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CASE REPORT

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Management of a Hyperactive Gag Reflex for Oral Appliance Therapy: A Case Report

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Background: A patient sought treatment at a prosthodontics practice for obstructive sleep apnea with a mandibular advancement device.

Case Information: Because of a hyperactive gag reflex, a patient required implementation of a unique protocol to overcome gagging whenever the mandibular advancement device was placed in the mouth.

Conclusion: The protocol described in this case report allowed the patient to overcome a hyperactive gag reflex and successfully use a mandibular advancement device to treat obstructive sleep apnea.

Keywords: Gag reflex; MAD; OSA; OAT

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INTRODUCTION

Impression taking and other dental procedures such as wearing a maxillary complete denture can be stressful for some patients and dentists because of the presence of a gag reflex. Sivakumar and Prabhu[1] defined the gag reflex as an involuntary reflex involving bilateral pharyngeal muscle contraction and elevation of the soft palate. It is thought that the gag reflex arose as humans evolved to prevent swallowing foreign objects and choking.[1] Physical examination of reflexes such as the gag reflex and response to pain often are used to determine brain activity levels or if brain death has occurred.[2] The gag reflex is controlled by cranial nerves IX (glossopharyngeal nerve) and X (vagus nerve) and is derived from the third, fourth, and sixth pharyngeal arches during development.[1] In newborns, the gag reflex is activated whenever the brainstem deems food to be too large or solid for an infant to digest. At approximately 6 months of age, the gag reflex becomes less pronounced, and the infant can start consuming more solid foods.[3]

The gag reflex can be classified as either somatogenic or psychogenic in nature. A somatogenic gag reflex occurs when there is direct physical contact with the base of tongue, the tonsillar pillar area, or the posterior pharyngeal wall with a physical object such as a piece of food, dental hand mirror, or oral appliance. A psychogenic gag reflex occurs from a mental trigger, often without a physical contact. A psychogenic factor could be the simple thought of going to a dental appointment, which can induce the gag reflex. [4]

A direct gag reflex is defined as the contraction of the pharyngeal musculature ipsilateral to the side of the stimulus. A consensual gag reflex is when the musculature of the pharynx contracts on the contralateral side of the stimulus.[1] Gagging can also occur when the soft palate is stimulated by activating the trigeminal nerve (CN V). According to a 1995 study by Davies et al, [5] approximately37% of people do not have a gag reflex; in addition, it was concluded that there is an increase in the absence of a gag reflex in those who smoke or use tobacco.[5] An absent gag reflex can be a cause for concern, however, because it might indicate cranial nerve damage or brain death.[5] Neumann and McCarty in 2001 found that 10% to 15% of people have a hypersensitive gag reflex and they will often gag when eating sticky or thick foods.[6]

There are many etiologic factors that stimulate the gag reflex:

(1) Local factors: nasal obstruction, deviated septum, postnasal drip, sinusitis, congestion.

(2) Systemic conditions: chronic gastritis, Patterson dysplasia, cancer of the stomach and pancreas, uncontrolled diabetes, and peptic ulcers.

(3) Social factors: smoking, coughing, chronic alcoholism.

(4) Psychologic factors: eating disorders, stress, neuroticism

(5) Iatrogenic factors: medical/ dental instruments, local anesthesia, small tongue space.

(6) Prosthetic factors: poor retention of prostheses, overextended or underextended dentures, inadequate posterior palatal seal.[7-9]

The Dickinson and Fiske gagging severity index can be used to classify the gag reflex severity as follows:[10]

- Grade I: Very mild: patient is able to control gagging
- Grade II: Mild: gagging is able to be controlled by patient/ dentist using simple measures
- Grade III: Moderate: some treatment is not accepted by patient without gagging
- Grade IV: Severe: some treatment is not possible
- Grade V: Very severe: any procedure in the oral cavity is impossible and affects patient behavior.

Clinicians can test for a gag reflex by using a tongue blade or cotton tip applicator. Using one of the two instruments, the clinician stimulates each side of the posterior pharynx, waiting each time for gagging.[1] In patients with severe gagging, placing dental instruments such as impression trays, a gloved finger, or even intraoral mirrors could be enough to stimulate the gag reflex. Management techniques to control gagging include behavior modification, desensitization, conditioning prostheses, pharmacologic therapy, acupuncture/ acupressure, modification of prostheses, hypnosis, and holistic remedies.[11] This article discusses a new and novel technique used on a patient with a Dickinson and Fiske grade IV gag reflex to successfully treat the patient's obstructive sleep apnea (OSA) using a mandibular advancement device.

NARRATIVE

A 60-year-old patient presented to a prosthodontics practice for treatment of OSA and bruxism. The patient was 64 inches tall and weighed 155 lb with a body mass index of 26.8. The patient's medical history was significant for hypertension, hyperlipidemia, Parkinson disease, impaired fasting glucose, melanoma, allergic rhinitis, somatoform disorder, and OSA. Full-night polysomnography (PSG) at Fort Eisenhower sleep clinic was completed, and the PSG results revealed an apnea-hypopnea index of 12.9 with moderate to loud snoring. The total sleep time during the PSG was 362 minutes, with 11% of total sleep in stage N1, 44.1% in stage N2, 32.6% in stage N3, and 12.3% in rapid eye movement sleep. Sleep latency was 9.5 minutes and rapid eye movement latency was 119 minutes. The patient spent 48.5 minutes sleeping in the supine position. Baseline oxygen saturation was 94.9% and the lowest recorded oxygen saturation was 87.9%. Increased periodic limb movements were observed.

The patient completed an in-home autotitration study that demonstrated effective treatment of OSA, but it also demonstrated inappropriate compliance using continuous positive airway pressure. The patient followed up with the sleep clinic, stating she did want to use a continuous positive airway pressure device and wanted to try oral appliance therapy. The patient's intraoral examination revealed a history of dental restorations, attrition of the dentition, mild crowding, barely visible tonsils, a normal uvula size, and a class 3 Mallampati score. The patient's Epworth Sleepiness Scale score was 15 and she complained of snoring, daytime drowsiness, bruxism, drooling while sleeping, and restlessness.

The patient had a hyperactive gag reflex that presented any time the intraoral mirror would touch the tongue or go past the anterior dentition. Intraoral scans with a Primescan (Dentsply Sirona, Charlotte, North Carolina, USA) were obtained by placing salt on the tongue as described by Friedman.[14] A protrusive bite registration using a George Gauge with 3-mm-thick bite fork (Great Lakes Sleep Technologies, Tonawanda, New York, USA) at 60% maximum protrusion was made. The scans and bite registration were sent to the laboratory and an EVO appliance (Prosomnus Sleep Technologies, USA) was fabricated. During the delivery appointment, the patient was unable to tolerate the maxillary and mandibular EVO appliance without gagging. A desensitization protocol was developed and implemented to aid the patient in being able to use the MAD to treat the OSA. The protocol was as follows:

- Days 1 through 7: The patient would wear the maxillary MAD for an increasing amount of time throughout the day, as much as the patient could tolerate.
- Days 8 through 14: The patient would use both maxillary and mandibular trays simultaneously for an increasing amount of time throughout the day.
- Day 15: The patient would use the MAD at bedtime and go to sleep while using it for as long as tolerable.
- Day 16: The patient stated she was able to lie in bed and go to sleep with the MAD but after a brief period she would start gagging intermittently. The patient also stated she could sit up without any gagging occurring. The protocol was modified, and the patient was instructed to go to sleep with three pillows propping up her head/upper body.
- Day 18: The patient was instructed to remove one pillow.
- Day 20: The patient was instructed to remove the second pillow.The patient was able to successfully lie in

bed using the MAD without gagging and without any positional modification to elevate the head/upper body.

The patient returned to the clinic for reevaluation approximately 21 days after the desensitization period ended. The patient stated she was able to use the MAD on a regular basis and was able to sleep with it throughout the night. She reported getting better sleep and waking up in the morning feeling more energetic, and that she was feeling less tired during the day. The patient was referred to her primary care manager for a follow-up sleep study; however, the MAD efficacy PSG has not yet been completed because of urgent medical conditions the patient had experienced. The patient and primary care manager are planning PSG once the patient's medical condition has stabilized.

DISCUSSION

According to Bassi.[7], gagging can be disruptive to dental treatment and can prevent the wearing of a prosthesis such as a complete denture or a mandibular advancement device. Gagging can be challenging for the patient and make dentistry difficult or sometimes even impossible to perform. As previously stated, many different techniques have been developed to prevent gagging, including medications, sedatives, holistic remedies such as herbs, acupressure and acupuncture, alteration of prosthetic devices, and general or local anesthesia.[11]

Sometimes, simple behavior modification and distraction such as providing reassurance and having the patient attempt to relax with music, television, or talking can stop the gag reflex.[9] Pharmacologic options to reduce the gag reflex include local anesthesia, conscious sedation, and general anesthesia.[12,13] Altering the size and shape of a prosthesis, such as reduction of the palate on a maxillary complete denture, could be enough to prevent gagging.[15] Other prosthodontic management techniques for gagging include reducing thickness and extensions of prostheses, choosing impression material with a high viscosity, providing patients with training prostheses prior to final prosthesis delivery, and making denture surfaces with a matte finish instead of smooth and glossy.[16] Friedman and Weintraub[14] discussed placing salt on the palatal region of a prosthesis or on the tongue to reduce gagging, a technique often used in dentistry to reduce gagging when obtaining radiographs or making impressions. In 2022, Mehdizadeh et al. [17] performed a systematic review that provided an update on the management of the gag reflex and stated that nitrous oxide, low-level lasers, and distraction techniques were effective in reducing the occurrence of the gag reflex.

A common technique used in dentistry to control the gag reflex is desensitization. Desensitization consists of slowly exposing the patient to a stimulus that invokes the gag reflex. Frequency, duration, and intensity of the stimulus is gradually increased with the goal of habituating the procedure that is to be performed or the use of a prosthesis such as a complete denture or other removable prosthesis.[9] Colvenkar et al. [15] described a step-by-step process to manage gagging in a patient without teeth that included having the patient brush the palate as far posterior as possible with a toothbrush and placing four pieces of chocolates in his mouth one at a time until all four pieces would go in without gagging.[15] In 1973, Singer[18] published an article discussing desensitization for treating patients with a severe gag reflex. The Singer marble technique called for placing marbles in the patient's mouth to desensitize the patient in preparation for use of complete dentures, demonstrating an odd but novel way to treat patient successfully. In dentistry, clinicians often must come up with creative ways to desensitize or distract, as did Colvenkar and Singer,to perform procedures that might stimulate the gag reflex, calm fears, or decrease anxiety.

CONCLUSION

This case report discusses a novel technique used to help a patient acclimate to using a MAD without activation of the gag reflex. The described protocol works with the patient's tolerances for wearing the appliance in small increments, allowing the patient to have complete control of the environment. The result allowed the patient to be able to use the MAD without the occurrence of gagging. This new and novel technique was successful for this patient, has the potential to help other patients overcome a hyperactive gag reflex, and can be personalized for each individual patient.

DISCLAIMER

The views expressed in this manuscript are those of the authors and do not necessarily reflect the official policy of the United States Government, the Department of Defense, the Defense Health Agency, or Uniformed Services University.

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DISCLOSURE STATEMENT

The authors have no conflicts of interest to report.