

## GAGGING AND ITS MANAGEMENT IN PROSTHODONTIC PATIENTS – A REVIEW OF LITERATURE

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### ABSTRACT

*The gag reflex is a normal protective reflex that protects the airway, restricts foreign bodies to enter the trachea and removes irritating mass from the posterior oropharynx and upper gastrointestinal tract. It can make diagnosis and active Prosthodontic treatment either troublesome or compromised if it is exaggerated in a patient. Also an abnormally active gag reflex may disturb the patient and frustrate the dentist. The patients are unable to wear a removable prosthesis in the presence of an exaggerated gag reflex. A number of techniques have been reported in the literature to overcome this problem which includes the use of distraction techniques, alternative impression materials, different prosthodontic technique and use of acupuncture and acupressure. Clinicians may need to attempt one or a few of these in order to assist the patients and carry out the required dental and prosthodontic procedures smoothly. This article reviews the methods for the management of exaggerated gag reflex in dental patients.*

*Keywords: Gagging; Gag reflex; retching.*

### INTRODUCTION

The gag reflex also called as gagging is viewed as a normal, defensive, physiological mechanism that happens so as to forestall foreign bodies or toxic materials from getting entry to pharynx, larynx or trachea.<sup>1</sup> A prosthodontist commonly encounters patients with gagging while providing prosthodontic treatment.<sup>2,3</sup> Various stimulating or triggering factors of gag reflex in prosthodontic patients are reported in the literature but broadly the gag reflex has been classified as either somatogenic or psychogenic.<sup>4,5</sup> Somatogenic gagging starts from insufficient retention of the prosthesis, thick posterior borders of the denture, inadequate posterior seal, lack of tongue space and malocclusion. Psychogenic gagging is triggered by anxiety, taste, fear and apprehension.<sup>5,6,7</sup> Somatogenic and psychogenic gagging may occur independently or a combination of these two types can be present. Some factors contribute and initiate gagging in patients. These are categorized as anatomical, medical, psychological and dental/iatrogenic factors.<sup>8,9</sup> Anatomical factors that may contribute to gagging include resorption of the maxillary residual alveolar bone that causes a move in the upper denture base and retention loss, variety of soft palatal anatomy, innate hypersensitivity along with variations of areas innervated by the 5<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> cranial nerves.<sup>10</sup> Medical factors that may contribute include nasal obstruction, post-nasal drip, sinusitis,

chronic catarrh and indigestion have been suggested as causes of gagging but have not been proved statistically. Excessive and chronic smoking has been seen as a typical factor in some gaggers. Gastric disorders, for example, peptic ulceration and diaphragmatic hernia have additionally been accounted for as causative variables.<sup>11</sup> Psychological factors like fear, alcoholism, stress, phobia, sight and sound of clinical dentistry, apprehension, hyperventilation have been reported.<sup>12,13</sup> Dental/iatrogenic factors include various denture design faults and characteristics like weak posterior palatal seal, overextension, abnormal thickness of the posterior palatal border have been suggested to explain gagging in denture wearers. Many of the factors compromise tongue space or position.<sup>14</sup> During a dental procedure, the patient may gag when sensitive areas of the oral cavity are manipulated e.g. suction tips touching the pillars of the fauces or mouth mirror contacting the posterior dorsum of the tongue during dental check-up. This is iatrogenic gagging. The freeway space was found to be inadequate in over 600 patients with retching while other studies have emphasized the need for an adequate posterior palatal seal and also for giving a matt finish to the denture.<sup>15,16</sup>

There is different level of severity of this problem in different patients. Faigenblum<sup>17</sup> categorized such patients by severity of the problem. The prosthodontic patient's gagging problems were divided into mild and

severe in this study. A gagging severity index has also been reported in the literature. This index assesses the magnitude of gag reflex in a patient. This gagging severity index is quite helpful in the diagnosis of a specific patient and after the appropriate diagnosis; the methods to overcome gagging problems can be planned accordingly.

This review of literature was carried out to understand the different causes and etiology of gagging in patients seeking prosthodontic treatment. From the introduction section it can be easily inferred that gagging is a common problem in the management of prosthodontic cases. There is a large variety of patients with gag reflex from mild to severe gagging problem.

The management of such patients with gag reflex is also reviewed after the diagnosis and assessing the severity of the condition.

#### Review of Management Procedures

The management strategies outlined in this review are broadly divided into:

1. Dentist based techniques
2. Patient based techniques

#### 1. Dentist based techniques

When impressions are usually made the patient is in the reclined or semi-supine position and this increases the likelihood of gagging because the intraoral space is reduced as the tongue drops back and the impression material flows towards the back of the mouth. Edwards<sup>18</sup> described the use of a dedicated sink for impression procedures. For the upper impression, the patient is made to sit directly in front of the sink keeping the neck vertical. The dentist standing behind and to the side of the patient holds the patient's head over the sink with one hand while inserting the tray with the other. Once impression material is in place, the patient can tilt the head forward keeping the mouth open over the sink. The advantages of this technique are that the patient is less apprehensive; patient can easily clear his mouth and can see the procedure through the wall mirror over the sink.

In distraction methods the basic principle is to avert the patient's attention from the stimulus eliciting the gagging allowing the dental procedure to be undertaken.<sup>19,20</sup>

Krol<sup>15</sup> depicted a procedure to redirect the patient's attention in which the patient is told to lift the leg and to hold it for some time. As the patient's muscles turn out to be progressively exhausted increasingly more cognizant exertion is needed to hold the leg-up. Intra-oral procedures might be done at the point where the patient experiences issues in doing conversation. In a second distraction technique,<sup>21</sup> the patient is told to inhale perceptibly through the nostrils and in the meantime musically tap the right foot on the floor. By focusing on these exercises the patient's consideration might be redirected far from the gagging stimulus.

This procedure may be used during clinical procedures. Seong<sup>22</sup> used a simple modified Krol's method to prevent gagging. This is based on Krol's basic principle that gagging is diminished in direct proportion to the decrease of consciousness of the stimulus. In this manner if the patient's consideration is diverted from the impression, gagging might be controlled. The patient is asked to raise his/her foot from the base of the chair and to raise a hand so that the patient becomes fatigued. As the patient becomes more fatigued, a conscious effort is needed to keep the foot raised. At this time tray insertion should be attempted. When the patient raises a hand ask him/her to change the foot that is raised and this is continued till the impression material sets.

A rapid effective approach for the elimination of maladaptive gagging of unknown origin was discussed by Fleece and Linston.<sup>23</sup> This method was recommended for eliminating the recently managed gag reflex that hampered desired denture wearing. A cotton swab was utilized to apply a light covering of an over the counter oral analgesic gel or paste to the soft palate and back of the tongue to create some decline in sensation and after that a wooden or metallic tongue depressor or tested the soft palate and back of the tongue more than once. At the point when the gag reflex failed to happen reliably the denture was placed into the mouth by the patient. While gagging appeared to be impending, the patient removed the denture to stay away from any association between denture wearing and gagging. Four series of 4 planned trials were directed on the initial 2 days of treatment. Lesser trials were done on days 3 and 4 so that the patient's tolerability to the maxillary denture expanded.

#### Prosthodontic techniques

The choice of impression material is important for the patients who gag. Ansari<sup>7</sup> concluded that a high viscosity elastomer material must be used for recording the initial impression of a maxillary partially edentulous patient. Use of high viscosity material will hamper the flow of the impression material to the gag reflex producing sensitive areas. In addition to the material used, stock trays can be modified. The distal or back end of stock trays may be built up with wax to stop the flow of impression material towards the throat. In clinical situations where full arch impressions are not needed, sectional trays may be used in such patients.

Farmer et al<sup>24</sup> and Anoop Jain et al<sup>24</sup> described the use of palateless dentures for gagging individuals with a previous history of difficulty in denture wearing and for individuals having large and inoperable tori. In the master cast obtained from the primary impression the labial, buccal and palatal extension is established. The lingual or palatal periphery of the denture is established by making a bead line of 0.5-1 mm in depth and width. The palatal border is determined similar to that

of the palatal arch like major connector in RPD design both in extension and location. The palatal border is placed near the horizontal and vertical slopes junction of the palate and they had to be symmetric as possible. A cast denture base made up of aluminum or cobalt chromium is advised because it will improve retention, and will be rigid. After maxilla-mandibular records are made a bilaterally balanced occlusion having modified and adjusted anatomic or cusp less tooth form is recommended. The possible pitfalls of this technique should be fully understood by the dentist and patient before starting the treatment.

Hattab et al<sup>26</sup> incorporated a local anesthesia solution into alginate material for reducing the gag reflex. He outlined various advantages for this procedure.<sup>1</sup> Carpule of local anesthesia (1.8 ml of 2% lignocaine having 1 part in 100,000 epinephrine) was added to the measuring cylinder and after that water was added to the exact volume. This water/anesthesia mixture was poured into bowl and powder was then added and mixed thoroughly.

### Pharmacologic Measures

When chair-side and prosthodontics procedures are not useful, then some pharmacologic agents are used but their efficacy is not generally accepted.

The drugs which are commonly used for gagging control may be grouped as:

1. Peripherally acting drugs: they are anesthetics (local or topical). These anesthetics can be used in lozenges form, gels, injections or sprays form and are used to reduce sensitivity of the patient's mouth. Topical anesthetics used include topical benzocaine 14% and tetracaine hydrochloride 2%. These are effective only for minor gagging.<sup>27</sup> Studies have indicated that in certain conditions topical and local anesthetics can increase gagging due to the numbness that is produced in the sensitive palatal and pharyngeal areas and it is sufficient to start the vomiting reflex.<sup>27,28</sup>
2. Centrally acting drugs: Such drugs eliminate or reduce the gag reflex and are normally categorized into antihistamines, tranquilizers, para-sympatholytic, central nervous system depressants and sedatives.<sup>29</sup> The use of these drugs for the control of gagging patient should not be a routine. Pharmacologic intervention is considered a short term remedy especially for severe and long standing reflex. Friedman suggested that placing table salt at the tip of the tongue would reduce the gag reflex.<sup>30</sup>

### Surgical Techniques

Leslie et al<sup>31</sup> described a surgical technique for patients who were unable to tolerate dentures because of gagging. Persistent gagging is frequently observed in patients with atonic and relaxed soft palates found in nervous patients. The palate will be in an abnormal rela-

tion with the uvula and pharyngeal wall and this produces a tendency for gagging. The author advocated a surgical procedure to shorten and tighten the soft palate. This solution is not accepted or used nowadays.

### Conscious Sedation

When a severe and strong gag reflex is present because of anxiety then addressing the cause may stop gagging. Inhalational, intravenous agents and oral sedatives can stop gagging on temporary basis during dental treatment. These agents also maintain the reflexes which are protective for the patient's airway.<sup>32,33</sup>

However, if the patient has to wear the prosthesis then these agents cannot be used because of the fear of addiction or side effects. These are only used to perform adequate treatment and dental procedures. Oral sedation is an unpredictable method and it is usually only recommended for mild gagging in the patients having an underlying anxiety state. Intravenous sedation is generally preferred over oral sedation, and is also more predictable in patients in which inhalation sedation is ineffective.<sup>28,32</sup>

### Acupuncture

Acupuncture<sup>34</sup> is a medical procedure that can be used to control gag reflex. In acupuncture a fine needle of few millimeters length is inserted in the skin at a specified point, waited for some time in place, sometimes moved and manipulated there and then removed smoothly. Chinese caves or acupuncture caves can reduce the gag reflex.<sup>35,36</sup> Fiske et al<sup>37</sup> selected ear acupuncture for the control of gag reflex. This was because:

1. An anti-gagging point is present near the external ear.
2. Needles used for acupuncture are not moved or disturbed and the dental treatment is completed inside the oral cavity.
3. The dental patient is unable to see the needles.

In this technique a fine and disposable needle of 7mm length pierces the anti-gagging point of each ear and a depth of 3 mm is achieved. The needles are usually manipulated before the treatment for 30 seconds and then left in situ during treatment. An acupuncture of Point Pericardium 6<sup>14</sup> (PC-6) located on the forearm is considered an important point for the reduction of the gag reflex. A concave area present between the first and second metacarpal bones commonly called as Hegu cave<sup>36</sup> is also another anti gagging point.

### Acupressure

Amornpong et al<sup>38</sup> described an acupressure technique for making maxillary impressions by controlling gagging. In acupressure procedure the specific points are pressed with gentle finger pressure and fine needles are not used, so it's considered a less invasive technique. 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.

## 2. Patient Based Techniques

### Systematic Desensitization

The aim of this method is to increase the patient's exposure to a gag inducing stimulus gradually. This incremental habituation relies on increasing some feature of the stimulus like progressively increasing the time and size of the object in the mouth allowing habituation to take place.<sup>39</sup>

### Singer's Marble Technique

Singer<sup>40</sup> devised the marble technique in which the patient's gag reflex can be exhausted and this gradual exhaustion of the reflex allows for a gradual exposure to the dental treatment or prosthesis. In the initial visit, the patient is advised to keep 5 round glass marbles (approximately 1/2 inch diameter) in the mouth one at a time at his disposal till all five marbles are present in his oral cavity. The patient was instructed to place all the five marbles in his mouth all the time continuously for seven days except eating or drinking. At the second visit patient was motivated and his ability to wear dentures was evaluated. At the third visit, preliminary impression was made, refined and completed without a wash. At the fourth visit the base tray for the lower denture was inserted. A training bead was made on the lingual surface of the lower denture at the proper location of the lower incisors teeth so that the patient can maintain proper tongue position. At the fifth visit, the upper denture base was inserted and the use of marbles was discontinued. The patient was advised to wear upper and lower denture base trays in his mouth all the time except when eating. At the sixth visit, jaw relation is made and occlusion rims marked. While the dentures were being fabricated the patient is asked to wear upper and lower trays continuously. This technique presents definite medico-legal risks in case of accidental aspiration of the training trays by the patient. The completed denture was inserted at the seventh visit. The Button's technique is a similar technique where the patient was asked to hold a set of buttons or plastic discs in his/her mouth for up to 2 hours a day and to roll them around the mouth. The time of this activity per day was recorded in a diary.

Gillian<sup>41</sup> evaluated the use of a controlled method of breathing based on the method recommended by the national childbirth trust for use by women in labor.

1. All gagging patients were instructed and trained to

practice controlled rhythmic breathing and were advised to practice it for 1-2 weeks before prosthodontic treatment was begun. The breathing which was instructed was even, steady, slow and rhythm maintained by concentrating the mind on a particular verse or tune with an even tempo.

2. A thin clear acrylic base plate was then fabricated with maximum palatal coverage, very thin posterior borders and satisfactory post dam. Impressions for the fabrication of thin acrylic base were made in two stages; primary and secondary (with impression plaster in shellac special trays) impressions and during the impression making the patient's rhythmic breathing was reinforced. When the base plate was inserted, the breathing technique was explained again and the patient advised to adopt a routine whereby a particular time each day was assigned for denture acclimatization. The length of time the base plate was worn each day should slowly be increased and a record of this maintained. The rhythmic breathing should be maintained for the whole base plate wearing period and the level of breathing deepened if the retching impulse becomes too great. This is continued for 2-3 weeks.

The models taken from the secondary impression are duplicated so that the final denture was fabricated on a model identical to that used for base plate. The base plate may be worn right up to the time the denture was inserted.

Another method suggested the use of a graduated toothbrush<sup>32</sup> to monitor a patient's progress in conquering his gagging. The patient is asked to brush the hard palate gently with a toothbrush as far back as possible without causing gagging. The patient makes a mark on the toothbrush handle.

### Psychological Intervention

Xianyun<sup>35</sup> suggested hypnosis is induced by a method involving eye fixation plus distraction for example staring at a colored dot in the dental light while at the same time counting backwards from 300.

**Behavioral approaches** to reduce hyper-sensitive gag reflexes have been reported in the literature. Some ways are discussed to reduce the treatment related fear and stress of the patient.<sup>20,43,44</sup> Neumann et al<sup>20</sup> proposed the following systematic way to control gagging. These techniques include:

1. Talk about fears identified with dental procedures with the patient and advise him/her to rehearse relaxation a few times each week. Audiotapes of relaxation strategies which incorporate symbolism, dynamic muscle relaxation and self-proposal components were given to the patient with directions for steady practice.
2. Encourage the patient to simulate his/her maxil-

lary alveolar ridges and palatal vault with a toothbrush, spoon, mouthwash or other upgrades. The regular incitement of the maxillary alveolar ridge may expand stimulation to the cerebrum establishing discrimination of the impression/denture stimuli progressively troublesome.

3. If the dentures/occlusal rims can't go on without serious consequences, the patient is told to utilize his prosthesis no less than 3 times each day, 5 days seven days. The patient is told to build time gradually by 30 second interims until the point that he achieves an comfortable level. The patient ought to be requested to eat delicate food until the point that he feels great enough to eat hard food.
4. In the event that dentures/rims are not endured after beginning treatment, a topical anesthetic on cloth might be set on the upper arch until the point that the territory is obtunded. The patient is then taught to attempt the dental prosthesis again.

Noble S<sup>12</sup> described the use of hypnotherapy in controlling a hypersensitive gag reflex. The method adopted was systematic desensitization which is based on the premise that people cannot be both relaxed and anxious at the same time. The individual is trained to relax prior to any dental procedure.

It is **concluded** that the dentist frequently encounters patients with unusual gagging in their practice. The most serious issue of concern with such patients is that there is a chance of treatment compromise. A thorough intraoral examination, medical and dental history, diagnosis should be made and then the etiology for the gagging should be established. Management strategies outlined in this article are broadly divided into patient based techniques and those that may be employed by the dentist making the impression i.e. dentist based techniques. Dentist based techniques include distraction techniques, prosthodontics techniques and pharmacological management whereas patient based techniques include desensitization techniques which include marble technique and controlled breathing method. No one method is superior to another and a combination of two or more techniques may be needed for severely gagging patients.

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#### Conflict of Interest

The authors declare no conflict of interest for this work.

#### Authors' Contribution

SA: Conception and designing of the manuscript. BG: Conception and designing of the manuscript. UK: Acquisition and analysis of the data. AKAAS: Acquisition and analysis of the data. FRAA: Acquisition and analysis of the data. ZI: Proof reading and final approval of the version to be published.

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