

# The Mechanism of Traditional Chinese Medicine and Western Medicine in the Treatment of Dysphagia after Stroke by Stimulating the Uvula

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## Abstract

The incidence of stroke is getting younger and younger. As a common complication after stroke, dysphagia will lead to an increase in the mortality and disability rate of patients, and seriously affect the quality of life of patients. Patients with dysphagia after stroke are often accompanied by deflection of the uvula and inability to lift. Some studies have used cold stimulation, traditional Chinese medicine popsicle stimulation, etc. to perform swallowing nursing and rehabilitation to promote the recovery of patients' swallowing function. Acupuncture on the uvula is effective in treating dysphagia after stroke, but it has not received extensive attention in the field of acupuncture research. This article discusses the correlation between the uvula and the dysphagia after stroke from the anatomical structure of the uvula, the mechanism of swallowing and the theory of TCM meridians, and provides a theoretical basis for the treatment of dysphagia after stroke by acupuncture combined with popsicle stimulation of the uvula.

## Keywords

Stroke, dysphagia, uvula, acupuncture, mechanism

## 1. Definition

The uvula is a small reddish cone-like body that protrudes and hangs from the posterior border of the soft palate of the oral cavity. It does not touch the surface of the tongue and is visible when the mouth is opened. It is also known as *Dui Zui* [1], *throat flower*, *Dizhong*, *Diding* [2], *little tongue* etc. It is vividly described in *Medicine Pivotal Points* [3] 'The larynx is drooping like a little tongue, it is called the uvula'. Although the uvula is a small sarcoplasmic structure with prominent drooping, its function cannot be ignored. As early as *You Hui Wu Yan in Lingshu* [4], it was mentioned that 'the uvula is the gateway of sound', and it is believed that the uvula is related to pronunciation and speech. This view was also inherited in later works such as *Treatise on the Origins and Manifestations of Various Diseases* and *Taiping Shenghui Fang*. The uvula has been valued by physicians in the past dynasties, but most of them have studied *Dizhong Feng* [5, 6] and *uvulacarbuncle* [7]. The emphasis is on syndrome differentiation and treatment through uvula observation, so as to eliminate the symptoms of uvula swelling and pain, prolapse and the resulting difficulty in pronunciation. Modern research has found that the uvula is not only related to pronunciation, but also closely related to functions such as breathing and swallowing [8]. For example, related researches on - in the treatment of sleep apnea syndrome [9, 10] and rehabilitation nursing research on popsicle stimulation for dysphagia after stroke [11, 12]. Patients with dysphagia after stroke have varying degrees of uvula deviation and inability to lift, which can easily cause choking, dysphagia and even pulmonary infection when eating

and drinking. This article discusses the correlation between the uvula and dysphagia after stroke from the anatomical structure of the uvula, the mechanism of swallowing and the theory of TCM meridians, provide more ideas for prevention and treatment.

## 2. Uvula anatomy and swallowing physiology

According to the anatomical structure, the swallowing activities can be divided into 4 stages [13], and the uvula is involved in the swallowing activities in the pharyngeal stage. The uvula, as the protrusion of the free edge of the soft palate, is inseparable from the soft palate in its tissue structure. The soft palate consists of three layers: the central layer, the lamina propria, and the epithelial layer from inside to outside [8]. The central layer mainly includes muscles and serous mucous glands, among which the muscles include tensor veli palatine, levator veli palatine, palatoglossus, velopharyngeal and uvula, collectively referred to as palatine muscles [14, 15]. The lamina propria is composed of serous mucous glands and loose connective tissue. In the connective tissue, the mucosa near the oral cavity is covered with squamous epithelium, and the mucosa near the nasopharynx is pseudostratified ciliated columnar respiratory epithelium. The uvula is rich in nerve endings and receptors, which can accurately sense the air-flow changes after food enters the oral cavity, the temperature of the food, and the swallowing reflex induced by direct food stimulation, which acts on the pharyngeal plexus and the lesser palatine nerve [16] to control the uvula. The vertical muscle contracts, lifts the uvula and the soft palate, and moves the posterior wall of the pharynx forward. The three connect to block the gap between the nasopharynx and the oropharynx, preventing food from flowing back into the nasal cavity. With the receptors in the uvula, the pharyngeal stage is activated, and the soft palate and other muscles of the pharynx can work further to prevent food from refluxing into the mouth and preventing food from falling into the airway. Therefore, the uvula plays a very important role in the normal initiation and progress of swallowing function in the pharyngeal stage.

## 3. Pathological mechanism of uveal deviation in stroke dysphagia

The swallowing reflex relies on the peripheral nervous system such as glossopharyngeal nerve, vagus nerve, trigeminal nerve [17, 18] to transmit sensory impulses into the center, process the swallowing signal through the cerebral cortex and subcortical tissue, and then receive the afferent swallowing from the brain stem. Impulses are converted into executive responses, and finally excitatory and inhibitory signals are fed through efferent nerves to innervate the muscles involved in swallowing. The central regulation mechanism of swallowing is complex. At present, the basic mode of swallowing regulation mechanism that everyone agrees on is the central pattern generator of swallowing in the brainstem and medulla oblongata. Pharyngeal stage of the swallowing process [19, 20]. When cerebral hemorrhage or cerebral infarction occurs in the swallowing pattern generator, it can lead to prolongation of the pharyngeal phase [21], and simultaneous impairment of the bilateral swallowing center pattern generator can lead to the complete disappearance of the swallowing reflex. But the brainstem is only a lower-level center that controls swallowing, and its swallowing center pattern generator is regulated by the cerebral cortex. Cortical and subcortical structures such as the primary sensorimotor cortex, thalamus, supramarginal gyrus, temporal lobe, anterior cingulate gyrus, premotor area, and anterior insula of both sides of the brain are involved in swallowing activities, which can lead to dysphagia when damaged. Injuries to the right hemisphere are more likely to cause dysphagia in the pharyngeal stage characterized by pharyngeal retention, penetration, and aspiration [17, 20]. Swallowing signals are transmitted between the cortex and the brainstem by bilateral ascending and descending projection fibers, and damage to the cortex in one hemisphere or damage to the fibers connecting them to the brainstem can lead to dysphagia. In particular, the corticomedullary tract, as an important conduction pathway, affects the inhibitory neuron circuit when it is damaged, and its dissimilation effect on the medulla oblongata swallowing center will be weakened, thereby prolonging the pharyngeal stage of the swallowing process. If the injury is severe, even if the gag reflex is normal, it will lead to inability to initiate active swallowing [20].

Therefore, in the event of cerebral hemorrhage or cerebral infarction, the normal brain tissue structure will be damaged, edema, ischemia or necrosis, the swallowing center and pathways are damaged, and the swallowing signal conduction, processing, and processing cannot be completed, resulting in the inability to perform normal swallowing reflex, making it difficult to perform normal swallowing reflexes. The effector loses central regulation. The uvula, as one of the effectors in the swallowing reflex, manifests as a deviated palate or weak lift, resulting in abnormal activation of the pharynx. The pharyngeal phase initiation disorder affects a series of muscle groups with abnormal swallowing movements, such as insufficient laryngeal elevation, delayed opening of the cricopharyngeal muscle, and failure of the epiglottis to cover the larynx in time, resulting in choking and aspiration. Long-term weakness in uveal lift can also lead to atrophy of the uveal muscle further aggravating dysphagia.

#### 4. Application and mechanism of uvula stimulation in the treatment of dysphagia after stroke

Acupuncture has a reliable effect on the treatment of dysphagia after stroke, so there are more and more studies on acupuncture for dysphagia after stroke. The results of some studies have shown that the effect of stimulating the uvula in the treatment of dysphagia after stroke is not inferior to that of acupuncture therapy such as three tongue acupuncture and three pharyngeal acupuncture, with a total effective rate of 91.67% [22]. The method of stimulating the uvula firstly observes whether the uvula of patients with post-stroke dysphagia is skewed, swollen, congested or abnormal in activity, then performs the operation of stimulating the uvula with a popsicle stick, and then combines acupuncture on the uvula to early intervene and treat the patients with acute stroke. By stimulating the uvula, it can improve the circulation of qi and blood in the meridians where it is located, and play the role of dredging the meridians and regulating the viscera. The uvula is located in the throat, and the "Huangdi Neijing" records that the meridians related to the throat include the stomach, spleen, heart, small intestine, kidney, liver and Rendu two meridians, and then pass through the foot taiyang bladder meridian "from the top". into the brain", strengthening the connection between the throat and the brain. The human body is a whole. The twelve meridians plus the Ren and Du meridians lead the Qi of the six yin and six yang meridians respectively. The yin rises and the yang descends, and the yin and yang are balanced. It is closely connected with the brain and plays a therapeutic role [23]. In addition, the stimulation of the uvula is also based on the meridian's near-treat effect and local acupoint selection. By puncturing the uvula, it can enhance local acupuncture, enhance the sensitivity of the palatine muscles, strengthen the contraction force of the muscle group, improve the functional coordination ability of the muscle group, and enhance the expectoration and food swallowing; the combination of popsicle and acupuncture can also stimulate the uvula. Enhancing the excitability of the nervous system can activate the feedback regulation of the swallowing sensory signal transduction pathway, induce the swallowing reflex, and speed up the initiation of swallowing; stimulating the uvula can promote the reconstruction of the swallowing reflex, enhance muscle contraction, and help prevent stroke dysphagia. The patient had late uvula muscle atrophy. At present, there is no research on the modern mechanism of acupuncture on the uvula. It is expected that the research on the stimulation of the uvula in the treatment of dysphagia after stroke will become more and more in-depth in the future, so as to escort the patients with dysphagia after stroke.

#### 5. Summary and Outlook

Acupuncture and moxibustion have various acupuncture methods for the treatment of dysphagia after stroke, and each type of acupuncture has its own unique functions and advantages. Stimulating the uvula in the treatment of dysphagia after stroke is effective. We look forward to further research on whether the stimulation of the uvula combined with other acupuncture methods in the treatment of dysphagia after stroke can further improve the effect. The treatment approach can provide experience and reference for further clinical research in the future.

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