

# Survey of Dental Treatment under Intravenous Sedation for Patients with Exaggerated Gag Reflex in Korean University Hospital

Sooil Shin<sup>1</sup>, Seungoh Kim<sup>2,\*</sup>

<sup>1</sup>Associate Professor, Department of Advanced General Dentistry, School of Dentistry, Dankook University, Cheonan, Korea

<sup>2</sup>Professor, Department of Anesthesiology, School of Dentistry, Dankook University, Cheonan, Korea

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## ABSTRACT

**Background:** The objective of the present study was to examine the status of patients who had received dental treatment under intravenous (IV) sedation for suppressing exaggerated gag reflex (EGR) at Dankook University Dental Hospital (DUDH) in Korea. And it was written to provide dentists information that dental treatment under IV sedation for relieve the EGR.

**Methods:** Retrospective analysis was performed on 457 cases of patients who had received dental treatments under IV sedation between January 2012 and March 2018. 90 cases of patients received dental treatment under IV sedation for relieve the EGR. The analysis examined the patient's sex, age, onset and recovery time for IV sedation, type of dental treatment performed and annual trends.

**Results:** Patients with EGR have difficulty getting the dental treatment, IV sedation is often used to relieve EGR in some patients. The mean duration of IV sedation was 87.1 min, while the mean duration of treatment was 73.4 min. The onset and recovery time for IV sedation is in short, 10 min to 45 min, mean time is 13.7 min. Total number of patients were 90, the number of different types of dental treatment were 109. These included surgical treatment (n=28), periodontal treatment (n=15), prosthodontic treatment (n=30), restorative treatment (n=13), implant surgery (n=8), endodontic treatment (n=14), etc. (n=1).

**Conclusions:** The use of IV sedation for dental treatment with EGR provide more comfortable dental service, fewer side effects because of the fast onset and recovery time and lesser risk than general anesthesia. Dentists can secure sufficient dental time through IV sedation and provide various type of dental treatments during that time. IV sedation will be able to satisfy the needs of patients with EGR to receive dental treatment more comfortably, and when sufficient information about IV sedation is provided, its use is expected to expand in the future.

**Key words :** Gag reflex, IV sedation, Retrospective analysis, Dental treatment

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## INTRODUCTION

Gag reflex (GR) is described as a normal defense mechanism that removes foreign bodies from entering the trachea,

pharynx, or larynx. The etiology is classified as either somatic or psychologic. Somatic responses occur in response to physical stimuli in the posterior palate, base of tongue or throat, while psychologic responses are induced by fear or anxiety<sup>1</sup>.

For these reason, some patients with GR are overly hyperactive during dental treatment, which makes treatment almost impossible. To resolve this problem, behavioral techniques and/or pharmacological techniques has been used. Nevertheless when these patients tried to received dental treatment in

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Correspondence : Prof. Seungoh Kim  
Department of Anesthesiology, School of Dentistry, Dankook University, 119 Dandaero, Dognam-gu, Cheonan 31116, Republic of Korea  
Tel: +82-41-550-1863  
E-mail: ksomd@dankook.ac.kr  
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local clinic, they were able to take the minimal dental treatment as the intraoral sensitivity and/or the fear develop the severe GR. So the dental treatment under the Intravenous (IV) sedation demanded from the dentists and/or the patients

IV sedation was introduced to relieve gagging and fear during gastrointestinal endoscope examination<sup>2</sup>. IV sedation has the advantage of rapid onset, quick recovery, maintenance an appropriately sedated state and immediate administration under emergencies when IV line has been secured. In addition, central nervous system depression can control anxiety and induce amnesia<sup>3,4</sup>.

Propofol is a highly lipid-soluble and provides rapid redistribution and metabolism, quick onset of action, short duration of effect, and rapid recovery. It also has minimal postanesthetic side effects and low incidences of nausea or vomiting post-anesthesia, which enables early discharge<sup>5-7</sup>. However, Propofol reduces arterial blood pressure by 20% to 40% of preinduction systolic pressure, following IV administration<sup>8,9</sup>. Propofol induced vasodilatation leads to a fall in systemic vascular resistance, as well as a dose-related depression of myocardial contractility<sup>10</sup>, although this can be partly avoided by reducing the rate of administration of drug. Propofol can also exhibit severe respiratory depression phenomenon by suppressing hypoxic ventilation, and hence, the administration of oxygen and anesthesiologist supervision are required. A burning sensation is another adverse effect of propofol but can be reduced by co-administering remifentanyl<sup>11</sup>.

Remifentanyl is a fast-acting opioid analgesic with minimal residual effects, and acts on opioid receptors in the brain and spinal cord. Remifentanyl is rapidly degraded by nonspecific esterase in blood and tissues and leads to a final elimination half-life of less than 10 min, and a context-sensitive half-life of 3 min without accumulation, regardless of duration of infusion<sup>12,13</sup>.

Propofol - Remifentanyl IV sedation reduces amount of propofol required to achieve deep sedation and results in reduced recovery time and reduced pain related to sedation<sup>14,15</sup>. When comparing the incidences of EGR after the administration of remifentanyl and propofol, a study reported that remifentanyl is more effective in suppressing GR while propofol had stronger sedative effects than attenuating effects on GR<sup>16,17</sup>.

Propofol - remifentanyl combination is safe and effective, but with a risk of respiratory insufficiency. Therefore immediate airway clearance is required and administration should be performed under supervision of an anesthesiologist<sup>18</sup>. As for these reason, propofol - remifentanyl IV sedation has been

used for dental treatment of patients with EGR since 2012 in Dankook University Dental Hospital (DUDH).

The present study investigated the status of patients who had received dental treatments under IV sedation to relieve EGR since first introduction the present time, and herein reports the results of retrospective analysis of various factors.

## MATERIALS AND METHODS

### 1. Participants

The study retrospectively analyzed 457 cases of patients who received dental treatments under IV sedation between January 2012 and March 2018. There were only 90 of these cases for dental treatment under IV sedation for relieve EGR by examining the medical records.

### 2. Methods

The procedures for performing propofol IV sedation were as follows. On the appointment date, the patient visited to the hospital after an 8-hour fast. After a systemic examination, oxygen at 2 L/min was supplied via a nasal cannula, and the IV line established using conventional venipuncture for propofol administration. A target-controlled infusion (TCI) device (Orchestra Infusion Workstation, Fresenius Vial, France) was used for IV infusion of propofol and remifentanyl, at target concentration of 0.5 µg/mL and 1.0 ng/mL, respectively. First, remifentanyl was administered at serum concentration controlled to 1.0 ng/mL, after which propofol at serum concentration of 0.5 µg/mL was injected under neuroleptanalgesia. After administration, upon the observation of ptosis, dental treatment was begun and the patients became relieved from GR.

The medical records of patients who underwent dental treatments using propofol IV sedation to relieve GR were collected for retrospective analysis of including sex, age, duration of anesthesia and dental treatment, type of dental treatment performed, and annual trends.

## RESULTS

### 1. Age distribution

Ages ranged between 15 and 74 years: 4 in 10~19 group (4.4%), 13 in 20~29 group (14.4%), 12 in 30~39 group (13.3%), 37 in 40~49 group (41.1%), 13 in 50~59 group

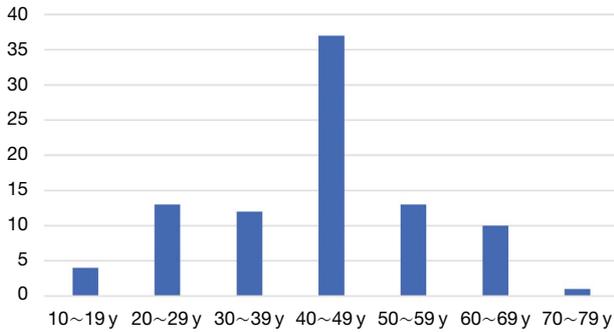


Figure 1. Age distribution.

Table 1. Onset and recovery time distribution

Onset and recovery time	Number of patients
~10 min	56
10~20 min	30
20~30 min	3
30~min	1

(14.4%), 10 in 60~69 group (11.1%), 1 in 70~79 group (1.1%). The most frequent distribution was in 40~49 group (Fig 1).

## 2. Sex distribution

There were clearly more males (n = 62) than females (n = 28).

## 3. Onset and recovery time

The onset and recovery time is in short minimum 10 min to maximum 45 min, the mean time is 13.7 min. The distribution of the patient according to the onset and recovery time is as follows (Table 1).

## 4. Type of dental treatment

109 cases were treated under a total of 90 propofol IV sedation, and the types of dental treatments included surgical treatment (n = 28), periodontal treatment (n = 15), prosthodontic treatment (n = 30), conservative treatment (n = 13), implant surgery (n = 8), endodontic treatment (n = 14), etc. (n = 1) (Fig 2).

## 5. Annual trends

Since 2012, the number of cases with propofol IV sedation

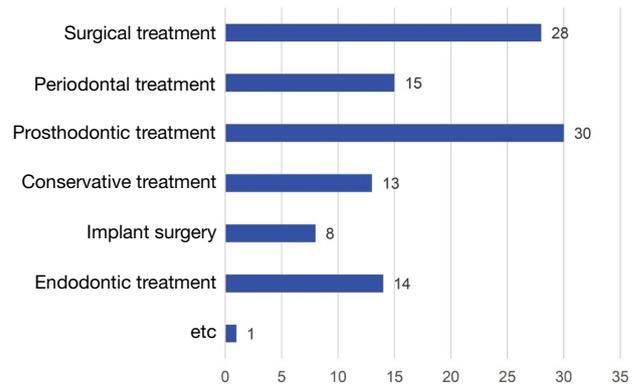


Figure 2. Type of dental treatment.



Figure 3. Annual trends.

for gag reflex increased gradually up to 2016 and it had declined somewhat in 2017 (Fig 3).

## DISCUSSION

From January 2012 to March 2018, 90 patients were treated under IV sedation due to EGR. These patients tried to receive dental treatment at local clinic but were unsuccessful due to their gag reflex. Patients tolerated when examining the anterior portion but once the mirror moved towards the posterior part of the mouth, it induced uncontrollable gag reflex making it impossible to complete examination or treat. Inability to receive treatment at their local clinic, these patients visited our hospital to receive more comfortable dental treatment under sedation or general anesthesia.

GR is a natural defense response derived by the stimulation of posterior intraoral structures. This mechanism of contracting oropharyngeal muscles prevents foreign objects from

entering the upper respiratory tract unintendedly. The etiology of GR has been categorized as either somatic or psychologic<sup>19</sup>. Somatic responses are induced by stimuli of intraoral trigger zones when dental instruments enter the posterior intraoral region. The intraoral trigger zones include palatoglossal and palatopharyngeal folds, base of tongue, palate, uvula, and posterior pharyngeal wall<sup>20</sup>. However, psychological responses are associated with fear or anxiety and may occur without a direct stimulus.

Therefore it is critical for dentists to modify patient behavior or prescribe appropriate medications to manage GR<sup>21</sup>. For relatively simple treatments, behavior modifications and different relaxing techniques are utilized in outpatient clinic setting. However, for patients with EGR who need treatments of posterior part or have had traumatizing dental experiences in the past, general anesthesia or sedation was used.

In our study, there were a total of 162 patients visiting due to EGR during the same period. In these patients, 58 were treated under general anesthesia, 90 were under IV sedation, and 4 were under sevoflurane inhalation.

General anesthesia is the most certain way to prevent patients from gagging during examination and treatment, but due to its high costs and risks, deep sedation is more preferred. Sevoflurane induction requires inhalation of gas through the respiratory tract, and since the nose is used as a conduit for inhalation, it can interfere with the vision of the dentists and limit the use of the instrument. Also, the leakage of gas into the mouth during the dental treatment can have a negatively affect the dentists. Propofol IV sedation has the quick onset time of sedation, ability to control sedative effects, rapid recovery and ability for quick response in emergency situations due to already established IV line. In addition, propofol IV sedation using TCI devices can adjust depth of sedation controlling capacity of propofol depending on the patient's state of consciousness. Therefore, when patients complained of discomfort due to gag reflex, they could adjust to a deeper sedation condition, and when breathing becomes unstable or oxygen saturation decreases due to deep sedation, it can be adjusted to a shallow sedation condition.

In spite of deep sedation with IV sedatives, if the patient complained of EGR and treatment was not smooth, this case was judged to be uncontrolled EGR by IV sedation. And the treatment plan was subsequently revised to general anesthesia.

One of the great advantages of IV sedation is that it has patient consciousness - even though it is not completely reliable. This enables cold/hot test, electric pulp test, percussion test,

bite test etc. which require patient response. It also enables physical movement of occlusion. However, for people with mental retardation, it is not recommended to use IV sedation, since their unconscious movements can interfere dental treatments.

In this study, ages of patients with EGR who received dental treatments under IV sedation ranged from 15 to 74. More males (n=62) than females (n=28) were identified in our study. However, this statistical result of age and sex is not highly reliable since number of patients who were treated under IV sedation may have been double checked. It requires further investigation to make certain of age and sex.

Duration of IV sedation ranged from 20 to 190 minutes. The duration of dental treatments ranged from 10 to 175 minutes. The mean duration of IV sedation was 78.1 min, while the mean duration of treatment was 73.4 minutes. The onset and recovery time can be determined by the difference between IV sedation time and dental treatment time. The onset and recovery time is in short minimum 10 min to maximum 45 min, the mean time is 13.7 min. These results show most of the total sedation time can be fully used for dental treatment and that from short-time dental treatment to time-consuming dental treatment is possible under IV sedation.

109 types of dental treatment were taken under 90 IV sedation with different types of dental treatments, which were surgical treatment (n=28), periodontal treatment (n=15), prosthodontic treatment (n=30), conservative treatment (n=13), implant surgery (n=8), endodontic treatment (n=14), etc (n=1). In this result, highly invasive treatments, such as surgical treatment (26.6%) and implant surgery (7.3%), take the highest part which was 33.9%, whereas prosthodontic treatment that used high speed handpiece with water spray or dental impression which irritates intraorally, was 27.5%. Periodontal treatment, endodontic treatment, and conservative treatment were 13.7%, 12.8%, 11.9%, respectively. The results shows how treating patients with EGR is possible for various treatments, whether it is invasive or non-invasive. Partly, some of these patients exhibited gag reflex when their intraoral was irritated, but this was overcome by manipulating the concentration of propofol in blood. Moreover, from amnesiac effects of propofol, some even changed their minds positively for dental treatments, which made it possible for simple treatment to be done at the outpatient clinic.

The number of patients treated under IV sedation from January 2012 to March 2018 was total 457, 90 patients (19.7%) were treated under IV sedation due to EGR.

The number of IV sedation cases with patients with EGR

increased gradually from 2012 to 2016 and somewhat decreased in 2017<sup>22</sup>. But considering the decrease in the total number of IV sedation, the decrease in the number of IV sedation in patients with EGR is interpreted as relatively small distribution. Also it can be interpreted that patients with EGR are searching for more comfortable ways to get dental treatments and want to be provide high quality dental services rather than treatment like an expedient response.

This study shows that remifentanyl - propofol IV sedation can be an appropriate alternative for general anesthesia, providing a more comfortable and safer treatment environment by the data of over the past 7 years in DUDH. Also, it is expected to provide good information for patients with EGR who were almost impossible to get dental treatments, and dentists who were try to provide a excellent dental service to patients with EGR.

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