

# **GAG REFLEX IN DENTAL PRACTICE - ETIOLOGICAL ASPECTS**

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## **ABSTRACT**

Gag reflex, quite commonly encountered in dental practice, is a defense reflex that the patient cannot control or overcome. Knowing its etiology may help preventing or lessening this unpleasant sensation, and knowing the underlying mechanisms of nausea may make it possible to avoid its occurrence.

**Key Words:** gag reflex, etiology, dental practice

## **INTRODUCTION**

Many dental practitioners are faced with patients presenting gag reflex, a phenomenon that appears quite commonly during prosthetic or dental treatment. Consequently, any therapeutic procedure becomes extremely annoying, both for the dentist who is unable to perform quality work, and for the patient who is unable to overcome the sensation, thus rendering the medical act difficult, even impossible.

What is the gag reflex? Nausea, derived from the Latin *nausea* (i.e., sea sickness), manifests itself through an unpleasant feeling that precedes the sensation of vomiting. It is a subjective sensation originating at the cortical level. More exactly, the gag reflex is an inborn reflex meant to protect the upper respiratory tract and the digestive tract against anything that might obstruct them. However, it can also be an acquired reflex, conditioned by various stimuli: visual, olfactory,

acoustic, psychic, chemical or toxic transmitted via the blood flow or the cerebrospinal liquid.<sup>1-3</sup>

## **REFLEX PHYSIOLOGICAL MECHANISMS INVOLVED IN TRIGGERING GAG REFLEX**

To be able to handle such a situation, the dental practitioner has to understand its various underlying etiological mechanisms in order to analyze the phenomenon and to correct it by a proper response and by using complementary therapeutic methods and techniques adapted to the respective etiology.

Gag reflex is an inborn reflex and it progressively regresses during the child's first four years of life, as his/her oral functions begin to mature, changing from the infantile methods of breathing and suction to the more mature functions of nasal breathing and aspiration-swallowing. Gag reflex becomes more posterior after the appearance of the first dentition which makes the child try to stimulate the respective receptors by introducing various objects in his mouth. Thus, the child enriches his sensorial references and is ready to begin lateral mastication.

The reflex is located at the tonsil pillars. The persistence of the gag reflex in the adult shows an orofacial immaturity, commonly associated with multiple forms of dysphagia.<sup>4</sup>

In the adult patient, nausea is triggered by a reflex physiological mechanism involving receptors located in various parts of the body, afferent paths that convey

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the stimuli to the nervous centres of vomiting and afterwards to the efferent paths.

The sensor stimuli capable to initiate the gag reflex are detected by three types of receptors located at the orofacial, digestive, respectively at the blood flow level.<sup>5</sup>

### **Orofacial receptors**

In the mouth, the area of the palatine veil, of the posterior pharynx and of the tonsillar pillars are rich in nociceptive receptors. These receptors, found on the tongue papillae that carry the taste buds, can equally trigger the gag reflex. They create a real reflex field which may spread more or less forward, depending on the individual. These receptors are associated with the labyrinth receptors which trigger gagging depending on the change in position. At the same time, gag reflex may also be triggered by the stimulation of visual, olfactory and auditory sensory receptors.

Somesthetic afferences coming from the labyrinth (the cochlear branch of the vestibulocochlear nerve-VIII), the Ramsay Hunt area (the auricular branch of the vagus nerve- X), the oral cavity (the trigeminal branches V2 – V3 – Wrisberg's VII bis intermediate nerve), tongue (the glossopharyngeal nerve- IX), the digestive tract (the vagus nerve X), the ocular system (the optic nerve II), all converge, more or less directly, towards the upper centers responsible for the gag reflex.

### **Digestive receptors**

These receptors, together with the olfactory ones, belong to the group of chemoreceptors. The afferences coming from the digestive tract, conveyed mainly through the vagus nerve, reach the solitary nucleus (situated at the bulbopontin level), towards which the afferences from Wrisberg's intermediate (VII bis) nerve and from the glossopharyngeal nerve also converge.

### **Blood-flow receptors**

There are no proper blood-flow receptors. In triggering the gag reflex, the blood flow and lymph carry the chemical mediators responsible for the humoral changes in the chemoreceptor area situated in the postrema area, in the wall of the fourth ventricle, rich in dopaminergic receptors. Pathological humoral alterations, such as uremia or drug poisoning (anaesthetics, apomorphins, etc.) can act on the bulbar centre of vomiting. At the same time, the hormonal changes inherent to pregnancy act through the blood flow and may induce nausea.

All these stimuli reach the nervous centre of nausea by the following paths:<sup>5,7</sup>

- The sensitive fibres of the trigeminal nerve, a sensitive and motor nerve involved in the sensitivity of

the face, eye sockets, nasal fossae and oral cavity. The sphenopalatine nerve, a branch of V2, innervates the anterior part of the palate, the mucous membrane of the rhino-pharynx and the posterior part of the palatine veil. The lower maxillary nerve innervates the mucous membrane of the tongue in front of the tongue V, the margins and the tip of the tongue.

- The sensitive fibres of Wrisberg's VII bis intermediate nerve, a sensitive nerve that provides the path for unpleasant tastes felt in the anterior two thirds of the tongue.

- The sensitive fibres of the glossopharyngeal nerve, which innervates the mucous membrane of the nasopharynx, oropharynx, tongue, the papillae in the tongue V and its posterior area. Thanks to this distribution, this nerve is the essential factor involved in swallowing and gag reflex, considered to be as the taste nerve, mainly for the sweet and bitter tastes.

- The sensitive fibres of the pneumogastric or vagus nerve, that spread over an extensive area (neck, chest and abdomen) and is divided in several branches. Its pharyngeal branch forms the pharyngeal plexus which innervates the muscles and mucous membrane of the pharynx and the muscles of the palatine veil. Its upper laryngeal branch (or upper laryngeal nerve) innervates the epiglottis and the base of the tongue. The inferior laryngeal nerve innervates the muscles of the larynx.

The afferences transmitted via the glossopharyngeal and vagus nerves reach the nuclei situated in the fourth ventricle, nuclei which are more or less directly connected to the vomiting centre. All these nervous paths belong to the parasympathetic area of the autonomous nervous system.

The nervous centres of vomiting are situated at different levels: bulbar, hypothalamic (supraoptical) and cortical.<sup>5,6</sup> The postrema area represents the chemoreceptor region of the gag reflex. It is situated at the base of the fourth ventricle. Its proximal segment is located near the centres of expiration, inspiration, salivation, vasomotor regulation and near the three cardiac nuclei, which explains the possibility of stimulating the nervous areas surrounding it, thus inducing the unpleasant sensations that accompany vomiting (sweating, pallor, palpitation, hypersalivation). On the other hand, in case of nausea of sensory origin, reflexes pass through the hypothalamus, the cortical areas and the island lobe.<sup>8</sup>

The stimuli, turned into motor impulses, are transmitted by the following paths:

- The motor fibres of the parasympathetic system (the vagus nerve, the glossopharyngeal nerve and the trigeminal nerve), that generate hypersalivation, of the lifting of the palatine veil, etc.

- The intercostal nerves, iliohypogastric and ilioinguinal, which innervate the muscles of the abdominal wall and the intercostal muscles.
- The phrenic nerve, which innervates the diaphragm.

The response is transmitted to different muscle groups that stay at the origin of the motor activity.

## **THE IMPORTANCE OF GAG REFLEX ETIOLOGY IN DENTAL PRACTICE**

Clinically, there are several therapeutic acts susceptible to stimulate, directly or indirectly, the areas and reflex paths, a stimulation that is manifested by triggering inborn or acquired, local or general reflexes.

### **Inborn reflexes**

Any risk of blocking the airways triggers the gag reflex. This depends mainly on two factors: oral breathing and hypersalivation. If a patient breathes through his/her mouth, he/she presents the risk of inhaling saliva, which causes nausea. This problem may also occur during the use of the water-cooling drill associated with defective suction<sup>3,9</sup> because a patient with his/her mouth open is unable to swallow the excess of water accumulating in his/her mouth. Consequently, the patient will be overcome by a sensation of suffocation followed by panic, which triggers a sensation of violent nausea. Hypersialorrhea also increases the frequency of swallowing and may have the same consequences. Sometimes, the mere noise of the burr may remind the patient such an incident,<sup>9,10</sup> inducing hypersalivation with all the ensuing consequences.

### **Acquired reflexes**

Acquired reflexes may have a general or local origin, and may be primary or complementary, secondary or associated. Their etiology is often difficult to establish. Among the general pathological situations that are accompanied by gag reflexes, one could mention alcoholism, certain digestive or hepato-biliary disorders and emetic medication.

Locally, gag reflex mainly depends on five types of stimuli.

### **Mechanical stimuli**

In dental surgery, there are several and various mechanical stimuli that may trigger nausea, such as PRINT LIFTING in total or partial edentation and the insertion of an adjunct total or partial prosthesis. The dexterity and experience of the practitioner

associated with his/her authority are an advantage in preventing such occurrences.<sup>11</sup>

Thus, Sewerin's study conducted on 478 patients with retroalveolar X-rays, showed that, although 13 % of them claimed to suffer from gag reflex, this figure decreased to 9 % when the X-rays were taken by an experienced dental practitioner, and increased to 26 % when the operator was a student. Moreover, Sewerin revealed that though the reflex occurs more commonly in the area of the molars, its occurrence is equally influenced by olfactory, visual and psychic stimuli.

### **Olfactory/taste stimuli**

Certain smells, especially that of sulphur given off by certain dental materials, or the bitter taste of the anaesthetic are enough to trigger nausea.<sup>12,13</sup>

### **Acoustic stimuli**

The noise of a rotating instrument may remind the patient of a traumatizing dental maneuver. In this case, cortical stimulation has a psychic origin.

### **Visual stimuli**

Sometimes the mere sight of a pair of rubber gloves, of a cotton swab or the contact of this swab with the mouth mucous membrane may trigger gag reflex.

### **Psychic stimuli**

Fear or the memory of an unpleasant experience may have a direct influence on the patient's behaviour when a print is taken. Nausea of psychic origin is essentially linked to wearing a mobile prosthesis. Most patients perceive edentation as a veritable mutilation. Each dental extraction alters the individual's body pattern and may endanger his/her psychological balance. The patient, more often than not, considers himself/herself responsible for his/her condition and experiences a feeling of hatred, of psychic dehiscence and ageing. If the patient is unable to overcome these feelings, if the respective prosthesis is not conform with his/her desires, the phenomenon of rejection is manifest by interminable and impossible complaints, as well as by an "insurmountable" sensation of nausea.<sup>13,14</sup> In most cases, once any other possible etiology has been eliminated, the psychogenic cause has to be considered and sometimes specialised therapy is required.

## **CONCLUSION**

1. Gag reflex appears in various circumstances, during or as a consequence of dental treatment, and may have multiple causes.
2. It is very difficult to make a clear-cut distinction

between the general or local causes of gag reflex and the psychological component.

3. The skill and patience of the dental practitioner is greatly responsible for controlling such a situation in order to carry out the respective treatment with satisfactory results for the patient.

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