

The etiology and management of gagging: A review of the literature

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Gagging in dental patients can be disruptive to dental treatment and may be a barrier to patient care, preventing the provision of treatment and the wearing of prostheses. This article reviews the literature on the gagging problem from English-language peer-reviewed articles from the years 1940 to 2002 found by conducting an electronic search of PubMed, coupled with additional references from citations within the articles. Dentally relevant articles have been cited wherever evidence exists, and a balanced view given in situations where there is controversy. The first section considers the normal gag reflex and factors that may be associated with the etiology of gagging, including anatomical and iatrogenic factors, systemic disorders, and psychological conditions. A review of the management of patients with an exaggerated gag reflex follows and includes strategies to assist clinicians. (*J Prosthet Dent* 2004;91:459-67.)

Gagging commonly occurs during dental procedures, such as making a maxillary impression. Clinicians successfully treat many patients with mild gagging problems using only minor procedural modifications. For some patients, however, severe gagging can be elicited by the dentist's fingers or instruments contacting the oral mucosa or even by nontactile stimuli, for example, patients seeing the dentist or remembering a previous dental experience. Providing dental treatment for this challenging group can be a stressful experience for both patients and clinicians.

Anticipation of the distress induced by dentistry can often dissuade a patient with a gagging problem from seeking regular oral care. As a consequence, the severely affected patient tends not to seek routine dental treatment, presenting only when in pain, and may request treatment under general anesthesia.^{1,2} Patients with a longstanding history of problematic gagging may therefore have poor dental health, and require extensive treatment. The clinician may believe that the difficulties encountered in restoring dental health are insurmountable, and treatment planning therefore tends to be more radical, commonly resulting in exodontia. However, this may merely compound the problem if the patient is unable to tolerate a removable prosthesis. Edentulousness, the final outcome, may profoundly affect a patient's social status, reducing self-esteem and quality of life.

The purpose of this article is to outline the etiology of problematic gagging and review the management of patients with an exaggerated gag reflex. A literature search of PubMed using keywords such as "gag," "retch," "dental," and "reflex" was performed, and

English-language peer-reviewed articles from the period 1940 to 2002 were included. Additional articles were selected from hand searches of the reference lists of those papers culled by the electronic search. A range of strategies is presented to aid the clinician with the treatment of these patients.

THE GAG REFLEX

The gag reflex is a normal defense mechanism that prevents foreign bodies from entering the trachea, pharynx, or larynx. Unwanted, irritating, or toxic material is ejected from the upper respiratory tract by the contraction of the oropharyngeal muscles. In retching, peristalsis becomes spasmodic, uncoordinated, and the direction is reversed.³ Air is forced over the closed glottis producing a characteristic retching sound. The patient who gags may present with a range of disruptive reactions; from simple contraction of palatal or circumoral musculature to spasm of the pharyngeal structures, accompanied by vomiting.⁴ Gagging may be accompanied by excessive salivation, lacrimation, sweating, fainting, or, in a minority of patients, a panic attack.²

When stimulation occurs intraorally, afferent fibers of the trigeminal, glossopharyngeal, and vagus nerves pass to the medulla oblongata.^{2,5} From here, efferent impulses give rise to the spasmodic and uncoordinated muscle movement characteristic of gagging.⁶ The center in the medulla oblongata is close to the vomiting, salivating, and cardiac centers, and these structures may be stimulated during gagging.⁷ Furthermore, neural pathways from the gagging center to the cerebral cortex allow the reflex to be modified by higher centers.⁷

Gagging is a natural reaction to tactile stimulation of certain intraoral structures. There is a wide variation in the sensitivity of the oral cavity and the ability of patients to withstand intraoral stimuli.^{8,9} Five intraoral areas are known to be "trigger zones": palatoglossal and palatopharyngeal folds, base of tongue, palate, uvula,

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and posterior pharyngeal wall.³ Interestingly, the passage of food across these areas does not usually incite retching. Gagging may also be elicited by nontactile sensations such as visual, auditory, or olfactory stimuli.^{10,11} The sight of the dentist or dental equipment may provoke some patients to gag. The sound of the dental handpiece or a person retching may initiate the gag reflex in other patients. Landa⁹ described a husband and wife who both suffered from severe gagging. The sound of the wife retching was sufficient to cause the husband to gag. Certain smells, such as dental substances, cigarette smoke, or perfume, may also induce the gag reflex. This strongly suggests that neutral stimuli become closely associated to the gag reflex, providing evidence that conditioning has occurred. Certain thoughts may also be potent enough to stimulate gagging in some patients.¹²

CONDITIONS ASSOCIATED WITH GAGGING

Gagging is often considered to have a multifactorial etiology,¹³ and a variety of precipitating or modifying factors have been proposed. The literature identifies 2 main categories of retching patients.^{2,14,15} The somatogenic group, in which gagging is induced by physical stimuli, and the psychogenic group, in which psychological stimuli are thought to initiate gagging. It may not be easy to distinguish between the 2 groups because physical stimuli may still provoke gagging of psychogenic origin; therefore, such a distinction is not always helpful in patient management. The 4 factors that are believed to be important in the etiology of gagging include: local and systemic disorders, anatomic factors, psychological factors, and iatrogenic factors.^{2,5}

Local and systemic disorders

Nasal obstruction, postnasal drip, catarrh, sinusitis, nasal polyps, mucosal congestion of the upper respiratory tract, a dry mouth, and medications that cause nausea as a side effect are thought to predispose to or cause gagging.^{1,9,14} Evidence that certain medical conditions are more prevalent in gaggers is equivocal.^{1,2} Chronic gastrointestinal disease, notably chronic gastritis, peptic ulceration, and carcinoma of the stomach, can lower the intraoral threshold for excitation and contribute to gagging.¹⁶ Hiatus hernia and uncontrolled diabetes have also been suggested as predisposing factors. Gagging has been noted as being worse in the morning for some patients, owing to an increased excitability of the vomiting center caused by metabolic disturbances such as carbohydrate starvation and dehydration with ketosis.¹

Anatomic factors

Physical factors such as anatomic abnormalities and oropharyngeal sensitivities have been suggested as

predisposing factors to gagging.^{17,18} In a study of denture wearers that compared the radiologic anatomy of gaggers and nongaggers, no anatomic abnormalities were observed.¹⁹ There were, however, fewer adaptive changes in the posture of the tongue, hyoid bone, and soft palate in the gagging group. Wright^{5,19} suggested that the distribution of the afferent neural pathway, particularly the vagus nerve, may be more extensive in gagging patients compared with nongagging patients. Enlarged areas of sensory innervation cannot, however, explain why patients gag with auditory, olfactory, or visual stimuli.²⁰

Psychological factors

Systemic conditions can have a functional (psychosomatic) component that may contribute to the etiology and the maintenance of a disease state. Examples of orofacial conditions that may have a strong psychogenic component are temporomandibular pain dysfunction syndrome, atypical facial pain, denture intolerance, burning mouth syndrome, and the gag reflex.²⁰ The personality of patients with a marked gag reflex has been investigated, and no differences were found between gaggers and nongaggers for neuroticism, extroversion, or psychoticism.^{10,21} The functional component of a condition may be strongly influenced by an individual's reaction to stressful events. This is sometimes referred to as "learning history." There are 2 major mechanisms of learning known as classical and operant conditioning.²²

Classical conditioning

Classical conditioning occurs when an originally neutral stimulus is paired with a specific behavioral response.²³ Inoffensive stimuli, such as the sight of an impression tray, the smell of the dental surgery, or the sound of a dental handpiece, may become associated with an unpleasant gag response. Gagging may occur initially as a result of an overloaded impression tray or the accumulation of large quantities of water from the handpiece. The patient learns to broadly associate the stimuli as the cause of the gagging, and hence a conditioned gag response to these stimuli may develop.^{12,20}

Operant conditioning

Operant conditioning is a training process whereby the consequence of a response changes the likelihood that the individual will produce that response again. In operant conditioning, some behavior patterns may be reinforced because they secure attention and sympathy (positive reinforcement), avoid a stressful situation (negative reinforcement), or achieve some other desirable result.^{20,23} An example is a patient who gags inadvertently and learns to associate this with a temporary suspension of treatment. The outcome is beneficial,

as the patient derives gain from the action, which is consistent with operant conditioning. Treatment involves discontinuation of the reinforcing actions and teaching alternative social skills, because gagging may be thought to be a more socially acceptable reason for not having dental treatment than admitting to being dentally anxious.

Iatrogenic factors

Poor clinical technique may elicit the gag reflex in patients not normally susceptible to gagging. For example, an overloaded impression tray or an unstable or poorly retained prosthesis may induce gagging. Overextended borders of a prosthesis, particularly the posterior aspect of the maxillary denture and the posterior lingual region of the mandibular prosthesis, can impinge on the "trigger zones" and produce gagging.⁹ An increased vertical dimension of occlusion has also been suggested as precipitating gagging.²⁴ A smooth, highly polished surface which is coated with saliva may produce a "slimy" sensation which is sufficient to cause gagging in some patients; a matte finish has been advocated as more acceptable in this situation.²⁵

Management

The management of the patient with a mild to moderate gagging problem may be performed in general dental practice. However, a patient with a severe gagging problem may initially require referral to a clinician who has an interest in the management of such patients. This does not imply that the general practitioner has no further role to play. Often, the patient's dentist is in an excellent position to reinforce and apply the management techniques to which the patient has been exposed.

Assessment

The management of the gagging patient may be influenced by the severity and etiology of the problem. It is important that the clinician obtains a detailed history in an unhurried, sympathetic manner, and the environment should be calm and reassuring. The attitude of the clinician towards the patient may influence the outcome of treatment. If the dentist attempts to identify the situations that trigger disruptive gagging, this may optimize patient care and operative success. It is helpful if the clinician can ascertain if there was a precipitating event responsible for initiating gagging, although this may not always be possible. Figure 1 outlines the assessment procedure.

The patient should be informed of what the intraoral examination involves, and the inspection should only proceed when consent has been given. The dentist should try to avoid stimulating the gag reflex and distressing the patient; therefore, only a limited exam-

ination may be possible. The role of the dental team is to be sympathetic to the patient's difficulties, to begin to establish a dialogue, and to generate trust, which can be time consuming.

Interventions

The aim of treatment is to allow the patient to receive dental care, such as restorative treatment or the wearing of dental prostheses with a minimum of anxiety and stress. Many diverse management strategies have been described in the literature, and the rationale and practicalities of some techniques are questionable.^{8,12,26} In general, whichever technique is employed, dental treatment is performed over a number of visits with reinforcement of the preferred technique at each appointment. The management techniques should be completely explained to the patient to allay as many fears as possible and to obtain valid consent. Tables I and II outline some of the treatment strategies.

When gagging is thought to be due to a poorly designed or ill-fitting prosthesis, the faults should be rectified, which may necessitate the remaking of the prosthesis.

BEHAVIORAL TECHNIQUES

Behavior modification

It has been recommended that all disruptive gagging should be viewed and presented to the patient as a behavioral response and, therefore, amenable to behavior modification.²³ An exaggerated or extended period of gagging in the absence of a normal stimulus is usually a learned response.²³ Theoretically, this response can be unlearned or extinguished. Behavioral modification is the most successful long-term method of managing the gagging patient.²⁷ Generally, the objectives are to reduce anxiety and "unlearn" the behaviors that provoke gagging. Relaxation, distraction, suggestion, and systematic desensitization are all methods that can be employed, singly or in combination.^{28,29} Cognitive behavioral therapy and sensory flooding are additional techniques that are available.

Relaxation

The gag reflex may be a manifestation of an anxiety state. Relaxation techniques may be helpful in reducing or abolishing the gag reflex. Relaxation can help ameliorate or override unhelpful thought processes. An example of this is to ask the patient to tense and relax certain muscle groups, starting with the legs and working upwards, while continually providing reassurance in a calm atmosphere.

Distraction

Distraction techniques can be useful to temporarily divert a patient's attention and may allow a short dental

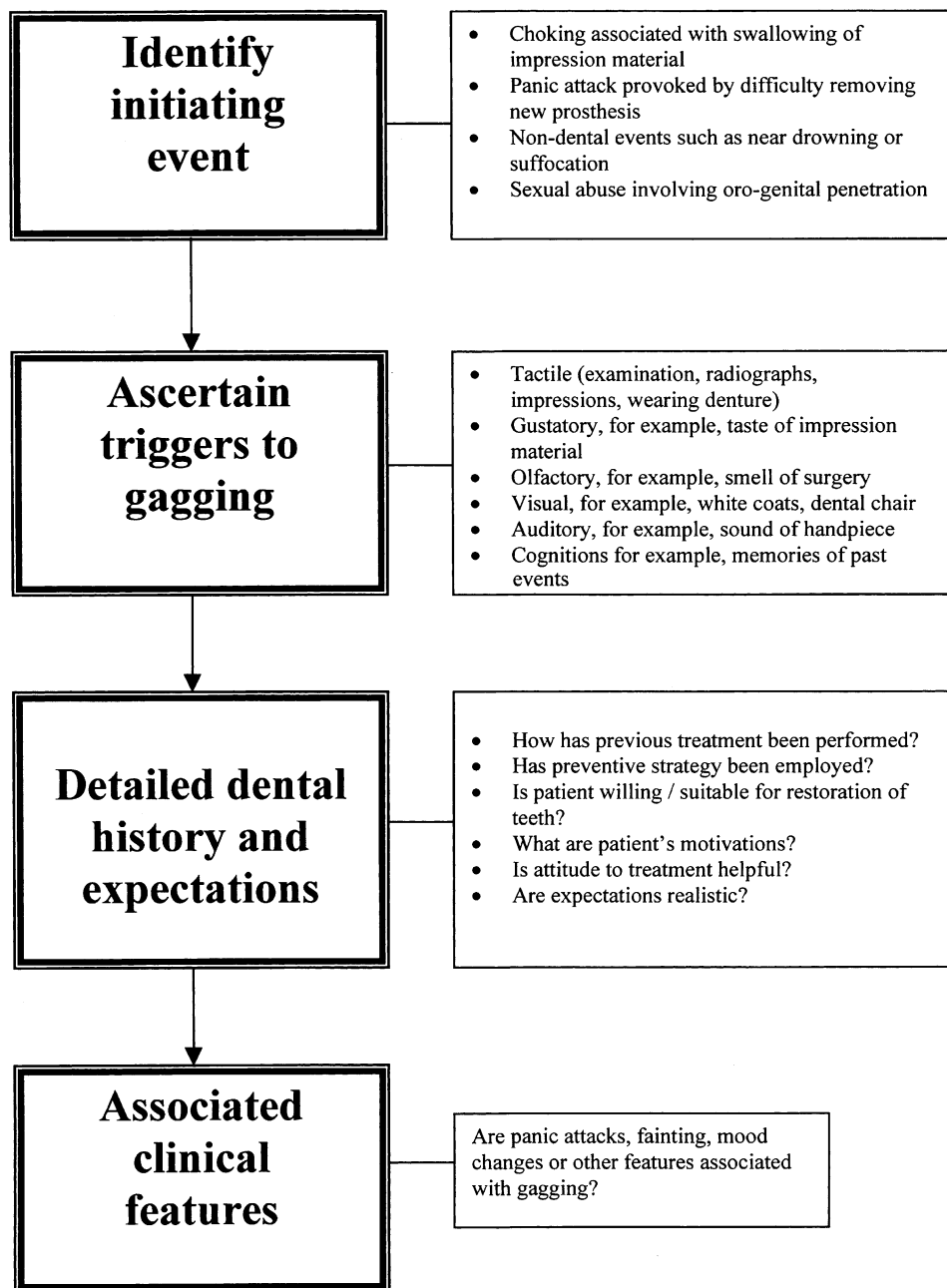


Fig. 1. Assessment of gagging patient.

procedure to be performed while the mind is dissociated from a potentially distressing situation. Conversation can be useful, or the patient may be instructed to concentrate on breathing, for example, inhaling through the nose and exhaling through the mouth. It is often helpful to ask the patient, prior to commencing treatment, to think of and visualize a safe, comfortable, relaxing place and then to describe it briefly to the dentist. The clinician may then help reinforce this image by verbally describing obvious features of this scene accompanied by feelings of well-being. This is termed "distraction imagery."^{15,30} The role of distraction can

be further emphasised by asking a patient to participate in activities that cause muscle fatigue, such as asking a patient to raise a leg off the dental chair and hold the position.²⁴ As the patient's muscles become increasingly fatigued, more conscious effort is required to hold the leg in an elevated position, thus diverting attention away from any intraoral procedures.

Distraction techniques can be used in combination with relaxation procedures. For example if patients find it difficult to dissociate from gagging during relaxation techniques, the use of a mantra that is repeated silently throughout the procedure may be helpful.²³ Distraction

Table I. Summary of management of gagging patient

Individual assessment	
Assess patient's attitude and motivation to treatment	Willingness to: -try treatment and invest time in treatment -commit to "homework" -accept that treatment may be prolonged Patient's ultimate goal for treatment? Does patient believe it is achievable?
Techniques common to all patients	
Sympathetic approach	
Positive attitude	
Thorough history	
Reassure patient	Gagging is a normal response Many patients have very sensitive gag reflex The majority of patients can learn to control gagging, but it takes time Gagging is nothing to be embarrassed about Build patient's self-confidence
Explain and demonstrate stop signal (for example, raising hand)	Allow patient to feel some control
Careful intraoral examination	Obtain patient feedback and continually re-negotiate consent Avoid trigger zones Praise patient
Specific treatment modalities	
Behavioral	Relaxation techniques Distraction Suggestion/hypnosis Systematic desensitization Cognitive behavioral therapy
Pharmacological	Oral Inhalation Intravenous
Combined	Several techniques may be used together or in succession
Simple measures for all patients (reduce iatrogenic factors)	Do not overload impression tray Use quick-setting impression materials Ensure efficient aspiration
Miscellaneous	Akinosi closed-mouth technique for local analgesia of inferior dental nerve Treat patient in an upright position Frequent cessation of treatment

techniques can be valuable for patients with mild gagging to allow short dental procedures to be performed such as impressions or intraoral radiographs.²⁴ These techniques may be inadequate, when used alone, in patients with a severe disruptive gag reflex.

Table II. Suggested treatment strategies for patient with disruptive gag reflex

Treatment problem	Management options
Prosthetic	
Unable to tolerate impressions	Distraction techniques Relaxation Systemic desensitization Hypnosis Sedation
Unable to wear denture(s)	Satisfactory dentures available – 'errorless' learning No satisfactory dentures – systematic desensitization, for example, training base and 'errorless' learning. Acrylic discs may be helpful prior to provision of training base.
Restorative	
Unable to tolerate instrumentation, for example, examination, scaling, tooth preparation	No short-term treatment requirements: -hypnosis -systematic desensitization for oral hygiene measure, scaling, polishing -encourage regular reviews -sedation In urgent need of treatment: -hypnosis -sedation

Distraction techniques have also been advocated for the insertion of new dentures.^{23,24} A method of deep rhythmic breathing, as advocated by the National Childbirth Trust of the UK, has been used with some success in denture wearers.¹³ Landa⁹ suggests having the patient count rapidly to 50 then read out loud. Kovats¹² reported a technique in which the patient breathes through the nose and at the same time rhythmically taps the right foot on the floor.

Suggestion

Distraction techniques can be refined by incorporating an element of suggestion.²⁸ Patients can be informed that retching will not occur during the distracting activity. Visual imagery may be used to enhance suggestion. Hypnosis may help to relax a patient and so temporarily remove or ameliorate the gag reflex to allow dental treatment to be performed.³¹ There are few contraindications to hypnosis, but it should only be used after the clinician has received appropriate training.^{31,32} An experienced hypnotherapist may use a sophisticated suggestion approach to help abolish the gag reflex.³³

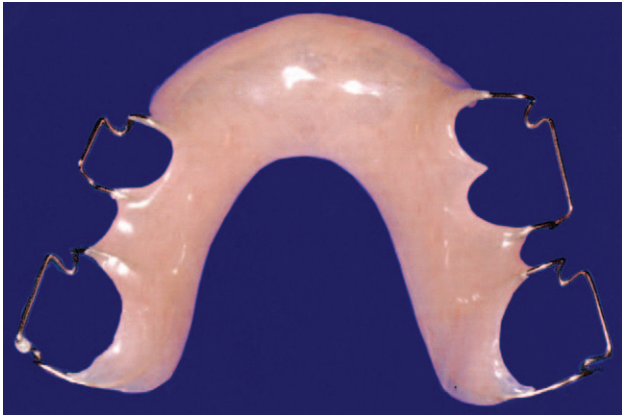


Fig. 2. Training denture without teeth.

Systematic desensitization

The maladaptive thoughts and expectations of patients can be altered by positive experience and this forms the basis of re-education techniques such as systematic desensitization.^{11,23,34} Behavior that has been learned by classical conditioning can be unlearned by essentially reversing the conditioning process. The technique consists of incremental exposure of the patient to the feared stimulus. The patient, under conditions of relaxation and reassurance, is exposed to a mildly aversive stimulus and learns to cope with this. The patient is then gradually exposed to increasingly aversive stimuli. In other words, the intensity, duration, and frequency of the noxious stimuli is slowly increased, thereby allowing the patient to gently habituate by developing coping strategies to deal with the feelings of discomfort or panic experienced. This may often involve behavioral techniques such as deep breathing and muscle relaxation. It is important to use a controlled step-wise approach to prevent or minimize the patient's gagging. The use of reassurance and praise is strongly recommended.

Many re-education techniques have been described in which the patient is given an object to place in the mouth for a period of time.^{11,23,35} The size of the object and the length of time for which it is held in the mouth gradually increases until the patient is able to tolerate dental procedures. A toothbrush, radiograph, impression tray, marbles, acrylic discs, buttons, dentures, and training devices have all been used to help patients overcome the gagging problem.^{23,26,35} For example, the hard palate is gently brushed with a toothbrush without inducing the gag reflex. The patient marks the position of the maxillary incisors on the toothbrush handle. The aim is to move the brush more posteriorly and the patient is encouraged as the mark on the toothbrush moves progressively down the handle.³² Singer³⁵ described a technique where ordinary glass marbles were used to re-educate the patient



Fig. 3. Training denture with anterior teeth only. Improved esthetics may be motivating factor.



Fig. 4. Training denture with posterior teeth.

prior to denture fabrication. Essentially, for 1 week marbles are sucked in the patient's mouth for increasing periods of time while awake. Once these are tolerated, maxillary and mandibular denture record bases are made, and later converted to conventional dentures. Alternatively, acrylic balls or discs may be used. Relaxation techniques are often employed at the same time as undertaking the intraoral exercise. Homework is an essential component of a systematic desensitization program. Such procedures should be undertaken regularly, preferably daily, and a log book of events kept.

Training bases

This is a further desensitization technique, whereby a patient is progressively supplied with a series of small to full-sized denture bases. It is useful for patients who are to become denture wearers. A thin acrylic denture base, without teeth (Fig. 2), is fabricated and the patient is

asked to wear it at home, gradually increasing the length of time the training base is worn. A suitable regime may be 5 minutes once each day, then twice each day and so on. After 1 week the patient is asked to increase this to 10 minutes 3 times each day, then 15 minutes, 30 minutes, and 1 hour. Eventually the patient is able to tolerate the training base for most of the day. The timing and rate of progress will vary between patients, depending upon individual needs and expectations. If problems are encountered it may be necessary to reduce the extension of the posterior border of the denture. The placement of 2 posterior palatal seals during fabrication is helpful as this allows the postpalatal seal to be maintained even if the extension of the posterior aspect of the training base is subsequently reduced. It can be advantageous to use distraction techniques with this approach. The patient is asked to initially wear the training base when busy or concentrating on a non-stressful task such as watching a favorite television program. Relaxation techniques can also be combined with the initial wearing of the training base. Anterior teeth are added to the original or an extended training base (Fig. 3) and, when the patient is able to tolerate this, posterior teeth are added (Fig. 4). Compromising the standards of denture production is counterproductive, and retention and stability of the prosthesis should be optimized. Palateless dentures have been shown to be effective in some patients³⁶ and loss of retention is not always significantly affected.^{37,38} Some authors, however, would still only recommend this option as a last resort.²³

Errorless learning

This desensitization technique is an effective simple method that can be used by all clinicians, and is helpful for patients who have dentures but do not wear them because the dentures evoke gagging.³⁹ The disadvantage is that it can be a very slow technique. However, once a motivated patient understands the procedure and rationale, the interval between clinic appointments can be extended while the patient continues to practice the exercises.

The patient is instructed to set aside time to position the denture closer each day and eventually into the mouth in "successive approximations." That is, the denture is placed perhaps millimeters at a time closer to the final position. In situations where retching is induced simply by looking at the denture, then the patient is merely requested to look at or hold the denture and to stop before symptoms of retching develop. The process is repeated, with a small increase in time spent undertaking this task, until eventually the patient can wear the denture. It is imperative (and gives the technique its name) that gagging is not induced and there is no reinforcement of the association between retching and denture wearing. The objective is to

unlearn the conditioned response. It is a laborious task on the part of the patient and the progress made should be strongly encouraged by the dentist.

Cognitive behavioral therapy

This method focuses on changing irrational thought processes. Alteration or elimination of unhelpful cognitions may lead to a change of behavior. Cognitive behavioral therapy (CBT) invites patients to challenge strongly held beliefs about the consequences of gagging by asking the patient to confront these beliefs with evidence collected from life experience.²² A patient who catastrophizes the possible outcome of dental treatment may be suitable for CBT. For example, some patients retch when water from the high-speed handpiece is felt. When questioned, it is not unusual for an individual to admit to a fear of choking, believing that breathing will stop, resulting in death. Some patients may believe that the fear of dentistry will cause a fatal heart attack. A cognitive behavioral psychotherapist will attempt to rationalize these thought patterns in patients with persistent psychogenic gagging. A good description of applying cognitive principles to gagging is made by Barsby⁴⁰ who considers patients with a gagging problem susceptible to panic attacks.

Sensory flooding

A technique known as sensory flooding has been advocated by some to be effective.¹⁵ It relies on a rapid extinction of the link between the stimulus (for example a denture) and gagging. It is accomplished by encouraging the patient to retain the denture in the mouth for as long as possible with the reassurance that the aversive reactions encountered will diminish. The basis of this method is to inform the patient that the physiological system cannot maintain the strength of the initial response and that habituation will occur within 30 minutes or so. This method would not be appropriate with severe gagging problems, and compliance would be unlikely. Some support for single-session exposure techniques such as this has been reported with other anxiety-related conditions such as claustrophobia and blood phobia.⁴¹ If this approach is attempted, full cooperation must be elicited from the patient and the rationale explained. This approach is in direct opposition to the errorless learning approach.

Teaching patients to swallow with their mouth open

It has been suggested that all patients who gag characteristically swallow with their teeth clenched, using the teeth, lips and cheeks as a buttress for the tongue to push against.¹¹ Teaching the patient to swallow with the teeth apart, the tip of the tongue placed anteriorly on the hard palate, and the orbicularis oris muscles relaxed, has been advocated.¹¹

PHARMACOLOGICAL TECHNIQUES

Local anesthesia

The use of local anesthesia for gagging has been criticized by some authors,^{16,23,24,42} but proponents suggest that if the mucosal surfaces are desensitized, the patient is less likely to gag.⁴³ The agents may be applied in the form of sprays, gels, lozenges, mouth rinses, or injection. While topical anesthetics may work for some patients, in others it may increase nausea and vomiting and may fail to suppress the gag reflex.^{24,42} The deposition of local anesthetic around the posterior palatine foramen has been used for patients who gag when the posterior palate is touched.²⁶ However, the administration of a local injection may not be possible and may in itself provoke gagging.⁹ Furthermore, injection of local anesthetic solution may distend the soft tissues resulting in an inaccurate impression, which may compromise retention of the prosthesis.²⁶ From a behavioral viewpoint, the use of anesthetics serves to focus the patient's thoughts on the impending stimulus²⁴ or possibly act as a direct antecedent without requiring an intervening conscious thought process.

Conscious sedation

When a disruptive gag reflex is thought to be a manifestation of anxiety, removal of the anxiety may prevent gagging. The use of conscious sedation with inhalational, oral, or intravenous agents may temporarily eliminate gagging during dental treatment while maintaining reflexes that protect the patient's airway.⁴⁴ Psychological approaches such as distraction or relaxation techniques may be enhanced when used in conjunction with sedation.⁴⁵ Clinicians should consider this increased suggestibility when treating the retching patient. A report by Rosen⁴⁶ provides a detailed example of how positive suggestion can be used with nitrous oxide sedation. Often, the use of sedation does not obviate the need for other treatment modalities.³² Sedation may be used initially to allow urgent dental treatment to be completed after which a behavioral approach is used to affect a long-term solution. A small number of patients will become dependent on sedation for dental treatment to be successfully completed. However, while sedation may allow adequate treatment to be performed, it will not help the patient overcome retching if, for example, a prosthesis must be worn.

Nitrous oxide alters the perception of external stimuli and it is suggested that this altered perception depresses the gag reflex.⁴⁷ The patient's tolerance to the placement of intraoral objects is increased and the anxiolytic properties of nitrous oxide can reduce or abolish the negative cognitions associated with gagging.⁴⁷ In addition, the effectiveness of semihypnotic

suggestion is enhanced by the administration of inhalation sedation.⁴⁸

The use of oral sedatives may be unpredictable and is usually only useful in the mild gagging patient with an underlying anxiety state. Intravenous sedation is often much more predictable than oral sedation, and can be of use in patients where inhalation sedation is ineffective.

General anesthesia

A minority of patients do not respond to any form of sedation or behavioral therapy and dental treatment under general anesthesia may be appropriate as a last resort. It is the authors' opinion that the limited resources available for the provision of restorative dentistry under general anesthesia and the inherent risks associated with a general anesthetic militate against the routine provision of dental treatment using general anesthesia in patients with a disruptive gag reflex.

SUMMARY

Overt gagging can be distressing for both the patient and clinician. There appears to be no universal remedy for the successful management of the gagging patient. A wide variety of management strategies have been described and these should be tailored to suit the needs of individual patients. This can only be ascertained by taking a detailed history. In many situations a combination of treatment techniques is required but, unfortunately, in a small minority of patients, successful management may not always be possible. Studies, including case series and randomized controlled trials with single treatment modalities and mixed intervention approaches, are encouraged to improve the evidence base.

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