RUHANI COLLEGE
OF HEALTH BUSINESS AND TECHNOLOGY

RUHANI COLLEGE OF MASSAGE THERAPY

Lecture 3

Neuroanatomy & Pathophysiology of the Cranial Nerves:
Facial Nerve (CN VII) and Vestibulocochlear Nerve (CN VIII)

Course: RU RMT 16 — Neurology 2

Relevance: Clinical application for Registered Massage Therapists (CMTCA competencies)

Learning Objectives

On completion of this lecture, the student will be able to:

1. Describe the motor, special sensory, and parasympathetic components of the Facial nerve (CN VII).
2. Explain the anatomy and function of the Vestibulocochlear nerve (CN VIII) and its two divisions.
3. Outline the physiology of hearing and equilibrium and identify the structures involved.
4. Perform and interpret the standard cranial nerve tests for CN VII and CN VIII.
5. Recognize the signs, symptoms, and pathophysiology of Bell's palsy and common CN VIII disorders.
6. Apply appropriate assessment, treatment adaptations, cautions, and referral decisions in RMT practice.

Facial Nerve (CN VII) — Overview

A mixed cranial nerve

Carries a large motor component together with a special sensory and an autonomic (parasympathetic) component. Somatic motor axons arise from the **pons**.

Motor	Muscles of facial expression, plus stylohyoid, posterior belly of digastric, and stapedius.
Special sensory	Taste from the anterior 2/3 of the tongue.
Parasympathetic	Secretion of tears (lacrimal gland) and saliva (submandibular & sublingual glands).

Facial Nerve (CN VII) — Motor Function

Five terminal motor branches (branching within the parotid gland, though CN VII does not innervate the parotid) supply the muscles of facial expression:

1. Temporal	Frontalis, orbicularis oculi (upper)
2. Zygomatic	Orbicularis oculi (lower)
3. Buccal	Buccinator, orbicularis oris, cheek
4. Mandibular	Depressors of the lower lip / chin
5. Cervical	Platysma

Also innervated (somatic motor):

- Stylohyoid muscle
- Posterior belly of the digastric
- Stapedius muscle (dampens ossicle vibration to protect the inner ear from loud sound)

Note: General sensation of the tongue is supplied by the trigeminal nerve (CN V), not CN VII.

Facial Nerve (CN VII) — Sensory & Autonomic

Special Sensory

Taste sensation from the anterior two-thirds of the tongue.

Parasympathetic (autonomic motor)

Fibres synapse in the pterygopalatine and submandibular ganglia, then supply the lacrimal, nasal, submandibular and sublingual glands — producing tears and saliva.

Function Summary

Special sensory	Taste — anterior 2/3 of tongue
Somatic motor	Facial expression; stylohyoid, digastric, stapedius
Autonomic motor	Secretion of saliva and tears

Facial Nerve (CN VII) — Assessment

The motor function of CN VII is screened in the RMT cranial-nerve assessment by asking the client to:

1	**Crease the forehead**	Raise the eyebrows (frontalis)
2	**Close the eyes tightly**	Hold closed against gentle resistance (orbicularis oculi)
3	**Puff out the cheeks**	Hold air against light pressure (buccinator)
4	**Show the teeth / smile**	Observe for symmetry of the mouth

Clinical note: An inability to raise the eyebrow on the affected side helps distinguish a peripheral (lower-motor) lesion such as Bell's palsy from a central (stroke) lesion, in which the forehead is usually spared. Suspected central causes require urgent medical referral.

Bell's Palsy — Pathophysiology

A neurological condition affecting the facial nerve that causes **paralysis or weakness of the muscles of one side of the face.**

Etiology	Exact cause is unknown; viral infection (e.g. herpes simplex) is often implicated, producing inflammation and compression of the nerve.
Onset	Frequently noticed in the morning, having developed overnight. Usually unilateral.
Course	Symptoms may be transient (short-term) or, less often, permanent. Most cases recover over weeks to months.

Bell's Palsy — Signs & Symptoms

Facial / motor

- Drooping / distortion of facial features on the affected side
- Difficulty closing the eyelid — including during sleep (risk of corneal drying)
- Facial pain or a pulling sensation in front of or behind the ear

Functional / sensory

- Difficulty eating and drinking; drooling
- Headache is common
- Possible loss of taste from the anterior 2/3 of the tongue; reduced tearing / salivation

Because the eyelid may not close, protecting the eye is a priority — an unaddressed cornea can be damaged.

Bell's Palsy — Massage Therapy Considerations

Assessment	Screen CN VII (forehead, eyes, cheeks, teeth); document symmetry, tone, and any changes over time. Rule out red flags suggesting a central cause and refer as needed.
Treatment goals	Support facial muscle tone, reduce compensatory tension in the face, jaw, and cervical region, and improve local circulation. Gentle facial and intra-/extra-oral work may help maintain muscle quality during recovery.
Cautions	Work gently; tissues may be hypersensitive. Protect the eye. Avoid over-fatiguing weakened muscles. Position for comfort if eating/drinking is difficult.
Referral / collaboration	Massage is supportive, not curative. Ensure the client has a medical diagnosis; collaborate with the physician and other providers within the RMT scope of practice.

Vestibulocochlear Nerve (CN VIII) — Overview

A **special sensory** cranial nerve with two divisions. Its sensory axons arise from the inner ear and end in nuclei located in the **pons.**

Vestibular division

Carries impulses for equilibrium (balance).

Receptors in the semicircular canals and vestibule.

Also links to nuclei controlling eye/head movement and to the cerebellum.

Cochlear division

Carries impulses for hearing.

Receptors in the cochlea (organ of Corti).

Relays to the thalamus, then to the primary auditory area of the temporal lobe.

Clinical connection: *vestibular injury may cause vertigo or nystagmus; cochlear injury may cause tinnitus or deafness.*

Anatomy of the Ear

The ear has three regions, each contributing to the pathway of sound and to balance:

Outer ear	Auricle/pinna (elastic cartilage; helix and lobule) and external auditory canal (meatus) through the temporal bone, ending at the tympanic membrane (eardrum). Directs and begins to amplify sound waves.
Middle ear	Air-filled space in the temporal bone. Contains the three ossicles — malleus, incus, stapes — which transmit vibration from the eardrum to the oval window. Houses tensor tympani and stapedius (protective muscles) and the Eustachian (auditory) tube.
Inner ear	A complex series of canals. Semicircular canals and vestibule contain receptors for equilibrium; the cochlea contains receptors for hearing.

Physiology of Hearing

The sequence by which sound becomes a nerve impulse:

1. The auricle/pinna directs sound waves into the external auditory canal.
2. Sound waves strike the tympanic membrane, causing it to vibrate (amount depends on frequency & intensity).
3. The eardrum vibrates the malleus, then the incus, then the stapes (the ossicles).
4. The stapes transfers vibration through the oval window from the middle ear to the inner ear.
5. Vibrations create pressure/fluid waves in the cochlea; hair cells (cilia) are stimulated and generate action potentials — louder sound produces greater AP generation.
6. Impulses travel via the cochlear branch of CN VIII to the thalamus, then to the primary auditory area of the temporal lobe.

Physiology of Equilibrium

Semicircular canals

Detect rotational (angular) movement of the head. Fluid within the canals shifts and bends the cilia of hair cells inside the ampulla, generating impulses about head rotation.

Utricle & saccule (vestibule)

Detect linear acceleration and head position relative to gravity. As the gelatinous layer with its otoliths slides, it changes the orientation of the underlying cilia, stimulating action potentials.

Equilibrium information travels via the vestibular branch of CN VIII to the vestibular nuclei in the pons, and on to nuclei for eye/head movement and to the cerebellum for balance and coordination.

Vestibulocochlear Nerve (CN VIII) — Assessment

Hearing (cochlear division) is screened with two tuning-fork tests:

Rinne test

Tuning fork placed on the mastoid process (bone conduction), then beside the ear (air conduction). Normally the second position (air) is heard louder.

Weber test

Tuning fork placed on the centre of the forehead. Normally the sound is heard equally in both ears; lateralization suggests conductive or sensorineural loss.

Vestibular division

Tested with specialized equipment. Abnormal nystagmus during normal eye movement can indicate a vestibular problem. RMTs screen for dizziness/balance red flags and refer for formal testing.

Deafness — Sensorineural vs. Conduction

Deafness is a significant or total hearing loss. Two main types:

Sensorineural

Damage to the hair cells of the cochlea or to the cochlear branch of CN VIII.

Common causes:

- Repeated loud noise
- Certain drugs (e.g., aspirin)
- Atherosclerosis reducing blood supply, destroying hair cells

Conduction

Impairment of the outer/middle ear mechanism that transmits sound to the cochlea.

Common causes:

- Impacted cerumen (ear wax)
- Otosclerosis (new bone around the oval window)
- Injury to the tympanic membrane
- Stiffening of the ossicle joints

Common Disorders of Hearing & Equilibrium

Ménière's disease	Increased endolymph enlarges the labyrinth of the inner ear. Symptoms: fluctuating hearing loss, tinnitus, vertigo; near-total hearing loss may occur over years.
Otitis media	Acute bacterial infection of the middle ear, often linked to nose/throat infection spreading via the Eustachian tube. Pain, malaise, fever, red bulging eardrum that may rupture.
Tinnitus	Perception of sound with no external source. A symptom (not a disease) from neurological damage, ear infection, or noise-induced hearing loss; loud noise can damage cochlear structures.
Vertigo	Sensation that the surroundings are spinning; often with nausea/vomiting. Causes include inner-ear or CN VIII disturbance, a loose calcified otolith, or neck (cervical) involvement.

CN VIII Disorders — Massage Therapy Considerations

Positioning & safety	For clients with vertigo/dizziness (Ménière's, BPPV), change table positions slowly and help them sit up gradually. Avoid rapid head movements and extreme cervical positions.
Screening & red flags	Sudden hearing loss, new or severe vertigo, spontaneous nystagmus, or ear pain/discharge warrant medical referral before or instead of treatment.
Acute infection	Otitis media is an acute infection — avoid local work over an infected/painful ear and consider whether systemic signs (fever) contraindicate treatment that day.
Supportive role	Massage may help associated muscle tension, TMJ, and cervical dysfunction that can accompany tinnitus or cervicogenic dizziness. It manages contributing factors, not the underlying pathology.

Key Clinical Takeaways

- CN VII (facial) is a mixed nerve: motor to facial expression, taste to the anterior 2/3 of the tongue, and parasympathetic to lacrimal and salivary glands.
- Bell's palsy is a peripheral CN VII palsy — assess forehead sparing, protect the eye, refer for diagnosis, and provide supportive, gentle care.
- CN VIII (vestibulocochlear) is special sensory: vestibular division for balance, cochlear division for hearing.
- Sound follows a clear pathway (eardrum → ossicles → oval window → cochlea → CN VIII → temporal lobe); balance depends on the semicircular canals, utricle, and saccule.
- Distinguish sensorineural from conductive deafness; know Ménière's, otitis media, tinnitus, and vertigo.
- For RMTs: screen the cranial nerves, adapt positioning for dizziness, respect acute infection, recognize red flags, and refer appropriately.