 cases(25.4%), motor dysfunction was reported. Unknown 1 cases in which did not answer the question was excluded(Table 8).

5) Rate and duration of recovery

Out of the 71 answers(including plural answers), 51 cases(71.8%) had recovered. No recovery was reported in 18 cases(25.4%). The mean duration of the recovery was 4.01 months(SD=2.87, range=0.5-12 months). In the recovery group, most cases recovered within 1-6 months, 45 cases(88.2%) out of 51(Table 9).

6) Recommended treatment

Out of 68 cases, 31(45.6%) dentists tried some treatment for their patients, however, 33(48.5%) dentists did not give any treatment. Table 10 shows

the various type of treatments which the respondents offered to their dysesthetic patients. Out of the 73 answers(including plural answers), the most recommended treatment was medication, 19 cases. Out of 19 cases, anticonvulsant(gabapentin) were recommended in 5 cases(26.3%), and steroid was in 4 cases(21.1%), and vitamin was in 5 cases(26.3%). In the 31 cases which was grouped as "treatment" group, 5 cases with no answer were excluded.

IV. DISCUSSION

Dysesthesia is well known complication of dental and maxillofacial surgery and has been well documented in the long term evaluation of patients after maxillofacial trauma, third molar and orthognathic surgery, vestibuloplasty, and ridge augmentation.<sup>11-15)</sup>

The cause of dysesthesia in dentistry can be systemic or local factors. Systemic factors include demyelinating diseases(eg, multiple sclerosis), viral infections, metabolic disorders(eg, diabetes and hypothyroidism), hypovitaminosis, Paget's disease, syphilis, transitory ischemic attack, cerebral strokes, neural neoplasia, metastatic malignancies, and some systemic drug reactions.<sup>16-22)</sup>

Local factors include traumatic injuries such as mandibular fractures, expanding compressive lesions(benign or malignant neoplasia and cysts), impacted teeth, local infections(osteomyelitis, periapical, and peri-implant infections), iatrogenic

Table 8. Associated symptoms

Symptom	Number of patients (%)
Pain	30(44.8)
Discomfort	19(28.3)
motor dysfunction	17(25.4)
Unknown	1(1.5)

Table 9. Rate and duration of recovery

Recovery	Duration(month)	Number of patients
Yes	0-1	4
	1-3	29
	4-6	12
	7-9	2
	10-12	3
	12-	1
No		18
Unknown		2

Table 10. Recommended treatment

Prescription or treatment	Number of patients	
Yes	medication	19
	physical therapy	7
	refer	-
	removal of implant	5
	no answer	5
No	33	
No answer	4	

lesions after tooth extraction, anesthetic injection, endodontic therapy (overfilling and apical surgery), operative treatment,<sup>23)</sup> implant surgery, orthodontic surgery, and prosthetic surgery.

Thus, various dental treatments can be a cause of dysesthesia, however, a lot of literature have shown that dysesthesia after tooth extraction and implant surgery is quite frequent.<sup>17,18,20-22,24)</sup>

In the aspects of dysesthesia after tooth extraction, a lot of studies had focused on the relationship between third molar extraction and inferior alveolar and lingual nerve damage. The incidence of inferior alveolar nerve damage after lower third molar extraction ranges from 0.5%<sup>25)</sup> to 8%,<sup>26,27)</sup> approximately; the usual rate is about 5%.<sup>13,25,28,29)</sup>

Van Steenberghe *et al.*<sup>30)</sup> reported a multicenter study of partially edentulous patients who were treated with implants, in which 17% of the patients experienced an altered sensation of the lower lip after implant surgery. Kiyak *et al.*<sup>31)</sup> reported that preoperatively 4% of the patients expect some form of sensory disturbance. Ellies and Hawker<sup>7)</sup> reported on a retrospective analysis of a multicenter study which took place in Toronto(Canada) and Adelaide(Australia). Two weeks after implant surgery they found altered sensation of the inferior alveolar nerve in 37% and 36% of patients respectively. In both centers, these complaints were persistent in 13% of the patients.

In this study, the incidence of dysesthesia after tooth extraction was 39.1% and the incidence of the dysesthesia after implant surgery was 24.6%. In addition, the incidence of permanent dysesthesia out of the dysesthetic cases was 14.3% after tooth extraction and 25.4% after implant surgery, respectively. Compared with the reviewed study above, the result of our study may be interesting values. To discuss with true incidence, the study should be directed to the patients, but the subjects of our study were dentists. Therefore, the incidence of our study was deduced indirectly from the dental practitioners. For that reason, the revised study should be needed.

The male:female sex ratio was about 3:5, in the cases of tooth extraction, and 1:1, in the cases of implant surgery. From the ratio of the tooth extraction, Similar sex ratios have been found in some studies: 2:3,<sup>32)</sup> 2:5,<sup>33)</sup> and 19:35.<sup>13)</sup> In this connection, it is of interest that Howe and Poyton found that the impacted third molar was frequently closer to the mandibular canal on radiographs in women than in men in their study of 1,355 third molar extraction cases. The predilection of female can be explained by the anatomical gap and sex hormones.<sup>34)</sup> However, many studies shows that there were no significant difference between the sex and the dysesthesia.

In most of the cases, between the tooth extraction and implant surgery, the affected site was mandibular region: the innervation of inferior alveolar nerve. In the group of the implant surgery, 100% affected the mandibular site. The extraction group was also 93.2% affected. This result was explained by close anatomic relationships.<sup>3-5)</sup>

In both of them, Pain was one of the most associated symptom with dysesthesia: 46.5% in the tooth extraction and 44.8% in the implant surgery. This result was in accordance with that of the Sandstedt and Sørensen.<sup>2)</sup>

It is well established that the oral and perioral regions are among the most sensitive areas in the human body.<sup>35)</sup> Considering this fact, it is not difficult to understand why minor oral nerve damage can be a major handicap for the individual. For many practitioners, it is commonly believed that nerve damage will be spontaneously recovered over time. However, complications and delayed recovery can cause demoralizing and disappointing, leading to loss of confidence in the clinician even if there would be happened only in a minority of the patients. Occasionally, a patient interprets them as negligence and malpractice with subsequent filing of a legal claim against the treating dentist.<sup>36)</sup>

The number of malpractice suits related to implants has increased significantly, with awards that are among the largest in dentistry.<sup>37)</sup> Some patients may even claim damage where there is

none, purely for financial gain because symptoms of neurosensory loss are largely subjective and based on what the patient states.

Therefore, practitioners must discuss the possibility of nerve injury with their patients and include this possibility in the consent forms. If dysethesia occurs after the procedure, the clinician must monitor recovery of sensation with various methods including not only a simple assessment but also light touch sensation, 2-point discrimination, brush stroke direction, thermal stimulation, pin prick/pain sensation, and pain-pressure threshold,<sup>12,38-42)</sup> for objective assessment of prognosis.

## V. CONCLUSION

Most of dysethesia may be recovered within 1 year. However, the possibility of persistent dysethesia should not be neglected. Therefore, practitioners must discuss the possibility of nerve injury with their patients, and include this possibility in the consent forms. Various methods of monitoring recovery of sensation should be considered for objective assessment of prognosis. In addition, immediate referral to orofacial pain specialists can offer the patients an opportunity for more effective and noninvasive treatments.

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국문요약

## 치과의사에 의해 보고된 발치 및 임플란트 수술 후 지각이상에 대한 분석

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본 연구의 목적은 발치 및 임플란트 수술 이후 발생하는 지각이상을 분석하여 추후 지각이상의 평가 및 처치 시 예측 가능한 지침을 확립하기 위함이다.

발치 및 임플란트 수술 이후 지각이상의 경험여부를 묻는 설문조사에 응답한 276명의 치과의사를 대상으로, 지각이상이 발생한 환자의 연령 및 성별, 지각이상이 발생한 위치, 동반증상, 회복율 및 회복기간에 대한 분석을 시행하여 다음과 같은 결론을 얻었다.

1. 지각이상은 환자의 성별, 연령과 상관성이 없었다.
2. 지각마비의 발생부위는 하악 구치부에서 가장 많이 발생되었으며 이는 발치 및 임플란트 시술시 지각마비가 발생한 경우에 모두 적용되었다(발치군: 93.2%, 임플란트군: 100%).
3. 가장 많이 동반된 증상은 동통으로, 발치의 경우 46.5%, 임플란트의 경우 44.8%로 지각마비 이후 통증을 호소하고 있었다.
4. 회복율은 발치의 경우 72.3%, 임플란트 수술 후 71.8%로 보고되었다. 대부분의 경우 지각이상이 6개월 이내에 해소되었다.

결론적으로, 발치 및 임플란트 수술 후 발생한 대부분의 지각이상은 발병 후 약 1년내에 해소된다고 볼 수 있다. 그러나 영구적인 지각이상의 발생가능성 또한 무시할 수 없다. 따라서 임상가는 환자에게 신경손상의 가능성을 미리 고지하고, 동의서 양식에 이에 대한 내용을 포함하도록 해야 한다. 또한 지각이상이 발생한 후, 객관적으로 예후를 평가하기 위하여 다양한 방법을 통해 지각이상의 경과를 기록할 수 있어야 하며, 보다 효과적이고 비침습적인 처치를 위하여 조기에 구강안면통증 전문가에게 의뢰하는 것을 고려해 보아야 할 것이다.

주제어 : 발치, 신경손상, 임플란트 수술, 지각이상

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