Management of exaggerated gag reflex using conscious sedation techniques in endodontic therapy - a pilot study

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Abstract

Objective: To evaluate the usefulness of inhalation sedation (IS) and intravenous (IV) sedation for gag reflex management in patients undergoing endodontic therapy.

Design: Twelve cases (five mandibular molars, two maxillary and two mandibular premolars, one maxillary canine and two maxillary incisors) of five retching, male patients were studied. Management techniques, complications during treatment, and the characteristics of the root canal obturation were surveyed. The postoperative discomfort was also examined every month for four months, up to two years after root canal filling.

Results: Two patients each underwent IS and IV sedation, and both management techniques were employed in the fifth patient. Endodontic treatment was completed without respiratory distress, nausea, vomiting or other complications. Radiographs indicated that the root canals were filled up to 0.5-2mm on the inner portion from the apex in 10 of 12 teeth, although the curved root canals of two mandibular molars showed unfilled space between the ledge and apex. After root canal filling, no postoperative pain/swelling or other discomfort was observed throughout the observation periods.

Conclusion: IS and IV sedation were useful management techniques that facilitated endodontic therapy for problematic gag reflex patients who could not tolerate therapy by behaviour modification.

Key words: Gag reflex, inhalation sedation, intravenous sedation, endodontic therapy

Introduction

Exaggerated gag reflex, a somatic natural response in which the body attempts to eliminate dental instruments or agents from the oral cavity by muscle contraction at the base of the tongue and the pharyngeal wall (Bassi et al., 2004), is troublesome for both patients and dental clinicians. Generally, the ultimate goal for these patients is to make routine dental care possible by reducing anxiety and unlearning the behaviour leading to gagging (Ramsay et al., 1987; Wilks and Marks, 1983). Consequently, strategies to overcome the gag reflex have focused on behaviour modification such as systematic desensitisation and distraction methods. However, endodontic therapy often demands urgent pain/swelling control (Weine, 1989). In such cases, pharmacological management is often required in order to commence immediate pain relief treatment. General anaesthesia (GA) is an attractive alternative to completely eliminate the gag reflex, especially in cases of treatment of multiple teeth, which would otherwise require treatment to be completed in a few visits, although, the cost should be considered in comparison with the benefits of dental care (Yagiela, 2001). On the other hand, conscious sedation methods such as intravenous (IV) sedation are thought to be beneficial in endodontic cases requiring several visits (Tomioka et al., 1998).

To date, most dental case reports on retching patients are associated with prosthodontic treatment (Barsby, 1994; Conny and Tedesco, 1983; Neumann and McCarty, 2001; Yoshida et al., 2007), but the usefulness of conscious sedation in endodontic therapy has not been sufficiently
explored. In this study, we described endodontic cases conducted under conscious sedation, that is, inhalation sedation (IS) and IV sedation.

**Materials and methods**

**Subjects**

Fifteen patients with a history of severe retching were referred to our clinic for dental therapy under pharmacological management, from February 1998 to July 2005. They had been unable to tolerate any dental treatment conducted by a general practitioner. Among them, 13 patients needed endodontic therapy. A total of eight patients had to be excluded from the survey (see further below): 3 patients who did not receive postoperative radiographic examination, 2 patients who refused the use of a rubber dam, and 3 patients who were unavailable for recall. Consequently, the subjects of this study were five male patients. The patients ranged in age from 18 to 63 years with a mean of 42.8 +/-16.2 years. There were a few medical or other complications such as hypertension in two patients and mild intellectual disability in one patient, but these did not pose any communication problem (Table 1). One patient (case 2) had a blood pressure reading of 175/110 mmHg at the first visit and was instructed to consult a medical doctor. With medication, the reading was reduced to 150/80mmHg. Another patient (case 3) was receiving treatment with an anti-hypertensive drug and the blood pressure reading was within the normal range. The intellectually disabled patient (case 5) had the vocabulary of an average 10-year old but could manage his daily life by himself.

The severity of the gag reflex level was assessed by the response to tactile stimulation of a dental mirror in the oral cavity. The criteria were as follows:

0. No response to the stimuli
1. The reflex was provoked by tactile stimulation only to the posterior teeth
2. The reflex was also provoked by tactile stimulation to the anterior teeth.
3. The reflex was provoked by visualization of a dental instrument.

Informed consent was obtained from all patients after a thorough explanation of the treatment and management plan at commencement of their treatment, when the opinion of the Ethic Committee of the Nagasaki University Graduate School of Biomedical Sciences was not available. Subsequently, all patients signed the consent form that had been approved by the institutional ethics committee. In case 5, the parent’s consent was obtained.

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<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Gag reflex level *</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>44</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>1</td>
<td>Hypertension</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>1</td>
<td>Hypertension</td>
</tr>
<tr>
<td>4</td>
<td>41</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>2</td>
<td>Mental disability</td>
</tr>
</tbody>
</table>

* 0. No response to the stimuli
  1. The reflex was provoked by tactile stimulation only to the posterior teeth
  2. The reflex was also provoked by tactile stimulation to the anterior teeth.
  3. The reflex was provoked by visualization of a dental instrument.

**Sedation techniques**

The patient assessment was clinical and allocation to sedative modalities was mainly based on the reflex level. IS was applied as the first choice to level 1 patients. In a patient who could not tolerate treatment under this method, IV sedation was administered. In patients with a reflex level over 2, IV sedation was selected and GA was also considered for a patient intolerant of treatment under IV sedation. The blood pressure, radial pulse and oxygen saturation were recorded continuously using a monitor, (Kolin, Komaki, Japan). In the event of any sign of respiratory distress, treatment was temporarily suspended, the neck extended, and the mandible manoeuvred forward for re-establishment of the airway. The degree of sedation was maintained at a level from which the patients could be roused by mild physical stimulation but at which the reflex was sufficiently suppressed.

For inhalation sedation, the gas was distributed via a valve and closed system (Sekimura, Tokyo, Japan). The patients were given 5% nitrous oxide (N\textsubscript{2}O) in combination with oxygen (O\textsubscript{2}) for five minutes via a nasal mask, followed by 5% increments of N\textsubscript{2}O every five minutes until a premix of 30% N\textsubscript{2}O/70% O\textsubscript{2} was administered, thus establishing the baseline level of sedation. Gas administration was prolonged until the end of the treatment.

For intravenous sedation, intravenous access was established and a bolus dose of 0.5-1.0 mg/kg Propofol, (AstraZeneca, Osaka, Japan) was administered intravenously by an anaesthetist. Maintenance of IV sedation was by a continuous infusion of 2-6 mg/kg/h Propofol during routine endodontic procedures. After completion of the treatment, the infusion was terminated. An anaesthetist judged the fitness for discharge by confirming the cognition level recovery and stable vital signs relative to
the patient’s baseline values.

Endodontic procedures
Diagnosis was made mainly on the basis of each patient’s subjective symptoms, mirror inspection from the labial / buccal side and radiographs, because the patients could not tolerate palpation, percussion and electric pulp test or any other kind of routine inspection in the oral cavity. In required cases, intraoral radiographs were taken under sedation, using a portable radiographic machine before commencement of treatment and after root canal filling. Otherwise, panoramic or oblique radiographs were used for diagnostic purposes. Five mandibular molars, two maxillary and mandibular premolars, one maxillary canine and two maxillary incisors were investigated in the present study.

In six teeth with pulpitis (Table 2), the patients were anaesthetised with lidocaine hydrochloride (Astra Zeneca, Osaka, Japan) with epinephrine as a vasoconstrictor (1: 80,000) for pulpectomy. In order to ensure an aseptic field of operation, the designated teeth were isolated with a rubber dam. Root canals were prepared with hand files (GC, Tokyo, Japan) using the instrumentation technique described by Grossman et al. (1988). At the completion of preparation, the root canals were filled with laterally condensed gutta-percha cones (GC, Tokyo, Japan) and zinc-oxide and eugenol sealer (Showa Yakuhin Kako, Tokyo, Japan). A permanent restoration was completed within two months. The patients were recalled monthly for at least four months after obturation of the root canal to observe postoperative pain and swelling.

Table 2. Tooth location and observation periods in endodontic therapy

<table>
<thead>
<tr>
<th>Case</th>
<th>Tooth location (IS)</th>
<th>Tooth location (IV)</th>
<th>Tooth location (Pulpectomy)</th>
<th>Observation periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>11</td>
<td>2 years</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15,13,22, 34,44</td>
<td>22,34,44</td>
<td>2 years</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>4 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>38,25,36, 47</td>
<td>38</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>37</td>
<td>37</td>
<td>1 years and 4 months</td>
<td></td>
</tr>
</tbody>
</table>

Results

Five patients took part in the study. The reflex level of the patients is also shown in Table 1.

Two patients each underwent treatment under IS and IV sedation. The other patient (case 2) received treatment using IS for three maxillary teeth, but IV sedation had to be employed for treatment of two mandibular premolars because of the patient’s intolerance of treatment under IS. The location of the treated teeth, sedation techniques and observation periods are presented in Table 2. Six teeth were diagnosed as pulpite and the other six as pulp ne-

crosis / apical periodontitis. Recovery time did not exceed 20 minutes, and the patients were able to return home less than an hour after completion of treatment using both sedation techniques. After treatment, no symptoms, such as nausea and dyspnea, were observed.

Radiographs showed that the root canals were filled up to 0.5-2mm on the inner portion from the radiographic apex in 10 of 12 teeth (Figure1). Two mandibular molars of one patient with a curved root (Case 4) showed an unfilled space between the ledge and apex. Restoration or prosthodontic treatment was conducted within a month after completion of endodontic therapy. No discomfort such as postoperative pain / swelling was observed throughout the observation period.

Discussion

The aetiology of the gag reflex is associated with anatomical and iatrogenic factors, systemic disorders, and psychological conditions (Bassi et al., 2004). Gagging occurs as a result, for example, of the collection of saliva in the back of the throat, an overfilled impression tray or placement of radiographs (Ramsay et al., 1987). Furthermore, even extremely mild tactile stimulation from non-invasive instruments such as a dental mirror or rubber dam to trigger sites like the dorsum of the tongue, soft palate or pharyngeal walls can elicit the reflex in gagging patients due to a learned negative experience (Wilks and Marks, 1983). As a result, these patients cannot tolerate diagnostic procedures even for endodontic treatment. To date, pharmacological management is not routine because of the risk of overdependence of patients on this option (Ramsay et al., 1987). However, our patients tended to suspend or avoid dental care for long periods of time due to anxiety, fear and a negative attitude towards dental treatment by general practitioners who tried behavioural management techniques. Consequently, we gave priority to immediate commencement of treatment using conscious sedation.

GA is beneficial for severely retching patients who cannot tolerate dental care under conscious sedation (Bassi et al., 2004). During the period of the study, 55 cases of GA were conducted in our clinic for intellectually disabled patients, including a retching male patient. However, we excluded the patient from the study because he could not tolerate any oral inspection and failed to respond to a request to return to the clinic routinely, even if only for assessment of postoperative discomfort without any treatment being undertaken.

The use of IS is an attractive alternative for relatively mild gagging cases (Bassi et al., 2004) because it does not cause venous injury in the forearm, has a low frequency of other adverse effects such as respiratory distress and airway blockage, and is accompanied by vomiting and nausea in no more than 6% of cases (Allen et al., 2006;
Collado et al., 2006). However, we selected IV sedation rather than IS as a management method for mandibular premolars in case 2 because of the patient’s intolerance to treatment under IS, as a previous report showed that IS exerts a limited effect on reflex control in many prostho-dontic cases (Bassi et al., 2004; Yoshida et al., 2007).

When utilising IV sedation, complications such as airway obstruction, respiratory arrest, reduction in saturation, cough and laryngospasm should be carefully evaluated (Chaushu et al., 2002). In our cases, the rubber dam effectively prevented water coolant aspiration, and reduction in saturation was easily alleviated by a brief suspension of treatment and extension of the head, with posturing of the mandible forward. As a result, endodontic treatment under IV sedation was successfully conducted without any complications, suggesting the usefulness of IV sedation for the control of gagging in endodontic therapy. IV sedation is effective for the elimination of the reflex, but the recovery time is longer than that of IS. It might be the procedure of choice for patients who have only a few decayed teeth but have to be treated repeatedly.

For endodontic therapy, Tomioka et al. (1998) used IV sedation for control of gagging in the treatment of an upper premolar tooth and achieved the successful elimination of the reflex. In our series, nine of 12 teeth were located in the posterior area (Table 2). The predominant location of the decayed teeth in the posterior area was probably due to poor oral hygiene as a consequence of tooth brushing problems, resulting from stimulation of trigger areas such as the palate, tongue and pharyngeal walls.

In endodontic studies, routine follow-up evaluations have been conducted by means of radiographs and observation of clinical symptoms from a year to two years after root canal obturation (Cengiz et al., 2006; Gesi et al., 2006). In the present study on patients with a pronounced gag reflex, we followed three of the five patients for more than a year. In other two cases, the follow-up observation terminated after four or six months, probably due to the patient’s wish to minimise dental care.

Since the patients were intolerant of oral examination by palpation or percussion, we assessed the postoperative condition by subjective symptoms and visual inspection from the labial / buccal side. Radiographic examination would normally also be required for routine follow-up observation (Gesi et al., 2006). In the present study, we could not conduct radiographic examinations because our patients were intolerant of intraoral radiographs under routine circumstances and were reluctant to undergo a radiographic review. Despite the risk of overlooking signs and symptoms related to the recurrence of apical periodontitis, the lack of discomfort such as postoperative pain and swelling indicates the contribution of conscious sedation to endodontic therapy in the patients. In order to assess the success rate of endodontic cases, further long-term follow-up of cases should be made. An assessment of the patient’s dental anxiety at each visit should also be considered in order to determine the most suitable method for reflex control during endodontic treatment and to estimate the effect of sedation techniques in facilitating treatment.

**Conclusion**

Conscious sedation using inhalational and intravenous sedation techniques was useful to facilitate endodontic therapy for patients with a problematic gag reflex.

**Acknowledgement**

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References


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