THE ETOLOGY AND MANAGEMENT OF GAGGING:
A REVIEW OF LITERATURE

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ABSTRACT

Gag reflex is a normal healthy defence mechanism which prevents foreign bodies from entering the trachea. Prosthodontists and general dentist frequently have had experience with the patient whose gag reflex is abnormally active. This article reviews the literature on the gagging problem. 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.

KEY WORDS : Gag Reflex, Retching.

INTRODUCTION

Every dentist and most dental students and paradental personnel have had experience with the patient whose gag reflex is abnormally active. Consequently, the clinical procedure in such patients become extremely difficult and to perform quality work is out of question. A reflex is a mechanism by which “Sensory impulse is automatically converted into a motor effect through the involvement of the central nervous system”(1). It is a type of protective mechanism.

Gag reflex; Gag reflex is a normal healthy defence mechanism and can be described as the protective mechanism against the entry of fluid or any substance in the upper respiratory tract. However it can also be an acquired reflex conditioned by various stimuli, visual, olfactory, acoustic, psychic, chemical or toxins transmitted via blood flow or cerebrospinal fluid. The patient who gags may present with a range of disruptive reactions: From simple contraction of palatal or circumoral musculature to spasm of pharyngeal structures, accompanied by vomiting (2).Gagging may be accompanied by excessive salivation, lacrimation, sweating, fainting, or ,in a minority of patients, a panic attack.

More strong and long-lasting stimulation of oral posterior mucosa and/or pharynx elicits simultaneous contraction of diaphragm and abdominal muscle, i.e. severe gagging. A rapid increase in the internal pressure of the stomach is produced by the simultaneous contraction of these muscles, and
The pressure spreads to the upper esophagus. Thus, the role of severe gagging is known to prevent food bolus from being lodged in the pharyngo-laryngeal region and the upper esophagus.(3)

Gag reflex is a subjective sensation originating at the cortical level. Schote related the gag reflex to the vomiting reflex and he also stated that describe that the vomiting center lies in the dorsal portion of the lateral reticular formation of medulla oblongata and to some extent, includes tractus solitaries.(4)

**Mechanism of Gag Reflex**

Gagging is a natural reaction to tactile stimulation of certain intraoral structures. There is wide variation in the sensitivity of oral cavity and the ability of patient to withstand intraoral stimuli. Five intraoral areas are known to be a trigger zones”. Palatoglossal and palatopharyngeal folds, base of tongue, palate, uvula and posterior pharyngeal wall. Interestingly, the passage of food across these areas doesn’t usually incite gagging. Gagging may also be elicited by non tactile sensation such as visual, auditory, or olfactory stimuli. The sight of the dentist or dental equipment may provoke some patients to gag. The sound of a dental handpiece or a person retching may initiate the gag reflex in other patients.

Landa (5) described a husband and wife who both suffered from severe gagging. The sound of wife retching was sufficient to cause the husband to gag. Certain smell especially that of sulphur given off by certain dental materials or bitter taste of anaesthetics are enough to trigger nausea. This strongly suggests that neutral stimuli become closely associated to gag reflex, providing evidence that conditioning has occurred. Certain thoughts may also be potent enough to stimulate gagging in some patients (6).

When stimulation occurs intraorally, afferent fibres of trigeminal, glossopharyngeal and vagus nerve pass to the medulla oblongata. From here, efferent impulses give rise to spasmodic and uncoordinated muscle movement characteristic of gagging. The centre in the medulla oblongata is close to the vomiting, salivary and cardiac center, and these structures may be stimulated during gagging (7), explaining why gagging may be accompanied by additional reflex activity(e.g drooling, tearing). Also there are fibers that pass from the center in the medulla oblongata to the cerebral cortex, so the reflexes can be modified by control of the cerebrum.

Retching or simultaneous and uncoordinated respiratory muscle spasm. When spasmodic contraction of respiratory muscles occurs during retching, air is forced through the closed glottis, producing the characteristic retching sound.

Chest muscles are in fixation and thoracic inlet muscles are contracting. This causes impediment of the venous return, dilating the veins of head and neck, with flushing and congestion of face.

**Etiology of Gag Reflex**

Gagging is often considered to have a multifactorial etiology, and a variety of precipitating or modifying factors have been proposed. The literature identifies two main categories of gagging patients
(8)- The somatogenic group in which the gagging is induced by physical stimuli and the psychogenic group in which psychological stimuli are thought to initiate gagging.

Flennikin(9) observed somatogenic gagging results from insufficient retention, incorrect occlusal vertical dimension, malocclusion, lack of tongue space, thick posterior borders, and inadequate posterior palatal seal. They also stated that the psychogenic gagging is induced by anxiety, fear and apprehension.

Behavioural management therapy or psychotherapy should be considered strongly in the management of psychogenic gagging patients. However it may not be easy to distinguish between two groups because physical stimuli may still provoke gagging of psychogenic origin.

The five factors that are believed to be important in the etiology of gagging include local and systematic disorders, anatomic factors, psychological factors, physiologic and iatrogenic factors (10).

1. Local & systemic disorders

Nasal obstruction, post nasal drip, catarrh, sinusitis, nasal polyp, mucosal congestion of upper respiratory tract, dry mouth, and medication that causes nausea as a side effect are thought to predispose to or cause gagging(11). Evidence that certain medical conditions are more prevalent in gagger is equivocal chronic gastrointestinal disease, notably chronic gastritis, peptic ulceration, and carcinoma of the stomach, can lower the intraoral threshold for excitation and contribute to gagging. Hiatus hernia and uncontrolled diabetes have also been suggested as predisposing factors. Metabolic disturbances such as carbohydrate starvation and dehydration with ketosis causes increased excitability of the vomiting centre and gagging.

2. Anatomic factors

Physical factors such as anatomic abnormalities and oropharyngeal sensitivities have been suggested as predisposing factors for gagging. In gagging patients there were adaptive changes in the posture of tongue, hyoid bone, and soft palate. Wright (12,13) suggested that distribution of the afferent neural pathway particularly of vagus nerve, may be more extensive in gagging patients.

3. Psychological factors

Some 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. Wright investigated that personality of patients with a marked gag reflex and no difference were found between gaggers and nongaggers for neuroticism, extroversion, or psychoticism. The psychosomatic component of the condition may be strongly influenced by and individuals reaction to stressful events. This is sometimes referred to as learning history. There are two major mechanisms of learning known as classical and operant conditioning. Classical conditioning occurs when originally neutral stimulus is paired with a specific behavioural response. Inoffensive stimuli such as sight of an impression tray, smell of dental surgery, or the sound of dental handpiece, may become associated with an unpleasant gag response. Gagging may occur initially as a result of overloaded impression tray or
accumulation of large quantities of water from handpiece. The patients learns to broadly associate the stimuli as the cause of gagging, and hence a conditioned gag response to these stimuli may develop.

Operant conditioning is a training process whereby consequences of a response changes the likely hood that individual will produce that response again. In operant conditioning, some behaviour patterns may be reinforced because they secure attention and sympathy, avoid a stressful situation, or achieve some other desirable result. 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.

4. Physiological factors

They may be extraoral & intraoral stimuli.

Extraoral stimuli: Visual, auditory & objective stimuli are extraoral factors that elicit the gag reflex. The smell of various dental substances, cigarette smoking etc. have been reported to cause gag reflex.

Intraoral gag reflex: is well known in patients.

A clinical description of gagging behaviour has been described:
1. Puckering of the lips or attempting to close the jaws.
2. Elevating of furrowing the tongue, with the rotation from back to front and with the hyoid bone at the centre.
3. Elevation of soft palate and hyoid bone.
4. Fixation of the hyoid bone.
5. Closing of the nasopharynx by an approximation of the posterior pillars of the fauces that elevate the soft palate.
6. Contraction of the anterior and posterior pillars of the fauces, causing the tonsils to rotate in an anteromedial direction.
7. Elevation, contraction and retraction of the larynx and closure of the glottis.
8. Retching or simultaneous and uncoordinated respiratory muscle spasm and
9. Vomitting.

Other reflex behaviours that are extraoral in nature also can be observed by clinician. These include excessive salivation, lacrimation, coughing and sweating. At times a full body response may occur. The patient extends the head, arms in an attempt to completely withdraw from the attending stimuli, if the stimulus is repeated, collapse may occur for the extremely apprehensive or excited patient.
5. Iatrogenic factors

Poor clinical technique may elicit the gag reflex in patient 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. An increased vertical dimension has also been suggested as precipitating gagging. 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.

Management Procedures

The management can be discussed in common techniques:

1. Sympathetic approach.
2. Build up confidence of the patient.
3. Simple measures like overloading the impression tray, using fast setting materials, upright position, frequent cessation of treatment can be used.

Effective management of gagging depends on treating the cause and not merely the symptom. Through examination, adequate medical history, and conversation with the patient, the dentist need to determine if the patient's problem is related to iatrogenic factors, organic disturbances, anatomic anomalies or psychologic factors. It is important to recognize whether single or multiple factors are causing the problem.

Early interventions included swabbing patients’ mouths with diluted cocaine; using distraction techniques; asking patients to use willpower, excise their uvulas, voluntarily increase respiration and hold their breath; hypnosis; and relaxation with hypnosis. Behavior modification, suggestion, systematic desensitization, sensory flooding and medications also have been explored. Acupuncture points on the ear or forearm can control the gag reflex effectively during dental treatments. (14)

1. Behavioral techniques

It has been recommended that all disruptive gagging should be viewed and presented to the patient as a behavioural response and therefore amenable to behaviour modification (15). An exaggerated or extended period of gagging in the absence of normal stimulus is usually a learned response. Theoretically this response can be unlearned or extinguished. Indeed Landa (5) claimed that most problem gaggers fall into this category (psychogenic group). Behavioral modification is the most successful long term method of managing the gagging patient. Objectives are to reduce the anxiety and unlearn the behaviour that induce gagging. Several methods like relaxation, distraction, suggestion, and systematic desensitization can be employed singly or in combination. Additional techniques like sensory flooding and cognitive behavioural therapy are also available.
2. Relaxation

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

Distraction-Distraction technique can be helpful to temporarily divert the patient’s attention and may allow short dental procedures to be performed while the mind is dissociated from the potentially distressing situations. Conversation can be useful, or the patient may be instructed to concentrate on breathing. For example, inhaling through nose and exhaling through the mouth. When simple concentration on breathing is ineffective, Faigenblum (16) discussed another approach. Evidence exist that vomiting is impossible during apnea. To control the gagging the patient is instructed to prolong the expiratory effort at the expense of inspiration. This will produce a state of apnea and discourage gagging. Faigenblum proposed that a well rested and relaxed patient with an empty stomach is less likely to gag.

Landa (5) suggested that the dentist 1. engage the patient in some conversation of special interest. 2. Have the patient count rapidly up to 50 or 100 and 3. have the patient read aloud.

Kovats (17) reported a technique in which the patient breathes through nose and at the same time rhythmically taps the right foot on the floor.

Krol (18) recommend a technique to divert attention, the patient is instructed to raise his or her leg and hold it in air. As the patients muscle becomes increasingly fatigue, more and more conscious effort is required to hold the leg up. At the point where the patient has the difficulty carrying on conversation, intraoral procedures may be attempted. Distraction technique may be used in combination with relaxation procedures. For example if patient find it difficult to dissociate from gagging during relaxation technique, use of a mantra that is repeated silently throughout the procedure may be helpful.

3. Systemic desensitization

The technique consist of incremental exposure of the patient to the feared stimulus. The patient is gradually exposed to increasingly aversive stimuli and learns to cope with this. A tooth brush, radiograph, impression trays, marble, acrylic discs, buttons, dentures and training devices have all been used to help patients overcome gagging problem.

4. Marble technique

Singer (19) described a technique where ordinary glass marbles were used to re-educate the patient prior to denture fabrication. Essentially, for a week marbles are sucked in the patient’s mouth for periods of time while increasing periods of time while awake. Once these are tolerated, maxillary and mandibular record bases are made, and later converted to conventional dentures.

Other techniques like sensory flooding, in which patient is encouraged to retain the denture in mouth as long as possible and cognitive behavioural therapy are also used.
5. Pharmacological measures

Certain drugs like local anaesthetics in the form of sprays, gels, lozengens or by injection can be used to control gag reflex. Centrally acting drugs like antihistaminics, sedatives and tranquilizers, parasympatholytics and CNS depressants can also be used. Grace L.E (20) concluded in a study that Tigan (trimethobenzamide) was useful as an antigagging agent. Chidiac J.J (21) used nitrous oxide sedation to control gagging. General anaesthesia is considered as last resort if patients donot respond to any form of therapy.

Prosthodontic management- This involves technical modification to render the prosthesis more acceptable to the patient. Excess thickness, overextension, inadequate post dam should be corrected before more radical modifications in the prosthesis are made. Jordan (22) suggest that the use of matte finish is more acceptable to the patients than a glossy surface in maxillary complete dentures. Feintuch(23) recommend use of smoothly polished toothless base tray. After two weeks of tolerating tray impressions were made smoothly.

Kroll (18) observed that after correcting the freeway space gagging problem was resolved. Borkin (24) used kerr impression wax (kerr Mfg .Co.,Romulus,Mich) for obtaining secondary impression. The pliable nature of wax allow reseating of tray and border molding until desirable results are obtained.

6. Acupressure technique

Application of pressure to the center of the palm during dental procedures would make triggering a gag reflex less likely.

A theory states that transient tactile connections between the touch sensory fiber tracts and the nucleus tractus solitarius are present at birth via an inhibitory connection. Furthermore, the activity of the transient fibers diminishes shortly after birth. In the aberrant or hypersensitive gag situation, these transient fibers fail to retract and consequently result in continued stimulation of the nucleus tractus solitarius with touch to areas other than the posterior one-third of the oral cavity.(14)

Patients who are unable to tolerate denture systematic desensitization, acrylic disc and training bases can be useful.

Acupuncture has an important role to play in improving the quality of care that can be delivered for dental patients, particularly around the management of the gag reflex, and treatment of temporomandibular disorders (TMD).(25)

Chenjiang (26) CREN-24 is an effective acupressure point for controlling the gag reflex during impression procedures. This point is situated in the horizontal mentolabial groove, midway between the chin and lower lip. Apply light finger pressure until the patient feels discomfort. It should be started 5 minutes before the procedure.

Koren (27) hand acupressure point K-D2 dorsum of the lateral aspect of the distal phalanx of the index finger. Leslie reported a surgical technique. He observed persistent gagging results from an atomic
and relaxed soft palate, which is found in nervous patients. Uvula touches the tongue and soft palate rests on the pharyngeal wall. This produces tendency to gagging and nausea. He advocated removal of uvula and operation to shorten and tighten the soft palate on healing. A preventive approach suggests that the sensory stimulation of the cranial nerves of the superior laryngeal nerve branch, (Cr N, IX, pharyngeal branch of X, Cr. N. V, and Cr N. X.) would block the physiologic response of gagging and retching. (28)

A case report described a newly developed dental treatment concept for patients with a distinctive gag reflex. "Hypnopuncture" is a combination therapy of hypnosis and acupuncture. Its simple, fast, and effective application autonomous of the cause makes it a valuable tool for dental-emergency treatment procedures. Physiologic and psychological aspects of gagging are influenced at the same time. (29)

CONCLUSIONS

Over gagging can be distressing for both the patient and clinician. The clinical procedure in such patients become extremely difficult and to perform quality work is out of question. There appears to be no universal remedy for the successful management of the gagging patient. A wide variety of techniques have been described and these should be tailored to suit the needs of individual patients. Treating the cause rather than symptom will leads to effective management. This can only be ascertained by taking a detailed history. In many situations, a combination of treatment is required.

REFERENCES