There are two types of vagal sensory fibers, each responsible for transmitting different types of sensory information. Visceral sensory fibers carry information from stretch receptors and chemoreceptors (regarding oxygen levels) in the abdomen and thorax. In addition to sensations from the abdomen, thorax, tongue, pharynx, larynx, bronchi and esophagus—they tell us when we feel “bad.” These fibers terminate in the solitary tract, which mediates the gag and cough reflexes, as well as keeping mucous membranes hydrated, which is important for swallowing. Visceral pain is carried separately in fibers of the sympathetic system.

General sensory fibers transmit pain, touch and temperature information from the skin of the external ear, external auditory canal, external tympanic membrane, larynx and pharynx to the spinal trigeminal nucleus, which is the pain and temperature center for all the cranial nerves.

Motor fibers begin in the dorsal vagal nucleus, the parasympathetic center in the brainstem. The parasympathetic system is responsible for initiating “rest and digest” activities in the body. Vagus nerve fibers originating in this nucleus activate smooth muscles and mucosal glands in the pharynx, larynx and esophagus—as well as the thoracic and abdominal viscera—to aid in swallowing and digestion. The nerve fibers synapse on nerve cell bodies in the ganglion and then travel in the pharyngeal branch and internal laryngeal branch of the superior laryngeal.

Sensory fibers

A Most Multi-talented Nerve
Cranial Nerve X The Vagus

Motor fibers

Pharyngeal branch (not shown)
The pharyngeal branch is the principal motor nerve of the pharynx and soft palate, supplying all the striated muscles except the salpingopharyngeus and the tensor veli palatini. It branches from the inferior ganglion and innervates all the pharyngeal constrictors, which aid in swallowing, and the levator palate, which closes off the nasal cavity from the oral cavity. It also innervates the salpingopharyngeus, palatopharyngeus and palatoglossus, all of which change the pharynx’s shape for speech and swallowing. Oral examination reveals deviation of the uvula to the unaffected side because of unopposed muscular block to make earmold impressions can result in coughing, vomiting or fainting on the affected side. Unilateral damage to this branch of the nerve results in dysphagia.

External portion of the superior laryngeal branch
The superior laryngeal branch arises from the inferior ganglion. At the larynx it splits into the internal and external laryngeal nerves. Although primarily a sensory nerve, the motor segment of the external laryngeal branch supplies the cricothyroid muscle, a primary controller of vocal pitch. Unilateral damage to this portion of the nerve results in voice disorders. The internal branch does not contain motor fibers.

Inferior pharyngeal constrictor muscle

Cricothyroid muscle

Cricopharyngeus muscle (part of the inferior pharyngeal constrictor)

Recurrent laryngeal nerve

At and below the vocal folds, visceral and general sensory fibers alike travel in the recurrent laryngeal nerve. Thus, the vocal folds create a division in the pathways conveying all sensory information.

The superior and recurrent nerves merge into the trunk of the vagus. The general sensory fibers’ destination is the spinal trigeminal nucleus, while visceral sensory fibers travel to the solitary nucleus. The solitary tract’s nerve fibers, and the mucosa they serve, are often damaged in radiation therapy for head and neck cancers, which poses additional challenges for patients and SLPs who work with them.

Continuing journeys...

The vagus nerve continues its travels through the esophagus, cardiac, pulmonary and gastrointestinal branches in the thorax and abdomen.

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