

A Revised Neuromyofascial Understanding for the Neck, Head and Facial Channel Sinews based on the Ling Shu

Abstract

The Channel Sinews ('Jing Jin', 筋經), originally described in the *Ling Shu* (Divine Pivot), have lost much of their clinical significance and relevance in modern acupuncture practice. In the contemporary traditional Chinese medicine (TCM) curriculum, the Channel Sinews are presented as symbolic descriptions of the myofascial system. This approach has its limitations, as myofascial anatomy alone does not adequately account for the pathways of the Channel Sinews on the neck, head and face. We have found that when the cranial and cervical nerves are included, there is a very high degree of overlap between neuromyofascial anatomy and the traditional pathways and disease descriptions of the Channel Sinews. This paper compares the Channel Sinews on the neck, head and face with neuromyofascial anatomy and assigns precise anatomical structures and landmarks. Our analysis demonstrates that there is a very high probability that the *Ling Shu* was recording precise neuroanatomical structures when describing the Channel Sinew pathways of the neck, head and face.

NB: In order to print the following figures in colour, they have been placed at the beginning of the article; please refer back to the appropriate image from each section.

By: Melissa Lee
& Poney Chiang

Keywords:
Channel Sinews, Jing Jin, Traditional Chinese Medicine, cranial nerves, peripheral nerves, fascia, anatomy, acupuncture, neuromyofascial anatomy.

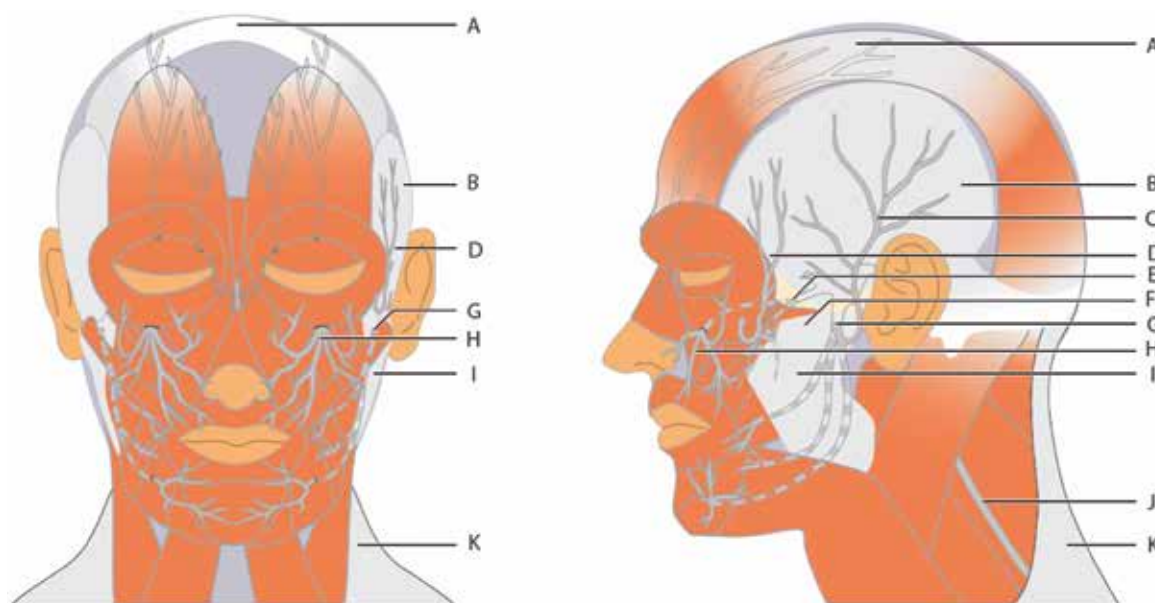


Figure 1: Modern Channel Sinew Pathway Hand Yang Ming (Large Intestine)

Orange: representation of muscles of the face/neck. **Dotted Grey:** Internal Hypoglossal nerve. **Grey/White:** corresponds to the following structures: A: Galea aponeurotica; B: Temporalis; C: Auriculotemporal nerve, mandibular branch of trigeminal nerve; D: Zygomaticotemporal nerve; E: Maxillary branch of trigeminal nerve; F: Pterygoids (Lateral); G: Mandibular branch of trigeminal nerve; H: Infraorbital nerve; I: Masseter; J: Spinal accessory nerve; K: Upper trapezius

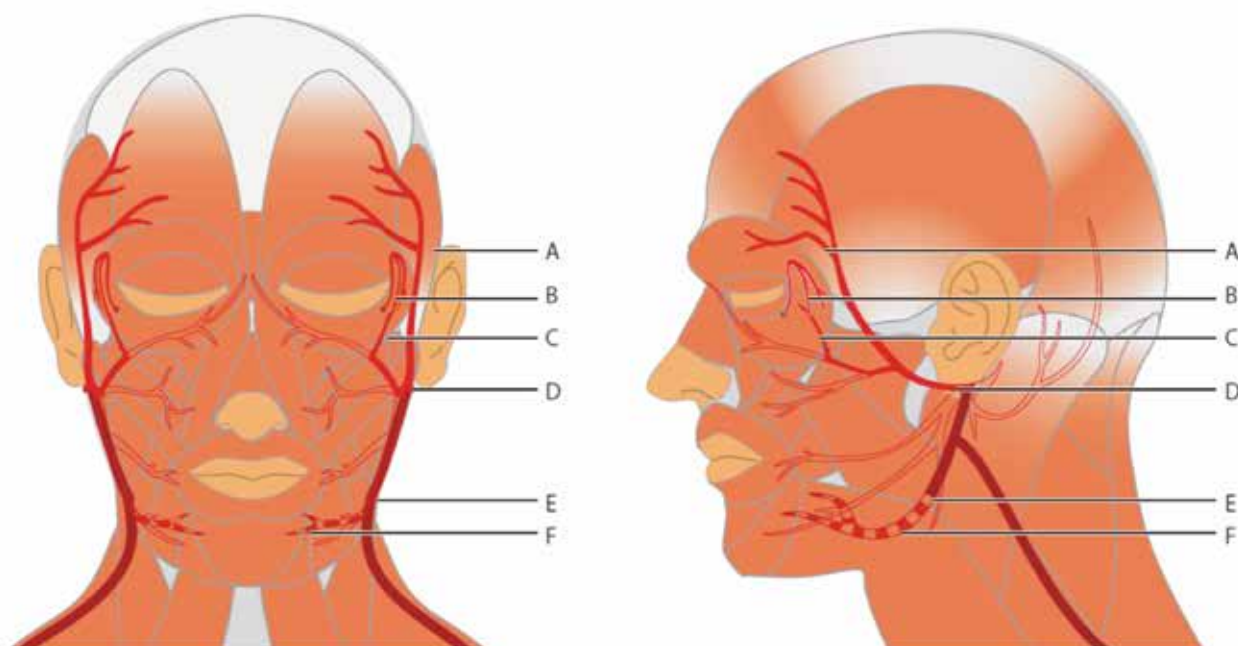


Figure 2: Modern Channel Sinew Pathway Hand Shao Yang (San Jiao)

Orange/White: representation of muscles and fascia of the face/neck. *Red Outlined Nerves:* representation of facial nerve for reference. *Red/Dotted Red Line:* corresponds to the specific following structures: A: Temporal branch of the facial nerve; B: Communicating branch between zygomatic branch of facial nerve and zygomaticotemporal branch of trigeminal nerve; C: Zygomatic branch of facial nerve; D) Facial nerve trunk; E: Mandibular angle; F: Hypoglossal nerve (dotted to represent internal structure)

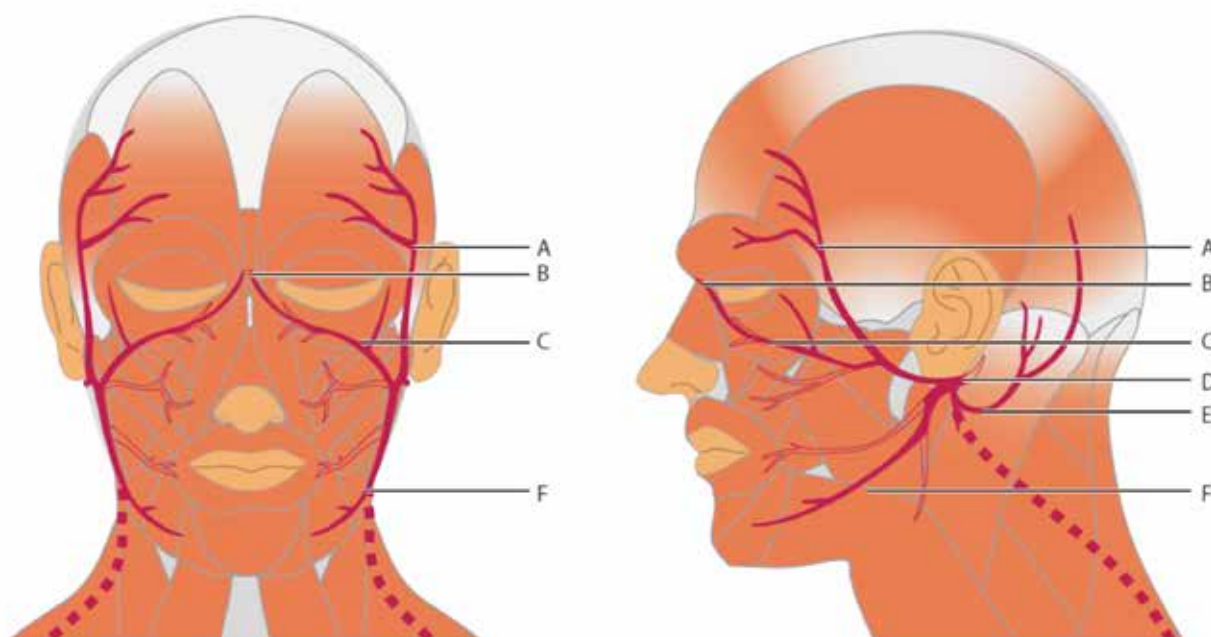


Figure 3: Modern Channel Sinew Assignment Hand Tai Yang (Small Intestine)

Orange/White: representation of muscles and fascia of the face/neck. *Magenta Outlined Nerves:* extension of facial nerve for reference. *Dotted Line:* Internal nerve structure. *Dark Magenta:* corresponds to the specific following structures: A: Temporofacial division of facial nerve; B: Procerus; C: Buccal branch of facial Nerve to the Procerus sub-branch; D: Facial nerve trunk (exiting from stylo-mastoid foramen); E: posterior branch of facial nerve; F: Cervicofacial division of facial nerve

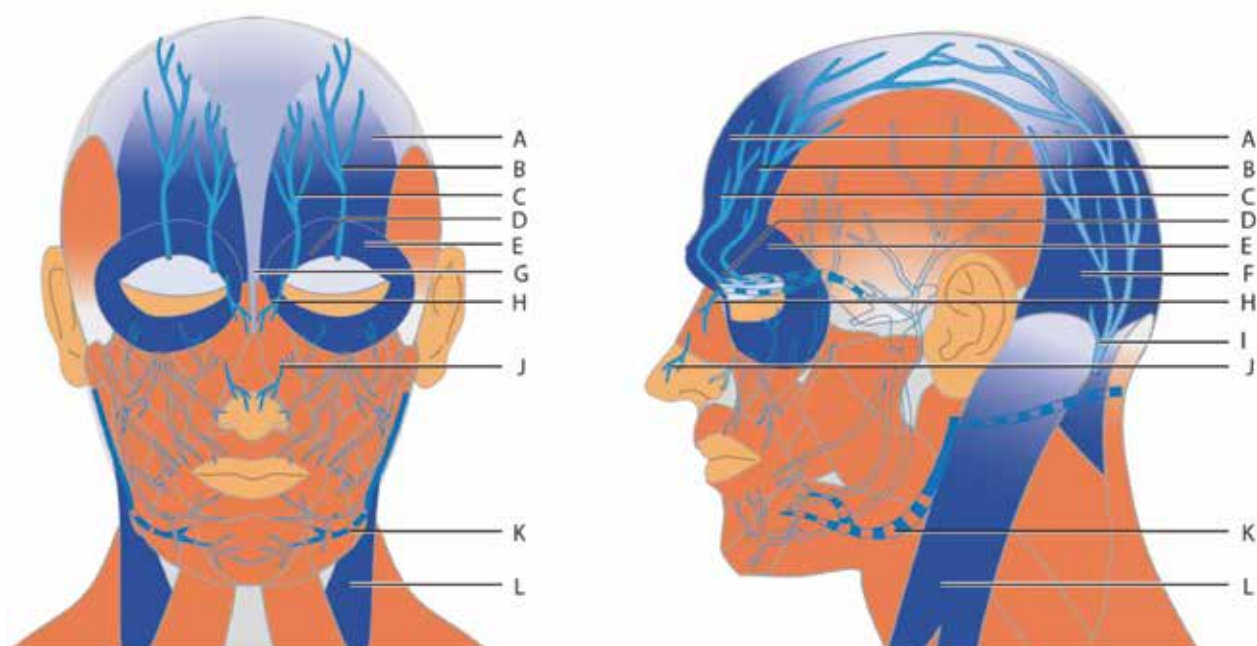


Figure 4: Modern Channel Sinew Pathway (Urinary Bladder)

Orange/White: representation of muscles and fascia of the face/neck. *Blue Hollow Nerves:* extension of facial nerves for reference. *Dotted Line:* Nerves that go internally. *Solid Dark Blue and Light Blue:* corresponds to the specific following structures: A: Frontalis; B: Supraorbital nerve; C: Supratrochlear nerve; D: Corrugator and superior palpebrae muscles (in this region) E: Orbicularis oculi; F: Occipitalis; G: Procerus; H: Infratrochlear nerve; I: Greater occipital nerve; J: External nasal nerve; K: Hypoglossal nerve; L: Sternocleidomastoid

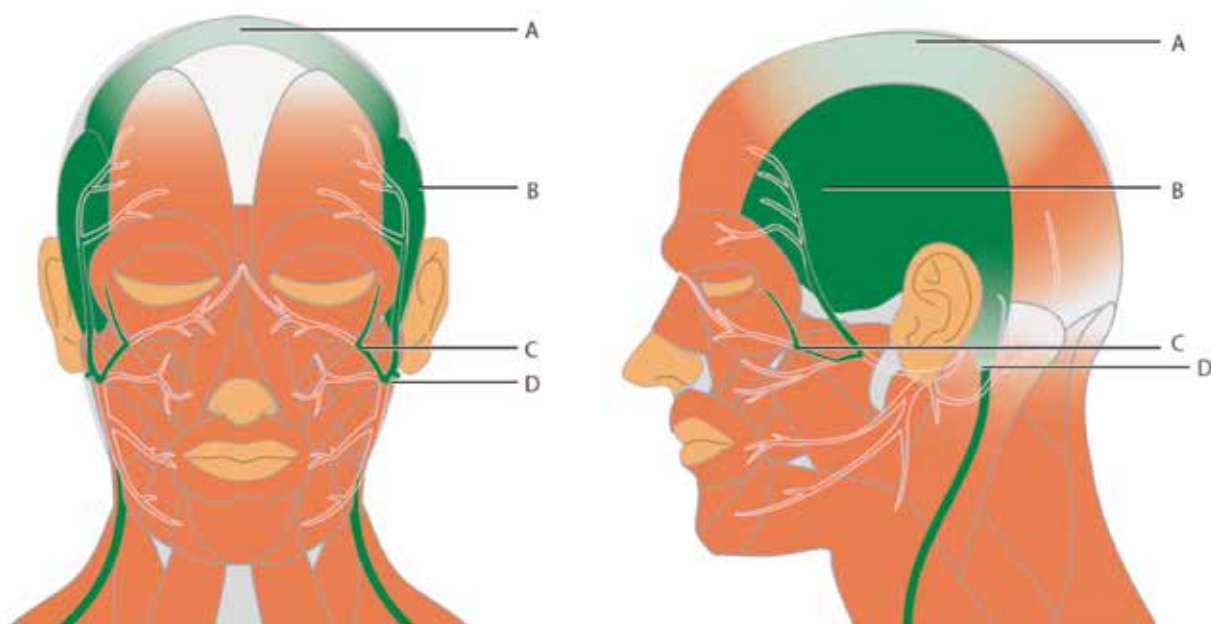


Figure 5: Modern Channel Sinew Pathway Foot Shao Yang (Gall Bladder)

Orange/White: representation of muscles and fascia of the face/neck. *Hollow Nerves:* extension of facial nerves for reference. *Solid Green Shades:* correspond to the specific following structures: A: Galea aponeurotica; B: Temporalis muscle/temporal fascia; C: Zygomatic branch of the facial nerve; D: Mastoid process

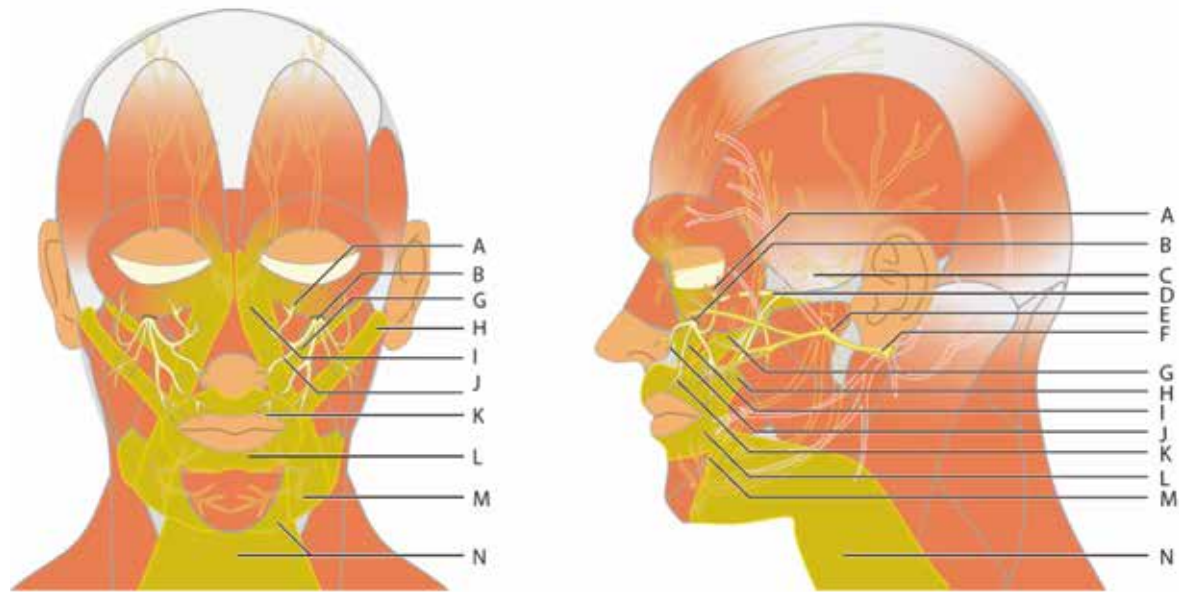


Figure 6: Modern Channel Sinew Pathway Foot Yang Ming (Stomach)

Orange/White: representation of muscles and fascia of the face/neck. **Hollow Nerves:** extension of facial nerves for reference. **Solid Yellow:** corresponds to the specific following structures: A: Frontal view, upper forehead; B: Infraorbital foramen; C: Trigeminal nerve trunk; D: Maxillary division of trigeminal nerve; E: Buccal branch of facial nerve; F: Facial nerve trunk; G: Zygomaticus minor; H: Zygomaticus major; I: Levator labii superioris; J: Nasal branch of infraorbital nerve; K: Labial branch of infraorbital nerve; L: Orbicularis Oris; M: Depressor anguli oris; N: Platysma

Introduction

Acupuncture is a form of therapy that has been rooted in Chinese medicine since approximately 2700 BC (Ma, 2000). Its first description in the classical texts *Su Wen* (Basic Questions) and *Ling Shu* (Divine Pivot) included the theory of channels, acupoints, principles of manipulation of needles and indications/contraindications for the treatment of various conditions.

Ling Shu Chapter 13, entitled 'Jing Jin' [筋經], contained the original detailed descriptions of the pathways and diseases of the Channel Sinews. Those who have taken an interest in the Channel Sinews have described them as symbolic descriptions of the musculo-skeletal system, including the skeletal muscle tissue, connective tissue and myofascial tissues in between (Legge, 2002; Kendall, 2010). This interpretation restricts the Channel Sinews solely to myofascial anatomy while ignoring other relevant anatomical structures such as the nervous system. In particular, the Channel Sinew pathways on the neck, head, and face are often confusing for students and practitioners because they deviate significantly from the path of their corresponding primary channels. Some scholars have proposed that the Channel Sinews on the face and head are likely to be based on descriptions of referred pain patterns rather than actual anatomical structures (Legge, 2002). In the present paper, we demonstrate that when cranial and cervical nerves are considered in the interpretation, there is

high degree of overlap between neuromyofascial anatomy and the traditional descriptions. The goal of this paper is therefore to correlate neuromyofascial anatomy with the Channel Sinews on the neck, head, and face.

We begin by transliterating passages from Chapter 13 of the *Ling Shu* relevant to the neck, head and facial Channel Sinew pathways, as well as their associated pathologies. Then we examine their pathways and give our interpretation of the specific anatomical structures referred to. These structures include nerve trunks/branches, muscles and fascial connections. Adhering to classical descriptions defined in *Ling Shu* Chapter 13, we propose a revised neuromyofascial understanding for the neck, head, and facial pathways of the Channel Sinews by summarising the information in pictorial and tabulated formats.

Many of the traditional disease symptoms described for the Channel Sinews can be understood in modern biomedical terms as neurofunctional deficits caused by specific cranial nerve palsies. These traditional pathologies and their corresponding modern neurological dysfunction were pivotal in allowing us to propose precise neuroanatomical structures. Finally, to provide additional clarification for students and practitioners, we summarise how this new interpretation can be useful in the treatment of acute and chronic cranial nerve pathologies.

The Channel Sinews

Only the yang Channel Sinews are presented in this paper, as the yin channels do not traverse the face and head. Our transliteration from *Ling Shu* Chapter 13 is presented under the heading '*Ling Shu Description*,' with passages pertaining to the face and head displayed in italics. After this, we include a summary of our neuromyofascial interpretation of the Channel Sinew pathway on the face/head under the heading '*Modern Head Channel Sinew Summary*.'

Hand Yang Ming (Large Intestine)

Ling Shu description

'Sinew of Hand Yang Ming, starts on the finger next to the large finger, knots at the wrist, follows up the arm, knot above at the outer elbow, up the arm, knots at the corner bone; its branch, coils the shoulder blade, clasp the vertebrae; *its branch from the shoulder corner bone rises to the neck, its branch, ascends the cheek, knots with cheekbone; straight branch, exits in front of Hand Tai Yang, up the left horn, wraps the head, down right jaw.*'

[手陽明之筋，起於大指次指之端，結於腕 上循臂，上結於肘外，上臑，結於臑；其支 者，繞肩胛，挾脊；直者，從肩臑上頸；其支 者，上頰，結於頰；直者，上出手太陽之前，上左角，絡頭，下右頰。]

Modern head Channel Sinew summary

The Hand Yang Ming Channel Sinew travels up the shoulder blade and attaches to the thoracic and cervical vertebral bodies, which accurately describes the trapezius muscle. The trapezius muscle is innervated by cranial nerve (CN) XI, the spinal accessory nerve. The upper fibres of the trapezius muscle rise up the back of the neck, then attach to the occipito-mastoid region, and become myofascially continuous with the temporalis muscle via the galea aponeurotica and temporal fascia. From the temporalis muscle, the remainder of the mastication muscles comprised of the masseter and medial and lateral pterygoids are fascially connected and share the same innervation from the mandibular division of the

trigeminal nerve (Myers, 2001; Standring, 2016).

'Knots with cheekbone' describes the maxillary branch of the trigeminal nerve, that travels through the middle cranial fossa to the pterygopalatine fossa (Craven, 2014; Bathla et al., 2013) then along the zygomatic bone ('cheekbone'). The maxillary branch provides sensory innervation for the skin of the temple, cheek and lacrimal gland. The nerve then exits at the inferior orbital foramen to become the infraorbital nerve, supplying the upper molar and premolar teeth, upper lip, side of the nose, lower eyelid and conjunctiva. The anterior superior alveolar branch supplies the canine and incisor teeth, the side of the nose and the maxillary sinus (Craven, 2014; Bathla et al., 2013).

The 'straight branch(es), up the left horn [that] wrap the head' correspond to the zygomaticofacial nerve of the maxillary division of the trigeminal nerve, the auriculotemporal nerve and deep temporal nerve from the mandibular division of the trigeminal nerve. The mandibular division exits the middle cranial fossa through the foramen ovale and divides into sensory and motor branches. The sensory branch of the mandibular division is also called the auriculotemporal branch (not to be mistaken with the auriculotemporal nerve, which is also part of this branch). The auriculotemporal branch includes meningeal, lingual, inferior alveolar and buccal branches. It also provides secretomotor parasympathetic fibres to the parotid gland, cutaneous innervation to the antero-superior ear (auriculotemporal nerve), temporal scalp, and temporomandibular joint (Craven, 2014; Bathla et al., 2013; Brown, 2010).

The motor branches of the mandibular division supply the muscles of mastication (temporalis, masseter medial, and lateral pterygoids), the tensor tympani and tensor veli palatine, the mylohyoid and the anterior belly of the digastric muscles (Craven, 2014; Brown, 2010). The deep temporal nerve from the mandibular division of the trigeminal nerve ascends to the temporal region of the scalp, sending deep temporal branches to innervate the temporalis muscle. The temporalis muscle

Channel Sinew Description	Muscle/Fascia/Bone Landmark	Nerve
Its branch from the shoulder corner bone rises to the neck	Upper fibres of trapezius	Spinal accessory nerve (CN XI)
Its branch, enters the cheek, knots with cheekbone		Maxillary division of trigeminal nerve (CN V2): infraorbital nerve
Straight branch, exits in front of Hand Tai Yang, up the left horn (angle between the anterior and temporal hairline)		Zygomaticotemporal nerve (CN V2); Auriculotemporal nerve and deep temporal nerve (CN V2 and CN V3)
Wrap the head	Bilateral temporalis connected by galea aponeurotica	
Down right jaw	Contralateral temporalis, masseter, medial/lateral pterygoids	Contralateral mandibular division of trigeminal nerve (CN V3)

Table 1: Modern Channel Sinew Pathway Assignment: Hand Yang Ming (Large Intestine)

ascends vertically to the vertex and then descends to the contralateral temporalis muscle (i.e. 'wrap[ping] the head and down the right jaw') via a connection made possible by the galea aponeurotica fascia.

Modern Channel Sinew pathway assignment

'Its branch from the shoulder corner bone rises to the neck (upper fibres of trapezius attaches on the lateral clavicle), its branch ascends the cheek, knots with cheekbone (maxillary division of trigeminal nerve [CN V2]); straight branch (zygomaticotemporal nerve, auriculotemporal nerve, deep temporal nerve [CN V2, CN V3]), exits in front of Hand Tai Yang, up the left horn wraps the head (ipsilateral temporalis), down right jaw (contralateral temporalis, masseter and pterygoids).'

TCM description of dysfunction

'Its disease is pain in its branch and sinew turn where the sinew traverses, inability to raise the shoulder, neck unable to look left and right.'

[其病當所過者，支痛 及轉筋，肩不舉，頸不可左右視]

The 'inability to raise the shoulders and the neck unable look left and right' can be attributed to a few possible muscles. Shoulder elevation is attributable to the trapezius and levator scapulae. Neck rotation ('look left and right') is attributable to the sternocleidomastoid, splenius capitis, splenius cervicis and other cervical erector spinae muscles. However, the trapezius and levator scapulae are the only muscles that can both elevate the shoulder and rotate the neck. Of these two muscles, only the trapezius is consistent with the *Ling Shu's* description of the Large Intestine Channel Sinew pathway. Therefore, the recorded trapezius dysfunction appears to describe spinal accessory nerve (CN XI) palsy. Furthermore, the spinal accessory nerve also contributes to the innervation of another neck rotation muscle, the sternocleidomastoid muscle. Lesions in the spinal accessory nerve would further exacerbate the restricted neck rotation described in the source text.

Hand Shao Yang (San Jiao)

Ling Shu description

'Sinew of Hand Shao Yang, starts at the finger next to the small finger, knots at the wrist, follows the middle of the arm, knots at the elbow, coils up the outer surface of the arm, ascends the shoulder, traverses the neck, unites with Hand Tai Yang; its branch, enters to link with the tongue root right at the cheek crook; its branch, ascends the crooked teeth, follows in front of the ear, belongs to the outer angle of the eye, upward rides the jaw, knots with the horn/angle.'

[手少陽之筋，起於小指次指之端，結於腕，中循臂，結於肘，上繞臑外廉、上肩、走頸，合手太陽；其支者，當曲頰入系舌本；其支者，上曲牙，循耳前，屬目外眥，上乘頰，結於角。]

Modern head Channel Sinew summary

When considering the cranial nerves, the Hand Shao Yang Channel Sinew could be seen as 'enter[ing]' the head at two branch points: the hypoglossal nerve (CN XII) and the facial nerve (CN VII) trunk. The hypoglossal nerve originates in the medullar aspect of the brain and exits the cranium at the hypoglossal canal. From here, it travels through the nasopharyngeal carotid space. Within this space, it descends through the neck between the internal carotid artery and internal jugular vein, close to the vagus nerve and deep to the posterior belly of the digastric muscle. It then loops anteriorly and crosses over the internal and external carotid arteries and lingual artery but below the posterior belly of the digastric muscle, where, at the level of the occipital artery, it gives rise to its terminal branches (Harrison et al., 2014). The terminal branches of the hypoglossal nerve have motor branches responsible for innervating the intrinsic and extrinsic muscles of the tongue (Alves, 2010). This description shows one branch point that 'enters' and 'links with the tongue root.'

The second branch path exits the sublingual space where it then travels in front of the ear ('follows in front of the ear'), a landmark consistent with the facial nerve trunk. From here, there are two pathways: the temporofacial division of the facial nerve courses over the masseter muscle and divides into the temporal branch superiorly and the zygomatic branch inferiorly. The zygomatic branch ascends anterior to the ear and exits at the superior medial border of the parotid gland, passing transversely over the zygomatic bone and ending close to the lateral canthus of the eye to innervate the orbicularis oculi muscle (Chatellier et al., 2012; May et al., 2000); this trajectory accurately correlates with the pathway of the San Jiao Channel Sinew.

The branch that 'knots with the horn/angle' corresponds to the temporal branch of the facial nerve that travels upwards to innervate the frontalis muscle at the angle of the hair at approximately the Touwei ST-8 region (horn and angle share the same Chinese character). Just before the channel reaches Touwei ST-8, at approximately Tongziliao GB-1 and Erheliao SJ-22, there is a communicating branch between the temporal branch of the facial nerve with the zygomaticotemporal nerve of the maxillary division of the trigeminal nerve in the superficial and deep temporal fascia. This communication happens at the line connecting the lateral canthus and the superior sulcus of the ear (Odobescu et al., 2012).

Modern Channel Sinew pathway assignment

'Its branch, enters to link with the tongue root right at the cheek crook (hypoglossal nerve, CN XII); its branch, ascends the crooked teeth (mandibular angle), follows in front of the ear (facial nerve trunk [CN VII, extra point Qian Zheng]), belongs to the outer angle of the eye (zygomatic branch of facial nerve [CN VII]), communicating

Channel Sinew Description	Muscle/Fascia/Bone Landmark	Nerve
Its branch enters to link with the tongue root right at the cheek crook	Tongue	Hypoglossal nerve (CN XII)
Its branch, ascends the crooked teeth	Mandibular angle	
Follows in front of the ear		Facial nerve trunk (CN VII)
Belongs to outer angle of the eye		Zygomatic branch of facial nerve (CN VII) Communicating branch between the zygomatic branch of the facial nerve (CNVII) and zygomaticotemporal branch of the trigeminal nerve (CNV).
Upward rides the jaw, knots with the horn	Corner formed by the anterior and temporal hairline, frontalis muscle	Temporal branch of facial nerve (CN VII)

Table 2: Modern Channel Sinew Pathway Assignment Hand Shao Yang (San Jiao)

branch between zygomatic facial nerve [CN VII] and zygomaticotemporal branch of trigeminal nerve [CN V]), upward rides the jaw, knots with the horn (angle formed by the anterior and temporal hairline, frontalis muscle innervated by temporal branch of facial nerve).'

TCM description of dysfunction

Its disease is in 'turning sinew where the sinew and its branches traverse, and tongue curling.'

[其病當所過者，即支轉筋，舌卷]

Dysfunction in this channel mainly refers to spasms or paralysis in the muscles that are innervated by branches of the facial nerve and the hypoglossal nerve. Specifically, dysfunctional movements are seen with muscles innervated by the temporal branch and zygomatic branches, such as the orbicularis oculi muscle, affecting closing of the eye (Craven, 2014; Chatellier et al., 2012; Babakurban et al., 2010).

A specific movement described in the *Ling Shu* is 'tongue curling', which is governed by the hypoglossal nerve. The hypoglossal nerve (CN XII) innervates the majority of the muscles of the tongue: the genioglossus, hyoglossus, styloglossus and intrinsic muscles. When damage occurs, the tongue will curve to one side on extension. For example, a unilateral upper motor neuron lesion will present as deviation of the tongue towards the side of nerve damage, due to a weaker genioglossus muscle creating an unopposed tongue muscle extension from the healthy side. Damage to this nerve can also create fasciculation or unilateral atrophy of the tongue muscle. In this description, the *Ling Shu* clearly describes impaired movement specific to the zygomatic facial, temporal facial and hypoglossal nerves.

Hand Tai Yang (Small Intestine)

Ling Shu description

'Hand Tai Yang Sinew, starts above the small finger, knots with the wrist, follows up the inner surface of

the arm, knots behind the sharp bone inside the elbow, pluck it respond above the small finger, enter knots under the armpit; its branch, travels back to the rear surface of the armpit, ascends to coil the shoulder blade, follows the neck exiting in front of the Tai Yang, knots with the completion bone; its branch enters the ear; straight branch exits above the ear, descend to knot with the jaw, upward belongs to the inner angle of the eye.'

[手太陽之筋，起於小指之上，結於腕，上循臂內廉，結於肘內銳骨之後，彈之應小指之上，入結於腋下；其支者，後走腋後廉，上繞肩胛，循頸出走太陽之前，結於耳後完骨；其支者，入耳中；直者，出耳上，下結於頰，上屬目外眥。]

Modern head Channel Sinew summary

The Hand Tai Yang channel ascends the neck and enters the head at the mastoid process (completion bone). From here, three important landmarks on the head are mentioned: above the ear, the jaw and the inner angle of the eye. Modern explanations demonstrate that these landmarks correspond to branches of the facial nerve. The facial nerve motor nucleus originates in the pons region of the brainstem where it passes beside the vestibulocochlear nerve through the internal acoustic meatus to the facial ganglion. Here the nerve enters the ear and plays a role in physical sensation and sensory hearing. Specifically, it supplies the muscle of the middle ear, the stapedius (Kochhar et al. 2016; Marur et al., 2014). It then travels posteriorly to descend through the posterior wall of the middle ear and emerges through the stylomastoid foramen (Craven, 2014; Marur et al. 2014). This exit marks the facial nerve trunk.

From the nerve trunk, four branches of the facial nerve match the four branches of the Channel Sinew. The divisions are: temporofacial division (superior division: *Ling Shu* landmark 'above the ear'), the cervicofacial division (inferior division: *Ling Shu* landmark 'jaw'), the buccal branch (middle division receives contributions from both superior and inferior divisions: *Ling Shu* landmark 'inner angle of the eye') and the posterior

branch of the facial nerve (*Ling Shu* landmark ‘completion bone’/mastoid process) (Marur et al., 2014; Craven, 2014).

When the classic text mentions the ‘inner angle of the eye’, it is important to note that the muscle of significance is the procerus muscle, a small pyramid-shaped muscle. This muscle is innervated by the buccal branch of the facial nerve, which travels from the facial nerve trunk to cross the intercanthal line at approximately the lateral third to the inner eye (Hwang et al., 2006). Fascially, the procerus originates from the fascial aponeurosis of the lower part of the nasal bone and upper lateral nasal cartilage, then inserts between the eyebrows. It is also fascially connected to the occipitofrontalis muscle. This muscle is responsible for frowning and pulling down the eyebrows. It is obvious given the combination of these structures that the Small Intestine Channel Sinew theory description in the classics is consistent with modern neuroanatomy.

Modern Channel Sinew pathway assignment

‘Knots with the completion bone (posterior branch of facial nerve traverse over the mastoid process); its branch enters the ear (cranial exit of facial nerve trunk at the stylo-mastoid foramen); straight branch exits above the ear (temporofacial branch of facial nerve), descends to knot with the jaw (cervicofacial branch of facial nerve), upward belongs to the inner angle of the eye (sub-branch of buccal branch of facial nerve that innervates the procerus muscle).’

We propose the following to be assigned to the Small Intestine Channel Sinew:

Channel Sinew Description	Muscle/Fascia/Bone Landmark	Nerve
Knots with the completion bone	Mastoid process	Posterior branch of facial nerve (CN VII)
Its branch enters the ear	Stylomastoid foramen	Facial nerve trunk (CN VII)
Straight branch exits above the ear		Temporofacial division of facial nerve (CN VII)
Descends to knot with the jaw		Cervicofacial division of facial nerve (CN VII)
Upward belongs to the inner angle of the eye	Procerus	Procerus sub-branch from buccal branch of facial nerve (CN VII)

Table 3: Modern Channel Sinew Pathway Assignment Hand Tai Yang (Small Intestine)

TCM description of dysfunction

‘Diseases are pain in small finger and at rear surface of the sharp bone in the inner elbow, follows the arm yin, enter below armpit, pain below the armpit, *pain in rear surface of armpit, coil shoulder blade refer to neck to cause pain, respond to ringing pain in the ear referring to jaw, to see the eyes ought to close for a long time, neck sinew urgency, thus sinew wasting neck swelling, cold-hot in the neck.*’

[其病小指支肘內銳骨後廉痛，循臂陰，入腋下，腋下痛，腋後廉痛，繞肩胛引頸而痛，應耳中鳴痛引頰，目瞑良久乃得視，頸筋急，則為筋癭頸腫，寒熱在頸者。]

The diseases referred to here are directly related to the pattern of innervation by the facial nerve. The facial nerve (CN VII) contains motor, sensory and parasympathetic fibres. The motor component of the facial nerve controls muscles of facial expression, the posterior belly of the stylohyoid and the stapedius muscles. The sensory fibres are responsible for taste sensations in the anterior two thirds of the tongue and cutaneous sensation in the external ear. The parasympathetic fibres are the secretomotor fibres to the submandibular and sublingual salivary glands, lacrimal glands and mucous membrane of the nose, pharynx and mouth (Kochhar et al., 2016; Craven, 2014).

Damage to this nerve in cases like Bell’s palsy or trauma will cause dysfunction in the corresponding motor, sensory and secretomotor functions. Therefore, the TCM disease descriptions are related to symptoms of facial nerve palsy. For example, ‘ringing pain of the ears’ refers to the facial nerve innervation of the stapedius muscle in the middle ear. The description ‘to see the eyes ought to close for a long time’ is likely referring to eyestrain caused by dry eyes, a condition attributed to hypofunction of the lacrimal glands that can be improved by closing the eyes to achieve better lubrication. It is interesting to note that these disease symptoms described in the classics account for sensory, motor, and autonomic functions of the facial nerve, which demonstrates the role of cranial nerve structures in Channel Sinew theory.

Foot Tai Yang (Bladder)

Ling Shu description

‘Foot Tai Yang Sinew, begins with the small toe, knots upward at the ankle, diagonally upwardly knotting with the knee, its lower branch follows the outer aspect, knotting at the heel, following up the heel, knots behind the knee; its separating branch, knots on the outer calf belly, upward in the inner surface of the back of the knee, with the centre of the back of the knee together ascends to bind with the buttock, *ascends clasping the spine to the neck; its branch separately enters the*

root of the tongue; its straight branch, knots with the pillow bone, up the back of the neck, down the face, knots with nose; its branch, becomes upper eye network, knots with cheekbone below; its branch, from the outer surface behind the armpit binds with the shoulder corner bone; its branch enters below armpit, exiting upwards from broken basin, knotting upward at the complete bone; its branch exiting broken basin, diagonally exits cheekbone.'

[足太陽之筋，起於足小趾，上結于踝，邪上結于膝，其下循足外側，結于踵，上循跟，結于臑；其別者，結于臑外，上臑中內廉，與臑中并上結于臂，上挾脊上項；其支者，別入結于舌本；其直者，結于枕骨，上頭，下顏，結于鼻；其支者，為目上網，下結于頰；其支者，從腋后外廉結于肩髃；其支者，入腋下，上出缺盆，上結於完骨；其支者，出缺盆，邪上出于頰。[...]
治在燔鍼劫刺，以知為數，以痛為輸，名曰仲春痺也。]

Modern head Channel Sinew summary

The Foot Tai Yang Channel Sinew has three main branches. The first branch, 'clasping spine to the neck', describes the paraspinal muscles, including the cervical erector spinae muscles. In the neck, a branch 'enters' the root of the tongue. This describes the hypoglossal nerve, which exits the hypoglossal canal and divides into multiple branches to innervate the muscles of the tongue. Within the tongue itself there is an anastomosis that occurs between the following cranial nerves: the hypoglossal nerve and lingual nerves (mandibular division of the trigeminal nerve); the glossopharyngeal nerve (CN XI) with the hypoglossal nerve; the lingual nerve and glossopharyngeal; and finally the glossopharyngeal nerve with the vagus nerve (CN X) (Touret et al., 2005). The hypoglossal nerve is not a pure cranial nerve as it also receives contributions from the ventral rami of the first and second cervical spinal nerves. As there is no direct myofascial connection between the tongue and the paraspinal muscles, the branching relationship from the Bladder Channel Sinew to the tongue is explained via the cervical spinal nerve contributions to the hypoglossal nerve.

The second branch point arises from the dorsal primary ramus at approximately the second or third cervical vertebrae, where it travels up the neck between the inferior capitis oblique and the semispinalis muscles. Following the branch of the greater occipital nerve, this branch travels along with the occipital artery and pierces the fascia (emerging through the semispinalis muscle or trapezius) around 3.5 to 4 centimetres below the superior nuchal ridge. It then ascends the medial portion of the posterior scalp, approximately 1.5 to 2 centimetres lateral to the external occipital protuberance to the vertex of the head to provide sensory innervation to the posterior scalp (Waldman et al., 2015; Tubbs et al., 2014; Standing et al., 2016; Mooser et al., 2004). In the posterior scalp, the greater occipital nerve and the occipitalis muscle travel up to the vertex of the head to become continuous with the frontalis

muscle via the fascia from the galea aponeurotica. The galea is a dense network of connective tissue fibers with high vascularity. It is controlled by the frontalis muscle anteriorly and the occipitalis posteriorly (Afifi et al., 2013).

The cutaneous sensation over the forehead and anterior scalp up to the vertex is provided by the supratrochlear and supraorbital nerves, both originating from the ophthalmic division of trigeminal nerve. They also contribute to cutaneous sensory innervation for the upper eyelid. The classical description of 'upper eye network' is, in our view, a precise description of the rich neural arborisations occurring around the supraorbital fossa where the supraorbital nerve exits. The classical pathway also describes the Channel Sinew as 'knot[ting] with [the] nose'. The skin over the nose is innervated by the infratrochlear nerve and external nasal nerves, both derivatives of the ophthalmic division of the trigeminal nerve. The observation made by the *Ling Shu* to include only the upper eyelid and nose region as a continuation of the scalp demonstrates a profound understanding of the ophthalmic division of the trigeminal nerve.

Finally, the third branch ascends along the anterior side of the neck. At the broken basin (supraclavicular fossa), it ascends to bind at the completion bone (mastoid process). The sternocleidomastoid represents the connection from the supraclavicular fossa to the mastoid process. An additional branch also connects the supraclavicular fossa to the cheekbone; however, we were unable to assign anatomical structures to this terminal branch.

Modern Channel Sinew pathway assignment

'Its branch separately enters the root of the tongue (C1 and C2 anterior rami contribution to hypoglossal nerve [CN XII]); its straight branch, knots with the pillow bone (semispinalis capitis attaching to the occipital bone), up the head (occipitalis muscle, great occipital nerve), down the face (frontalis muscle, supratrochlea, supraorbital nerves [CN V1]), knots with the nose (procerus, nasalis, infratrochlear nerve, external nasal nerve [CN V1]); its branch, becomes upper eye network (corrugator, supraorbital nerve, supratrochlear nerve [CN V1]), knots with cheekbone below (orbicularis oculi); its branch enters below armpit, exiting upwards from broken basin, knotting upward at the complete bone (sternocleidomastoid); its branch exiting broken basin, diagonally exits cheekbone (unclear).'

TCM description of dysfunction

'Diseases are swelling pain of the small toe and heel, spasm behind the knees, spine bent backward, *sinew urgency on back of the neck, inability to raise shoulder, twisting pain in broken basin for the armpit branch, unable to turn left and right.*

[其病小趾支跟腫痛，臑攣，脊反折，項筋急，肩不舉，腋支缺盆中紐痛，不可左右搖。]

Channel Sinew Description	Muscle/Fascia/Bone Landmark	Nerve
Its branch separately enters the root of the tongue		C1, C2 anterior rami connection to Hypoglossal nerve
Its straight branch, knots with the pillow bone	Cervical erector spinae	Third occipital nerve
Up the back of the neck	Occipitalis	Greater occipital nerve
Down the face	Frontalis	Calvarial branches of Supratrochlear and supraorbital nerves (CN V1)
Knots with nose	Procerus and nasalis	Infratrochlear and external nasal nerves (CN V1)
Its branch becomes upper eye network	Superior palpebrae, corrugator	Palpebral branches of the Supratrochlear and infratrochlear nerves (CN V1)
Knots with cheekbone below	Orbicularis oculi	
Exiting upwards from broken basin, knotting upward at the complete bone	Sternocleidomastoid	

Table 4: Modern Channel Sinew Pathway Assignment Foot Tai Yang (Bladder)

‘Sinew urgency (spasm) on the back of the neck’ is easy to comprehend as both the erector spinae muscles and Urinary Bladder Channel Sinew run up the back of the neck. Tension in the erector spinae muscle group could manifest as pain in the back of the neck. ‘Inability to raise the shoulder’ is difficult to explain as no direct fascial connections exists between the erector spinae muscles and muscles of shoulder elevation such as trapezius or levator scapulae. However, fascial continuity has been described between the rhomboid muscle and the splenius capitis muscle, which is a part of the cervical erector spinae group that contributes to neck rotation (Myers, 2001). The rhomboid muscles retract the scapular but work with the levator scapulae to elevate the shoulder. Therefore, ‘inability to raise the shoulder’ and to ‘turn left and right’ could be accounted for by the splenius capitis muscle as a part of the cervical erector spinae group. It is important to note that the greater occipital nerve has a complicated pathway that passes through the semispinalis capitis (a member of cervical erector spinae muscle group) and trapezius muscles. Thus, tightness in these muscles can contribute to compression of this nerve, further aggravating any pain related to the ‘sinew urgency’ of the posterior neck.

‘Twisting pain in broken basin’ and inability to ‘turn the head left and right’ correspond to the sternocleidomastoid muscle as it attaches to the sternum and clavicle, which delineate the supraclavicular fossa (broken basin). The sternocleidomastoid’s actions include unilateral cervical rotation to opposite side; and cervical lateral flexion to same side, cervical flexion, raising of the sternum and assisting forced inhalation. Dysfunction in this muscle results in the impaired range of motion described by the classics.

Foot Shao Yang (Gall Bladder)

Ling Shu description

‘Foot Shao Yang Sinew, starts second from the small toe, knots upward at outer ankle, follows upward on the outer surface, knots with outer surface of knee; its branch separates starting at assisting bone, upward traverses hip-bone, the front branch knots above crouching rabbit, back branch, knots with sacrum; its straight branch rides up small rib, traverses upward in front of the armpit, ties up with breast, knots with broken basin; straight branch exits above armpit, links broken basin, exits in front of Tai Yang, *follows behind ear, up to corner of forehead, crosses top of peak, traverses down jaw, knots upward with cheekbone; its branch, knots with outer angle of the eye.*’

[足少陽之筋，起於小指次指，上結外踝，上循脛外廉，結於膝外廉；其支者，別起外輔骨，上走髀，前者結於伏兔之上，後者，結於尻；其直者，上乘沙季脅，上走腋前廉，係於膺乳，結於缺盆；直者，上出腋，貫缺盆，出太陽之前，循耳後，上額角，交巔上，下走頰，上結於頰；支者，結於目眇為外維。[……] 治在燔針劫刺，以知為數，以痛為輸，名曰孟春痺也。]

Modern head Channel Sinew summary

The Foot Shao Yang Channel Sinew ascends the neck, posterior to the ear, where it follows two major anatomical structures: the temporalis muscle and its temporal fascia, and the zygomatic branch of the facial nerve. The temporal fascia is deep and medial to the temporalis and auriculares muscles. It is continuous with the galea aponeurotica and the lateral part of the orbicularis oculi. Therefore, the observation that the channel sinew ‘follows behind ear’ resembles the temporal fascia; ‘up to corner of forehead’ corresponds to the temporalis muscle; ‘crosses top of peak’ matches the galea aponeurotica; ‘traverses down jaw, knots upward with cheekbone’ corresponds

to the temporalis muscle tendon entering the zygomatic arch; and 'its branch, knots with outer angle of the eye' resembles the orbicularis oculi and its innervation by the zygomatic branch of the facial nerve, which forms its motor entry near the lateral canthus of the eye. The zygomatic branch originates from the facial nerve trunk and passes through the parotid gland, travels up along the external canthus line around 2- 2.5 centimetres in front of the intertragic notch (Chatellier et al., 2012).

The temporalis muscle is a fan-shaped muscle that has two main parts: a main fan shape division (consisting of anterior, middle, and posterior parts) and three muscle bundles. The main division originates from the temporal fossa, which includes the temporalis muscle, the deep temporal fascia, and superficial fat pad (Babakurban et al., 2010). The three muscle bundles lie on the anterior side and are divided into anteromedial, anterolateral, and mediolateral. Specifically, the anteromedial bundle arises from the infratemporal crest of the greater wing of the sphenoid bone and inserts into the medial aspect of the anterior ramus of the mandible (Shimokawa et al., 1998; Kadri et al., 2004; Babakurban et al., 2010). This muscle receives innervation from multiple nerves: the inferior part of the temporalis (below the mandibular ramus) is innervated by the buccal and masseteric nerves, whereas the superior portions are innervated by the anterior, middle, and posterior deep temporal nerves of the anterior trunk of the mandibular division of the trigeminal nerve (Chang et al., 2013).

Modern Channel Sinew pathway assignment

'Follows behind ear (temporal fascia), up to corner of forehead (temporalis), crosses top of peak (galea aponeurotica), traverses down jaw, knots upward with cheekbone (temporalis tendon passing under the zygomatic arch inserting into the mandible); its branch, knots with outer angle of the eye (zygomatic branch of facial nerve).'

We propose the following to be assigned to the Gall Bladder Channel Sinew:

TCM description of dysfunction

'Diseases are turning pain of the second toe from the small toe, lead to turning sinew of outer knee, knee unable to bend and stretch, sinew urgency behind the knee, lead forward to hip-bone, lead back to sacrum, pain to the small rib, lead up to ST-12, breast, neck cord sinew urgency. Follow left to right, right eye cannot open, upward through right angle, jointly course with Qiao Mai, left wrap with right, thus injure left angle, right leg unusable, called linking sinew mutual crossing.'

[其病小指次指支轉筋，引膝外轉筋，膝不可屈伸，臑筋急，前引髀，後引尻，即上乘（月少）季脅痛，上引缺盆、膺乳、頸維筋急。從左之右，右目不開，上過右角，並蹻脈而行，左絡於右，故傷左角，右足不用，命曰維筋相交。]

The important structure involved in these symptoms is the galea aponeurotica. The galea is connected by the frontalis muscle anteriorly and the occipitalis posteriorly (Afifi et al., 2013), and fascially it continues over the temporal fascia and zygomatic arch as a layer of areolar tissue. Therefore, tightness or muscular dysfunction in the muscles of the neck where there is an occipital connection can affect the galea and therefore everything attached to the galea: the temporalis muscle, the temporal fascia, and the orbicularis oculi innervated by the zygomatic branch of the facial nerve (CN VII).

The disease description regarding the inability to open the eye (ptosis) refers to dysfunction of the levator palpebrae superioris muscle, which is innervated by the oculomotor nerve (CN III). The pathway of CN III is completely intracranial so cannot be assigned to any particular Channel Sinew, as they are not thought to have internal pathways. The zygomatic branch of the facial nerve that innervates the orbicularis oculi muscle functions only to close the eye; it does not play a role in opening the eyes. Therefore, it is challenging to explain the ptosis described in the *Ling Shu* based on our neuromyofascial interpretations. Nevertheless, this discrepancy does not alter our thesis that many facial channel sinew pathologies involve cranial nerve palsies, suggesting that cranial nerves are a pivotal part of the Channel Sinew system

Channel Sinew Description	Muscle/fascia	Nerve
Follows behind ear, up to corner of forehead	Temporalis and temporal fascia	
Crosses top of peak	Galea aponeurotica	
Traverses down jaw, knots upward with cheekbone	Temporalis tendon	
Its branch, knots with outer angle of the eye		Zygomatic branch of facial nerve (CN VII)

Table 5: Modern Channel Sinew Pathway Assignment Foot Shao Yang (Gall Bladder)

Foot Yang Ming (Stomach)

Ling Shu description

‘Foot Yang Ming Sinew, starts with central three toes, knots above the in-step, diagonally outwardly upward adding to assistant bone, knots above the outer surface of the knee, knots directly upward with the hip-bone pivot, follows upward the rib belonging to the spine: its straight branch, follows upward bone stem, knots with knee; its branch knots with the outer assistant bone, unites with Shao Yang; its straight branch, follows up crouching rabbit, knots above with hip-bone, gathers with genitals. Ascends the abdomen thus spreads out, reaches broken basin to knot. *Up the neck, up clasping the mouth, unites with cheek-bone, knots with nose below, uniting upward with Tai Yang. Tai Yang is the upper eye network, Yang Ming is the lower eye network; its branch binds from cheek to in front of the ears.*’

[足陽明之筋，起於中三指，結於跗上，邪外上加於輔骨，上結於膝外廉，直上結於髀樞，上循脅屬脊；其直者，上循胛，結於膝；其支者，結於外輔骨，合少陽；其直者，上循伏兔，上結於髀，聚於陰器，上腹而布，至缺盆而結，上頸，上挾口，合于頰，下結於鼻，上合於太陽。太陽為目上網，陽明為目下網；其支者，從頰結於耳前。[...] 治之以馬膏，膏其急者；以白酒和桂，以塗其緩者，以桑鉤鉤之，即以生桑炭置之坎中，高下以坐等。以膏熨急頰，且飲美酒，敢美炙肉，不飲酒者，自強也，為之三拊而已。治在燔鍼劫刺，以知為數，以痛為輪，名曰季春痺也。]

Modern head Channel Sinew summary

The Foot Yang Ming Channel Sinew travels up the neck as the platysma muscle. It then ‘clasps the mouth’, corresponding to the orbicularis oris muscle. At the orbicularis oris, the sinew travels with the zygomaticus major and minor muscles to the mid face and then to the lateral aspect of the nose with the levator labii superioris (‘knotting with the nose’). It then follows the levator labii superioris muscles to the glabellar region where it connects to the Foot Tai Yang channel via the ophthalmic division of the trigeminal nerve and periocular muscles detailed in the Foot Tai Yang section above. The infraorbital nerve branch of the trigeminal nerve (CN V2) gives off inferior palpebral branches that provide sensory innervation to the lower eyelid and conjunctiva, which is consistent with the description of the ‘lower eye network’ described in the *Ling Shu*. From a cranial nerve perspective, the ‘clasping the mouth’ could also be the superior labial branch of the infraorbital nerve, while ‘knots with nose below’ parallels the nasal branch of the infraorbital nerve.

The branch that ‘binds from cheek to in front of the ears’ is the buccal branch of the facial nerve, which innervates the muscles in the cheek and the facial nerve trunk (before it divides into various branches) situated anterior to the ear lobe, approximately at the extra point Qian

Zheng. Specifically, the buccal branch of the facial nerve is divided into two main branches: the superior branch, which supplies the superior aspect of the anterior region of the cheek, and the inferior branch, which supplies the interior aspect of this region, with one branch continuing into the subcutaneous tissue superficial to the buccinators muscle (Chang et al., 2013).

Modern Channel Sinew pathway assignment

‘Up the neck (platysma), up clasping the mouth (orbicularis oris, labial branch of infraorbital nerve), unite with cheek-bone (zygomaticus major & minor, infraorbital nerve from infraorbital foramen), knots with nose below (levator labii superior, nasal branch of infraorbital nerve [CN V2]), uniting upward with Tai Yang (The Urinary Bladdery Channel Sinew is the ophthalmic division of trigeminal nerve [CN V1]). Tai Yang is the upper eye network (supratrochlear nerve, supraorbital nerve), Yang Ming is the lower eye network (infraorbital nerve of the maxillary division of trigeminal nerve [CN V2]); its branch binds from cheek to in front of the ears (buccal branch of facial nerve and facial nerve trunk [CN VII]).’

Channel Sinew Description	Muscle/fascia	Nerve
Up the neck	Platysma	Cervical branch of facial nerve (CN VII)
Up clasping the mouth	Orbicularis oris	Labial branch of infraorbital nerve (CN V2)
Unites with cheek bone	Zygomaticus major and minor	Infraorbital nerve (CN V2) exiting the infraorbital foramen (CN V2)
Knots with nose below	Levator labii superior	Nasal branch of infraorbital nerve (CN V2)
Uniting upward with Tai Yang		Supratrochlear nerve (CN V1) Supraorbital nerve (CN V1)
Its branch binds from cheek to in front of ears		Buccal branch facial nerve, facial nerve trunk (CN VII)

Table 6: Modern Channel Sinew Pathway Assignment Foot Yang Ming (Stomach)

TCM description of dysfunction

‘Diseases are middle toe turned sinew, foot jump hardness, crouching rabbit sinew turn, front hip-bone swelling, gui shan disorder, *abdominal sinew urgency, lead to ST-12 and cheeks, corner of mouth become weird, urgency, eyes cannot close, heat thus sinew vertically straighten, eyes cannot open. Cheek sinew become cold, thus*

urgent, lead cheek to shift the mouth, heat thus sinew become hot and relax vertically, slow unable to overcome restrain, thereby cause weirdness.'

[其病足中指支脛轉筋，腳跳堅，伏兔轉筋，髀前踵，疝，腹筋急，引缺盆及頰，卒口僻；急者，目不合，熱則筋縱，目不開，頰筋有寒，則急，引頰移口，有熱則筋弛縱，緩不勝收，故僻。]

This description involves muscle spasms ('urgency') of the neck, cheeks, face and around the eyes. The muscles involved here include the platysma, orbicularis oris, zygomaticus major and minor, orbicularis oculi and levator palpebrae. Except for the levator palpebrae, which is innervated by the oculomotor nerve (CN III), the above muscles are all innervated by the facial nerve (CN VII). The platysma muscle lies over the neck, therefore having an insertion site which covers the 'broken basin' (supraclavicular fossa) to the cheeks. Dysfunction of the platysma could cause distortion of the lower lip. Classical observations such as 'straighten', 'shift' and 'become weird' for the eyes and mouth are likely to be describing asymmetry of the face because of facial nerve palsy (CN VII). Once again, the classical Channel Sinew pathways accurately trace the facial nerve trunk to 'in front of the ear', demonstrating the importance of cranial nerves in the interpretation of the Channel Sinews.

Clinical relevance

There are clear resemblances when comparing the head, neck and face Channel Sinews to specific neuroanatomical structures. It is imperative to consider the neuroanatomy in any clinical case, but specifically in myofascial, neurological and pain conditions. It is also important to acknowledge the cranial and peripheral nerve innervations, vascular supplies and muscle structures, while examining the Channel Sinews in a classroom setting.

Clinically, patients with acute or chronic cranial nerve pathologies will have a range of symptoms, including numbness, tingling, facial muscle paresis, aphasia, neuralgia, muscle spasms, flaccidity, and restricted range of motion. When approaching a case, one can consider using neuroanatomical and traditional Chinese medical thought processes to dissect their case. Two main steps can be applied when faced with a myofascial, neurological or pain case:

1. What symptoms are manifesting in the presenting case?

One needs to identify the location and characteristics of any sensations including pain, numbness and tingling. All these characteristics give rise to information as to whether the nature of the pathology would be an impingement sign, neurological, muscular related, etc. Onset and duration of symptoms will help one to differentiate whether this will be an acute or chronic case, which ultimately will help to predict length and time of treatment. Lastly, by

considering the possible muscle(s), fascia and nerve(s) involved, one needs to consider all neuroanatomical structures involved to have better precision and accuracy in their point selection and location.

2. What is the differential diagnosis?

By coming up with a list of potential diagnoses (Table 8), one can compare presenting symptoms from a TCM and neuroanatomical perspective. For example, the condition could involve:

- Central nervous system disorder (eg. multiple sclerosis, Parkinson's disease, stroke; TCM differential diagnosis: atrophy flaccid syndrome).
- Peripheral nervous system disorder (eg. carpal tunnel syndrome; TCM differential diagnosis: bi syndrome).
- Bacterial/viral infection (eg. Bell's palsy; TCM differential diagnosis: exterior invasion).
- Musculoskeletal/nerve impingement case due to trauma or postural weaknesses (eg. whiplash; TCM differential diagnosis: blood and qi stagnation)

By thinking about the diagnosis from both a neuroanatomical and TCM perspective one can see the direct overlap between the two philosophies and treat in a more comprehensive way. Specifically, in Table 8 we have provided a comparison of biomedical and TCM symptoms plus differential diagnosis, and potential nerves and muscles to consider in treatment. Ultimately this will help one to include the cranial and peripheral nerves, muscles and fascial connections in their treatment plans.

Conclusion

Our textual interpretation of the *Ling Shu* demonstrates a high degree of overlap between anatomical structures and classical Channel Sinew pathway descriptions on the neck, head and face. Many of the Channel Sinew pathologies described in the *Ling Shu* correlate with cranial nerve palsies commonly seen in clinical practice, suggesting that Channel Sinews are still clinically relevant today. Specifically, the cranial nerves associated with the Channel Sinews include the facial, trigeminal, hypoglossal and spinal accessory nerves. The cervical nerves include the greater occipital nerve and third occipital nerve. Our analysis demonstrates that there is a very high probability that the *Ling Shu* was recording precise neuroanatomical structures when describing the Channel Sinew pathways of the neck, head, and face. Application of peripheral nerve and myofascia knowledge together with channel theory during treatment can allow one to have greater clinical accuracy in point location and selection, resulting in improved clinical outcomes.

Melissa Lee, ND is a Naturopathic Doctor practicing in Toronto, Ontario, Canada. She is an instructor for the Integrative Acupuncture Program at the Faculty of Health, York University in Toronto, Ontario, Canada. Email: info@santehealth.ca

Poney Chiang, PhD is a TCMP and Acupuncturist practicing in Markham, Ontario, Canada. He is an adjunct professor and the founding director of the Integrative Acupuncture Program at the Faculty of Health, York University in Toronto, Ontario, Canada. Email: poney.chiang@riverclinic.ca

Ling Shu Manifestation of Disease	Biomedical Manifestation of Disease	Pathologies Indicated (confirm with other symptoms, where clinically relevant)	Nerve	Surrounding Structures
Hand Yang Ming (Large Intestine)				
'Inability to raise the shoulder and the neck unable to look left and right.'	- Weakness and atrophy of the trapezius muscle and levator scapulae causing impaired shoulder elevation and rotational movements of the neck and chin - Weakening of shrugging movements of the shoulder and winging of the scapulae, which is due to the serratus anterior muscle - Rotation will be affected by pathology in the sternocleidomastoid, splenius capitis, splenius cervicis, and other cervical erector spinae muscles	- Motor neuron conditions (e.g. ALS) - Iatrogenic injury (e.g. during lymph node biopsy or dissection for head and neck cancers) - Any pathology that affects the C2-C7 nerves	Spinal accessory nerve (CN XII)	Sternocleidomastoid Trapezius muscle
		Compression of V2 and V3 branches caused by conditions such as: Tumour, infarct, vasculopathy, trauma	Maxillary and mandibular division of trigeminal nerve (CN V2, CN V3)	Temporalis Masseter Medial/Lateral pterygoids
Hand Shao Yang (San Jiao)				
'Turning sinew where the sinew and its branches traverse, and tongue curling.'	- Injury to the hypoglossal nerve results in hypoglossal nerve palsy; this can be manifested as tongue fasciculation or muscle wasting, tongue curling, or deviation to the side of the lesion, and possible neck pain (Harrison et al., 2014). - Unilateral weakness of the tongue musculature, lingual dysarthria, and deviation of the tongue towards the side of weakness on protrusion	- Surgery: cosmetic - Stroke - Diseases of the posterior fossa or base of skull: e.g. tumour, metastatic disease - Motor neuron conditions (e.g. ALS, lower brain stem diseases including ischemia)	Hypoglossal nerve (CN XII)	Tongue: Genioglossus Hypoglossus Styloglossus Geniohyoid Thyrohyoid
		- Facial nerve palsy - Otomastoiditis: complicated otitis media with mastoiditis - Iatrogenic: e.g. surgery - Blunt trauma/fractures to skull - Infection (viral, bacterial): e.g. Bell's palsy, herpes zoster, otitis externa - Lyme disease - Stroke - Tumour	Facial nerve trunk (CN VII) Facial nerve Zygomatic branch of facial nerve Communicating branch between zygomatic branch of facial nerve and zygomaticotemporal branch of trigeminal nerve	Frontalis

Hand Tai Yang (Small Intestine)				
'Ringing pain in the ear referring to jaw, to see the eyes ought to close for a long time.'	Any injury to this nerve will affect motor, sensory, and autonomic function of the facial nerve. For example: • Motor muscles of facial expression and scalp • Innervation to the stapedius of the middle ear affected causing ringing of the ears • Hypo-functioning of lacrimal glands	All facial nerve pathologies: • Otomastoiditis: complicated otitis media with mastoiditis • Iatrogenic: e.g. surgery • Blunt trauma/fractures to skull • Infection (viral, bacterial): e.g. Bell's palsy, herpes zoster • Lyme disease • Stroke • Tumour	Facial nerve trunk (CN VII)	Stylomastoid Foramen
			Temporofacial branch of facial nerve (temporal and zygomatic branches) (CN VII)	Frontalis Orbicularis oculi Corrugator supercilii Procerus Depressor supercilii Temporalis muscle
			Cervicofacial branch of facial nerve (marginal mandibular and cervical) (CN VII)	Orbicularis oris Depressor anguli oris Depressor labii inferioris Mentalis Parotid gland Platysma
			Buccal branch of facial nerve (CN VII)	Procerus
Foot Tai Yang (Bladder)				
'Sinew urgency on back of the neck, inability to raise shoulder, twisting pain in broken basin for the armpit branch, unable to turn left and right.'	• Tongue fasciculation or muscle wasting, tongue curling, or deviation to the side of the lesion, and possible neck pain • Unilateral weakness of the tongue musculature, lingual dysarthria, and deviation of the tongue towards the side of weakness on protrusion	• Surgery: cosmetic • Stroke or tumour • Motor neuron conditions (e.g. ALS) • Metastatic disease to skull base may involve nerve • Diseases of the posterior fossa or skull base • Neoplasm, blunt and penetrating trauma with occipital condyle fractures, inflammation, and post-radiation injury may affect hypoglossal function at the hypoglossal canal	C1, C2 anterior rami connection to hypoglossal nerve (CN XII)	Tongue: Genioglossus Hypoglossus Styloglossus Geniohyoid Thyrohyoid
	• Tension in the erector spinae muscle group could manifest as pain on the back of the neck		C3 (3rd occipital nerve)	Cervical erector spinae
	• Tenderness along the course of the GON or complain of continuous unilateral pain throughout the occipital and parietal scalp • Hyperalgesia, dysesthesia, and paroxysmal vertigo is associated with occipital neuralgia, which accompany migraine headaches	Entrapment of the nerve causing: • Migraine • Occipital neuralgia • Cervical trauma • Iatrogenic injury during surgery • C2 osteophyte formation • C2 arthritis • Cervical cord tumours	Greater occipital nerve	Semispinalis capitis, occipitalis, base of skull Obliquus capitis inferior Aponeurotic attachments of trapezius and semispinalis capitis muscles to the occipital bone.
	Dysfunction in this muscle results in the impaired range of motion described by the classics: • Unilateral cervical rotation • Bilateral cervical flexion • Raising of the sternum and assisting in forced inhalation	• Motor neuron conditions (e.g. ALS) • Iatrogenic injury (e.g. during lymph node biopsy or dissection for head and neck cancers) • Any pathology that affects the C2-C7 nerves	Cervical plexus (C2-C7 cervical nerves)	Sternocleidomastoid

Foot Shao Yang (Gall Bladder)				
'Neck sinew urgency. Follow left to right, right eye cannot open.'	• Upper-mid face, mainly eyelid problems: blinking, tearing, which can damage vision • Mid-lower face, difficulty with face movements: e.g. facial expression, mastication, speaking	• Otomastoiditis: complicated otitis media with mastoiditis • Iatrogenic: e.g. Surgery • Blunt trauma/fractures to skull • Lower or upper motor neuron conditions causing lower facial weakness • Infection (viral, bacterial): e.g. Bell's palsy, herpes zoster	Zygomatic branch of facial nerve (CN VII)	Orbicularis oculii Zygomaticus major Zygomaticus minor Levator labii superioris Alaeque nasi and levator labii superioris Levator anguli oris
			Oculomotor nerve (CN III)	Levator palpebrae
		• Lyme disease • Stroke • Tumour • Intratemporal facial nerve schwannomas within the facial canal	Mandibular branch of trigeminal nerve (CN V3)	Temporalis and temporofascia
Foot Yang Ming (Stomach)				
'Abdominal sinew urgency refers to broken basin and cheeks, corner of mouth become weird, urgency, eyes cannot close, when hot thus sinew vertically straighten, eyes cannot open. When cheek sinew become cold, thus urgent, lead cheek to shift the mouth, heat thus sinew become hot and relax vertically, slow unable to overcome restrain, thereby cause weirdness.'	• Muscle contraction or spasms of the neck, cheeks, face, and eyes	• Otomastoiditis: complicated otitis media with mastoiditis • Iatrogenic: e.g. surgery • Blunt trauma/fractures to skull • Infection (viral, bacterial): e.g. Bell's palsy, herpes zoster • Lyme disease • Bacterial infection • Stroke • Tumour	Cervical branch of facial nerve (CN VII)	Platysma
			Infraorbital nerve (CN V2) exiting infraorbital foramen	Zygomaticus major and minor
			Labial branch of infraorbital nerve (CN V2)	Orbicularis oris
			Nasal branch of infraorbital nerve	Levator labii superior
			Supratrochlear nerve Supraorbital nerve (CNV1)	
			Buccal branch of facial nerve and facial nerve trunk (CN VII)	

Table 8: Summary table and clinical applications

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