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Facial Nerve Paralysis: Understanding, Evaluation, and Management

Tricia Scaglione, AuD, FAAA, CCC-A, ABAC



Tricia Scaglione, AuD

Tricia Scaglione, AuD, F-AAA, CCC-A, CH-TM, CH-AP is a tinnitus expert, consultant, and clinical audiologist. She is Board Certified in Audiology (ABAC) and served as an invited validation panelist for the national American Board of Audiology's Certificate Holder in Tinnitus Management (CH-TM) program. She is the current chair of the American Academy of Audiology Foundation, is involved in numerous committees for the National Academy of Audiology, and is currently serving on the American Tinnitus Association's (ATA) Scientific Advisory Committee (SAC) and Tinnitus Practitioners Association (TPA) Board of Directors.

Dr. Scaglione is an invited speaker for state, national, and international meetings.

Disclosures

- **Presenter Disclosure:** Financial: Tricia Scaglione is a tinnitus consultant for True Silence Therapeutics. She received an honorarium for this presentation. Non-financial: Tricia Scaglione is non-compensated remote research assistant at VA Pittsburgh Healthcare System. Tricia Scaglione is a current MBA Healthcare Management student at Western Governors University. She is also the chair of the American Academy of Audiology Foundation and scientific advisor for the American Tinnitus Association. Dr. Scaglione is a member/volunteer of AAA, AAAF, ATA, and TPA.
- **Content Disclosure:** This learning event does not focus exclusively on any specific product or service.
- **Sponsor Disclosure:** There is no external sponsor for this course.
- **Patient Consent:** Case Study #1 provided written consent to include his personal information, photographs, and medical records in this presentation.

Learning Outcomes

After this course, participants will be able to:

- Explain the anatomical and physiological connections between the facial nerve and auditory system, and how dysfunction in the facial nerve can affect audiology patients.
- Discuss the administration and interpretation of a range of audiological tests tailored to assess hearing function in individuals with facial nerve paralysis. This includes techniques such as pure-tone audiometry, speech audiometry, acoustic reflex threshold testing, and electroneuronography.
- Describe the creation of individualized management strategies integrating audiological rehabilitation techniques with facial nerve rehabilitation protocols. This includes counseling on communication strategies, recommending appropriate hearing aids or assistive listening devices, and collaborating with other healthcare professionals to optimize outcomes for patients with facial nerve paralysis.

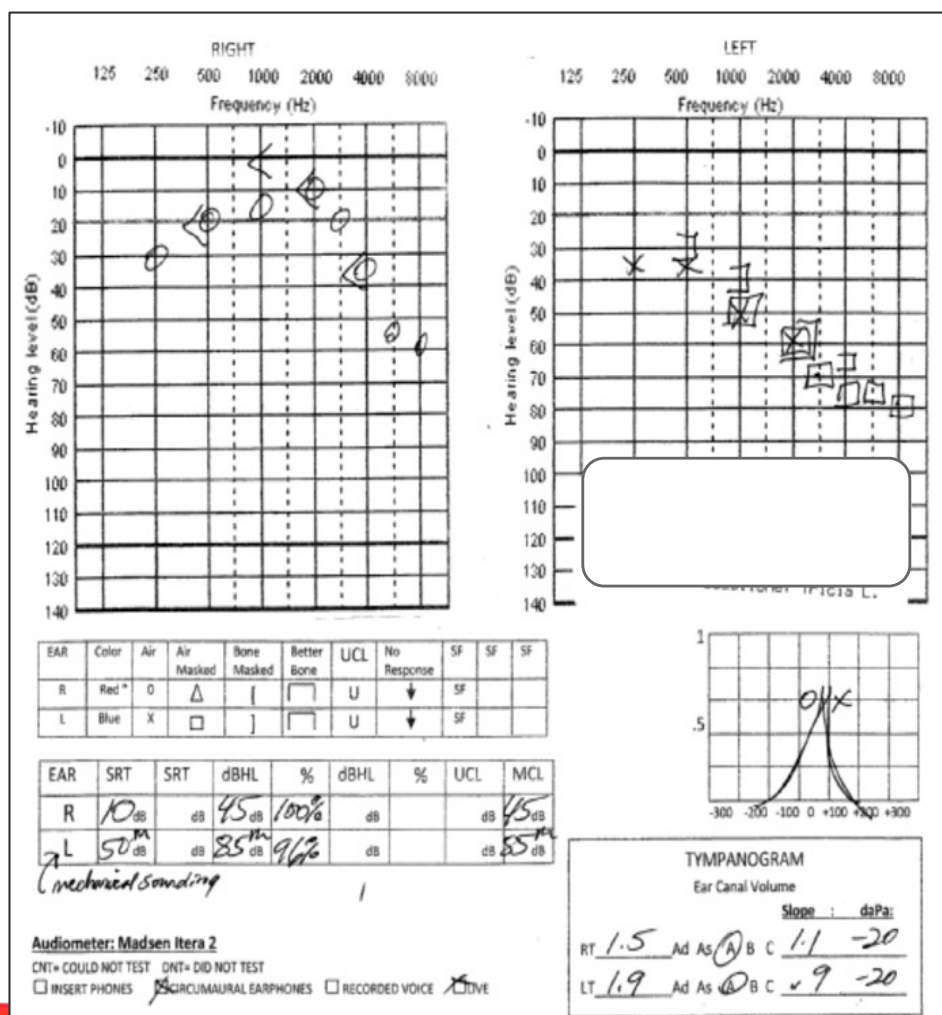
Case Study

- 64 y.o. Male
- Musician
 - Music teacher
 - Community orchestra



Otologic History

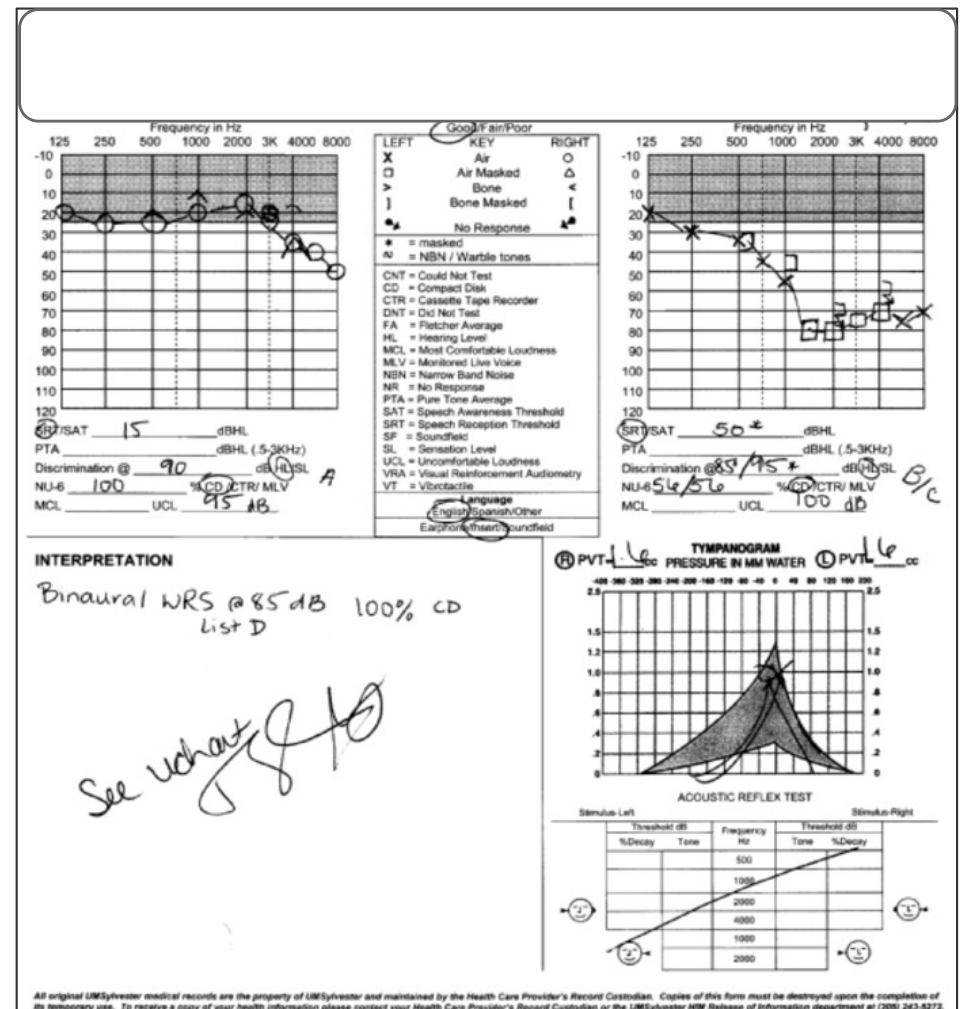
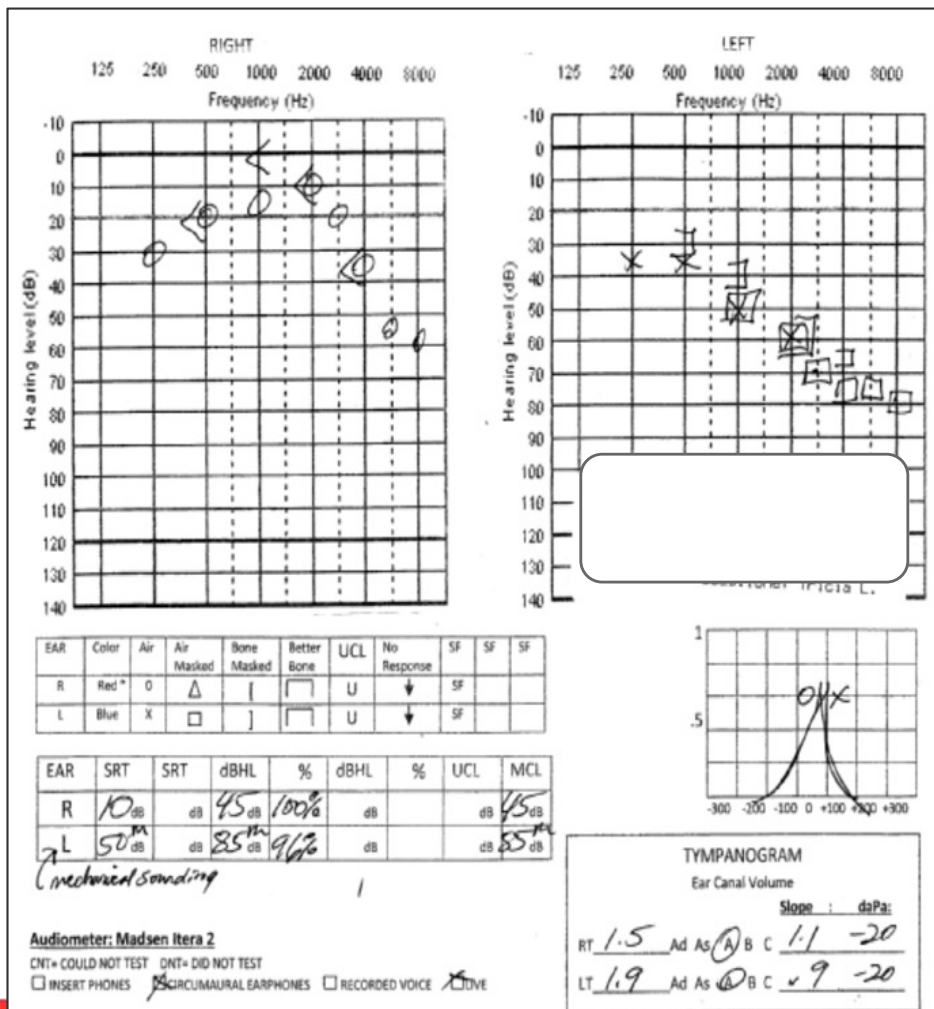
Sept. 2016



Otologic History

Sept. 2016

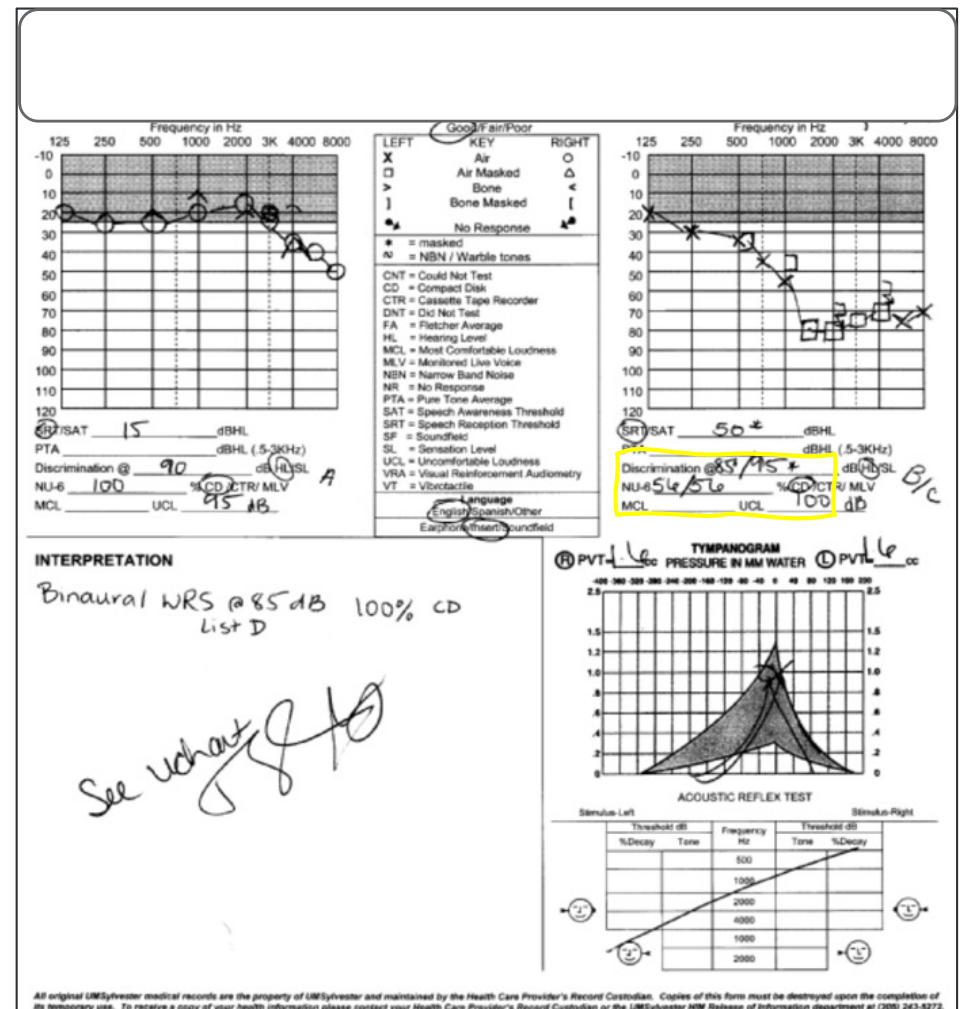
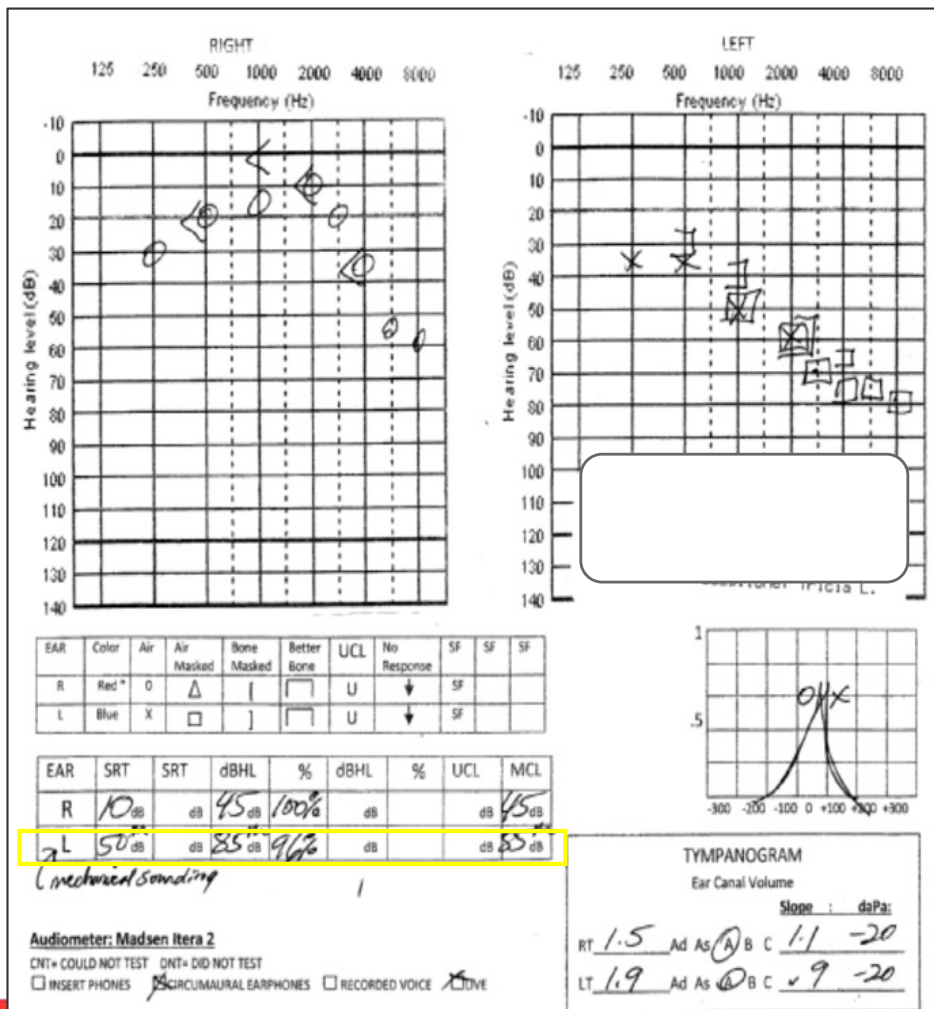
June 2018



Otologic History

Sept. 2016

June 2018



Nov. HA Appointment Request



**Photo from June 2018*

Hearing Aid Appointment # 1

- 11/28/18- Hearing Aid Repair #1
- Something seems “off”?

Hearing Aid Appointment # 2

- 11/28/18- Hearing Aid Repair #1
 - Something seems “off”?
- 12/6/18- Hearing Aid Repair #2

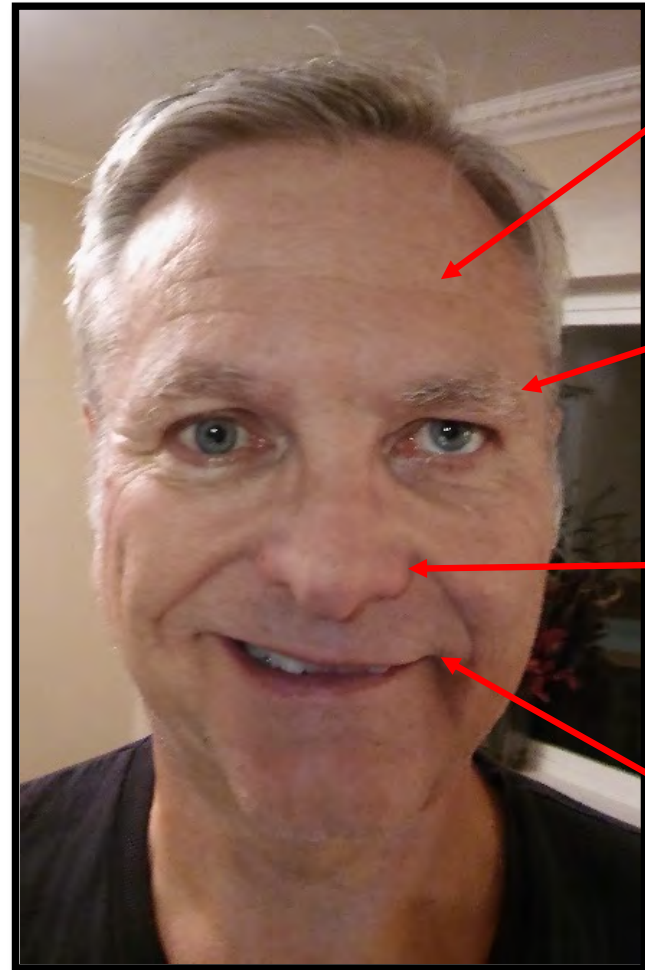


Comparison

6/1/18



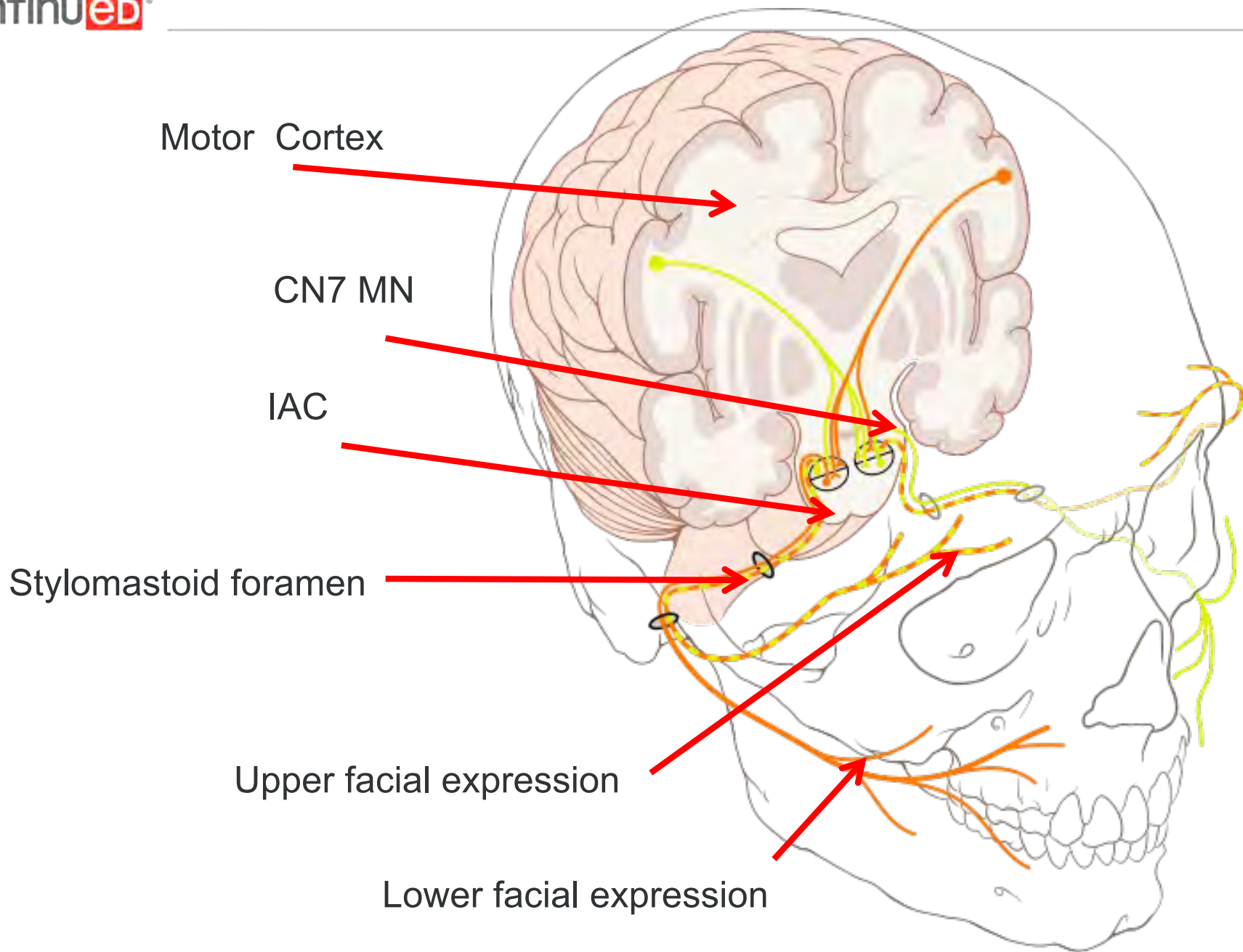
12/6/18



Anatomy & Physiology

Anatomy & Physiology of FN

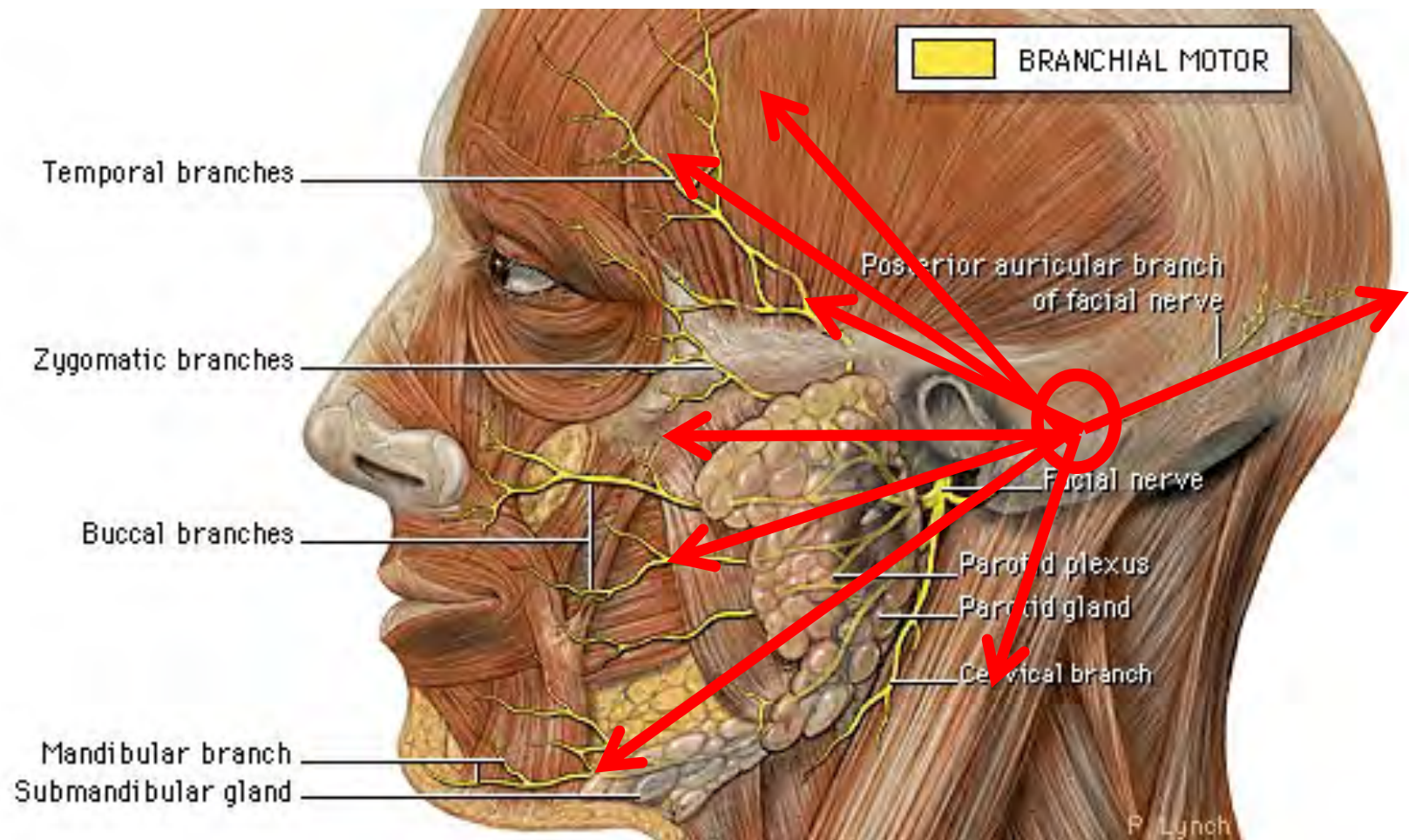
- CN VII has 10,000 fibers
 - 2/3rds motor
 - 1/3rd sensory
- Normal facial motion requires only half of the motor fibers to be intact.
- Facial nerve originates in motor cortex and exits the Stylomastoid foramen to innervate the muscles of the face.



Physiology

Branchial Motor	Efferent	Facial expression Posterior belly of digastric muscle Stylohyoid Stapedius
Visceral Motor	Efferent	Parasympathetic innervation of lacrimal submandibular and sublingual glands mucus membranes of nasopharynx hard and soft palate
Special Sensory	Afferent	Conveys taste info from anterior 2/3 of tongue
General Sensory	Afferent	Sensation in concha and behind the auricle

FN branches (motor innervation)



Etiology of Facial Nerve Paralysis

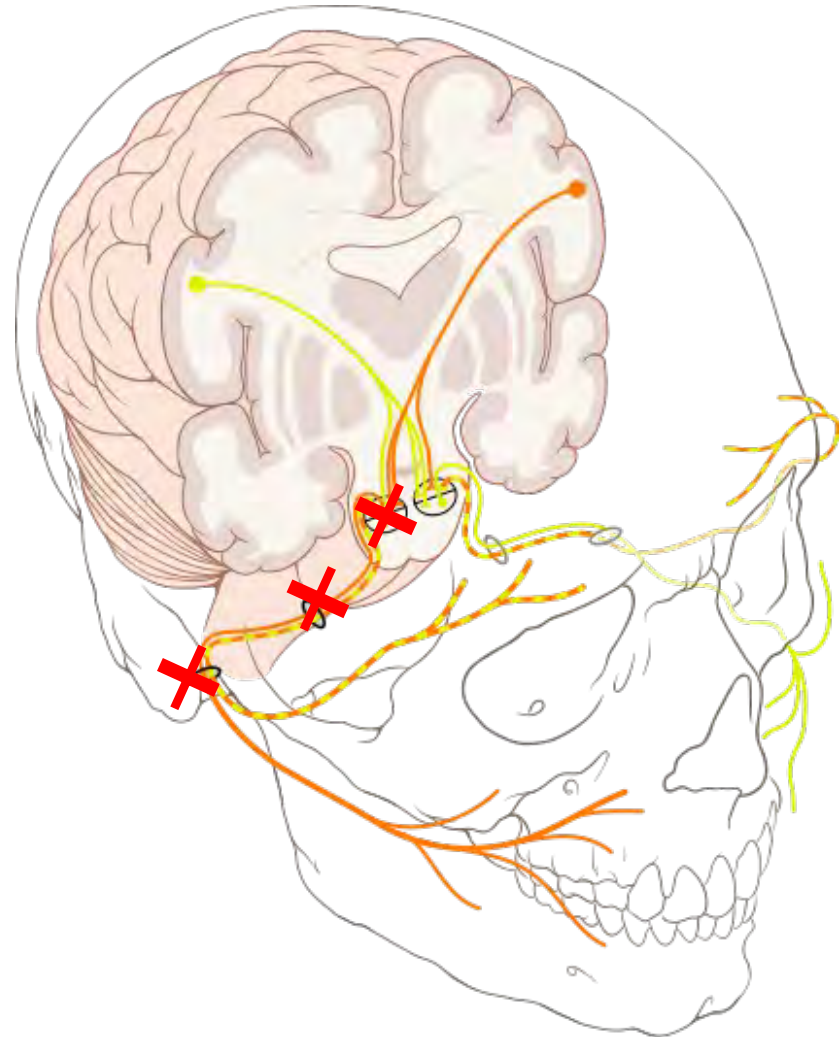
- Bell's Palsy (BP)
- Iatrogenic injury
- Trauma to the temporal bone
- Otitis media
- Herpes zoster oticus
- Multiple sclerosis
- Melkersson-Rosenthal syndrome
- Mumps
- Chicken-pox
- Guillian-Barre syndrome
- Central nervous system disorders (i.e., stroke)
- Glomus jugulare
- Meningioma
- Facial nerve neuroma
- Mastoiditis
- Idiopathic
- and others

Epidemiology

- 70/100,000
 - 20/100,000 Bells Palsy
 - 30/100,000 Trauma
- 127,000 cases annually
- No gender predilection
- 10% bilateral involvement
- 24% with hearing loss

Lower Motor Neuron Lesion

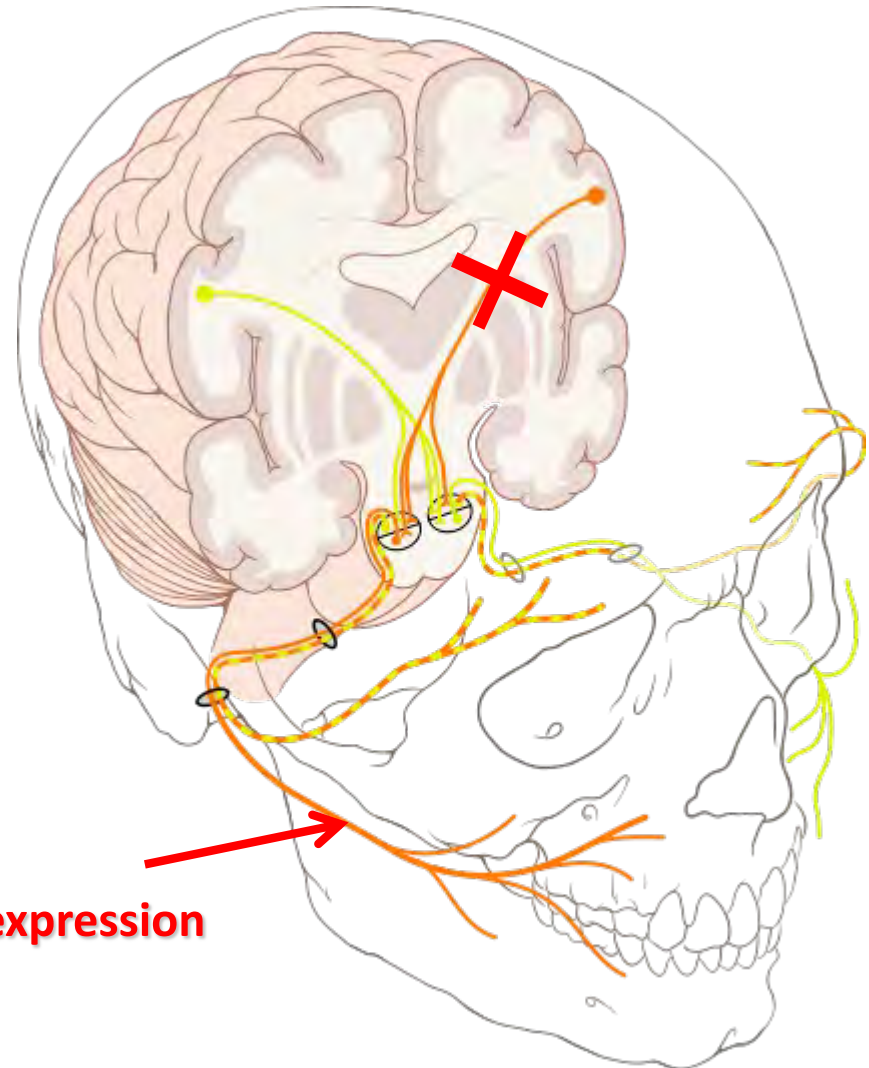
- Asymmetry of the face
- Eyebrow droop
- Drooping of the mouth
- Tearing
- Inability to close eye
- Inability to purse lips
- Inability to smile/frown
- Nostril control



Upper Motor Neuron Lesion

- Facial asymmetry
- Atrophy of muscles of lower portion of the face on affected side
- No eyebrow droop
- Maintain ability to close eye
- Inability to purse lips
- Inability to smile/frown
- Nostril control

Lower facial expression



Anatomy of a Nerve Fiber

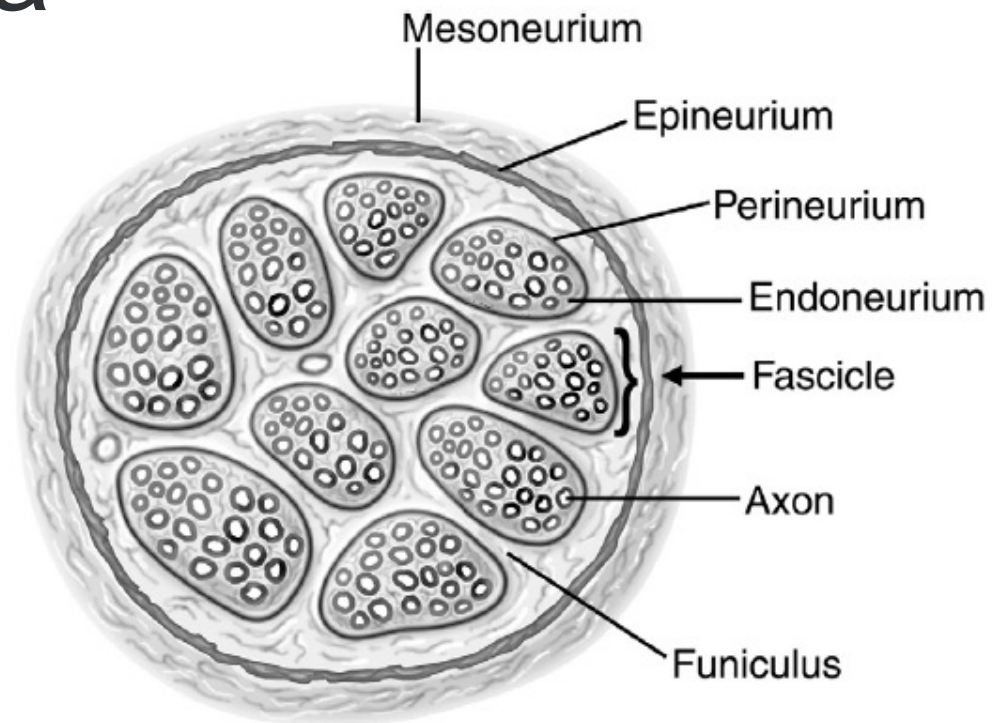


Table 2 Contents of a nerve fiber

Nerve axon	Extension of the neuron that contains axoplasm and is responsible for transduction of electrical impulses away from the cell body.
Endoneurium	Contains the axon. It is a single layer of Schwann cells and an inner layer of connective tissue called neurilemma. It serves as a protective sheath for myelinated nerve cells.
Perineurium	Connective tissue that bundles together a number of endoneural tubes to form the funiculus.
Epineurium	Funiculus bundles are held together by areolar connective tissue, which is more compressed at the surface. The bundles gradually become intermingled as fibers ascend along the nerve.

<http://www.neurosurgery.tv/imgperipheralcns/fig-2.jpg>

Wallerian Degeneration

- Occurs in the axon stump distal to the site of injury and begins 24-36 hours after injury
- Prior to degeneration, axon remains excitable
- Complete denervation takes 72 hours
- **FN testing should be performed between 72 hours to 3 weeks of onset for best prognosis**

Sunderland and Seddon Classification for Nerve Injury

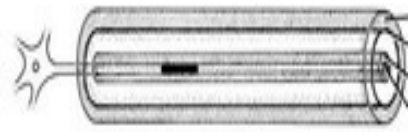
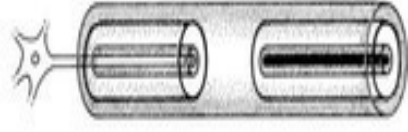
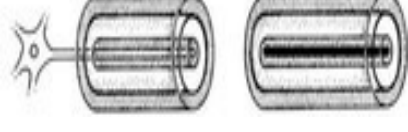
	Sunderland	Seddon	Injury	Description	Recovery
	I (Mild)	Neurapraxia	Conduction block	No Wallerian degeneration Nerve is intact	≤ 3 months
	II	Axonotmesis	Axonal disruption	Wallerian degeneration Axonal regeneration No scar impedance	1 mm/day
	III		Axonal + Endoneurium disruption	Wallerian degeneration Axonal regeneration Scar impedance	<1 mm/day
	IV		Axonal + Endoneurium + Perineurium disruption	Wallerian degeneration Axonal regeneration Significant scar impedance	Surgical intervention
	V (Severe)	Neurotmesis	Nerve trunk discontinuity	Nerve no longer in continuity	Surgical intervention

Photo: http://o.quizlet.com/i/qqQNo-PGjg5sV9rmEZmGqg_m.jpg

Assessment

Facial Motor Bedside Exam

- **Forehead and Upper lid Innervation**
 - Eyebrow elevation
 - Forehead wrinkling
 - Frowning
 - Tight Closing of the eyes
- **Lower Face Innervation**
 - Showing teeth
 - Whistling
 - Puffing cheeks
 - Natural smile

House-Brackmann: Facial Nerve Grading System

Grade	Severity	At Rest	Motion	Eye Closure	Synkinesis
I	Normal	Normal	Normal	Yes	None
II	Mild dysfunction	Normal	Slight Asymmetry	Yes	None
III	Moderate dysfunction	Normal	Obvious asymmetry	Yes	Noticeable
IV	Moderate-severe dysfunction	Normal	Disfiguring asymmetry	No	Severe
V	Severe dysfunction	Asymmetry	Slight movement	No	None
VI	Total paralysis	Asymmetry, loss of tone	No motion	No	None

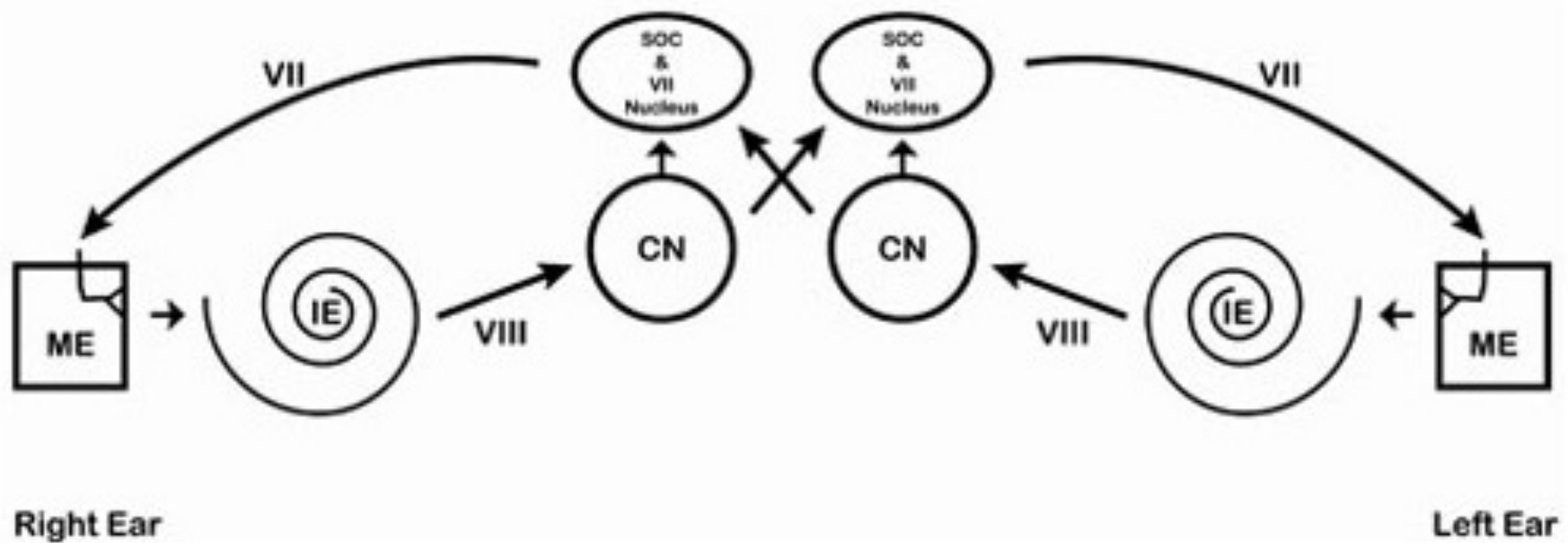
David's HB Score

Grade	Severity	At Rest	Motion	Eye Closure	Synkinesis
I	Normal	Normal	Normal	Yes	None
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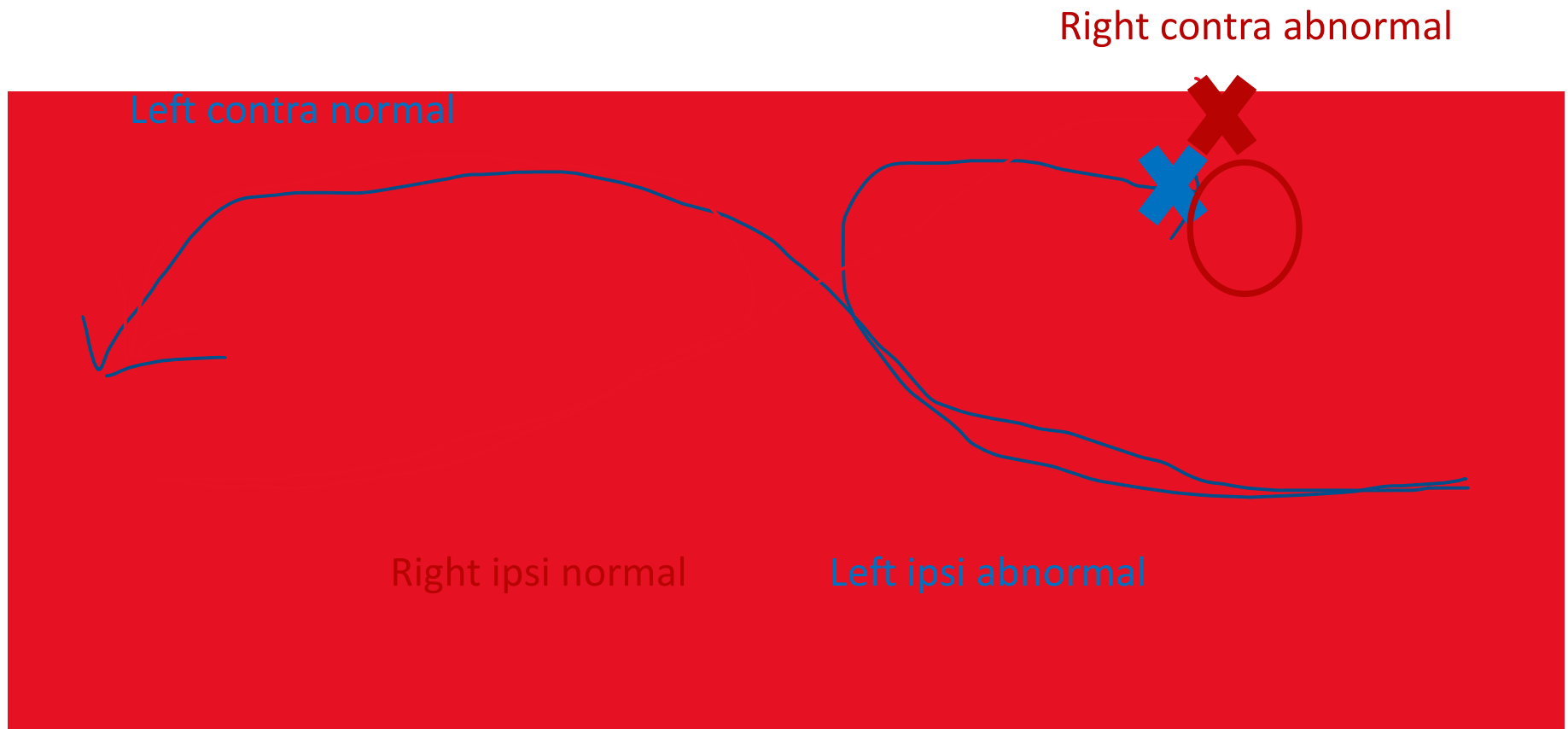
Audiologic Assessment

- Otoscopy
 - TM perforations, hematoma, etc.
- Tympanometry
- Acoustic Reflex Threshold (ART)
 - Objective measure of facial nerve function
 - Allows for early detection of facial nerve dysfunction
 - Complementary to other monitoring techniques

Acoustic Reflex Pathway



Left Facial Nerve Involvement



Audiologic Assessment

- Otoscopy
 - TM perforations, hematoma, etc.
- Acoustic Reflex Threshold (ART)
 - Objective measure of facial nerve function
 - Allows for early detection of facial nerve dysfunction
 - Complementary to other monitoring techniques
- ART patterns
 - Absent
 - Elevated
 - Asymmetric
 - Variable

Audiologic Assessment

- Comprehensive audiometric evaluation
- Compromised stapedial muscle function can result in hyperacusis and impact sound transmission through the auditory system.
 - McCandless et al., 1979

Evaluation of Facial Nerve Function

- Electroneuronography (ENoG)
 - Most accurate, qualitative measurement
 - Measures the compound action potential
 - Magnitude of the response of normal side is compared to impaired side
 - Not useful until WD has occurred
 - <90% decrease in amplitude on impaired side suggests spontaneous recovery
 - >90% decrease in amplitude is an indicator for medical intervention

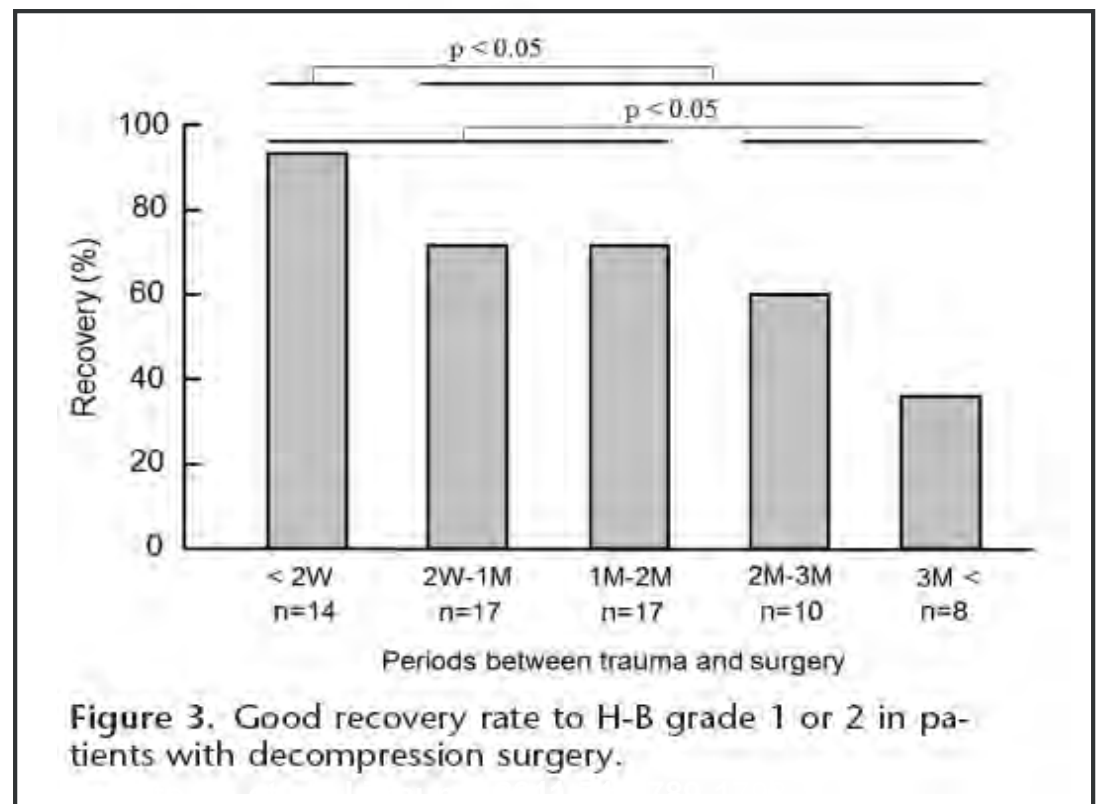
Usefulness of ENoG

- Determine if the FN is intact
- Monitor FN function
 - Improvement
 - Progression of decreased function
 - Test every 3 days
- Decision to treat is primarily based on whether there is complete vs. incomplete paralysis

Immediate, Severe/Complete Facial Paralysis

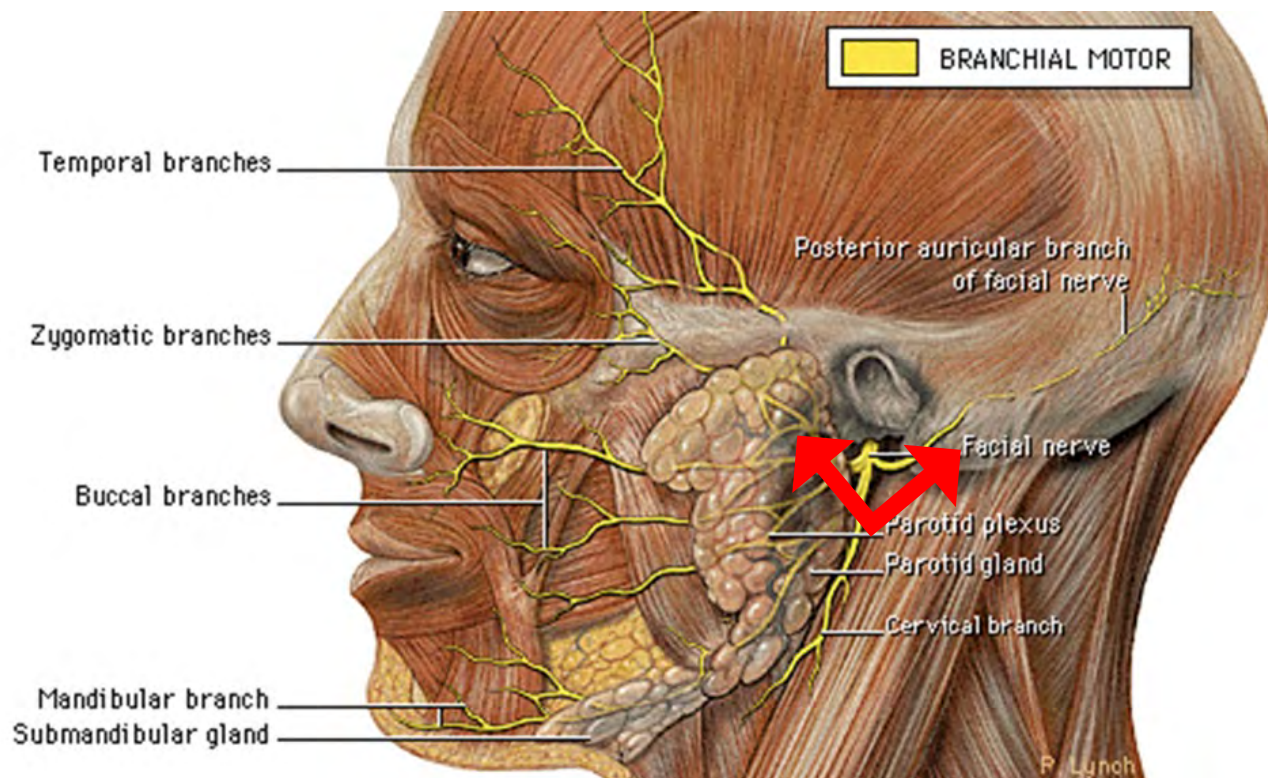
- 2011: Hato and colleagues performed a retrospective study of 66 patients with immediate onset, HB IV-VI facial palsy that demonstrated ENOG >90% 1-151 days after injury that received surgical intervention

Fractures of the mastoid segment of the facial nerve and surgical intervention within 2 months of injury had a higher percentage of facial nerve recovery



Electroneurography (ENoG)

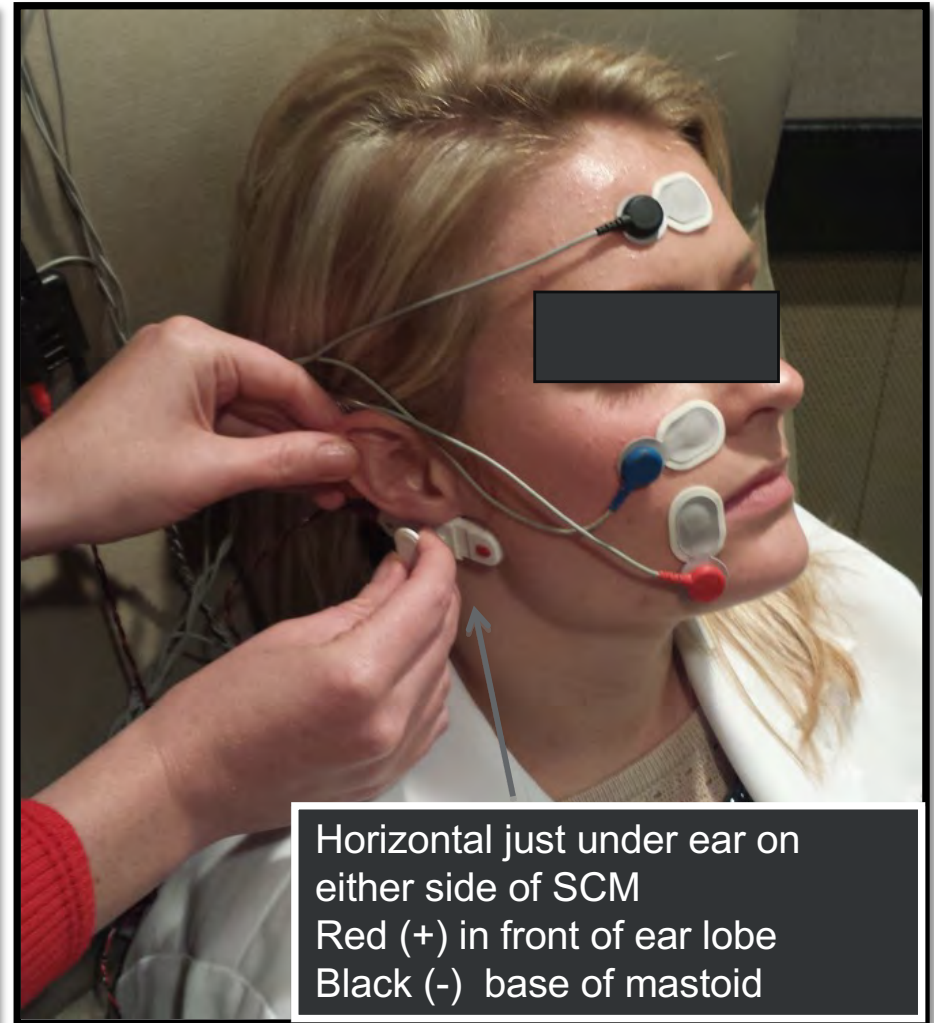
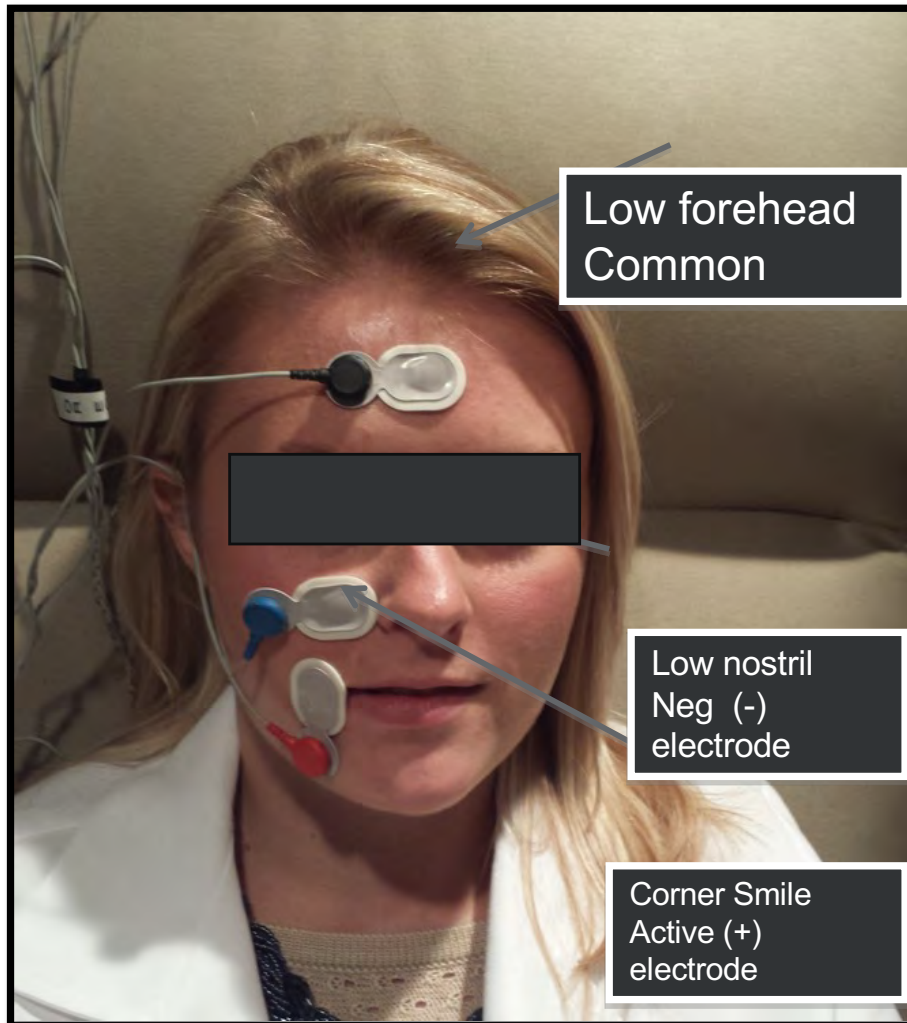
- Electrodes over the main trunk and then distally



ENoG Equipment



ENoG Set Up



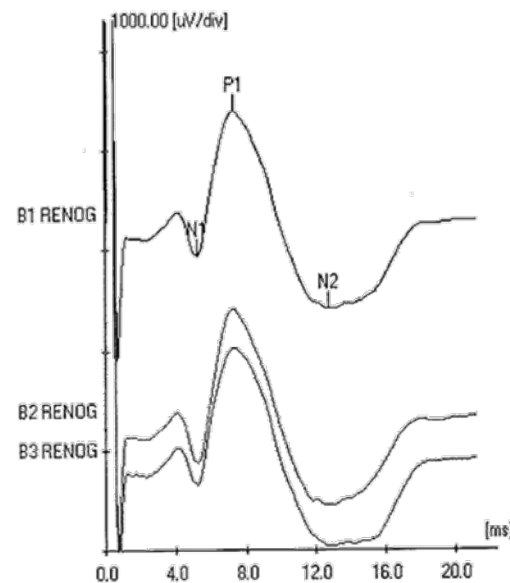
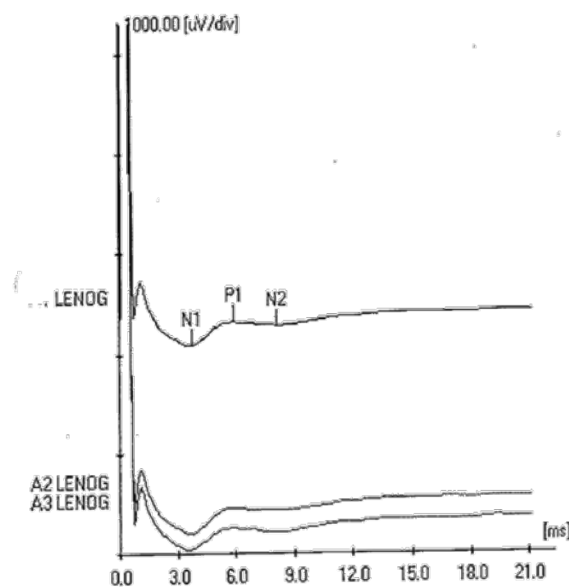
Modifications

- Neck brace
- Radical surgery, lack of landmarks
- Surgical wounds
- Children
 - Nerve trunk is more anterior and lateral on exit through SMF



Interpreting Results

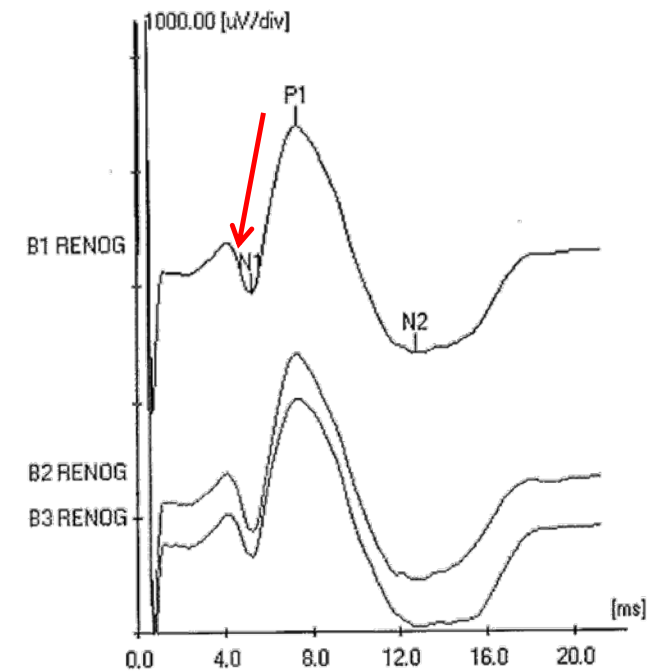
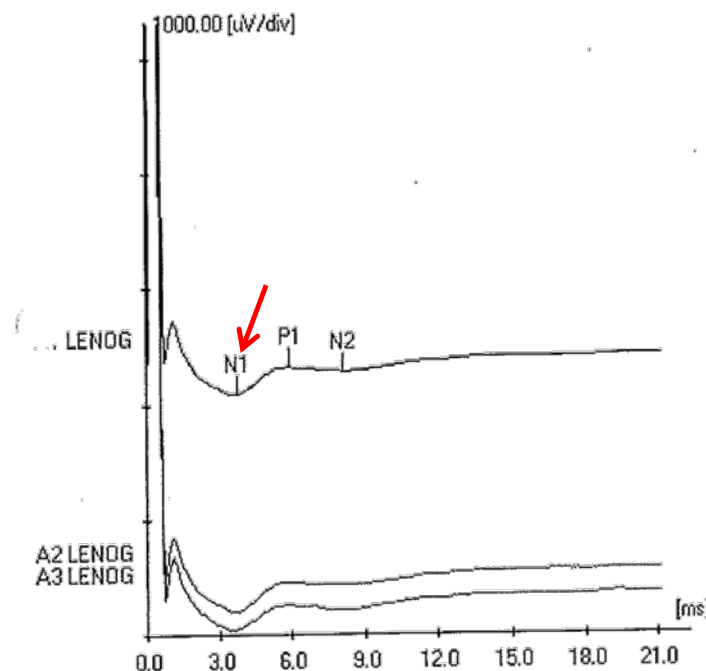
- The facial nerve response → 8 ms
- Masseter response → 5 ms
- Negative deflection (N1), followed by a large positive deflection (P1), followed by a final negative deflection (N2)



Interpreting Results

$$\% \text{ Denervation} = 100 - \frac{\text{Amplitude of involved side}}{\text{Amplitude of uninvolved side}} \times 100$$

- Amplitude: P1 – N2 (μV)
- Latency used to differentiate from masseter response
- Reported as a percentage of denervation



Management & Referral

Management Options

- Wait and Watch
 - Most common for Bell's Palsy
 - Monitor every 3-5 days until patient plateaus
- Surgical intervention
- Steroids and/or Antivirals
- Eye Care
- Acupuncture
- Physical Therapy

Back to David

Medical Attention

- 11/29- Urgent Care
 - Dx with Bell's Palsy
 - Prednisone 60 mg x 7 days
 - Acyclovir 1 gm BID x 7 days

David's Management

- 12/6 - Immediate course of action
 - Addressed concern with patient
 - Expedited testing
 - Advocated for patient
 - Comprehensive follow-up

Facial Nerve Assessment

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I	Normal	Normal	Normal	Yes	None
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VI	Total paralysis	Asymmetry, loss of tone	No motion	No	None

House, JW Laryngoscope 1983; 93:1056-69

Facial Motor Bedside Exam: 1 Week Post-Onset



At Rest

Showing
Teeth

Forehead
Wrinkling

Eyebrow
Elevation

Tight Closing
of Eyes

Week 1 Post-Onset



Day 1
11/29

Day 2
11/30

Day 3
12/1

Day 4
12/2

Day 5
12/3

Day 6
12/4

Facial Motor Bedside Exam



At Rest



Showing
Teeth



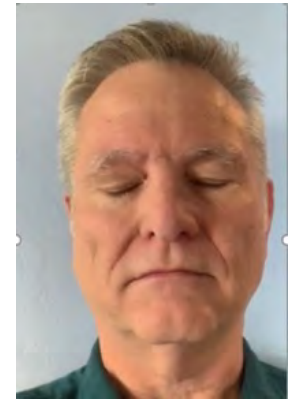
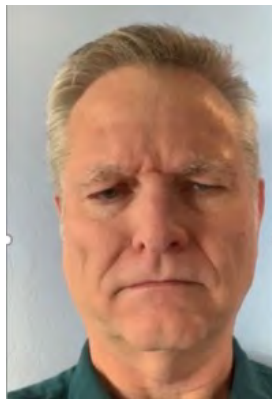
Forehead
Wrinkling



Eyebrow
Elevation



Tight Closing
of Eyes



Comparison

6/1/18



12/6/18



2/25/19



Case Study #2

Case Study #2

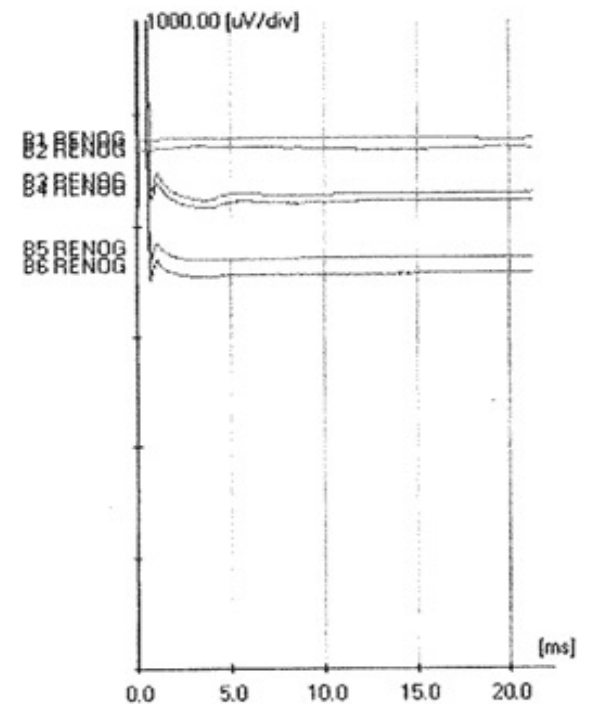
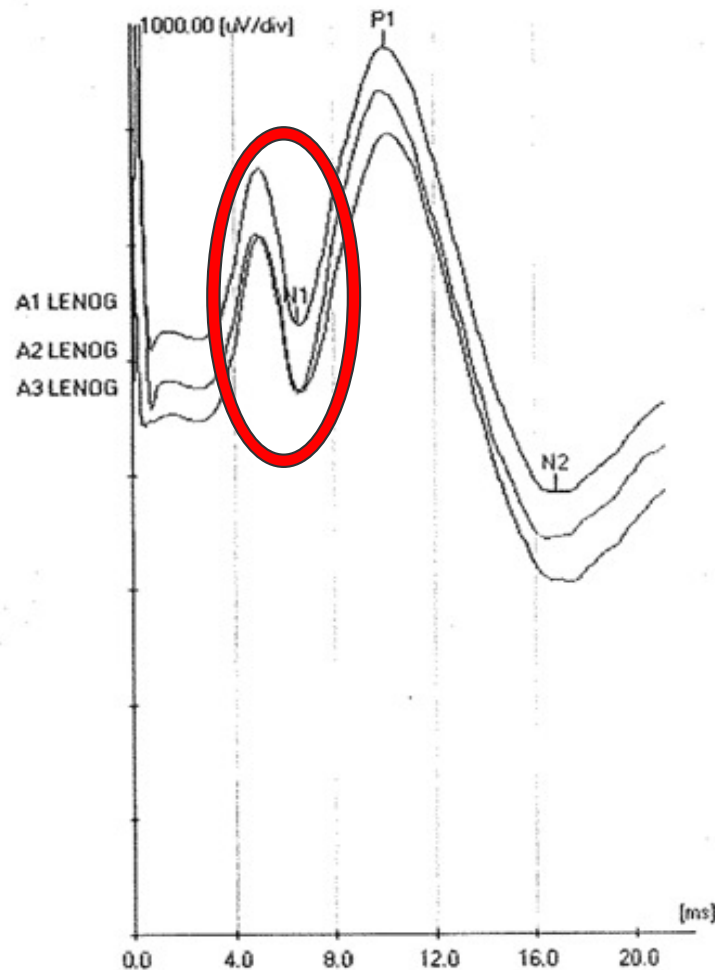
- 9 y.o. male
- Attacked by pitbull
- Trauma to right ear/ neck
- Weakness of right side of face reported immediately
- No eye care
- Patient reports normal sensation bilaterally
- Denied dizziness, HL
- HB: 6/6 right, 1/6 left
- ENT recommends ENoG & eye care

Case Study #2 Work Up

ENoG evaluated 6 days post onset

Audiometry

- Tymps: WNL
- ART: Right CN VI
- Hearing: WNL



ENoG: 100% denervation

Case Study #2 Results

ENT

Recommendation:

- Emergency surgery, Keflex 1 week
- Exploration and repair of FN, possible facial decompression, repair, nerve graft

Outcome:

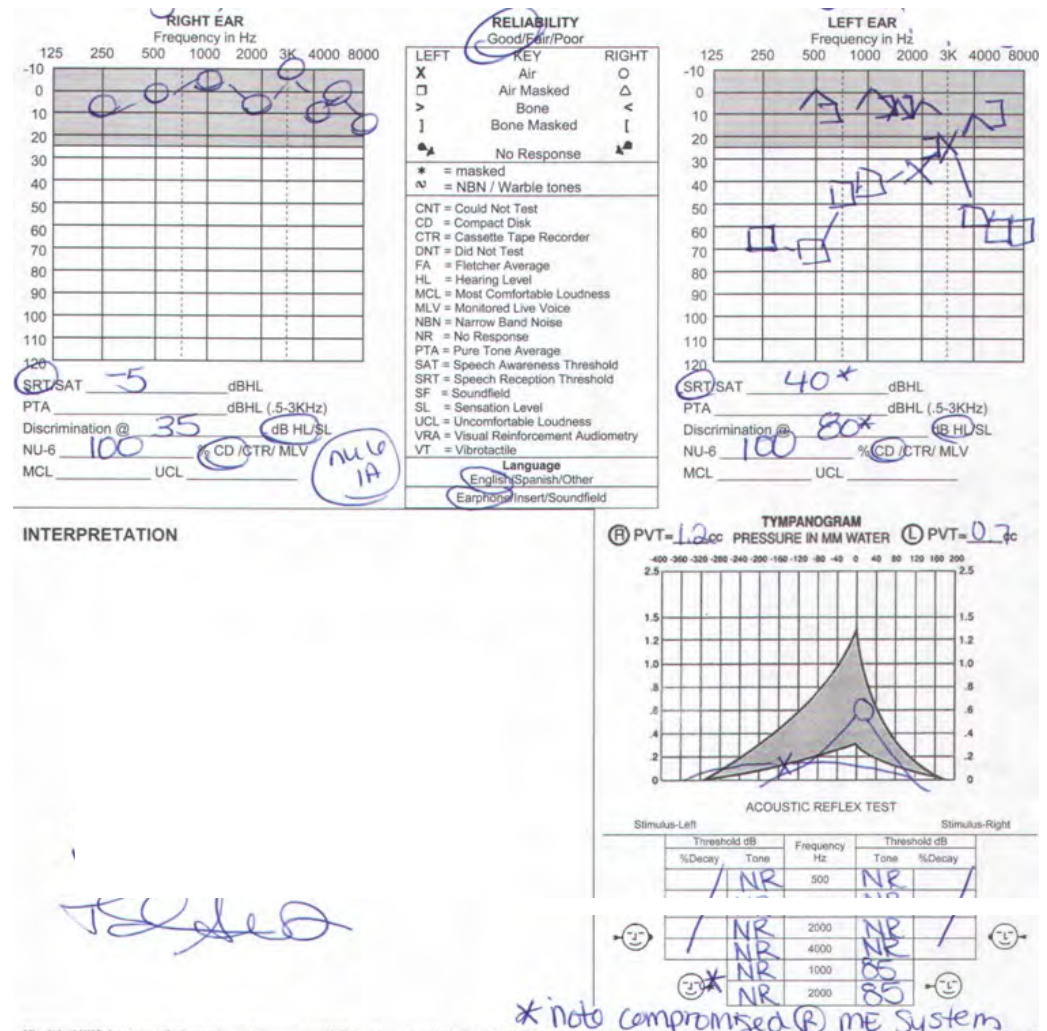
- FN repair, mastoidectomy, auricular nerve graft
- HB: 5/6 on month post- op
- Referral to Ophthalmology

Case Study #3

- 41 y.o female
- Head trauma resulting in 17 fractures to the skull, fractured spine, stroke, and CSF leak.
- Vertigo with movement
- Unilateral hearing loss
- Left facial paralysis
- Using neck brace
- Left ear discharge
- Initially some eye closure and mouth movement
- Reports facial movement has decreased with time

Case Study #3 Work Up

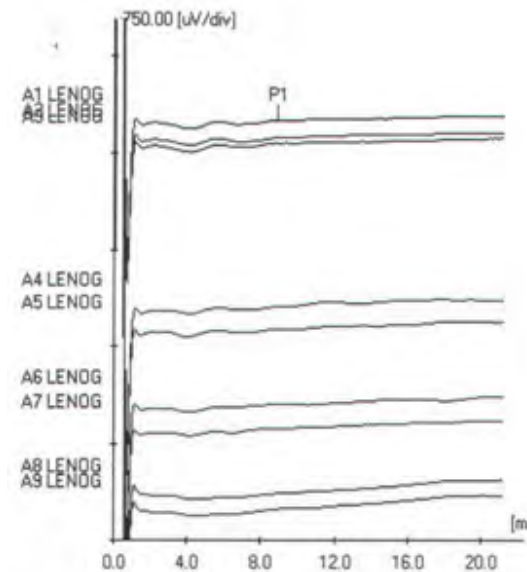
- Tympanometry: reduced mobility left
- ART: Left CN 7
- Hearing: normal right, moderately-severe conductive hearing loss in the left ear.



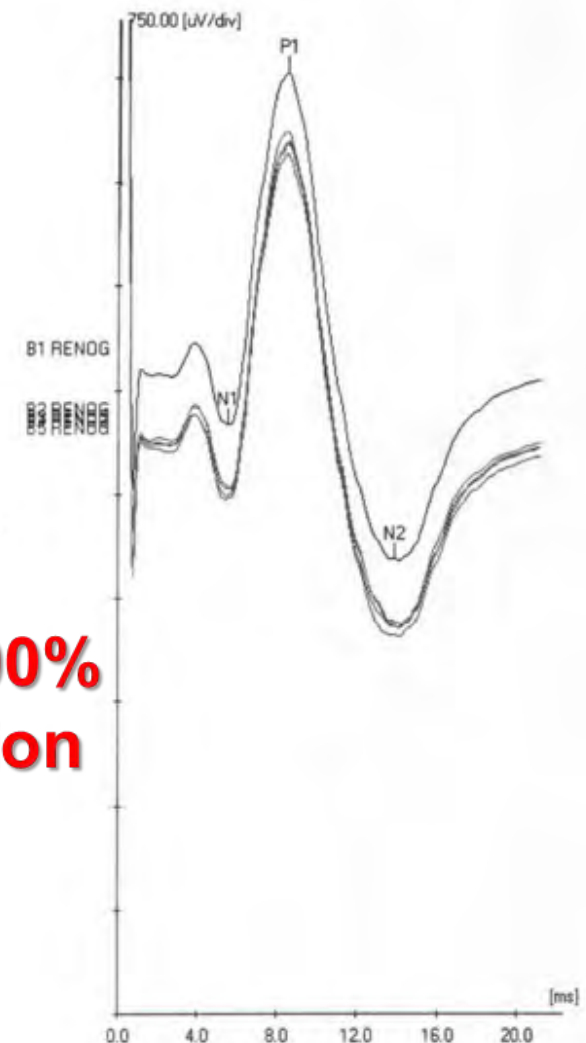
Case Study #3 Work Up

HB Screen:

- Partial eye closure
- Unable to raise eyebrow
- Unable to smile/frown
- No movement of left nostril

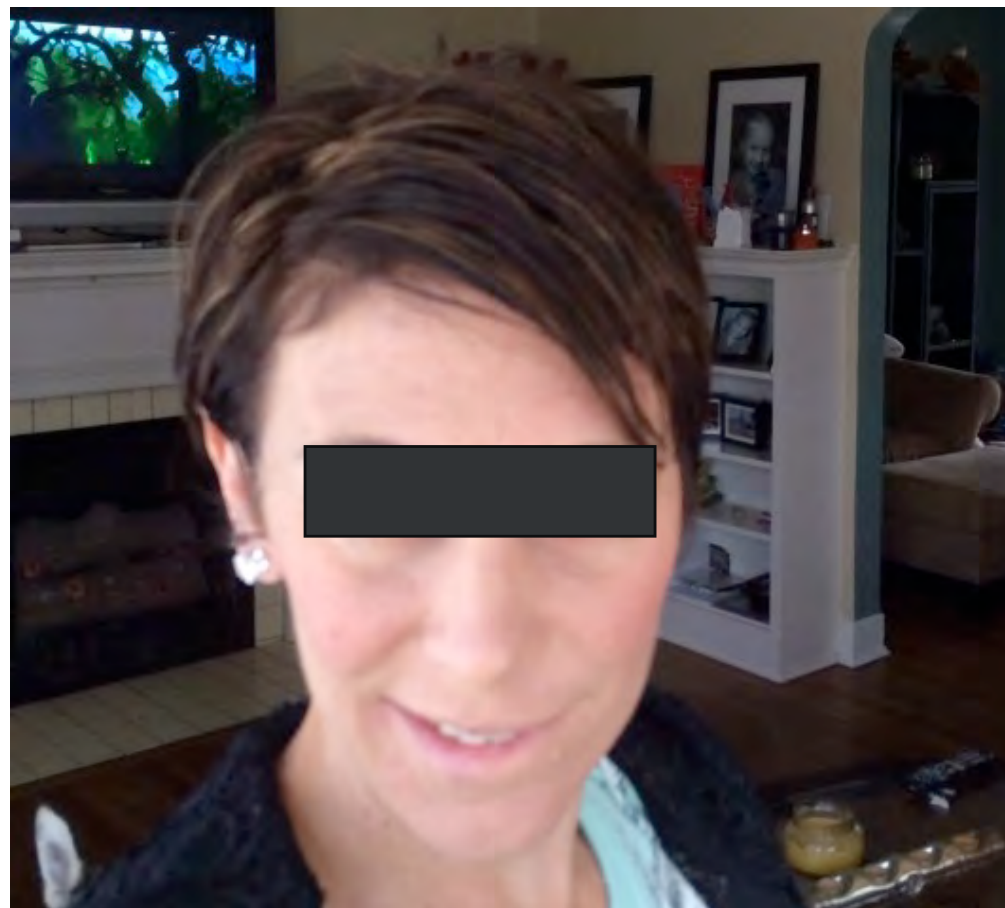


**ENoG: 100%
denervation**



Case Study #3 Results

- Surgical intervention contraindicated due to medical complications so deferred ~3 months
- Nerve graft of FN
- Tympanoplasty & ossiculoplasty with titanium TORP
- FN function improved to: HB 3-4/6
 - Symmetry at rest
- Hearing loss persists
 - HA or repeat ossiculoplasty



Take Home Points

- Facial nerve monitoring is within the audiologist's scope of practice.
- ENoG is an objective means of evaluating the function of the facial nerve.
- For many patients with facial nerve paralysis, monitoring through ENoG is essential for determining the course of treatment and prognosis for recovery.
- In general, facial nerve monitoring is utilized when there is concern that greater than 90% denervation has or will occur. With less than 90% denervation, there is a high rate of spontaneous recovery.
- Patients with temporal bone fractures are also at risk for hearing loss and vestibular disorder. Comprehensive evaluation of hearing and balance function is an important component of the diagnostic work-up of these individuals.

References

1. Katz, J., Chasin, M., English, K., & Hood, L. (Eds.). (2009). Handbook of Clinical Audiology (6th ed.). Lippincott Williams & Wilkins.
2. Roeser, R. J., Valente, M., & Hosford-Dunn, H. (Eds.). (2007). Audiology Diagnosis (2nd ed.). Thieme.
3. Haberkamp, T. J., Tanyeri, H. M., Hicks, D. M., Kanuch, S. W., & Dedo, H. H. (1996). Audiologic monitoring of patients with acute facial nerve paralysis. *Otology & Neurotology*, 17(3), 412-415.
4. Beck, D., & AuD III, J. W. Electroneuronography (ENoG): Neurophysiologic Evaluation of the Facial Nerve.
<http://www.audiologyonline.com/articles/electroneuronography-enog-neurophysiologic-evaluation-facial-1225>
5. Hato, N., Nota, J., Hakuba, N., Gyo, K., & Yanagihara, N. (2011). Facial nerve decompression surgery in patients with temporal bone trauma: analysis of 66 cases. *Journal of Trauma and Acute Care Surgery*, 71(6), 1789-1793.

Thank you!

Tricia Scaglione, AuD, FAAA, CCC-A, ABAC

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