Combating the Hypersensitive Gag Reflex in Patients Undergoing Dental Treatment – A Review

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ABSTRACT

Gag reflex is a complex physiologic reflex which can lead to a compromised dental treatment and can prove a barrier for optimal patient care and management. This gag reflex is protective in nature, but can present a bewildering, annoying and frustrating problem during various dental procedures. The aim of this article is to review normal gag reflex, neurophysiology of gag reflex, factors associated with etiology of gagging and role of different methods to manage gagging during routine dental procedures.

Keywords: Desensitization, Gag, Reflex, Retching, Therapy

INTRODUCTION

Gagging is a process in which pharyngeal muscles undergoes ejectory contraction to form pharyngeal sphincter while in retching, there is an initial process in an attempt to eliminate noxious substances from the stomach.[1,2] Gag reflex is a normal reflex which is protective in nature and it serves to protect airway and eliminate irritating factors and noxious material from oropharynx and upper gastrointestinal (GI) tract. During gagging, reaction from patient varies from mild choking to violent, excessive, uncontrolled retching which may lead to emesis.[3] In 1959, Schote found a relation between gag reflex and vomiting reflex and revealed that gagging center & vomiting center lies in dorsal portion of lateral reticular formation of medulla oblongata and may include tractus solitarius.[4] In 1970, Means and Flennien stated that mechanisms of swallowing and gagging are also physiologically related to each other as both mechanism share similar afferent neural pathways, brain centers and efferent neural pathways.[5] However, gag reflex can be differentiated from the swallowing reflex. If muscle action is co-ordinated and smooth, swallowing occurs. However, if muscle action is smooth but not coordinated, gagging occurs.[6]

When the gag reflex is abnormally extremely active, dentist may encounter an inexplicable and frustrating situation during dental procedure, resulting in state of much compromised treatment. A hypersensitive gag patient can not only delay the treatment but can also develop agitation towards dental treatment thus creating a barrier between dentist, treatment and patient. By taking proper history, thorough examination and talking with the patient, the dentist should identify the causative factors. Efficient control and management of gag reflex depends not only on treatment of the symptoms, but more importantly treatment of the cause/s.

Aetiology:

Gag reflex may occur because of single causative factor or it may be multifactorial in nature. According to Krol, the causative factors can be categorized as systemic, psychogenic, physiologic and iatrogenic.[7] According to Wright, deviated nasal septum, post nasal drip, nasal obstruction, sinusitis and nasal polyp block nasal passages and increase incidence of the gag reflex.[8,9] Other systemic factors like heavy smoking, chronic gastritis, pharyngitis, medications, dry mouth, alcoholism, uncontrolled diabetes, peptic ulcer, pancreatic carcinoma and diaphragmatic hernia can lead to chronic gastric irritability and hence gagging.[8,9] According to Wilks, psychogenic factors causing gagging include fear, stress and phobia.[10] According to Kramer, fear is most common elementary factor influencing psychological gagging. The sights and sounds of clinical dentistry may also induce fear.[11] According to Faigenblum, apprehension to dental treatment, mediated by negative past experiences, is the underlying emotional response that act as a precursor to gagging. Some patients have an abnormal fear of swallowing a foreign object and thus, have physiologic gagging.[6]

Certain extra-oral and intra-oral physiological factors can trigger gag reflex. The extra-oral factors include sight of dental chair, mouth mirror, impression tray, other dental instruments or sometimes, olfaction of dental substances. Landa observed a hearing-challenged patient gag on seeing another patient gag in dental clinic.[12] The intra-oral stimulating factors include stimulation of trigger zones during or after dental procedure. These trigger zones are the faucal pillars, posterior most region of palate, uvula, base of the tongue and posterior pharynx.[5] Landa observed that upper surface of posterior one-third of tongue and posterior part of palate are most sensitive regions in the entire oral cavity. Iatrogenic factors include overextended posterior borders of denture impinging trigger areas and unstable occlusion resulting in tickling due to movement of the denture.[12] According to Levin, inadequate extended

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borders result in reduced retention and movement of denture that causes tickling sensation. According to Krol, elevator muscles do not relax normally if the vertical dimension at occlusion (VDO) exceeds vertical dimension at rest (VDR) causing spasm of the tensor veli palatine and depression of the soft palate which presses it against posterior border of denture.[7] According to Kovats, shallow post dam with too little pressure on palatal tissue causes tickling sensation.[13]

Classification

Faigenblum classified gag reflex as mild form to severe retching. Patient showing mild retching may feel nauseating because of reaction to the stimulus and he/she is capable to control and manage the reaction on his/her own. There is no need for any clinician intervention. Most of the patients lie in this category. Severe form of retching can also occurs easily and may require physical intervention. Patient may get choking sensation.[6]

Morstad also classified gagging based on time duration, whether gagging occurred immediately after delivering of prosthesis or after certain delayed period.

- Immediate gagging – Overextension at post palatal region in maxillary denture or bulky distolingual flange in mandibular denture can cause this type of gagging. It occurs immediately on insertion of the prosthesis in patient's mouth.
- Delayed – This type of gagging occurs in a time period of two weeks to two months after denture insertion. Incomplete and improper border seal allows flow of saliva under the denture and stimulate the gag reflex.

Fiske and Dickinson[3] gave Gagging Severity Index (GSI) and classified gagging into five grades:

- Grade I (Normal/Obtunded gag reflex): This type of gagging is a very mild form and can be controlled and managed by the patient. It is present during dental treatment procedures like making maxillary impressions or restorative procedure of palatal, distal or lingual surfaces of molars.
- Grade II (Mild/Partially controlled gag reflex): This is also a mild type of gagging. It can occur during dental treatment procedures such as scaling, restorations and impression making but does not limit dental procedure. Patient need assurance from the dentist to control gag reflex.
- Grade III (Moderate/Partially controlled gag reflex but frequent): This is a moderate type of gagging which sometimes restricts treatment procedure. It may occur during simple dental procedures such as clinical examination of regions such as lingual aspect of lower molars.
- Grade IV (Severe/Inadequately controlled gag reflex): This represents a severe form of gagging and dental treatment becomes difficult without clinician interventions. This type of gag can occur with even simple visual examination.
- Grade V (Very severe gagging): This form of gagging is very severe and can affect patient's behavior on dental chair. It occurs very easily, frequently and does not require any physical intervention to trigger the gag reflex. Dental treatment is highly impossible without proper management of gag reflex.

The Nature of Gagging

The gag reflex is a normal protective and healthy defence mechanism of human body. This reflex prevents entry of foreign objects into trachea and lower airway. Initially, there is puckering of the lips aiming to close jaws. The tongue is then elevated with rotation postero-anteriorly and with the hyoid bone at the centre. Then, soft palate and hyoid bone gets elevated followed by fixation of the hyoid bone. It is followed by contraction of anterior and posterior faucial pillars, rotation of tonsils in an anteriomedial direction and elevation, contraction and retraction of the larynx with closure of the glottis. Simultaneous, uncoordinated spasm of respiratory muscles may occur followed by vomiting.[14] On stimulation of trigger zones, afferent impulses are transmitted to gag reflex centre in the medulla oblongata. From this gag reflex centre, efferent impulses are transmitted to effector cells located in the same initial region that can carry out the appropriate response. This results in uncoordinated spasmodic movements of pharyngeal muscles causing gagging. The gagging centre lies in close approximity to the vomiting, salivating and cardiac centres in medulla oblongata. This explains why gagging is frequently associated with these additional reflexes like increased salivation, increased lacrimation, increased heartbeat, etc.[14]

Clinical features

Feintuch described clinical features of a gagging patient. "As the body trembles and footrest is stamped, large tears roll down from the eyes. The face of the victim takes on the hue of apoplectic purple and the patient gasps for breath, at the same time attempting to eject the introduce from his mouth and his insides with them". When uncontrolled spasmodic contraction of muscles of respiration occurs during retching, air is forcefully passed through the closed glottis, which produces a characteristic retching sound. Additionally, thoracic muscles undergo contraction which causes decreased venous return, dilating veins of facial region, leading to congestion and flushing of the face. Some extra-oral reflexes and symptoms can be seen during gagging. These include excessive drooling of saliva, lacrimation, sweating and coughing. Sometimes, whole body shows reaction in response to gagging. If the stimulus is still present, continuing or repeated, extremely apprehensive or excited patient may collapse requiring urgent medical assistance.[14]

Management

Fiske and Dickinson[3] gave gagging prevention index (GPI) which describes treatment modalities of gag reflex according to their grades. These include[3]:

1. Obtunded gag reflex; dental treatment successful
2. Partially controlled gag reflex; all dental treatments possible
3. Partially controlled gag reflex but frequent gagging; simple dental treatment possible

4. Inadequately controlled gag reflex; simple dental treatment unable to be completed
5. Very severe gag reflex; no dental treatment possible

Effective treatment of gagging depends on treating the causative factors, not merely the symptomatic treatment. These factors or methods include[8,9,10,11]:

1. Clinical techniques
2. Pharmacologic measures
3. Psychological intervention
4. Therapies of 'Complementary Medicine'
5. Prosthodontic management

Clinical techniques[10,15] include Appleby and Day's Finger massage technique and temporary elimination by using common salt. Finger massage of the soft palate helps in eliminating gag reflex. Otherwise, table salt can be put at tip of tongue for 5 seconds. Gag is eliminated by superimposed simultaneous stimulation of chorda tympani branch of facial nerve to taste buds presser in anterior two-third of tongue. Wilks and Marks[10] stressed the importance of communication with the use of predetermined & preset signs (e.g. hand raising) whenever patient feels uncomfortable and wants dental treatment procedure to be stopped or when he/she feels gagging sensation. Pharmacological treatment[4,14] include use of certain drugs to control gagging and can be peripherally acting drugs or centrally acting drugs. Peripherally acting drugs constitutes local and topical anesthetic drugs. These peripherally acting drugs eliminate the afferent impulses arising from sensitive regions in the oral cavity. Centrally acting drugs used for managing and preventing anticipated gag reflex include antihistamines, tranquilizers, sedatives, parasympatholytics and central nervous system (CNS) depressants. Pharmacologic measures can provide temporary and short-term solution, especially in cases of chronic, severe gag reflex. Watt and Mac Gregor suggested infiltration of local anesthesia and analgesia to anesthetize palate during maxillary impression making.[1] Krol also advocated anaesthetizing the soft palate.[7] Lee-Singer proposed use of cotton swabs for topical application of local anesthetics on palate prior to impression making.[16] Kramer advocated use of local anesthetic sprays.[11] Conscious sedation may temporarily prevent gagging while maintaining airway patent and reflexes functional. Oral sedatives prove supportive in cases of mild gag reflex with an elementary anxiety state.[14]

Many authors recommend psychological techniques directed at diverting and shifting the patient's attention from any disturbing stimuli. The spectrum of psychological techniques varies from a gentle approach to psychotherapy. Psychotherapy includes systemic desensitizing, hypnosis, reinforcement modelling and fear reduction.[14] Hoad-Reddick and Murphy[17,18] advocated use of breathing rhythm and control as a mode of relaxation for patients with excessive gagging reflex. Barsby[19] advocated 'relaxed abdominal breathing'. Certain other distraction techniques have been described in the literature. According to Faigenblum[6], talking to the patient on some topic of special interest can help distract patient attention and eliminate gag reflex. Krol[7] advised to tell patient to raise one lower limb and hold it in air. As the muscles of lower limb become more and more fatigued, patient will require more conscious effort to hold the lower limb up in air. Other de-sensitization techniques include[10] holding small buttons below tongue and rolling them around, stroking the tip of the tongue repeatedly, and swallowing with teeth apart ('soft swallowing').[14] Kovats[13] described a technique in which the patient is asked to breathe audibly and simultaneously tap the right foot on the floor in rhythm with breathing.

Therapies of 'Complementary Medicine' include hypnosis, acupuncture and hypnotherapy.[3] In acupuncture therapy, the disease is treated by puncturing definite anatomic 'points' with needles to induce stimulation. Direct pressure is applied over points without puncturing the skin. Acupuncture sites or 'points' used to control gagging and/or nausea are Neiguan point (medial aspect of forearm), Hegu point (concave region between 1st and 2nd metacarpal bones of the hand) or Fiske-ear point (anti-gagging point of each ear). Fine, single-use disposable needle of 7 mm length is used at the mentioned points to a depth of 3 mm. The procedure is performed for 30 seconds prior to carrying out dental treatment. The needle is kept inserted throughout the treatment procedure and is eliminated just before the patient is discharged. This technique is safe, quick, inexpensive and non-invasive. Chengjang (REN-24) is a point present at the mento-labial groove, between chin and lower lip. Finger pressure is applied till the patient feels mild distension so that the impression procedure can be completed. This accupressure procedure should be commenced atleast 5 minutes before starting any procedure like impression making, continued throughout the procedure and be terminated only when the procedure is complete (the impression has been removed from the patient's mouth). Pressure can be applied by the dental assistant, patient or dentist. Morrish advocated use of a portable transcutaneous electrical nerve stimulation (TENS) device to stimulate the Neiguan point prior to impression making. Hypnosis is production of a state, resembling deep sleep, in which patient acts only on external instructions. 'Hypnotherapy is 'treatment of disease using hypnosis.' Hypnotherapy is contraindicated in poorly motivated, severe depressed and patients receiving treatment for psychoses.[3]

Various prosthodontic measures have been reported in the literature to manage gagging during treatment procedure. Prosthodontic management of the patient with gagging problem involves technical and prosthetic modifications to make prosthesis more acceptable to the patient. Jordon (1954) suggested that a matt finish to the denture is more readily accepted than a glossy surface to overcome the problem. Krol[7] emphasised on the importance of "Freeway space" to the gag reflex and proposed that increase in interocclusal distance eliminates the gagging problem. Borkin[20] (1959) proposed using Kerr impression wax to make impression over special trays. The pliability of the impression wax simplifies border molding and seating of the tray. Murphy[18] (1979) fabricated training plate made up of clear acrylic to manage gag reflex.

Farmer and Connelly[21] (1984) emphasized on construction of palateless denture to minimize horizontal movement of denture. Fleece and Linton[15] (1988) used sedative impression to manage and treat cases of hopeless uncontrolled gagger to rapidly eliminate the hyperactive reflex. Gallison[22] used modified maxillary impression tray with incorporated suction tube to prevent gagging due to posterior displacement of impression material. Baseplate wax was applied and adapted on the postero-superior surface of custom acrylic resin tray and disposable saliva ejector was embedded in wax and a 2nd layer of self-cure resin was attached to tray and wax spacer was removed. After border molding, final impression was made and the excess material is sucked into the formed vaccum chamber**.**

Selection of accurate sized impression tray, good and meticulous impression technique, optimally fast setting impression material, accurate thickness of posterior border of maxillary dentures, sufficient peripheral border seal and stable occlusion are few prosthodontic measures which can be employed to prevent gagging. Training bases is a type of desensitization technique, in which a patient is given a series of denture bases progressively increasing in size. Patient is instructed to wear a thin acrylic denture base and slowly time period for which training base should be worn is increased. Initially, the training base is worn for five minutes once per day, then twice per day and subsequently increasing the duration. When one week is over, the length of time should be increased to ten minutes thrice per day, then fifteen minutes, half an hour and one hour. Subsequently, the patient becomes accustomed to the training base. Now, anterior teeth are added to the extended training base and, when the patient gets adapted to this, posterior teeth are added. Despite all these measures, gagging may persist because of relaxed and atonic soft palate. This condition has to be surgically corrected to tighten and shorten the soft palate.[14]

CONCLUSION

There is a strong potential for compromised treatment associated with gag reflex as it presents a challenge to the skill and capability of a treating dentist. The use of a combination of the many techniques available will help to manage gag as no single technique can solve each patient's problem. The methods to manage gag reflex varies with each patient as the causative factor varies. Every case needs to be addressed and assessed individually as the strategy needs to be applied and adapted to that particular patient's needs and requirements.

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