Sensory fibers

There are two types of vagal sensory fibers, each responsible for transmitting a different type of sensory information.

Visceral sensory fibers carry information from stretch receptors and chemoreceptors (regarding oxygen levels) in the abdomen and thorax, in addition to other 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.

Auricular branch (not shown)
The auricular branch, a general sensory fiber, is one of the few branches containing no motor fibers. Stimulating the auricular branch by means of something as benign as placing an oto-block to make earmold impressions can result in coughing, vomiting or fainting in some people—what’s known as a vasovagal response.

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 sylvian pharyngus and the tensor veli palati. 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 action and drooping of the soft palate on the affected side. Unilateral damage to this branch of the nerve results in dysphagia.

Internal laryngeal nerve

The internal laryngeal nerve transmits visceral sensory information from most of the larynx, the aryepiglottic folds, mucous membrane of the epiglottis and the base of the tongue. In addition, general sensory fibers convey touch, pain and temperature information from areas above the vocal folds. The internal laryngeal nerve exits the larynx through the thyroid membrane and joins with the external laryngeal branch to create the superior laryngeal nerve. The superior laryngeal nerve supplies the other branches to create the vagus.

People with damaged visceral sensory fibers of the vagus present a significant risk of aspiration. Their ability to detect foreign matter in the larynx is impaired, so they cannot initiate a cough response to clear the area. Speech-language pathologists play a key role in determining the patient’s ability to eat and drink safely, as well as teaching compensatory strategies to the family and patient.

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 presents additional challenges for patients and SLPs who work with them.

Continuing journeys...

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