

Review

Anatomic Review of Ten Important Canine Acupuncture Points Located on the Head: Part II

Martha A. Littlefield DVM, MS*

ABSTRACT

This paper reviews 10 commonly used acupuncture points located in and around the head and the relative anatomy associated with these points. Common anatomical structures are demonstrated with their relationship to needle placement in dogs with some comments on the cat.

Keywords: canine anatomy, acupuncture, traditional Chinese veterinary medicine

*Address correspondence to Dr. Martha Littlefield (drmarthallittlefield@icloud.com)

ABBREVIATIONS

m	Muscle
mm	Muscles
V	Cranial nerve V (trigeminal)
V₁	Branch of V (ophthalmic nerve)
V₂	Branch of V (maxillary nerve)
V₃	Branch of V (mandibular nerve)
VII	Cranial nerve VII (facial nerve)
IX	Cranial nerve IX (glossopharyngeal nerve)
X	Cranial nerve X (vagus nerve)
XI	Cranial nerve XI (accessory nerve)

Acupuncture points and their effect on the surrounding and distant environment in the dog can seem mysterious. When the mystery is matched with the surrounding anatomy, clues to how stimulation with dry needle, electro-acupuncture or aquapuncture work may provide answers. This article is designed to cover some very commonly used acupuncture points in and around the head and their anatomically-related structures beneath the skin. Some of the points are classical acupoints, while some are transpositional acupoints.

To begin a discussion of anatomy, it is important to understand acupoint nomenclature which is divided primarily into traditional and Western nomenclature systems. In the traditional (classical) nomenclature, acupoints are named based on anatomic location (*Wei-jian*, “tail” “tip”), association with *Zang-Fu* organs (“*Wei-*

shu”, Stomach association point, “stomach-back”), therapeutic (“*Duan-xue*”, “stopping hemorrhage”) and symbolic (imaginative descriptive names to suggest location: “*Long-hui*”, “Dragon Meeting”). Western nomenclature assigns a unique combination of letters and numbers that correspond to an acupoint location on 1 of the 14 Meridians (example: LI-11, BL-23).

Acupoints are typically located in or near muscles, blood vessels, lymph vessels or nerves. Each acupoint has a unique location and physiological effect.¹ With this in mind, the anatomic location of ten common canine points located on the head will be presented with a discussion of the detailed anatomy associated the needle placement.

ACUPUNCTURE POINT CLINICAL ANATOMY

Stomach 6

Stomach 6 (ST-6, *Jia-che*, *Bao-sai*), known as “Jawbone” or “Embrace the mandible” is found in the depression in the middle of the masseter muscle just cranial to the angle of the mandible (Figure 1). It is used for dental pain, mandibular pain, facial paralysis, headache, and head shaking.

Anatomical Information²

Along with the other three muscles of mastication (temporalis, medial pterygoid, lateral pterygoid), motor innervation of the masseter is supplied by the mandibular division (V₃) of the trigeminal nerve (cranial nerve V). Sensory innervation to the skin surface of this area is provided by a facial branch of the auriculotemporal nerve (branch of mandibular nerve-V₃) which emerges between the base of the auricular cartilage (caudally) and the masseter muscle (rostrally) (Figure 2). The depression

From: Department of Biomedical Sciences, Clinical Associate Professor of Anatomy, LSU School of Veterinary Medicine, Baton Rouge, Louisiana USA
Author Professional Certification: CVA

that is felt within the masseter muscle is the masseteric fossa.

All sensory information from the face is sent to the trigeminal nucleus. This large nucleus extends throughout the brainstem, from the midbrain to the medulla, continuing into the cervical cord. Although primarily sensory, the trigeminal supplies masticatory innervation (as defined previously) with the nucleus located in the pons area near the sensory nucleus.

Also innervating this area, the facial nerve (sensory, motor, parasympathetic functions) travels from the pons through the facial canal exiting at the stylomastoid foramen (caudal to external acoustic meatus). First, this nerve must course rostrally and ventrally to the cartilage of the ear canal and then travel dorsal and rostral with exits toward its destinations very close to (and sharing fibers with) the trigeminal nerve. This complicated pathway of the facial nerve and trigeminal nerve with their interconnections may be responsible for the multiple results when acupuncture needles are placed at this acupoint. Consider that placement of ST-6 is targeting, from superficial to deep, cranial nerves V (trigeminal) for skin, VII (facial) for muscles of facial expression and then V (muscles of mastication) again (Figure 3).

The parotid salivary duct wrapped in its buccopharyngeal fascia travels straight across the masseter muscle to empty into the buccal mucosa at tooth 108 and 208 (right and left upper premolar 4). One anatomical structure within the masseteric fascia that will be punctured with a needle at ST-6 is the platysma (Figure 4). This well-developed muscle sheet begins at the tendinous raphe of the neck (as the cutaneous colli m.) and courses over the parotid salivary gland and masseter region to insert at the commissure of the lips where it inserts between fascicles of the orbicularis oris m. The zygomaticus m. also crosses this area. The innervation to

the platysma and zygomaticus mm. is the dorsal and ventral buccal branches of the facial nerve.

Comments

While the facial nerve is primarily considered a motor nerve, the sensory components triggered by the facial nerve have the cell body in the geniculate ganglion and axons that travel into various regions of the brain. This muscular region is also derived from branchial arches and should send afferents to the solitary nucleus via the solitary tract. This is a poorly dissected area by anatomists for afferents from the platysma. If it does go to the solitary nucleus, other neurons are entering from the auditory tube, pharynx, larynx, esophagus, thoracic and abdominal viscera. The most rostral end of the nucleus receives inputs from cranial nerves IX (caudal 1/3 of tongue), X (larynx) and VII (rostral 1/3 of tongue). Efferents from the solitary nucleus have numerous terminals including the hypothalamus and amygdala (Figure 5).

The internal brain anatomy may be causing most reader's eyeballs to roll but these connections do make sense for what may be happening within the brain after stimulation of ST-6 with an acupuncture needle. The nerves that reside deep to the skin within the masseteric fascia and superficial to the masseter muscle are the dorsal and ventral buccal branches of the facial nerve and the auriculotemporal branch of the mandibular (V_3) (Figure 6). Additionally, it is important to remember that any disturbance in the fascia or release of the extensive fascia in this area will have effects on any nerve. For example, the masseteric fascia with its collagen fibers surround nerves which travel down to the different masseteric muscle fibers and eventually blend into the periosteum of the bone. Importantly, where there is connective tissue, there are blood vessels to the capillary level and, with them, motor and sensory nerves.

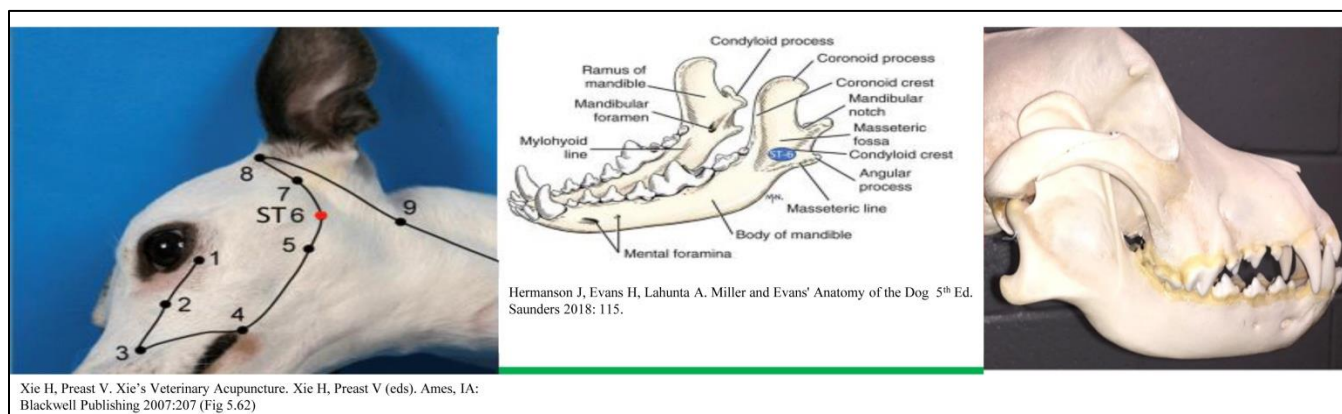


Figure 1: ST-6 is found in the depression in the middle of the masseter muscle just cranial to the angle of the mandible. It is used for dental pain, mandibular pain, facial paralysis, headache and head shaking.³

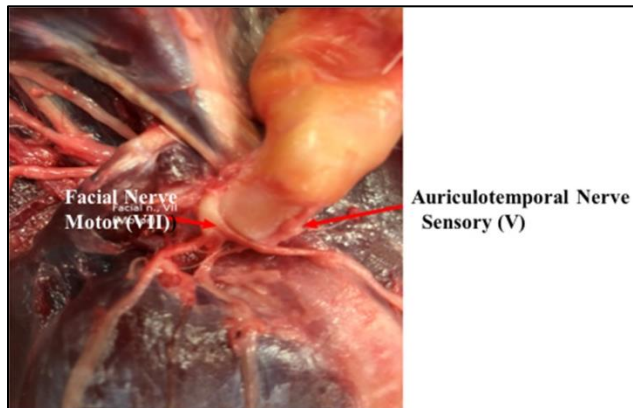


Figure 2: The auriculotemporal nerve (branch of mandibular-V₃) emerges between the base of the auricular cartilage (caudally) and the masseter muscle rostrally. It supplies sensory innervation to the skin over the masseter muscle.

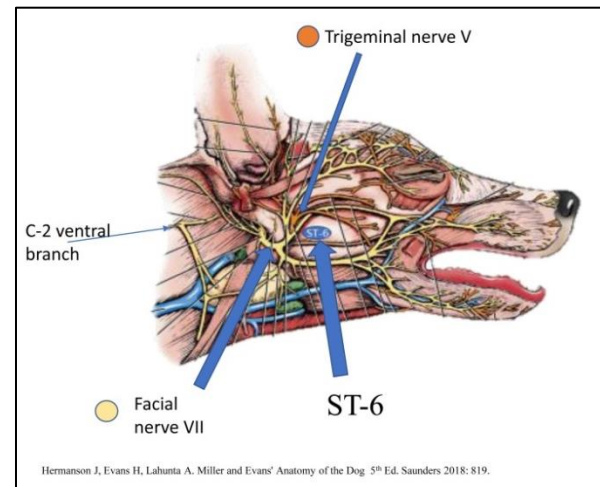


Figure 3: Placement of ST-6 targets superficial to deep: cranial nerves V (trigeminal) for skin, VII (facial) muscles of facial expression and then V (muscles of mastication).³

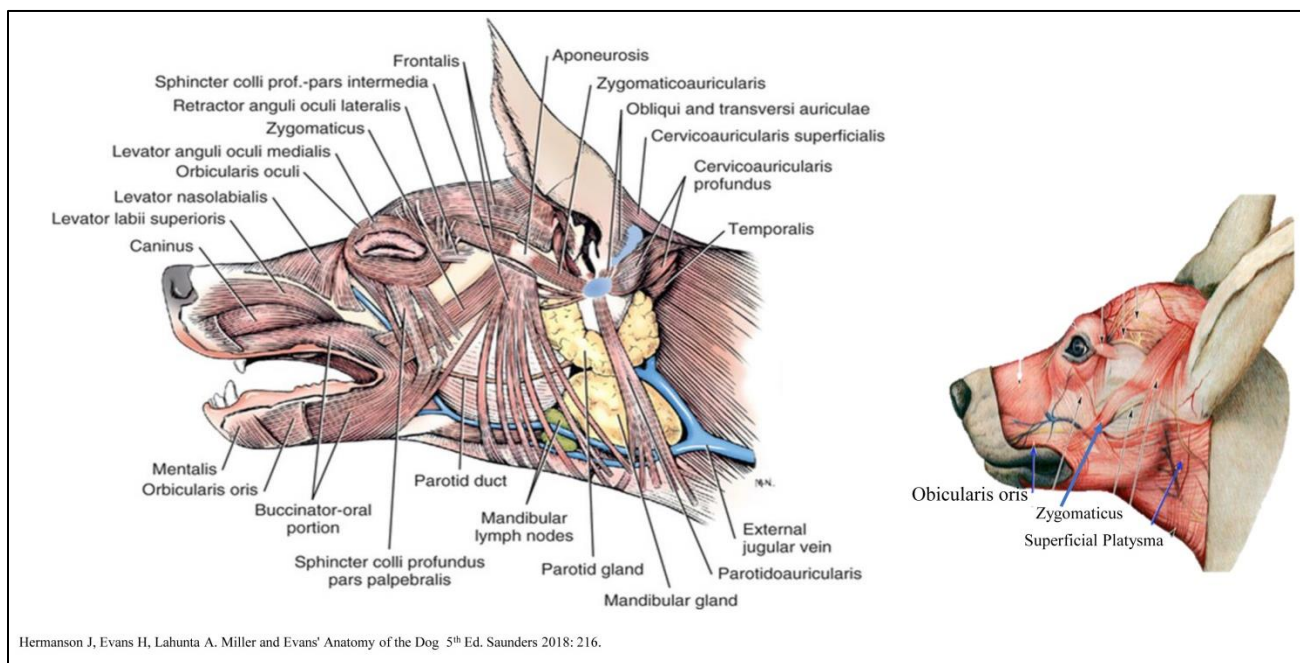


Figure 4: Muscles of the face demonstrating deeper muscles (left) as well as the superficial platysma muscle (right) which courses over the tendinous raphe of the neck, parotid salivary gland, masseter region, and inserts at the commissure of the lips between the fascicles of the orbicularis oris muscle.³

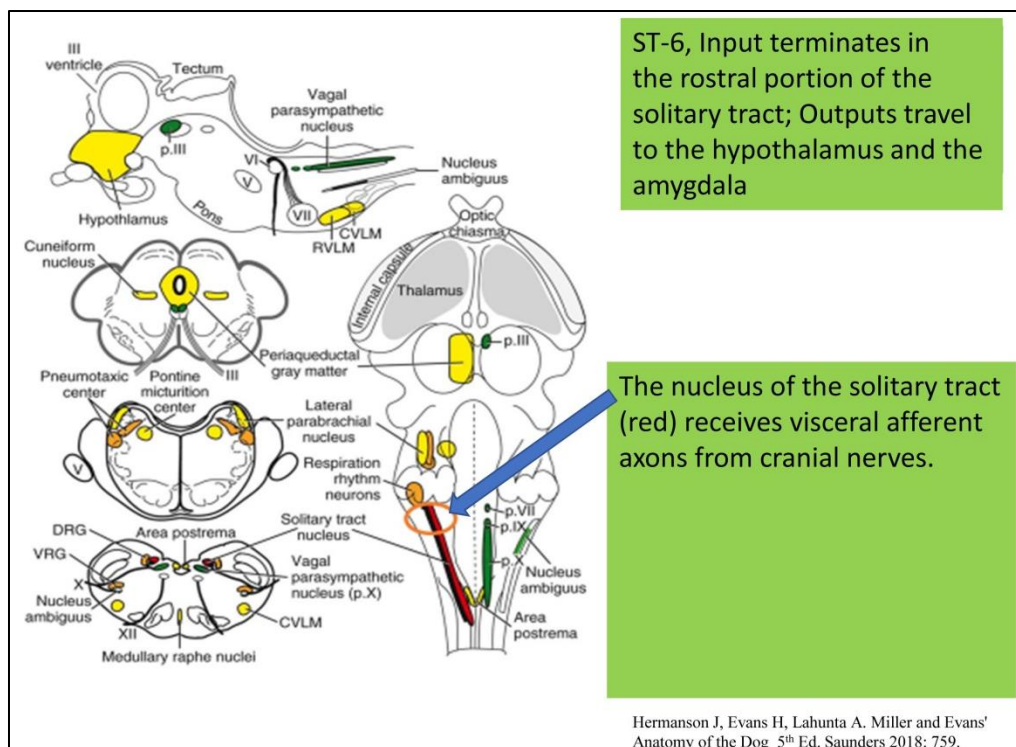


Figure 5: The muscular region of ST-6 should send afferents to the solitary nucleus via the solitary tract.³

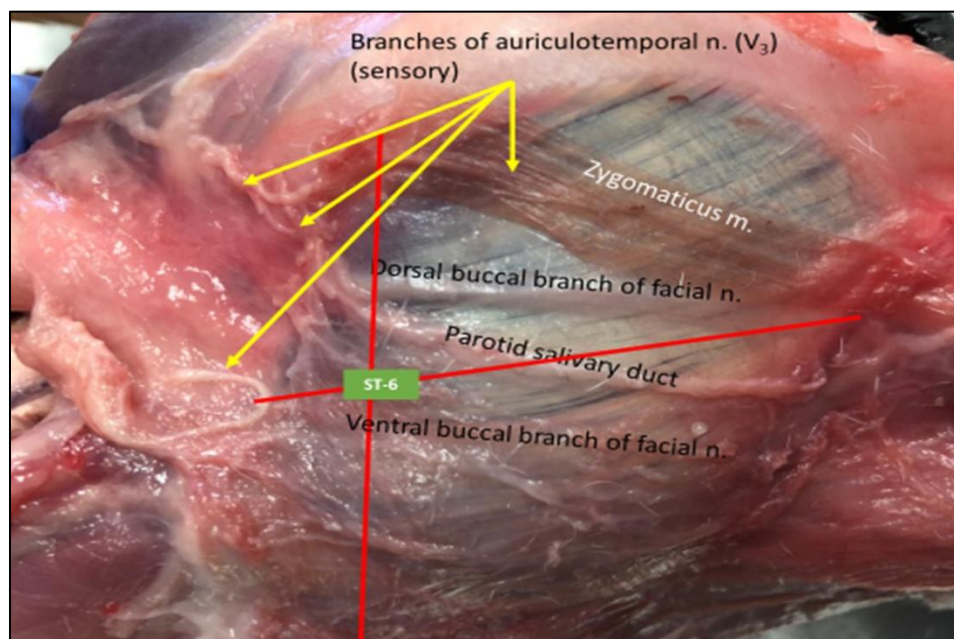


Figure 6: Deep anatomic dissection adjacent to ST-6 reveals an area rich with important structures. The auriculotemporal nerve is a branch of the mandibular nerve (V₃ trigeminal) and supplies sensory innervation to regions located on the side of the head. Also innervating this area is the buccal branch of the facial nerve (VII) which has sensory, motor, and parasympathetic functions. The parotid salivary duct courses across the surface of the masseter muscle. The platysma muscle, which is innervated by cranial nerve VII, has been removed.

Triple Heater 17

Triple Heater 17 (TH-17, *Yi-feng*, “Wind Screen”) is ventral to the ear in the depression between the mandible and cranial to the mastoid process of the temporal bone (Figures 7 and 8). It is used for otitis, cervical stiffness, facial paralysis and swelling in the face.

Anatomical Information²

Near the location of this acupoint, the facial nerve exits the stylomastoid foramen, with motor branches to the stapedius muscle of the middle ear, sensory fibers from taste and mechanoreceptors (fungiform papillae, rostral two-thirds tongue) and axons (preganglionic parasympathetic) to salivary glands and glands of the tongue (Figure 9). It then gains axons from the auricular branches of the vagus nerve (which supplies the external ear canal) and will send branches to the caudal auricular muscles (which rotate the ear laterally as it courses caudally close to the dorsal midline of the neck).

The facial nerve (VII) curves around the annular cartilage and gives off branches to the digastricus (inserts on mandible, opens the jaws) and the stylohyoideus mm (raises basihyoid bone). Sensory information enters the facial nerve at this point from the surface of the ear. As the facial nerve curves near the caudal border of the mandible, it divides into several branches. One branch innervates muscles over the parotid salivary gland and superficial muscles over the neck and then joins cranial nerve XI. Another divides into dorsal and ventral buccal branches and distributes to muscles of facial expression. The dorsal branch receives sensory inputs from the area ventral to the zygomatic arch on the caudal aspect of the cheek from cranial nerve V. The last branch distributes motor input to several superficial facial muscles like the orbicularis oculi, rostral auricularis and levator nasolabialis muscles (mm) as well as some around the rostral ear area.

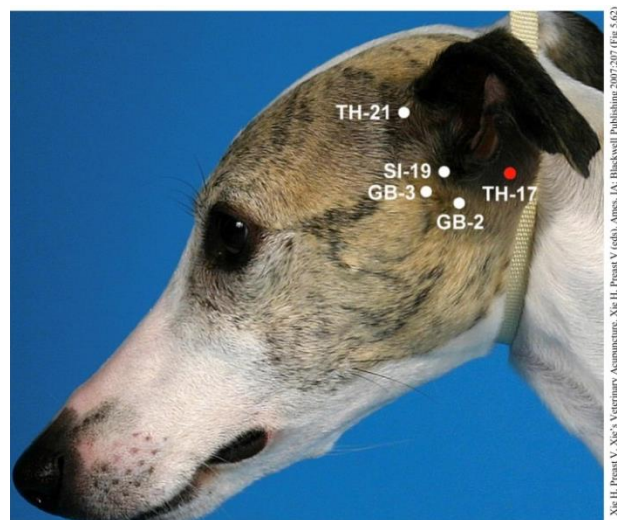


Figure 7: Location of TH-17 acupoint ventral to the ear.

Comments

An acupuncture needle influencing TH-17 will therefore have some direct influences on the facial nerve (VII) with lesser effects on cranial nerves V, X, and XI. TH-17 is very close to where the facial nerve exits the skull, and, therefore, has far-reaching effects for much of the lateral sensory and motor nerves innervating the face.

Triple Heater 21

Triple Heater 21 (TH-21, *Er-men*, “Ear Gate”) is rostral to the pretragic incisure directly dorsal to SI-19 at the caudal border of the mandible and dorsal to the condyloid process of the mandible with the mouth open, rostral to the scutiform cartilage edge (Figures 10 and 11). This point is often used for ear and dental disease. It is important to remember that the ear canal is surrounded by the parotid salivary gland.

Anatomical Information²

This is a commonly used point for dental and ear pain. Sensory input from the maxillary division (V_2) of the trigeminal nerve (V) enters the rostral alar foramen and then through the round foramen of the skull, quite close to the ear and dentition. Other branches of the trigeminal nerve enter the brain cavity at the orbital fissure (ophthalmic, V_1) and oval foramen (mandibular, V_3). The trigeminal ganglion is present immediately inside the skull in this area with fibers traveling to the trigeminal nucleus. This is a very long tract which extends through the medulla oblongata and pons. Nociceptive (painful stimuli) and thermoreceptive fibers enter the spinal tract of the trigeminal nerve and synapse by modality in its nucleus. In addition, there are axons carrying impulses from the touch (Meissner) corpuscles. Proprioceptive information travel to unipolar nuclei of the nucleus of the mesencephalic tract of V and then travel to other regions of the brain.

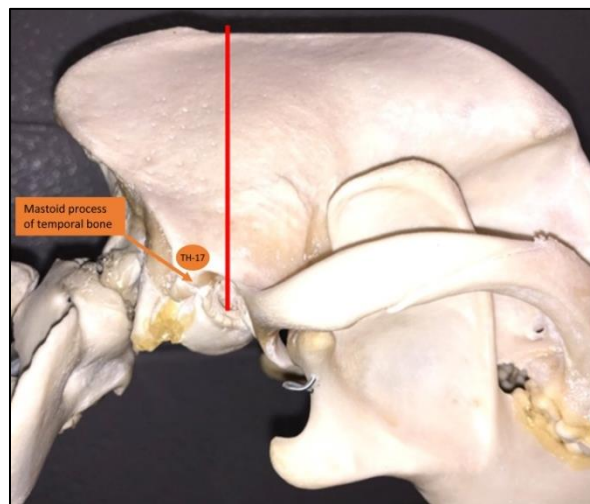


Figure 8: The TH-17 acupuncture point is ventral to the ear in the depression between the mandible and cranial to the mastoid process of the temporal bone. The red line demonstrates the center of the ear canal.

Comments

While some axons from the nucleus of the spinal tract of the trigeminal (V) interact with other cranial nerves (VII, IX, X) the axons can decussate and travel to the opposite ventral caudal nucleus of the thalamus. The medial part of this thalamic nucleus relays primary information from cutaneous and proprioceptive receptors to the primary and secondary somesthetic areas of the cerebral cortex. These areas in the cerebral cortex can regulate sensory input to the brain by sending axons to primary afferent axons (presynaptic inhibition). Thus, pain can be relieved by the stimulation of this plethora of nerves.

Small Intestine 19

Small Intestine 19 (SI-19, *Ting-gong*, “Hearing Place”) is rostral to the tragus and ventral to TH-21 at the caudal border of the mandible and slightly dorsal to the condyloid process of the mandible (Figures 12 and 13). It is ventral to the rostral portion of the scutiform cartilage and TH-21 (Figure 11). It is used for otitis, deafness, headshaking, dental pain, mania and epilepsy. Needle placement for this commonly used acupuncture point is perpendicular to a depth of 0.5-1 *cun*.

Anatomical Information²

The anatomical location of this point has many features in common with TH-21. With placement slightly ventral to TH-21, more stimulation of sensory afferent signals via the trigeminal (V) and facial nerves (VII) are possible (Figure 14). The facial nerve inputs have been

discussed within the TH-17 description above. It should be noted that the zygomaticotemporal nerve of the mandibular division of cranial nerve V collects sensory information over the lateral and rostral areas around the tragus, as well as other areas such as the dorsomedial edge of the ear, over the zygomatic arch and skin over the mandible. This nerve travels ventrally, rostral to the auricular cartilage, then curves around the retroarticular process of the temporal bone to enter into the oval foramen. It also collects sensory information from the external acoustic meatus skin and discharges parasympathetic postganglionic axons to the parotid and zygomatic salivary glands that piggy-back on the mandibular nerve from the otic ganglion and cranial nerve IX. After the mandibular nerve enters the cranial vault, the cell bodies in the trigeminal ganglion project axons to the spinal tract of the trigeminal nerve and its nucleus. The rest of the pathway in the brain is similar.

Gall Bladder 14

Gall Bladder 14 (GB-14, *Yang-bai*) is a commonly used point that is a crossing point of the Gallbladder and *Yang-wei* Channels. It is used for shoulder pain, facial paralysis and ocular diseases such as keratitis, conjunctivitis and uveitis. Commonly called the “clown point,” GB-14 is located 1 *cun* dorsal to the midpoint of the extended eyebrow, on a vertical line dorsal to the pupil. It is rostral to the *Tai Yang* point. On a skeleton, the area is identified by a slight irregularity in the orbital ridge of the frontal bone (Figure 15). The acupuncture needle is inserted obliquely to a depth of 0.5 *cun*.

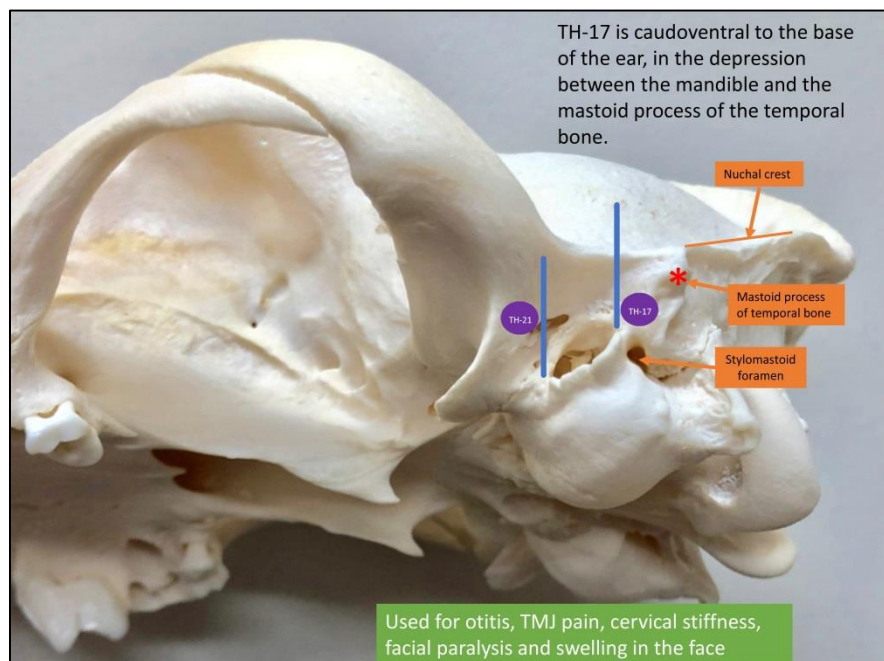


Figure 9: Near the location of TH-17, the facial nerve exits the stylomastoid foramen, with motor branches to the stapedius muscle of the middle ear, sensory fibers from taste and axons to salivary glands /tongue. The blue lines mark the location of the ear canal.

Anatomical Information

The ophthalmic nerve (V_1) provides sensory innervation to the cornea. The three main sensory branches of this nerve include (from medial to lateral) the nasociliary (infratrochlear), frontal, lacrimal nerves. The area surrounding GB-14 is innervated by the ophthalmic nerve branches: the frontal and infratrochlear nerves (Figure 16). The frontal nerve is located on the dorsal ridge of the frontal bone and passes sensory information toward the brain under the periorbital, dorsal to the dorsal oblique and dorsal rectus muscles of the eyeball, through the orbital fissure of the skull (Figure 17). After the

ophthalmic nerve passes back toward the skull through the orbital fissure, it enters the sensory nuclei of the trigeminal nucleus which sends information to the spinal tract of the trigeminal nerve. Axons conveying touch synapse in the pontine sensory nucleus of the trigeminal nerve.

The palpebral nerve (motor branch of facial, VII) is also located in the GB-14 area under the cutaneous muscles of the face (Figure 18). This nerve innervates the orbicularis oculi muscle which is responsible for involuntary blink as well as voluntary wink of the eyelids.



Figure 10: TH-21 is rostral to the pre-tragic incisure at the caudal border of the mandible.

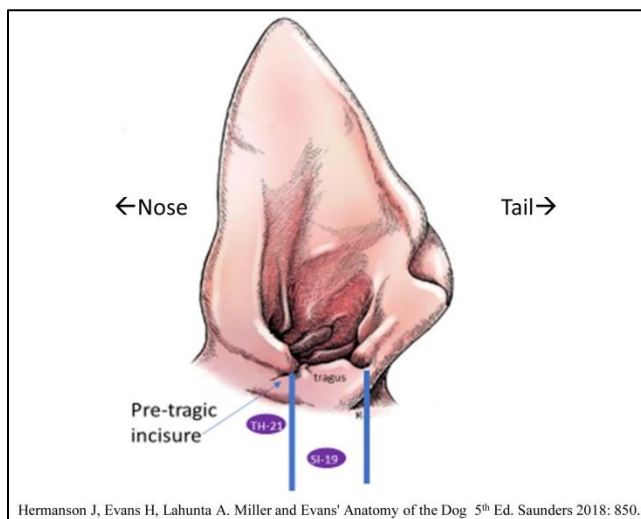


Figure 11: Location of TH-21 and SI-19 with TH-21 cranial to the pre-tragic notch and SI-19 rostral to the tragus and ventral to TH-21. The blue lines indicate the vertical portion of the ear canal.³

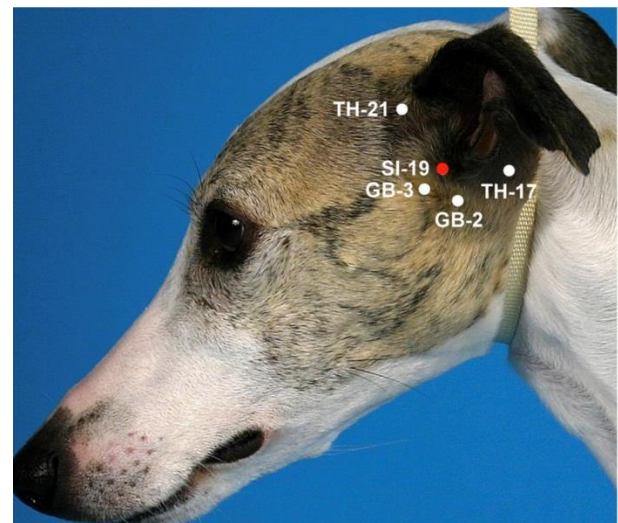


Figure 12: Location of SI-19 acupoint rostral to the tragus and ventral to TH-21

Comments

The spinal tract of the trigeminal nerve projects noxious, temperature and crude touch stimuli from the face, nasal and oral cavities, including the teeth. Surprisingly, the spinal tract of the trigeminal nerve also receives afferents from the vagus (laryngeal area), glossopharyngeal (pharyngeal area) and facial nerves (concave surface of the ear).

SUMMARY

It is hoped that continued anatomical evaluation of the nerves and fascia and their role in the relief of pain

and other clinical signs associated with acupuncture will help clinicians choose points with more purpose and thought. More research is certainly needed to continue to make connections between the needle and the actual site in the brain that is responsible for the clinical effects observed when using acupuncture as a therapeutic modality.

Declaration of Interest

The author declares that there is no conflict of interest that could be perceived as prejudicing the impartiality of this paper.

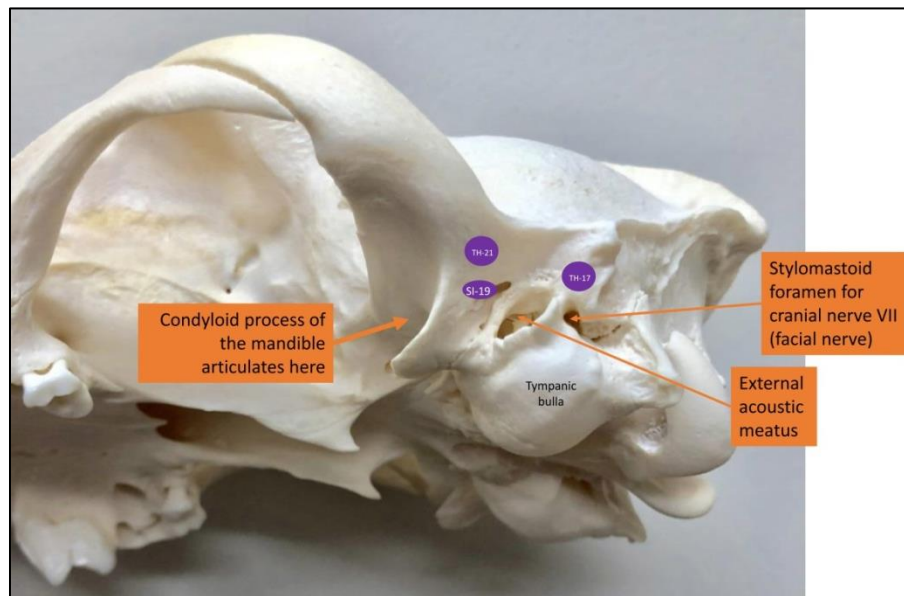


Figure 13: Bony landmarks on the skull adjacent to the acupoint locations of TH-21, TH-17 and SI-19.

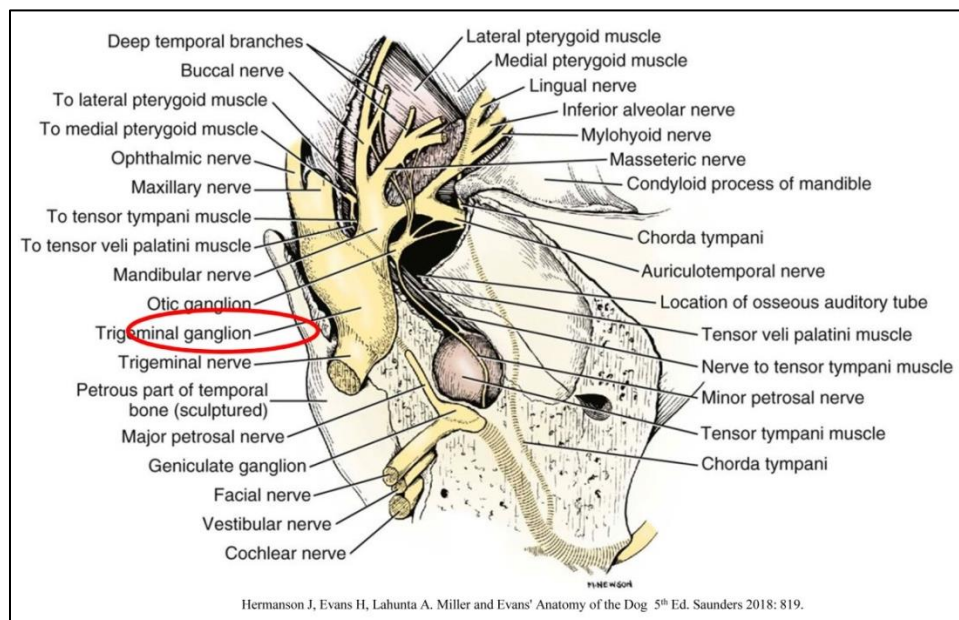


Figure 14: Stimulation of SI-19 stimulates fiber tracts which travel from the inner ear skin toward the trigeminal ganglion on its way to the somatosensory cortex.³

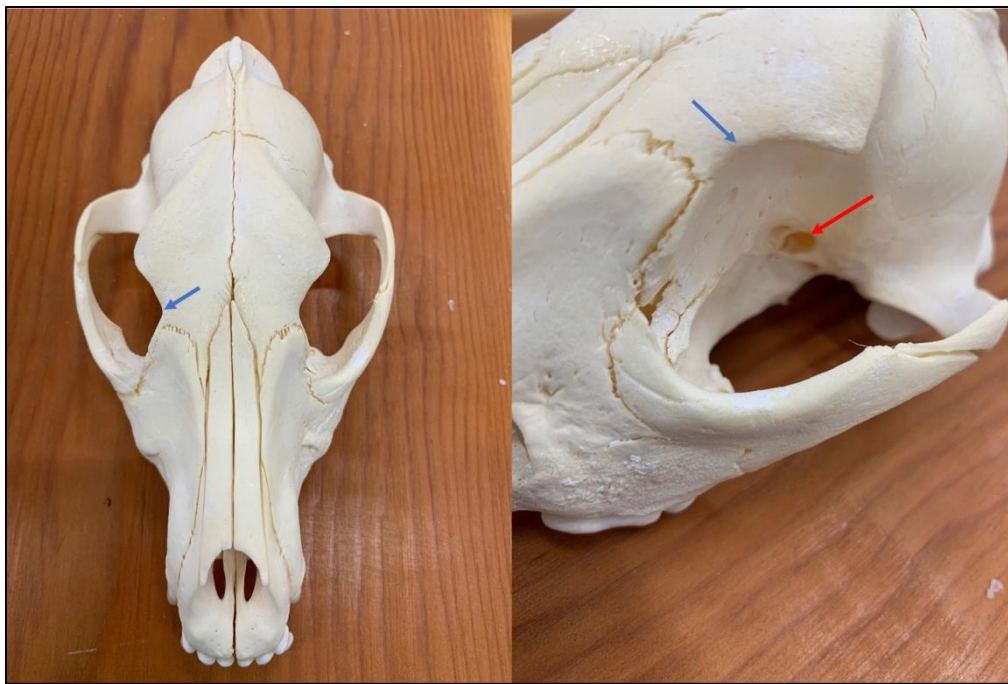


Figure 15: The blue arrow indicates the notch on the orbital ridge of the frontal bone where the frontal nerve resides. The red arrow indicates the orbital fissure. Just rostral and dorsal is the orbital canal, while caudal and ventral is the rostral alar foramen.

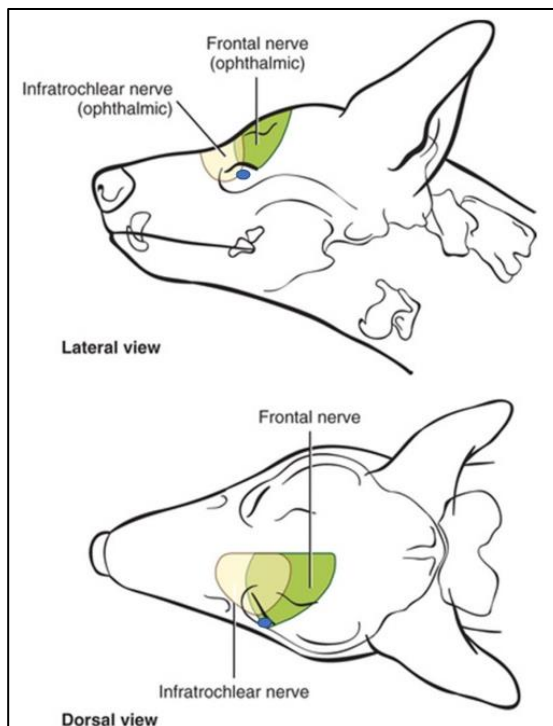


Figure 16: Cutaneous areas of the major branches of the ophthalmic nerve (V). The clear areas are zones of overlap between adjacent cutaneous areas. Both the frontal and infratrochlear nerves supply sensory information from the dorsal medial aspect of the eyelid. GB-14 is located at the intersection of the innervation of the two nerves (blue circle).^{3,4}

Hermanson John W., Howard Evans, Alexander Lahunta.
Miller and Evans' Anatomy of the Dog - E-Book 5th Edition.
Saunders 2018: 819.

Whalen LR, Kitchell RL. Electrophysiologic studies of the cutaneous nerves of the head of the dog. *Am J Vet Res* 44:615-627, 1983a. Figure 19.13 modified with permission.

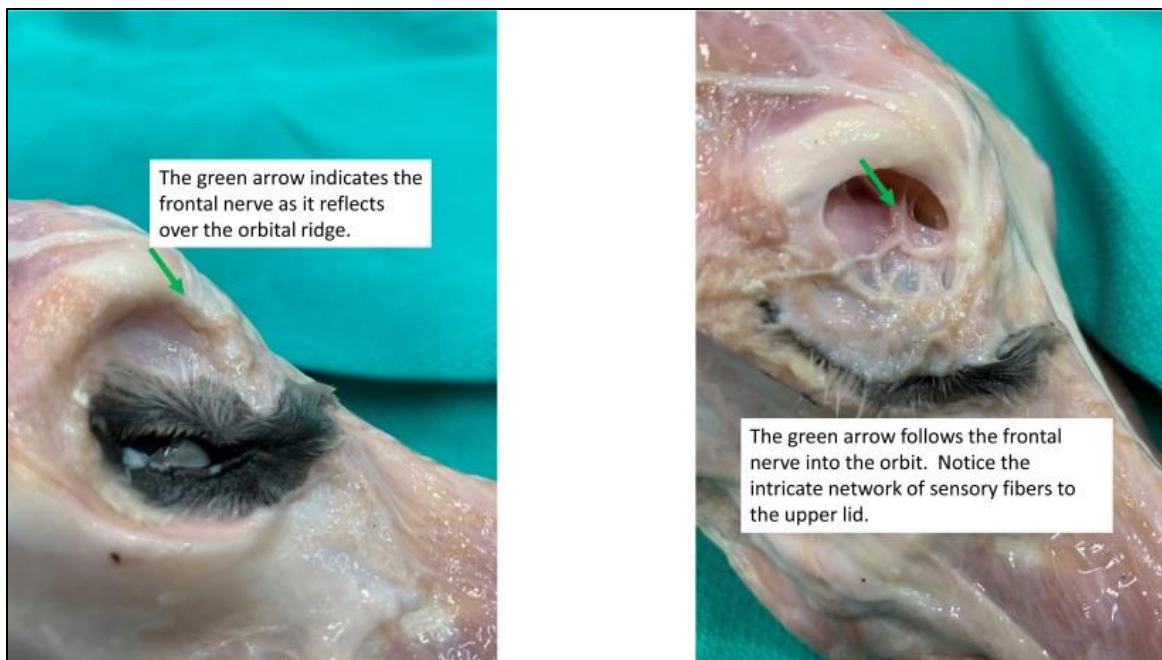


Figure 17: The frontal nerve (branch of ophthalmic) reflects over the orbital ridge near GB-14 acupoint.

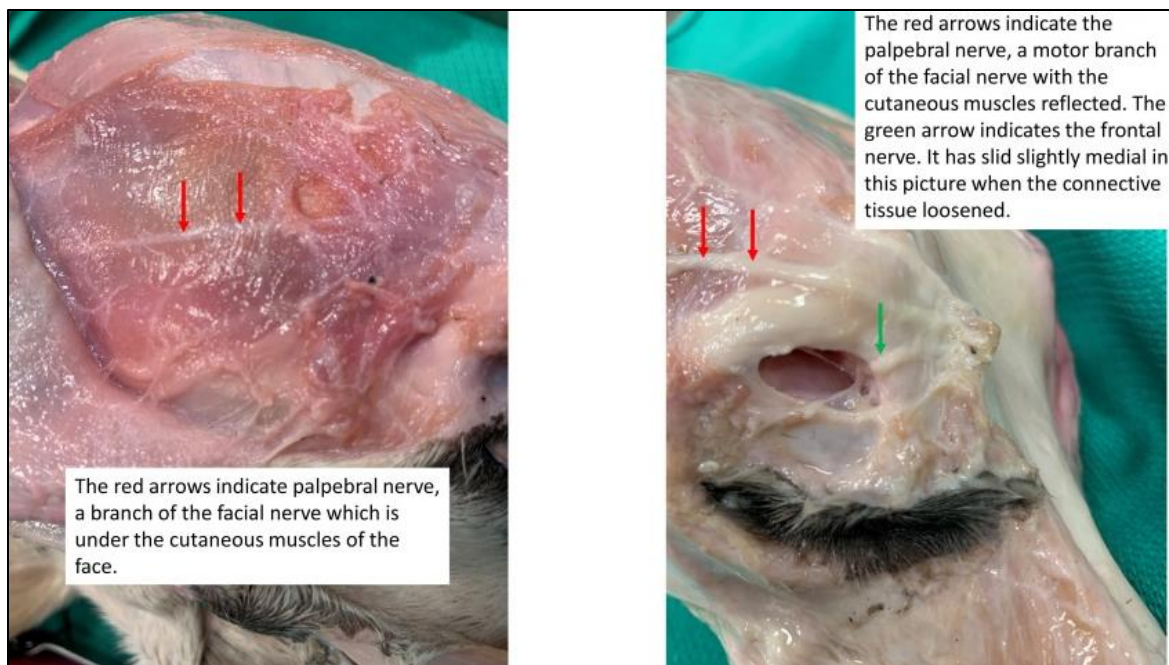


Figure 18: Location of palpebral nerve (branch of facial –VII) coursing in the area of GB-14 acupoint.

Funding

The author did not receive any specific grant or funding from any organization in the public, commercial, or non-profit sectors.

REFERENCES

1. Xie H, Preast V. Introduction to acupuncture points. Xie's Veterinary Acupuncture.. Ames, IA: Blackwell Publishing 2007: 13-28.
2. He T, Zhu W, Du S et al. Neural mechanisms of acupuncture revealed by FMRI studies. Auton Neurosci 2015; 190:1-9.
3. Hermanson J, Evans H, Lahunta A. Miller and Evans' Anatomy of the Dog 5th Ed. Saunders 2018: 115, 216, 759, 819, 850.
4. Whalen L, Kitchell R. Electrophysiologic studies of the cutaneous nerves of the head of the dog. Am J Vet Res 1983; 44:615-627. (Figure 19.13 modified with permission).