

Gagging: A Review

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ABSTRACT

Background: Gagging is a normal, physiologic, protective reflex. The gag reflex is an innate reflex intended to guard the upper respiratory tract and the digestive tract from foreign body that might block them. Some patients have a pronounced, exaggerated reflex that can be a severe limitation to patient's ability to accept dental care and for clinicians to provide it. The aim of this article is to review the etiology, neurophysiology and different treatment modalities of gagging so that dental practitioners and Prosthodontists can utilise flexible approaches in dealing with patient's gagging problems.

Keywords: Gagging; Palate; Prosthodontics; Psychological.

INTRODUCTION

Prosthodontists and general dentists frequently come across patients who have extreme oral sensitivity by which they are unable to tolerate any foreign materials in the oral cavity. Patients with such sensitivity often complaint of nausea, gagging or vomiting during the dental procedures which creates a difficult situation to manage. The phenomenon of gagging is responsible for many embarrassing situations both for the patient and the clinician on account of sudden, violent uncontrolled retching. The normal gag reflex is an adaptive vital mechanism for survival, controlled primarily by parasympathetic division of the autonomic nervous system. Gagging movement alters the shape of the pharynx, and its various structures eject foreign bodies from mouth and pharynx and thus prevent the foreign bodies from entering the trachea¹. The objective of this presentation is to underline and understand the neurophysiology of gag reflex and enable an operator to manage the task.

Definitions: According to Concise Illustrated Dental Dictionary Gag means: 'to retch without actually vomiting. Retching means: 'involuntary spasmodic

but ineffectual attempts to vomit'. The Oxford English Dictionary defines it as to 'make the motion of vomiting ineffectually and involuntarily. According to GPT-8: Gag is an involuntary contraction of the muscles of the soft palate or pharynx that results in retching. Butterworth defines retching as 'a strained or ineffective effort to vomit'. Savage and MacGregor² state that 'retching or gagging is an ejective contraction of the muscles forming the pharyngeal sphincter'.

Nature of Gagging/ Gag Reflex

Normal healthy defense mechanism which prevents foreign bodies from entering the trachea. Swallowing occurs if muscle action is smooth and coordinated, if it is spasmodic and uncoordinated gagging occurs. Gagging may be accompanied by excessive salivation, lacrimation, sweating, fainting, or in a minority of patients, a panic attack. When stimulation occurs intraorally, afferent fibers of the trigeminal, glossopharyngeal, and vagus nerves pass to the medulla oblongata. From here, efferent impulses give rise to the spasmodic and

Received: May. 8, 2019; Accepted: July. 25, 2019

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uncoordinated muscle movement characteristic of gagging. The center in the medulla oblongata is close to the vomiting, salivating, and cardiac centers, and these structures may be stimulated during gagging.³ Furthermore, neural pathways from the gagging center to the cerebral cortex allow the reflex to be modified by higher centers. According to Kahn when spasmodic contractions of respiratory muscles occurs during retching, air is forced through the closed glottis, producing the characteristic retching sound. In addition, chest muscles are in fixation and thoracic inlet muscles are contracting. This causes impediment of venous return, dilating the veins of the head and neck, with flushing and congestion of face. Gagging is present from birth and it is more in males than females.

Five intraoral areas are known to be “*TRIGGER ZONES*” for gagging⁴

- Palatoglossal And Palatopharyngeal Folds
- Base Of Tongue
- Palate
- Uvula
- Posterior Pharyngeal Wall

Upper surface of the posterior one third of the tongue is the most sensitive region in the entire oral cavity. Gagging may also be elicited by non-tactile sensations such as visual, auditory, or olfactory stimuli.

Events occurring during gagging:

1. Puckering of lips or attempt to close the jaws.
2. Elevation and furrowing of the tongue.
3. Elevation of soft palate and hyoid bone.
4. Fixation of hyoid bone.
5. Closing of nasopharynx.
6. Contraction of faucial pillars causing tonsils to rotate in anteromedially.
7. Elevation, contraction and retraction of the larynx, closure of glottis.

8. Simultaneous and uncoordinated respiratory muscle spasm or retching

9. Throwing out of foreign body.

Gagging Severity Index⁴ – GSI

- I. Very mild, occasional and controlled by the patient.
- II. Mild and control is required by the patient with reassurance from the dental team.
- III. Moderate, consistent and limits treatment options.
- IV. Severe and treatment is impossible.
- V. Very severe, affecting patient behavior and dental attendance and making treatment impossible.

Classification of Gagging⁵:

Faigenblum's classified patients with gag as

Mild retching patients- experience nausea with minimal reaction to a stimulus and generally is able to control the response.

Severe retching patients – responds in an exaggerated manner to physical or psychological stimuli, can't tolerate impressions, operative procedures, or insertion of new or old dentures, radiographs.

Gagging is also classified as somatogenic or psychogenic. In somatogenic physical stimulation leads to gagging while in psychogenic psychic stimulation leads to gagging. Somatogenic and psychogenic gagging may occur independently or a combination of these two types can be present.

Factors causing gagging:

Gagging is often considered to have a multifactorial etiology and a variety of precipitating or modifying factors have been proposed. The 4 factors that are believed to be important in the etiology of gagging include

1. **Anatomic Factors:** Atypical anatomy and oropharyngeal sensitivity influences patient to gag. A comparatively long soft palate and a larger angle

between the hard and soft palates are associated with the gagging problem. Gagging also has been seen in hypersensitivity of the soft palate, uvula, fauces, posterior pharyngeal wall and the tongue.⁶

2. Systemic Factors

Nasal obstruction, sinusitis, post nasal drip, chronic catarrh & congestion, have all been clinically sited in the etiology of gagging (Wright SM). Heavy smoking has been observed as a common factor in one group of gagging patients. Gastric disorders such as peptic ulceration and diaphragmatic hernia have also been implicated.⁷ Retching has been described as a presenting feature of pancreatic carcinoma (Faigenblum) and a glosso-pharyngeal neoplasm. Some patients with motor neurone disease have been found to have more easily triggered palato-pharyngeal reflexes. Dysphagia has been implicated in both pronounced gagging and the absence of gag reflexes.

3. Psychological Factors

Influencing factors such as fear, alcoholism, stress and phobia, have all been investigated. Kramer found that, gagging could be triggered simply by the sights and sounds of clinical dentistry. According to Kramer and Brahan, "Fear is almost always the underlying factor influencing psychological gagging"^{8,9}. Murphy felt that 'thresholds of oral perception' played an important role in gagging aetiology¹⁰.

4. Physiologic Factors

There are two types of physical stimuli: tactile & non-tactile. In dental prosthesis physiological factors include smooth shiny surface, inadequate post dam, under extended dentures, overextended borders, disharmonious occlusion, and inadequate freeway space.^{11,12} Odors- smell of various dental substances, cigarette smoke on dentists fingers and even perfume have been reported to elicit gag.

5. Iatrogenic Factors

Intolerance to prosthesis, shallow postdam → too little pressure on palatal tissue → tickling sensation gag (Kovats J.)¹³, overextended posterior borders impinge on trigger areas and causes gag. According to Landa disharmonious occlusion causes movement of the denture which causes tickling and

provoke gag. Inadequate freeway space according to Krol also causes gagging.¹⁴

Management of gagging:

The relationship between the dentist and patient is considered to be of prime importance when treating patients with gagging problems. Wilks and Marks emphasize the importance of communication with the use of predetermined signals (e.g. hand raising) when the patient wants treatment to stop or if they felt close to gagging.

1. Clinical techniques

A. According to – Friedman¹⁵ common salt causes temporary elimination of gag reflex. Tip of tongue is salted for 5 seconds with table salt. Gag is extinguished by super imposed simultaneous stimulation of chorda tympani branches to taste buds in anterior 2/3 of tongue.

B. Relaxation techniques

Hoad-Reddick and Murphy used breathing control as a way of relaxation for patients with gagging problems. Hoad-Reddick¹⁶ used a method of 'controlled rhythmic breathing,' developed by the National Childbirth Trust for women in labour, to overcome gagging problems. The technique is similar to relaxation breathing exercises taught within schools of martial arts, yoga and meditation. Barsby¹⁷ promotes the adoption of 'relaxed abdominal breathing' to control the hyperventilation that he believes may be an important factor in gagging etiology. He does this using a simple biofeedback mechanism where the patient places their hand(s) on their abdomen to monitor their abdominal breathing movements.

C. Distraction techniques

Faigenblum advocates simply talking to the patient. **Krol**¹⁴ asked patients to raise one of their legs during impression taking and to concentrate on keeping it there for the duration of the procedure. **Robb** describes the use of two suggestion/distraction techniques. Firstly the 'sick-stick' on which the patient focuses their attention following verbal suggestion that gagging will not occur as long as they continue to stare at it. Secondly in the 'Temporal tap' technique the clinician gently taps the temporo-parietal suture as

a trigger to verbal suggestion regarding gagging prevention, prior to dental procedures⁶.

D. Desensitization techniques

They aim to produce permanent effects in contrast to distraction techniques, which are single measures to produce temporary resolution. **Wilks** used a number of successful methods of desensitization, termed habituation and de-conditioning. These include stroking the tip of the tongue repeatedly; holding small buttons under the tongue and rolling them around the mouth and instructing the patient on methods of swallowing with the teeth apart ('soft swallowing'). The prescribed tasks are given as 'homework'. **Robb** advocates stimulating the hard palate with a toothbrush using a mark on the handle to indicate how far back is tolerable.

Lee-Singer¹⁸ used a technique that required patients to keep up to five marbles in their mouth, as often as possible, in the week prior to the commencement of prosthodontic treatment. He then constructed acrylic training baseplates without teeth. Lee-Singer comments that the finish of the denture plates is important in the technique and sandblasts the acrylic to create a dull, matt surface texture. These baseplates are worn and up to three marbles used concurrently. The dentures are constructed and given to the patient with a small acrylic bead attached to the lingual polished surface. This is a further distraction 'device' that he believes focuses the patient's attention and keeps their tongue in a more favourable position.

2. Therapies of 'Complementary Medicine'

A. Acupuncture and Acupressure: Acupuncture 'treats diseases by puncturing certain 'points' of the human body with metal needles to induce stimulation by various manipulation methods.' Acupressure uses direct pressure over points without puncturing the skin. The reported acupuncture sites or 'points' used in the control of dental gagging and/or nausea lie on the medial side of the forearm or Neiguan point and the concave area between the 1st and 2nd metacarpal bones of the hand or Hegu point¹⁹. **Fiske**²⁰ has used an ear point successfully to reduce gagging during dental procedures. Acupuncture is a skill requiring training and experience. **Amornponget al**²¹

described an acupressure technique for making maxillary impressions by controlling gagging. The Chengjiang REN-24 is reported in the literature as an effective acupressure point. The location of this point is in the horizontal mento-labial groove approximately present in the middle of lower lip and prominence of the chin. Light progressively increasing finger pressure is given at this point. As a result the patient experiences some discomfort and distension. The procedure of pressing is started five minutes before making the impression and is finished once the impression tray is withdrawn from the patient's mouth after completing the impression.

B. Trans-cutaneous Electrical Nerve Stimulation (TENS)

A preventive approach suggests that the sensory stimulation of the cranial nerves of the superior laryngeal nerve branch, (Cranial nerve IX, pharyngeal branch of Cranial nerve X, Cranial nerve V, and Cranial nerve X) would block the physiologic response of gagging and retching.²²

C. Hypnosis and Hypnotherapy

Hypnosis is the artificial production of a state, resembling deep sleep, in which the subject acts only on external suggestion. Hypnotherapy is the treatment of disease by hypnosis. **Barsby**¹⁷ states that hypnosis is not in itself a therapy but is a means of facilitating a particular treatment strategy. Management by hypnotherapy using a systematic desensitisation technique allows for extraction of teeth and permanent elimination of the gagging problem. Contra-indications to the use of hypnosis appear few with only poor motivation, severe depression and people receiving treatment for psychoses as absolute contra-indications.^{23,24}

3. Psychological and behavioural therapies

Psychoanalytical techniques lie in the domain of the trained psychotherapist and should not be undertaken by dental professionals. These techniques are useful to help patients manage their gag reflex and suggested techniques include ego enhancement, confidence reinforcement, mock rehearsals of the dental procedures using the Tell-

Show- Do approach prior to actual treatment are very useful.

Muir and Calvert also used visualisation techniques and audio tapes to achieve relaxation prior to dental procedures, with success²⁵. Many used breath control and breathing techniques as the cornerstone for relaxation, hypno-analysis and the basis for behavior modification through semi-hypnotic suggestion. Nevertheless motivation (self and externally induced) seems to be a prime factor in success.

4. Pharmacological Measures

A. Local anesthetic techniques: By injection or topical application has been used to prevent gagging prior to dental procedures. Watt and MacGregor advocate infiltration local analgesia to the palatine nerves for maxillary impression taking. Krol advocated anaesthetizing the soft palate. Lee-Singer used swabs to topically apply local anesthetic to the palate prior to impressions. Hattab incorporated local anesthetic into alginate impression material for reducing gag reflex.²⁶

B. Sedation techniques

Nitrous oxide inhalation sedation, intravenous sedation with midazolam and intravenous sedation using propofol have all been described in the treatment of patients with gagging problems. Robb states that 'sedation should be considered as a useful part of the general dental practitioners' armamentarium and as an important alternative to general anesthesia in selected cases'.

C. General anesthesia

When all the other gagging treatment options are not possible/acceptable or failed and the patient requires extensive treatment in such cases general anesthesia is used. It is a risk prone procedure and should be cautiously used in presence of trained professionals.

d. Miscellaneous drugs

The use of drugs with strong anti-emetic properties, like metoclopramide, cyclizine and promethazine, antihistamines like Benadryl - Diphenhydramine hydrochloride, antinauseants Tigan-trimethobenzamide have been reported.

5. Prosthodontics techniques:

A complete denture patient may develop a gagging or vomiting problem. Various biomechanical aspects of dental prostheses are suggested as causing the gag reflex

Immediate Gagging On Insertion

- Overextended borders (especially the posterior part of maxillary denture and the distolingual part of mandibular denture) may impinge on one or more "Trigger Areas" and produce gagging
- Thick posterior border: This is a very common cause of nausea resulting from the dorsum of the tongue being irritated by the thick edge. The edge of the upper denture should be thin and slightly embedded in the compressed mucosa, so that the tongue is unable to detect any definite junction between denture and palatal mucosa.

Delayed Gagging (2 Weeks To 2 Months After Insertion)

- An inadequate post dam produce gagging as a result of too little pressure applied to the palatal tissue. When a post dam is too shallow, the light pressure that results can produce a tickling sensation, which elicits a gag.
- Correct occlusion and balanced articulation are critical for minimizing the gag reflex. A stable occlusion causes the denture to compress the underlying tissue. Conversely, unstable occlusion produces movements of the denture base, which in turn produces a tickling sensation and gagging.
- An under extended prostheses result in poor retention, movement of such prosthesis may stimulate oral tissues to elicit a gag. Incomplete border seal allow saliva under the denture, a smooth, shiny surface causes nausea and gagging in some patients, when such a surface is coated with saliva a "slimy" sensation may result.

KROL presented information suggesting that inadequate freeway space may be an additional cause of gagging related to complete dentures. If the

occlusal vertical dimension exceeds the rest vertical dimension, the elevator muscles do not relax normally, these muscles enter into spastic contractions which ultimately involves all the muscles activated during swallowing this provides stimuli for gagging.

- The maxillary denture can be reduced to a U-shaped border situated approximately 10 mm from the dental arch. Denture wearers with the above type of dentures, reported that reduction of the palatal coverage influences their sense of taste positively, and gagging tendency disappears.²⁷

Callison²⁸ suggested modification in maxillary custom tray to reduce gagging. This modification involves forming a vacuum chamber at the posterior extent of the custom tray to which a saliva ejector tip is embedded. When the saliva ejector is connected to the low-volume evacuation hose, the chamber will trap any excess impression material that might extrude from the posterior border of the loaded tray. This results in a reduced chance of eliciting the patient's gag reflex.

Borkin²⁹ recommends low-fusing wax as an impression material for gagging patients. This material can be seated repeatedly between gagging episodes until a satisfactory impression is obtained. The low-fusing wax must be hardened in the mouth. This is done by squirting ice water from a bulb syringe along the borders of the completed impression and over as much of the impression surface as possible. Copious amounts of ice water should be used because the impression must be thoroughly chilled before it is removed. The ice water will retard the paroxysms of gagging by its cooling effect so this chilling can be done with a minimum of difficulty. This low-fusing wax will not set hard at mouth temperature, but it will remain soft and pliable until it is chilled by the dentist. Taking advantage of this characteristic, the tray can be resealed an unlimited number of times until the desired results are obtained.

Webb³⁰ suggests that distortion of tissue contour due to injection of anesthetic solution can be minimized by adding hyaluronidase (1-3cc) to 2 % lidocaine HCl (1cc). One-third of this solution is injected into the area of each greater palatine foramen to prevent gagging effectively. He also

advocated the use of this injection technique for insertion of dentures thereby controlling post insertion gagging. The choice of impression material is important for the patients who gag. Ansari³¹ concluded that a high viscosity elastomer material must be used for impression. Use of high viscosity material will hamper the flow of the impression material to the gag reflex producing sensitive areas. The distal or back end of stock trays may be built up with wax to stop the flow of impression material towards the throat. Also sectioned impression trays should be used for impression if possible. Fast setting impression materials should be used in gagging patients. Flavoured alginates, matte finish of denture rather than glossy finish, use of tooth supported overdentures and use of implant supported prosthesis reduces retching so use of all these should be encouraged.

CONDITIONING PROSTHESIS²⁹: A conditioning denture can be used in problematic patients, which is used to train the patient to gradually control gagging. This conditioning prosthesis consists of alveolar palatal prosthesis constructed in acrylic similar to an orthodontic appliance in which ball clasps are included to retain the prosthesis. Such an appliance is worn for 1 week for adaptation, with 1 week of respite between prosthesis. This helps the patient in accepting the permanent prosthesis to be inserted later.

Summary of management of gagging patients.

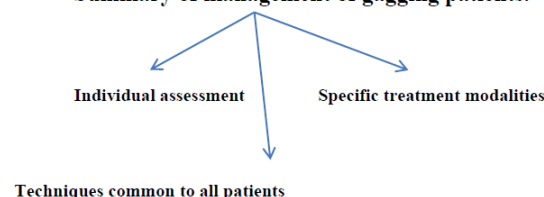


Fig 1: Management of gagging Patient.

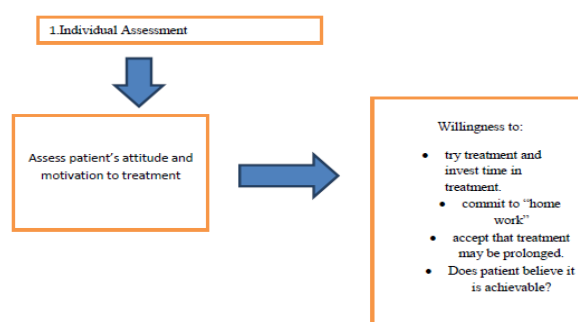


Fig 2: Individual Assessment.

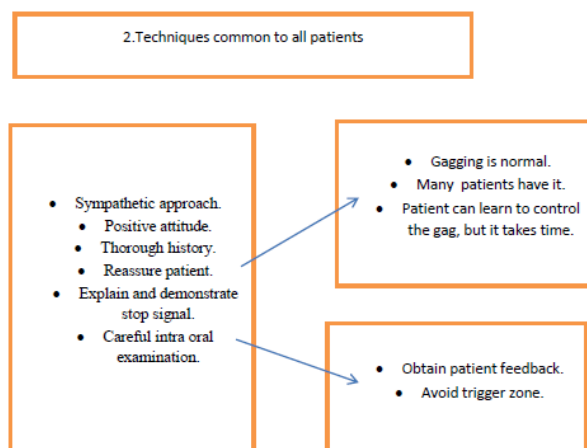


Fig 3: Common techniques for patients.

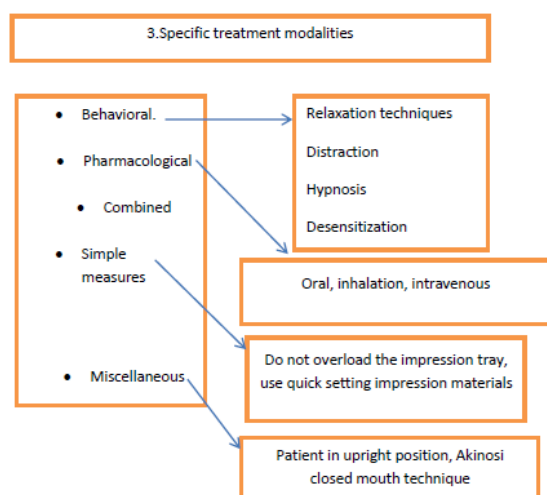


Fig 4: Specific treatment modalities.

CONCLUSION

In day to day practice we frequently encountered the patients with gagging which compromises and also complicate the treatment. . Thorough examination and diagnosis is required to arrive at the etiology of gagging. To overcoming patient's gagging problem clinicians requires experience and knowledge of variety of techniques. In most of the times multiple strategies and techniques need to be employed during a treatment plan. It is important for the clinician to assess which technique or techniques will be most appropriate for that particular patient. As we cannot avoid such patients in daily practice but we should have thorough knowledge and also we must be well versed with all the mentioned techniques so that we can manage these patients efficiently.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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