

Facial Nerve

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Facial Nerve

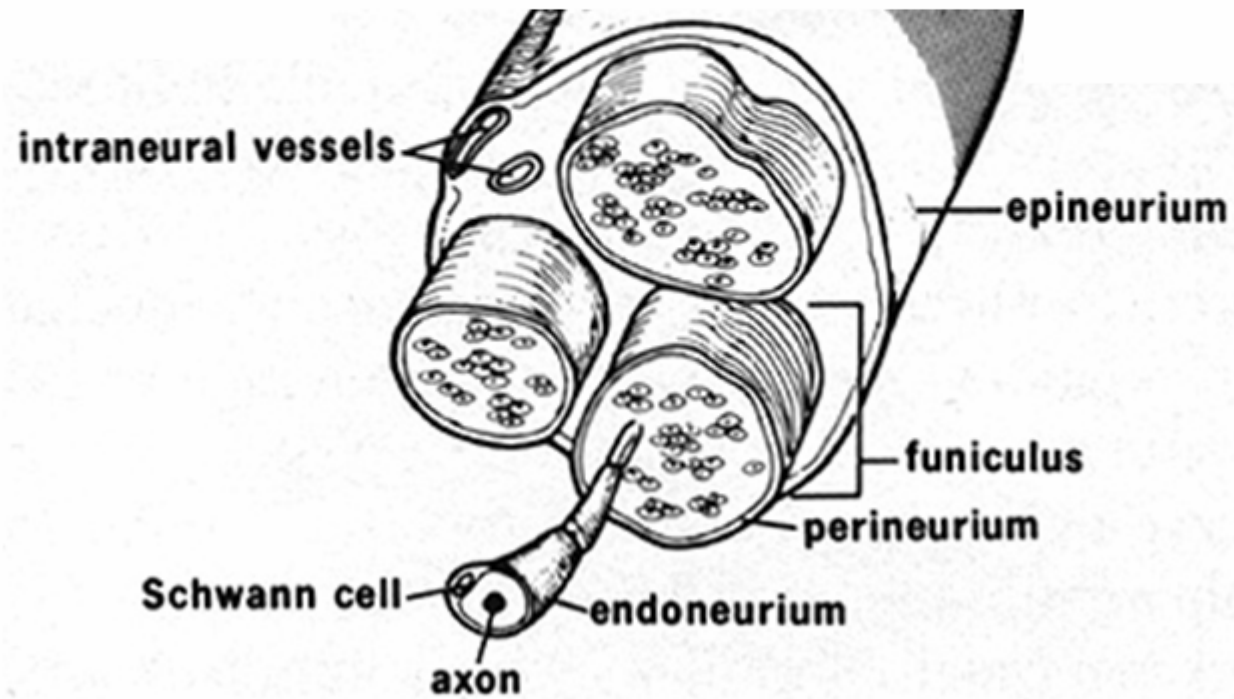
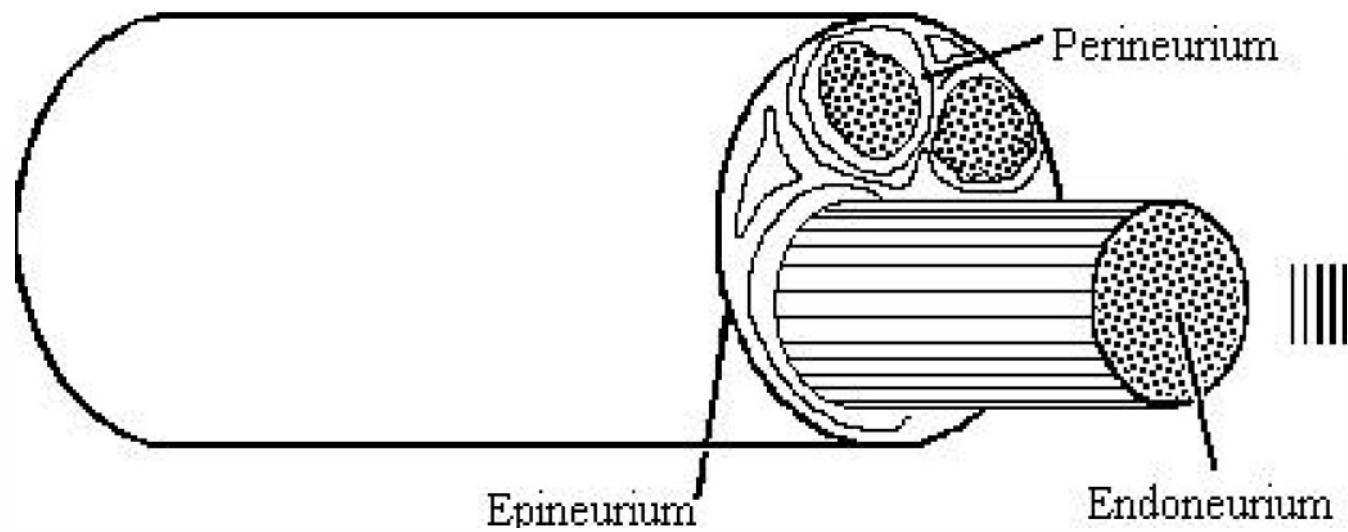
- **Embryology**
- **Anatomy**
- **Physiology**
- **Pathology**
 - **Pathophysiology**
 - **Evaluation**
 - **Causes**
- **Treatment**

Embryology

- Second Branchial Arch
- 0.05 % unilateral facial palsy
- 80% birth trauma
- 90% spontaneous recovery
- Congenital Unilateral Lower Lip Paralysis (CULLP)
- Anatomy of adult (Mastoid more superficial)

Facial Nerve

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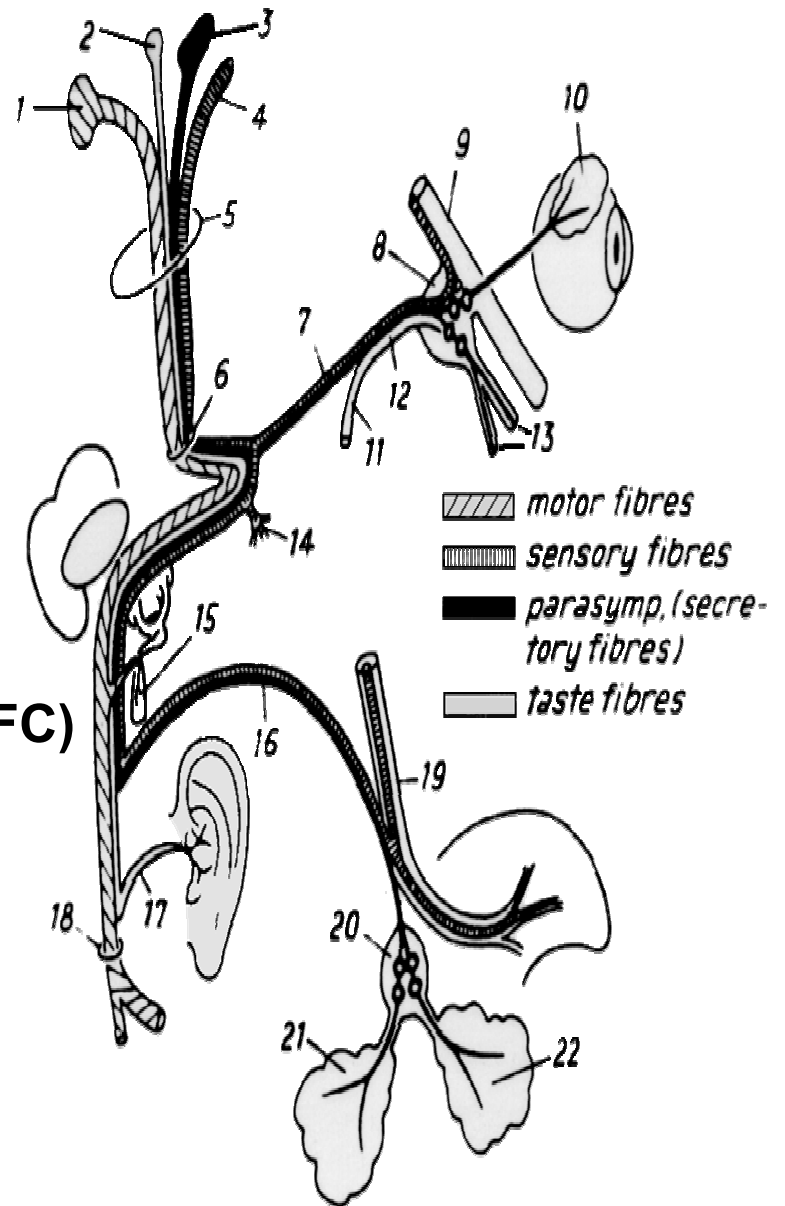
Facial Nerve

- 10,000 neurons
- 7,000 myelinated facial expression.
- Superiorly along the roof of the IAC (7UP)
- The course 7segments

Facial Nerve Anatomy

Facial nerve segments:

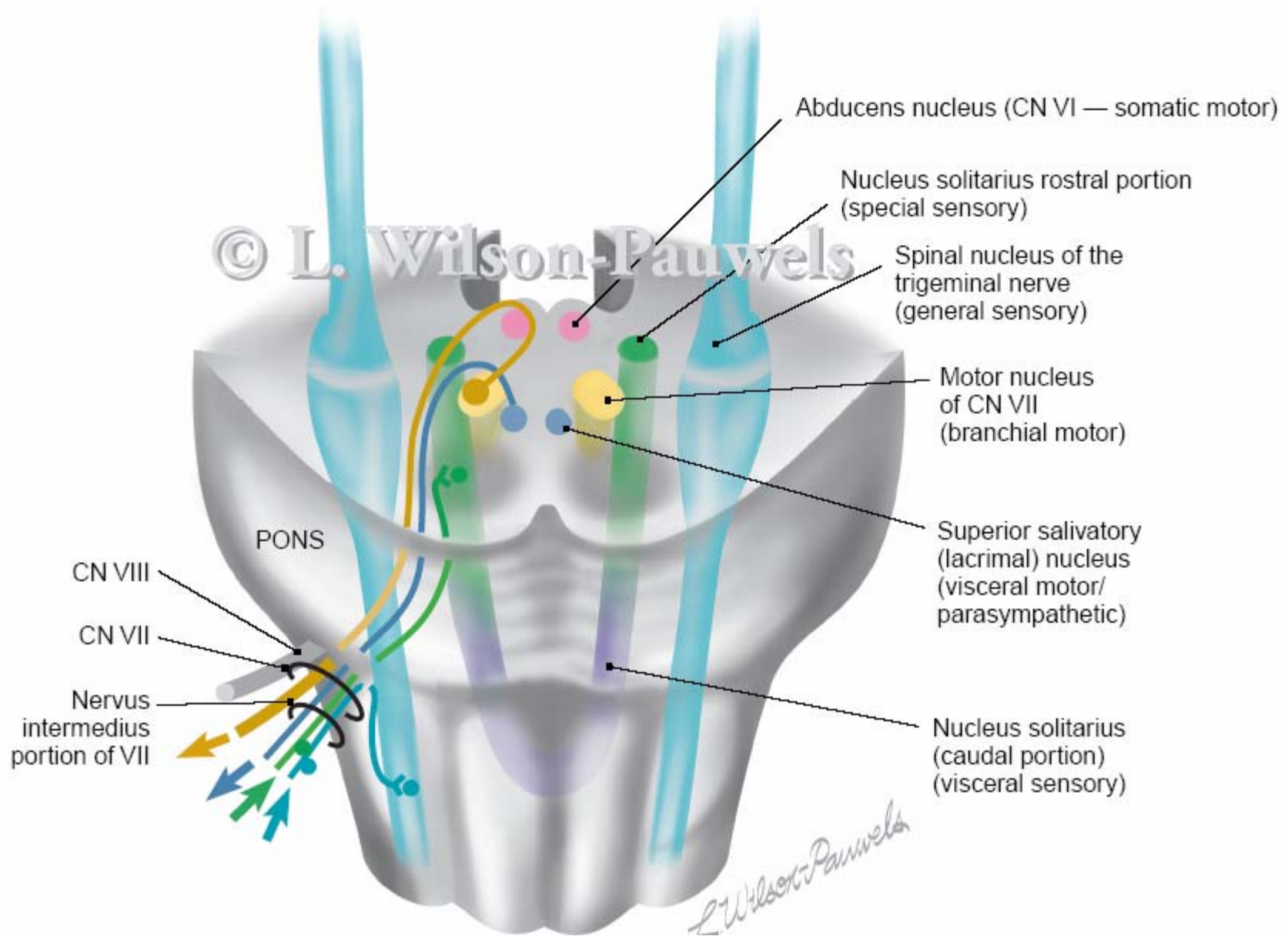
1. Pons
 2. Cerebulo-pontine angle (CPA)
 3. Internal Auditory Canal (IAC)
 4. Labyrinthine
 5. Tympanic
 6. Mastoid
 7. External
- Fallopian canal (FC)



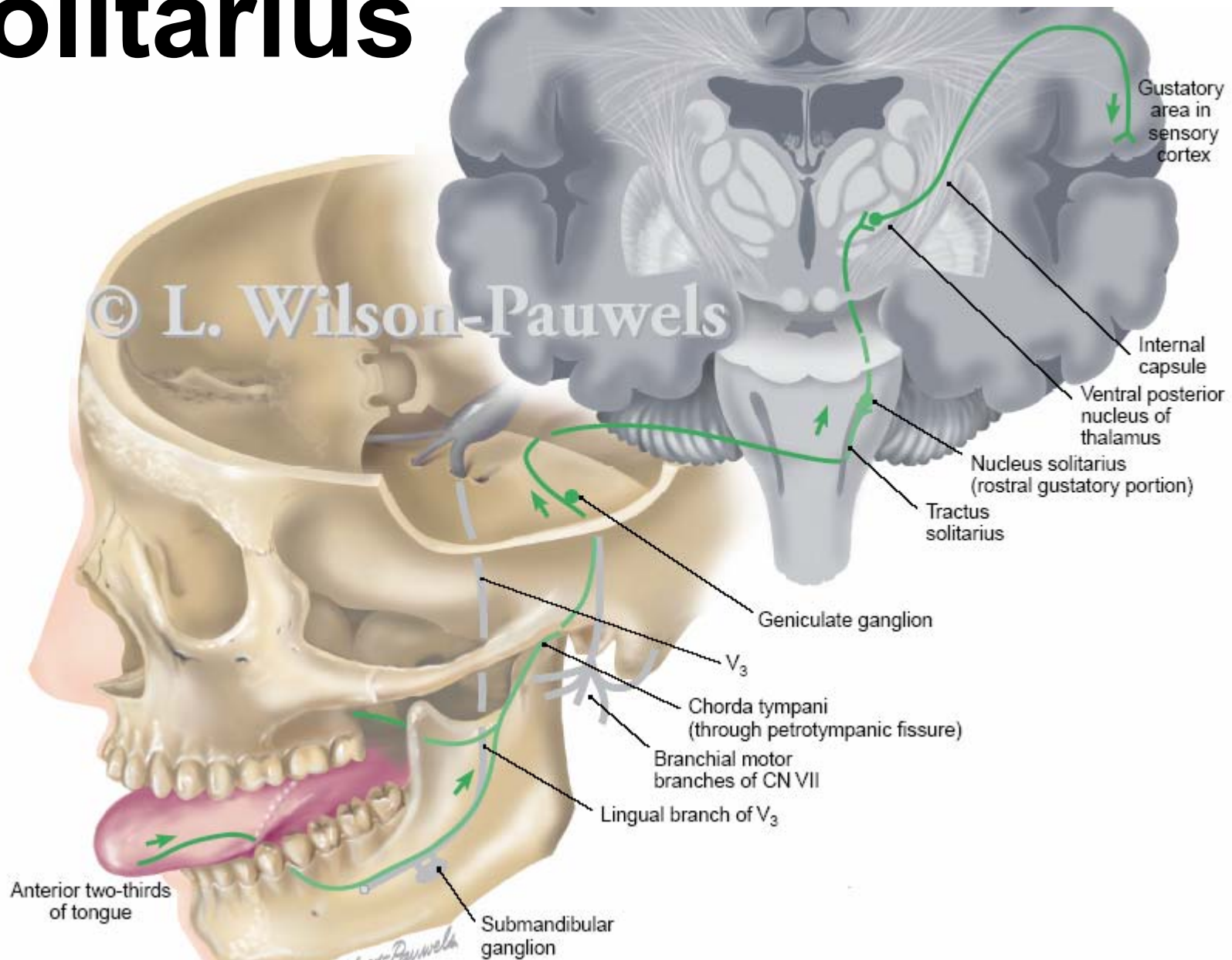
Pons

4 Ss Nuclei

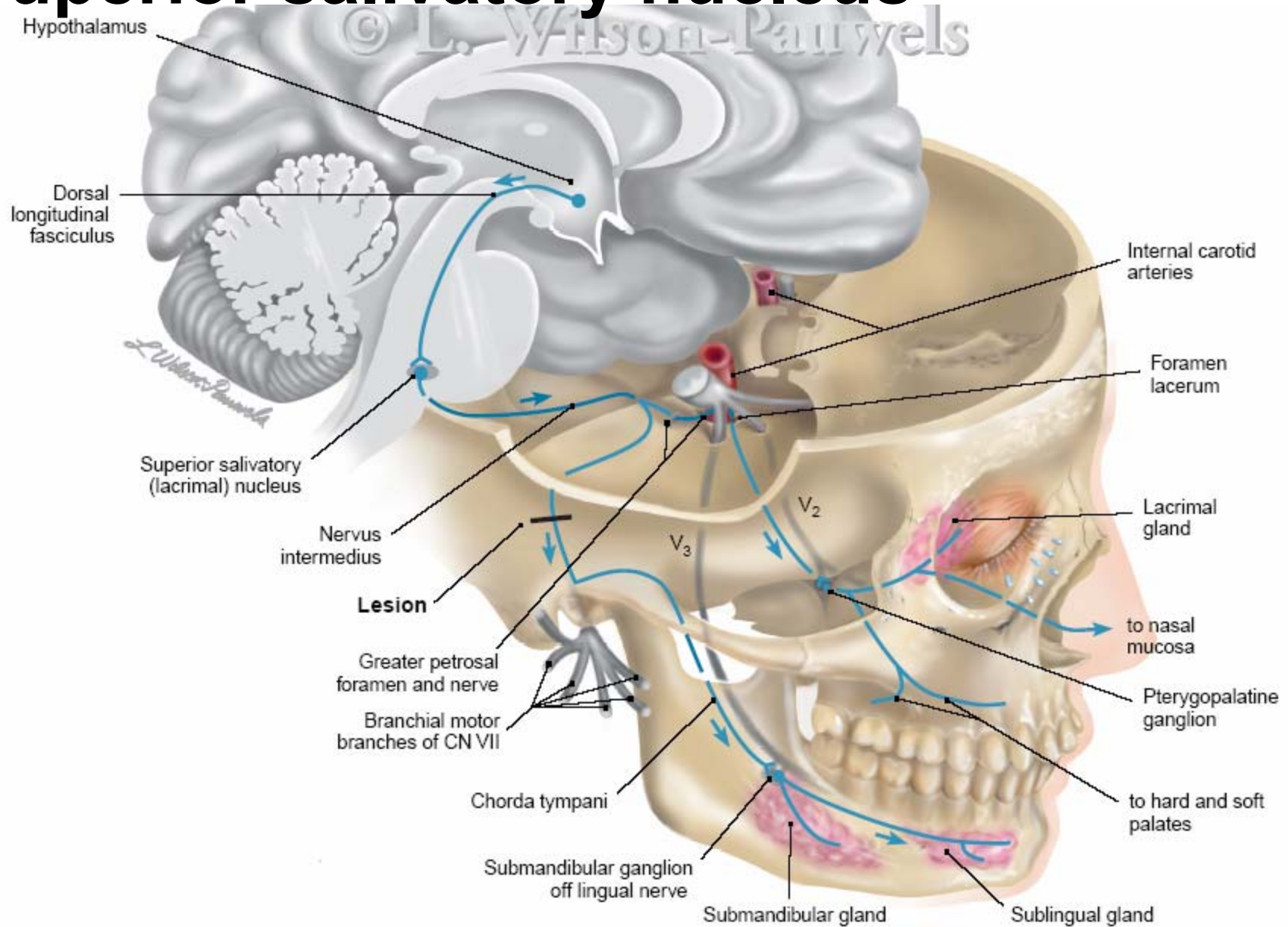
1. Solitarius (Taste)
2. Superior salivatory nucleus
3. Spinal nucleus of the trigeminal nerve
4. Seventh motor



Solitarius

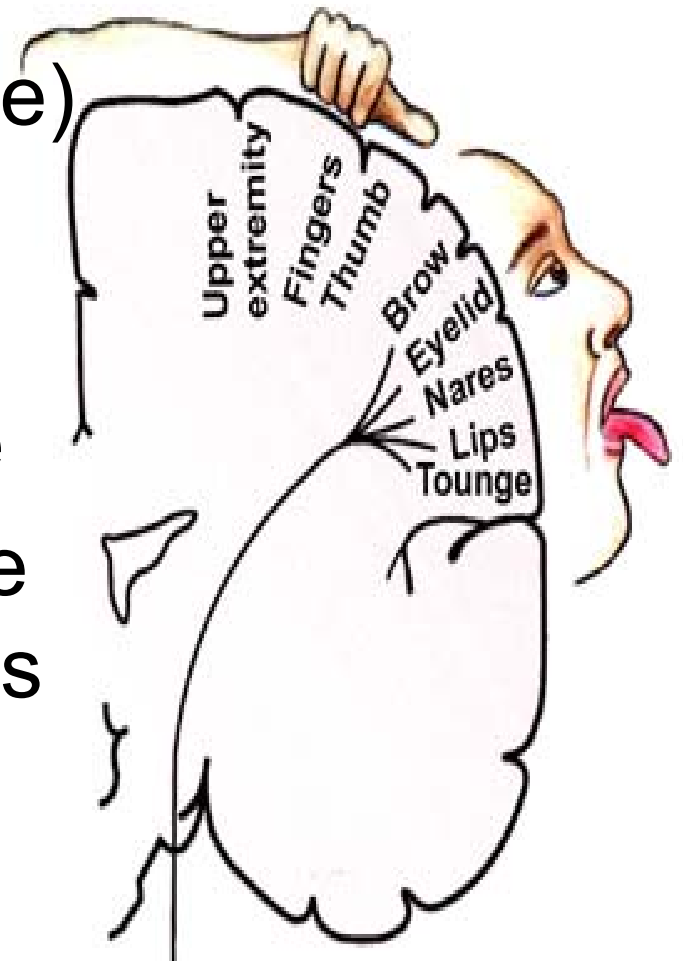


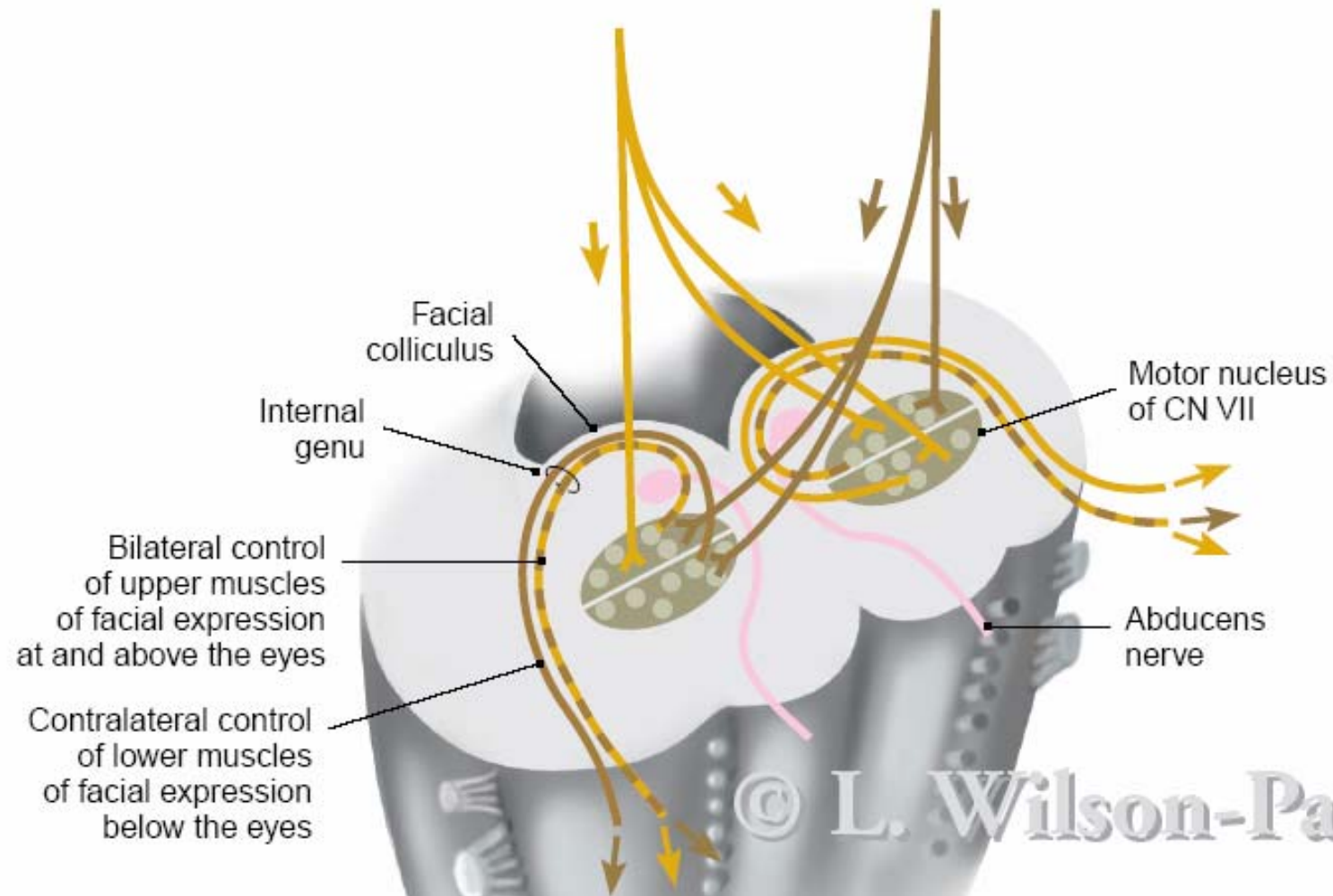
Superior salivatory nucleus



Motor part

- Precentral gyrus (frontal lobe)
- Upper face corticobulbar cross
- Contralateral predominance
- Motor fiber bend around the abducens (CN VIth) nucleus

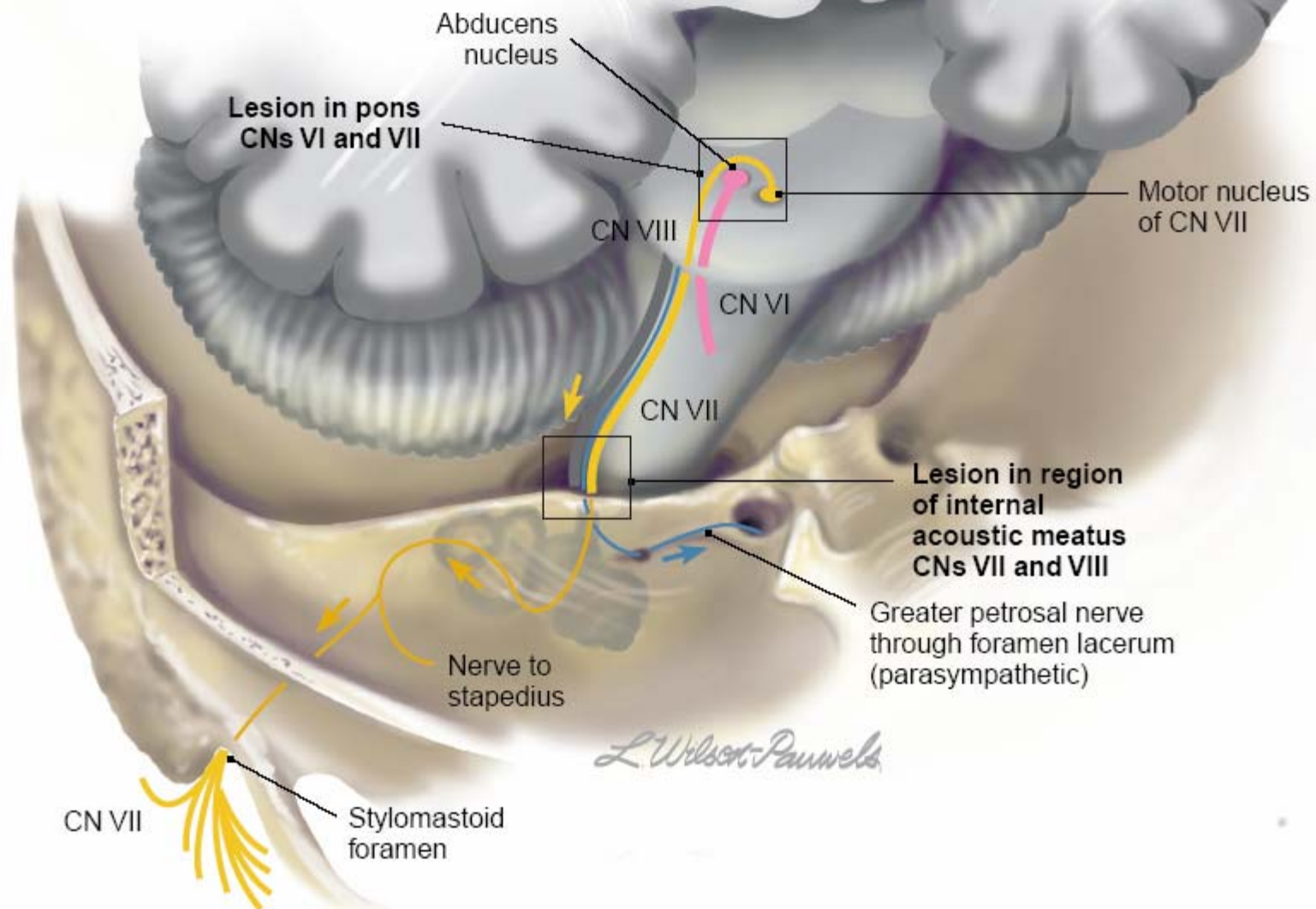




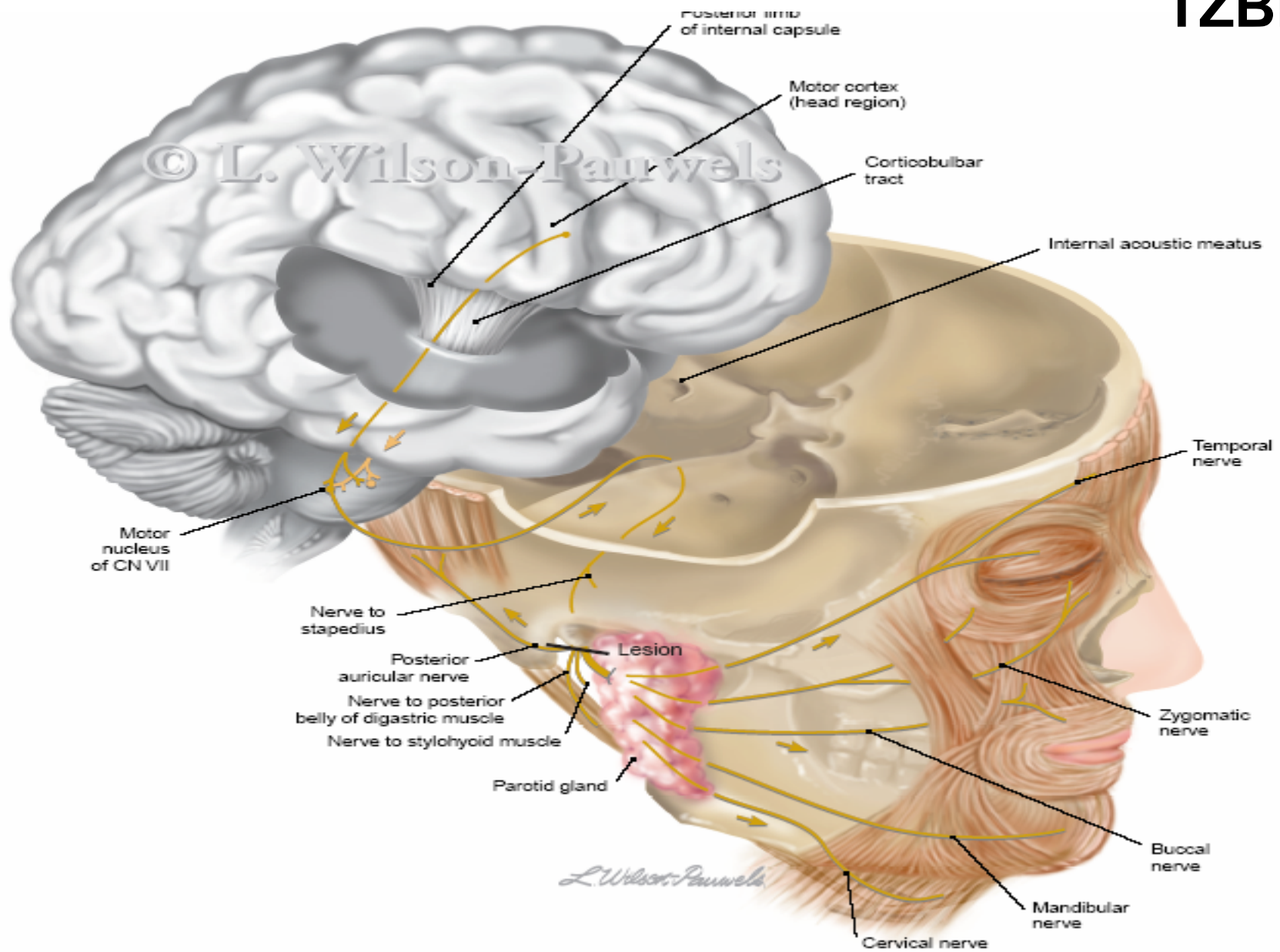
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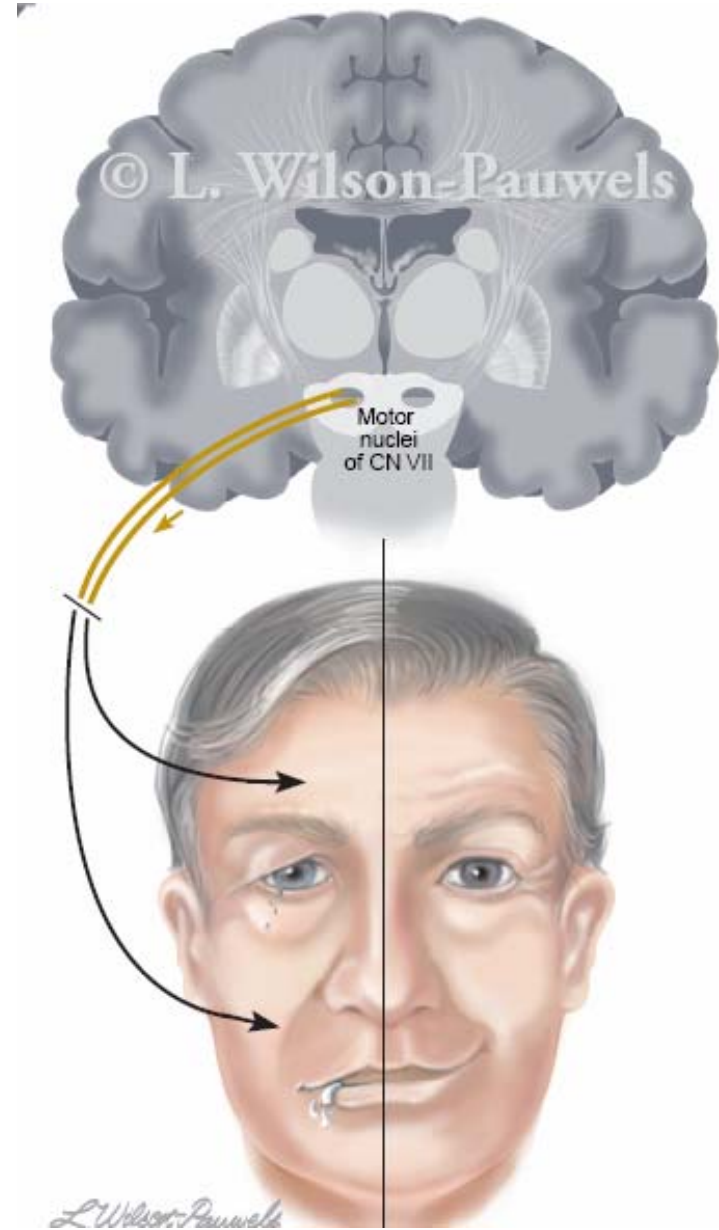
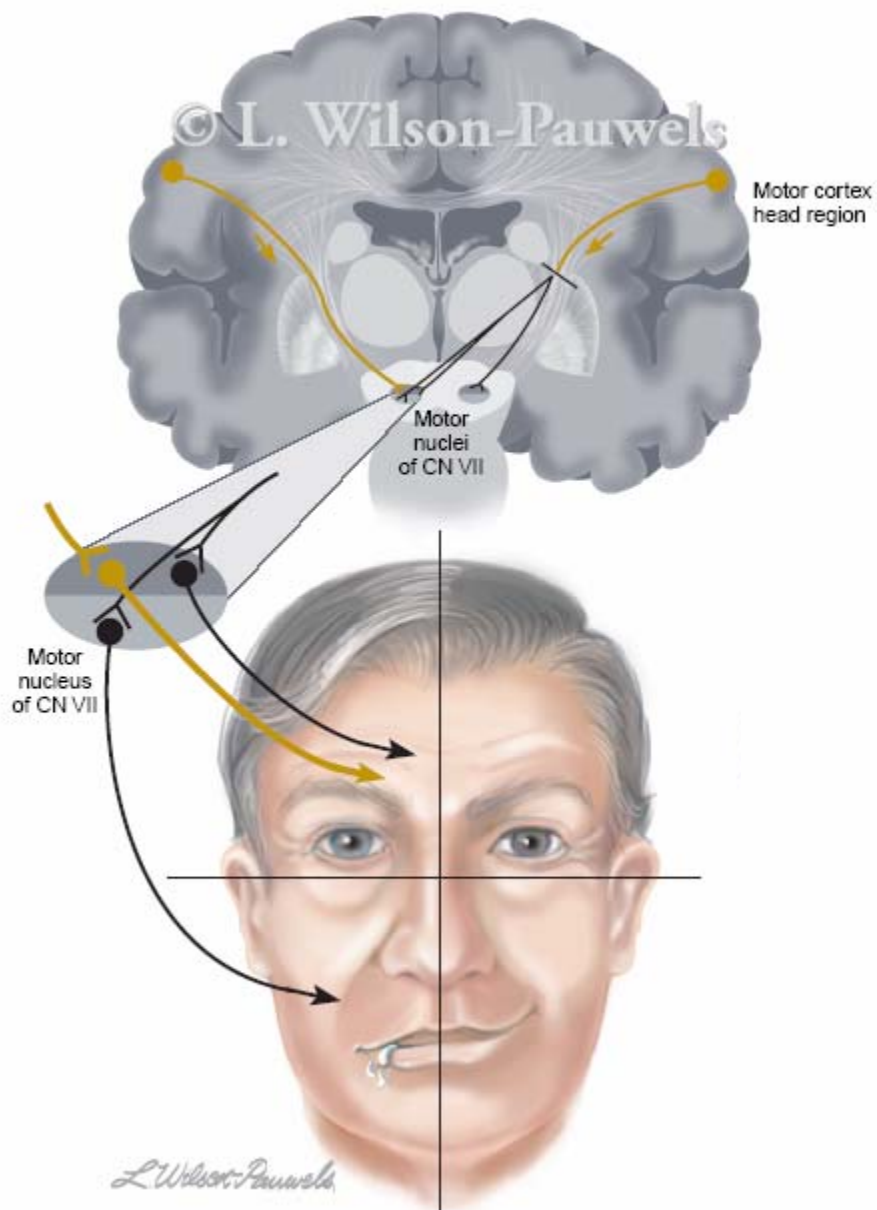
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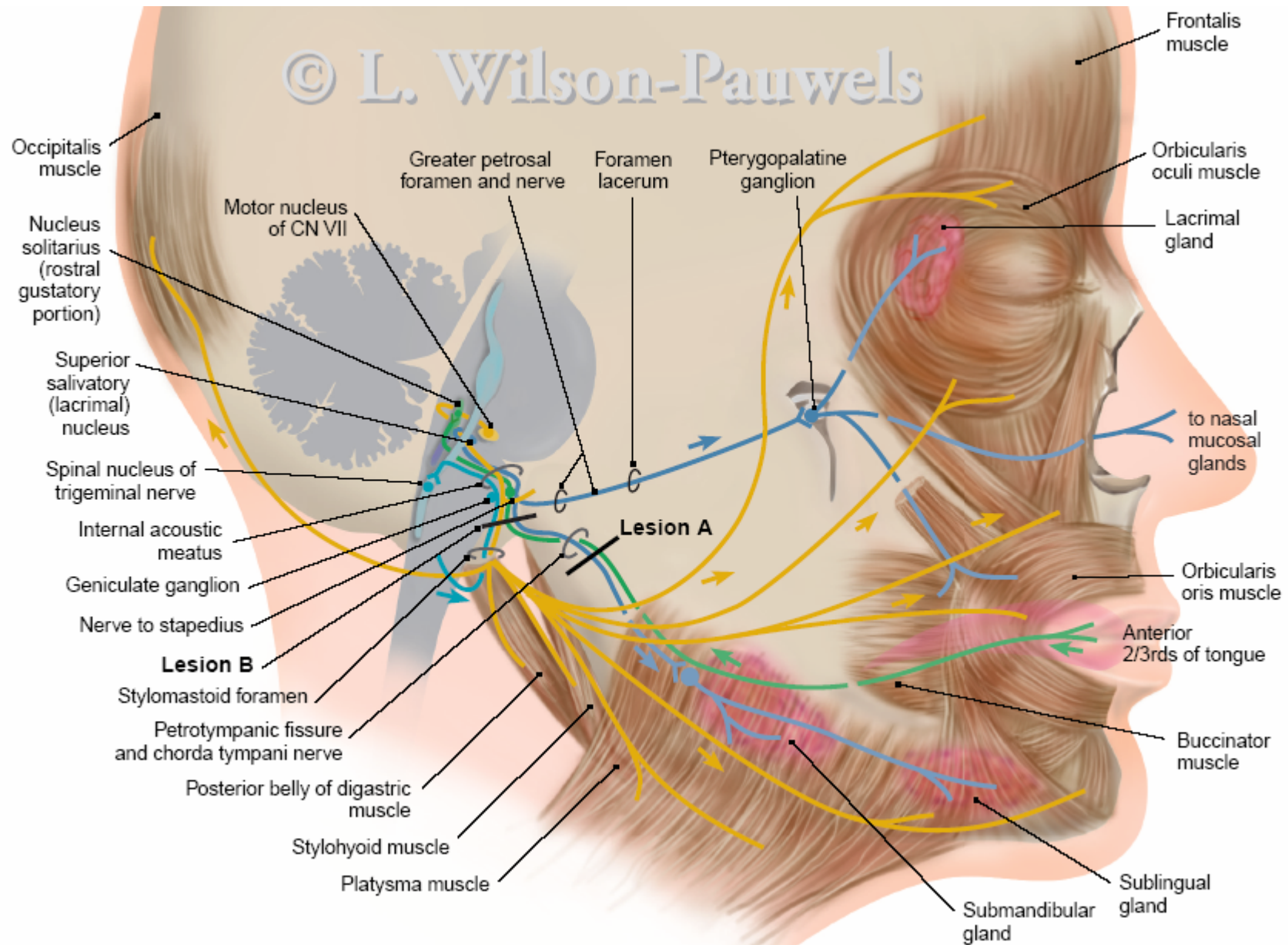


TZBMC





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Fallopian canal

- **The labyrinthine segment**
 - shortest & narrowest part → susceptible to compression
 - Only segment that lacks arterial anastomosis
 - embolic phenomena
 - vascular compression
- **Geniculate ganglion**
 - 1st genu (bend or knee)
 - Common trunk (nervus intermedius and VII nerve)
 - Greater superficial petrosal nerve → lacrimal gland
- **Tympanic segment**
 - 50% dehiscent
 - 1st → 2nd genu

Fallopian canal

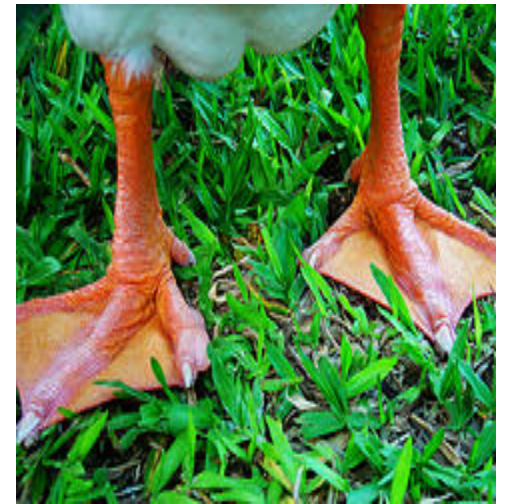
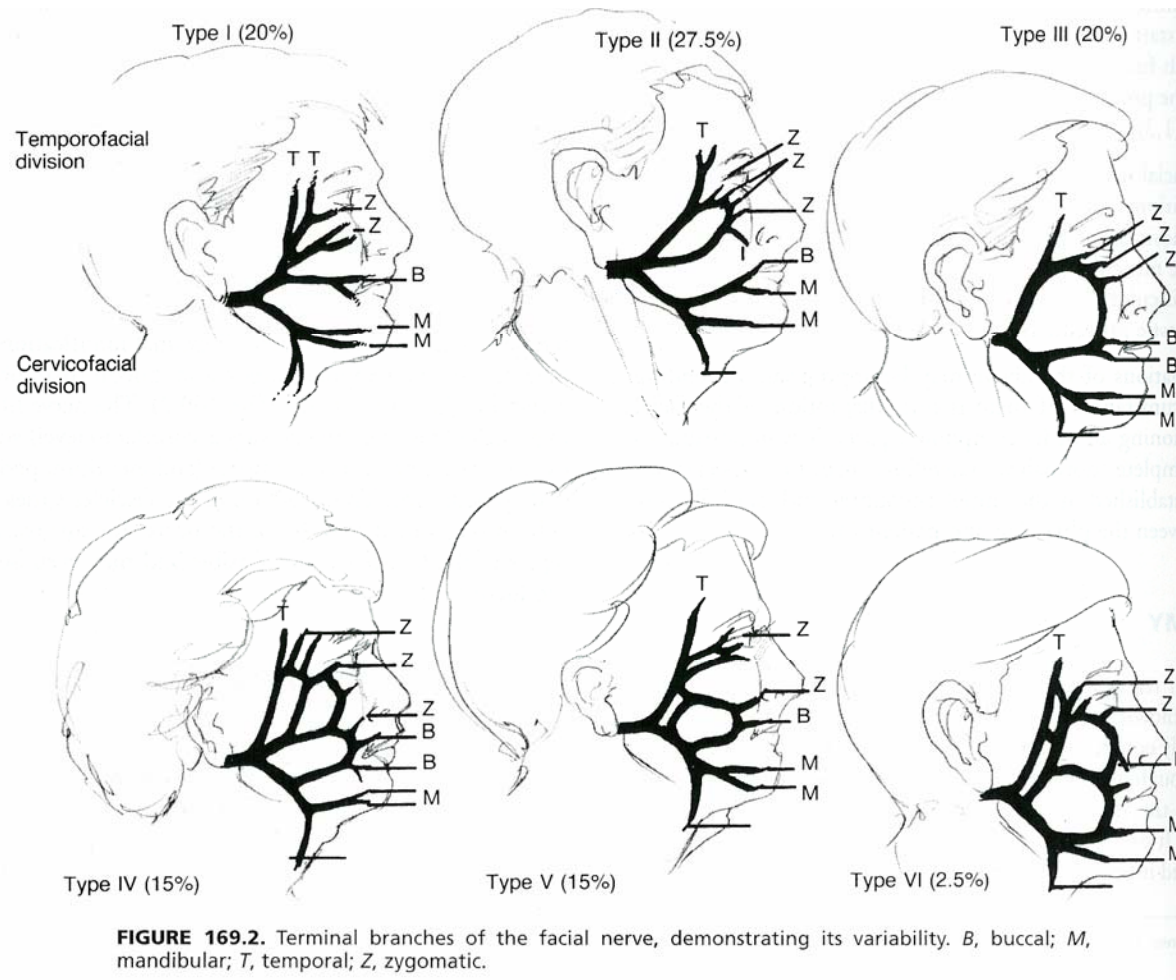
- **Mastoid segment**
 - 2nd genu → vertically → stylomastoid foramen
 - longest part of the intratemporal course
 - Branches
 - Stapedius muscle
 - Chorda tympani nerve
 - submaxillary and sublingual
 - Taste anterior 2/3 tongue
 - pain, temperature, and touch EAC.
 - Auricular nerve

Extracranial

- Postauricular muscles
- Stylohyoid muscle
- Posterior belly of the digastric muscle
- Pes anserinus (goose's foot) separates parotid → deep and superficial lobes
- 5 major branches T,Z,B,M,C
- Highest risk during surgical T&M



Pes anserinus (goose's foot)



<i>Nerve Fiber Modality</i>	<i>Nucleus</i>	<i>Function</i>
General sensory (afferent)	Spinal of the trigeminal nerve	To carry sensation from the skin of the concha of the auricle, a small area of skin behind the ear, and possibly to supplement V ₃ , which carries sensation from the wall of the external auditory meatus and the external surface of the tympanic membrane
Special sensory (afferent)	Solitarius (rostral gustatory portion)	For taste sensation from the anterior two-thirds of the tongue
Branchial motor (efferent)	Motor of cranial nerve VII	To supply the muscles of facial expression (ie, frontalis, occipitalis, orbicularis oculi, corrugator supercilii, procerus, nasalis, levator labii superioris, levator labii superioris alaeque nasi, zygomaticus major and minor, levator anguli oris, mentalis, depressor labii inferioris, depressor anguli oris, buccinator, orbicularis oris, risorius, and platysma). In addition, the branchial motor fibers supply the stapedius, stylohyoid, and posterior belly of digastric muscles
Visceral motor (parasympathetic efferent)	Superior salivatory (lacrimal)	For stimulation of the lacrimal, submandibular, and sublingual glands as well as the mucous membrane of the nose and hard and soft palates

<i>Named Branches</i>	<i>Muscles Supplied</i>
Nerve to stapedius	Stapedius
Nerve to posterior belly of digastric	Posterior belly of digastric
Nerve to stylohyoid	Stylohyoid
Temporal	Frontalis, occipitalis, orbicularis oculi, corrugator supercilii, procerus
Zygomatic	Orbicularis oculi
Buccal	Buccinator, orbicularis oris, nasalis, levator labii superioris, levator labii superioris alaeque nasi, zygomaticus major and minor, levator anguli oris
Mandibular	Orbicularis oris, mentalis, depressor anguli oris, depressor labii inferioris, risorius
Cervical	Platysma
Posterior auricular	Occipitalis

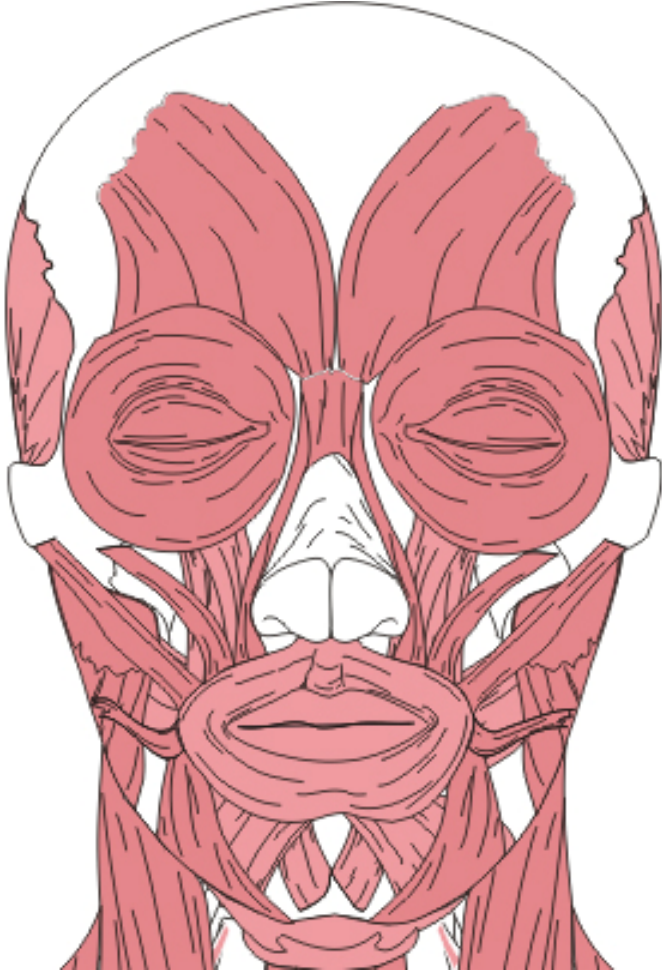
Facial Nerve

- Embryology
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Physiology

- Lacrimation
- Expression
- Mastication
- Salivation
- Speech
- Hearing

Facial Nerve



- (تعرف في وجوه الذين كفروا المنكر).. الحج
- بالوجه خمساً و خمسين عضلة
- الوجه مرآة النفس و أن عليه تنعكس حالات الإنسان لاسيما العاطفية

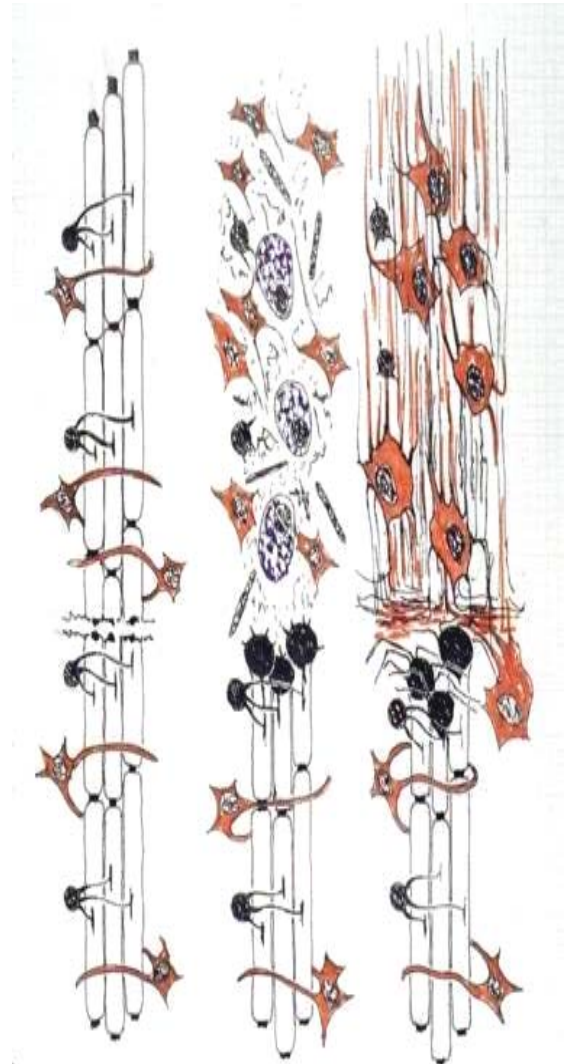
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Facial Nerve Palsy

Degeneration

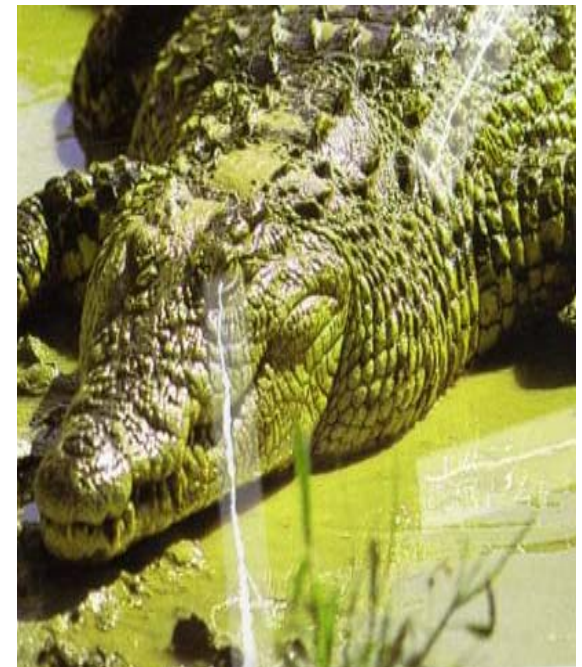
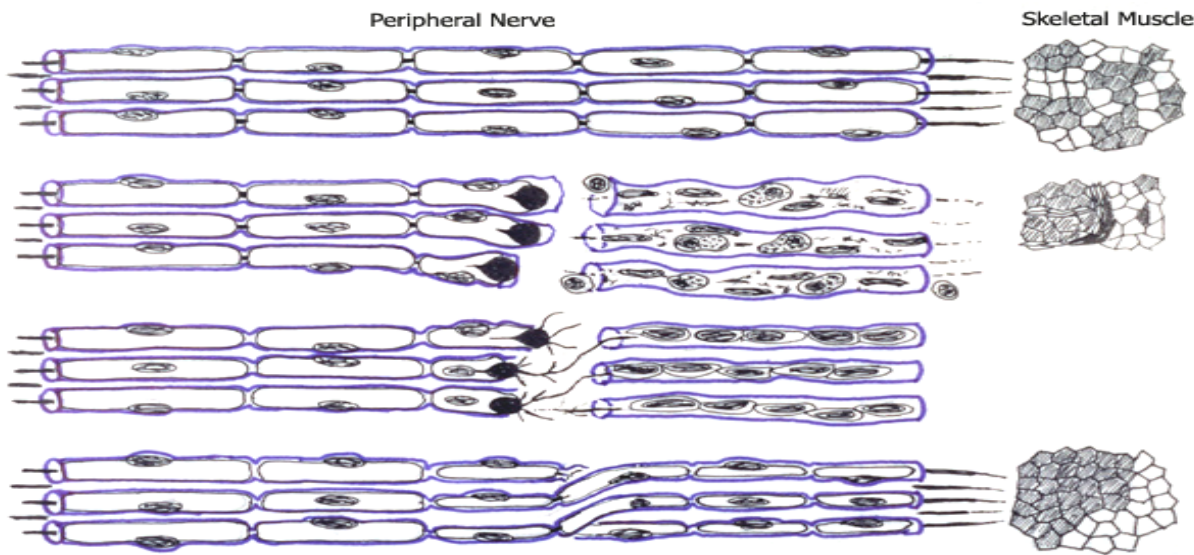
- Metabolic source (cell body)
- Wallerian degeneration
 - Begins within 24 hours
 - Degeneration distal axon & myelin sheath
 - Distal to the site of an injury
 - Without local Inflammation
- Macrophages degrade myelin and axons



Facial Nerve Palsy

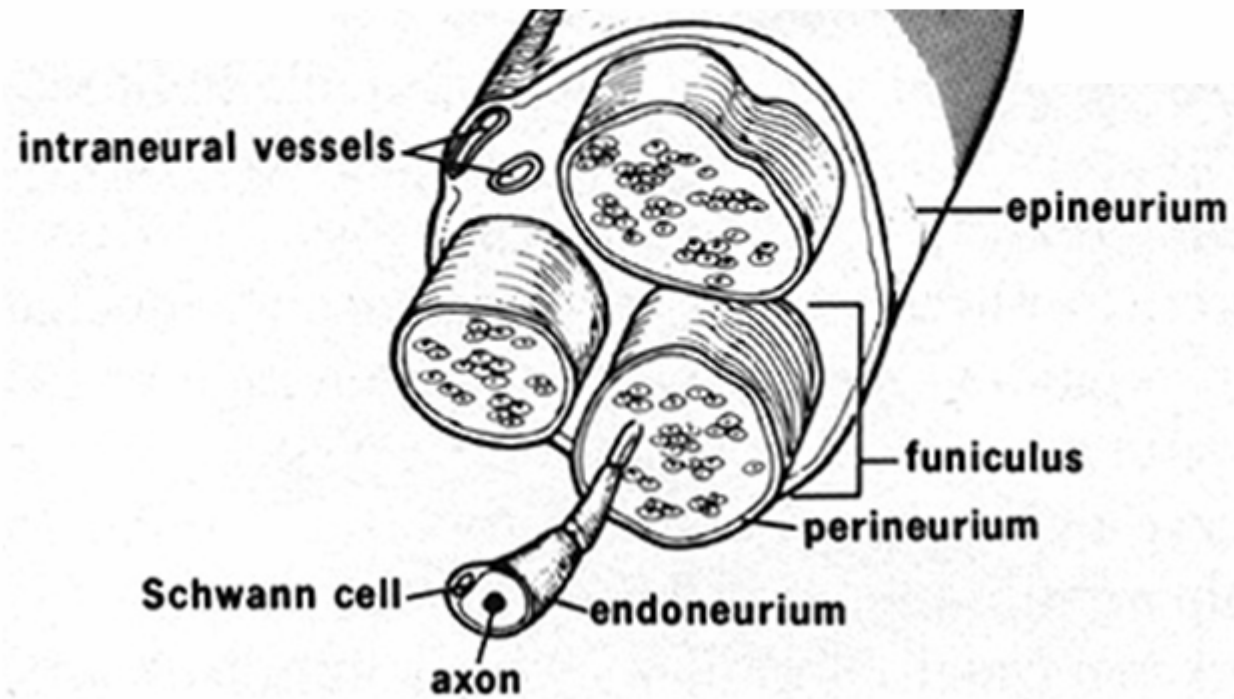
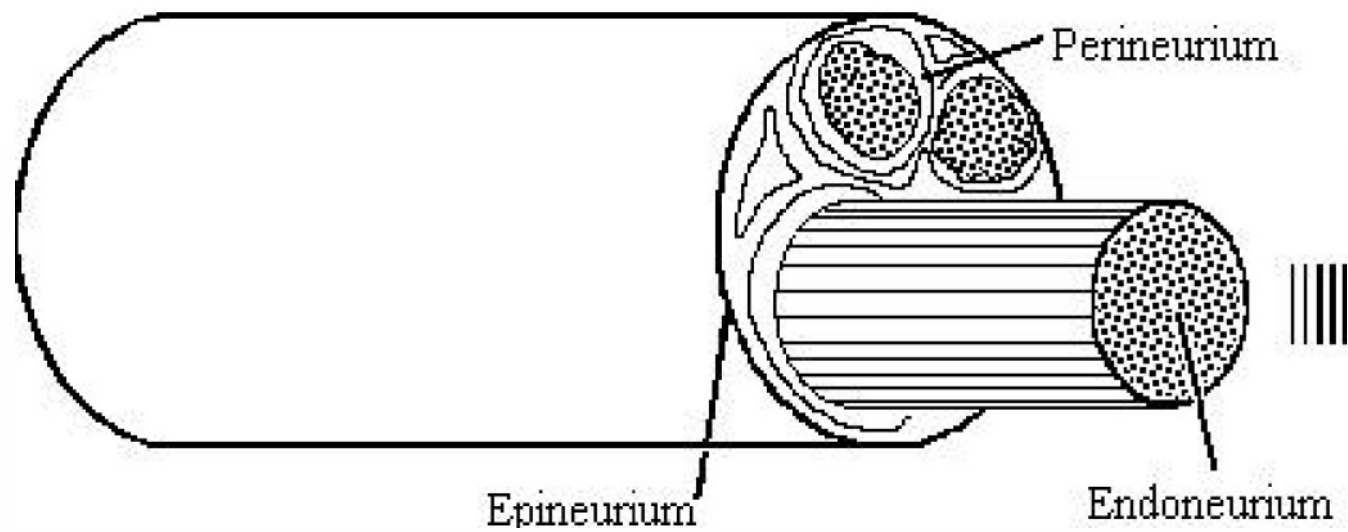
Regeneration

- Axonal stumps swell and proliferating neurofilaments
- Misdirected regrowth of nerve fibers
 - Facial muscle contractures → Synkinesia
 - Salivation → crocodile tears



Pathophysiology

- Neuropraxia— no axonal discontinuity
- Axonotmesis
 - Wallerian degeneration (distal to lesion)
 - Endoneural sheaths intact
- Neurotmesis
 - Wallerian degeneration (distal to lesion)
 - Axon disrupted, loss of tubules, support cells destroyed



House-Brackmann

- **Grade 1**
 - = Neurapraxia
 - Spontaneous recovery
- **Grade 2-3**
 - = Axonotmesis
 - Flow interruption
 - Wallerian anterograde degeneration.
 - Incomplete degeneration

House-Brackmann

- **Grade 4**
 - =Neurotmesis (permanent loss of axons)
 - Demyelination
 - Moderate-to-severe facial musculature dysfunction
 - Regenerative → synkinetic movements
- **Grade 5 and 6**
 - Partial or complete transection of the nerve
 - Minimal/complete loss of function

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Evaluation

- Careful history
- Physical exam
- Audiometry
- CT/MRI/other
- Topographic
- Electrophysiology



History

- Timing
- Associated symptoms
- SNHL
- Vesicles
- Severe pain
- Trauma
- OM acute or chronic
- Past medical history

Physical exam

- Complete head and neck exam
- Wide smile
- Whistling
- Blowing
- LMNL
 - Forehead wrinkling
 - Eye closure
 - Bell's phenomenon →





Topognostic Tests

- Schirmer's Test
- Stapedial reflex
- Taste
- Salivary Flow
- Imaging





Evaluation Facial Nerve Palsy

Electro-Physiology

- Electroneurography (ENoG)
- Electromyography (EMG)
- Nerve excitability test (NET)
- Maximum stimulation test (MST)

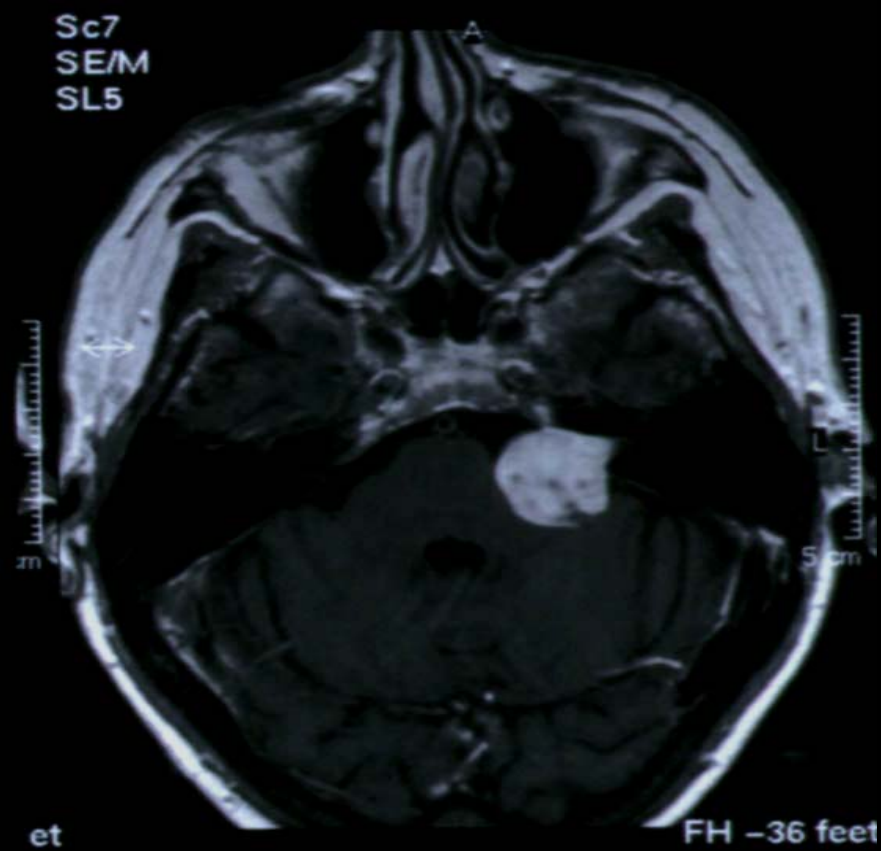
ACUTE = Acute + Complete + Unilateral + Threedays → Evaluate

16

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Facial Nerve Palsy

Causes:

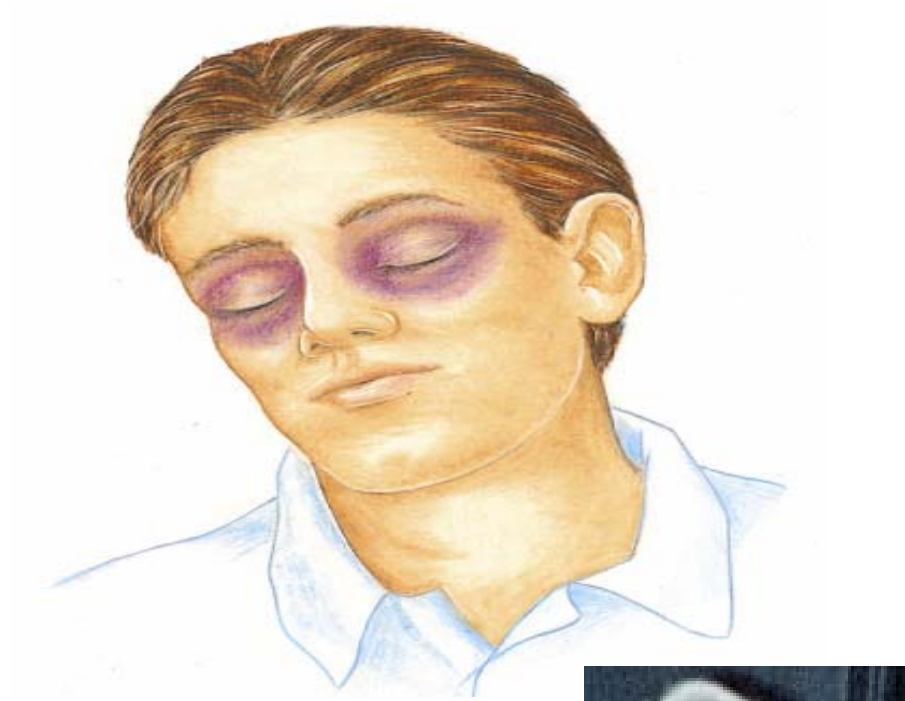
- Congenital
- Trauma
- Iatrogenic
- Idiopathic
- Infection
- Toxic
- Neurologic
- Neoplastic

Facial Nerve Palsy

Trauma

- Forceps delivery
- Basal skull/temporal bone fractures
- Facial injury
- Penetrating to middle ear
- Barotrauma
- Lightning

Raccoon eyes sign

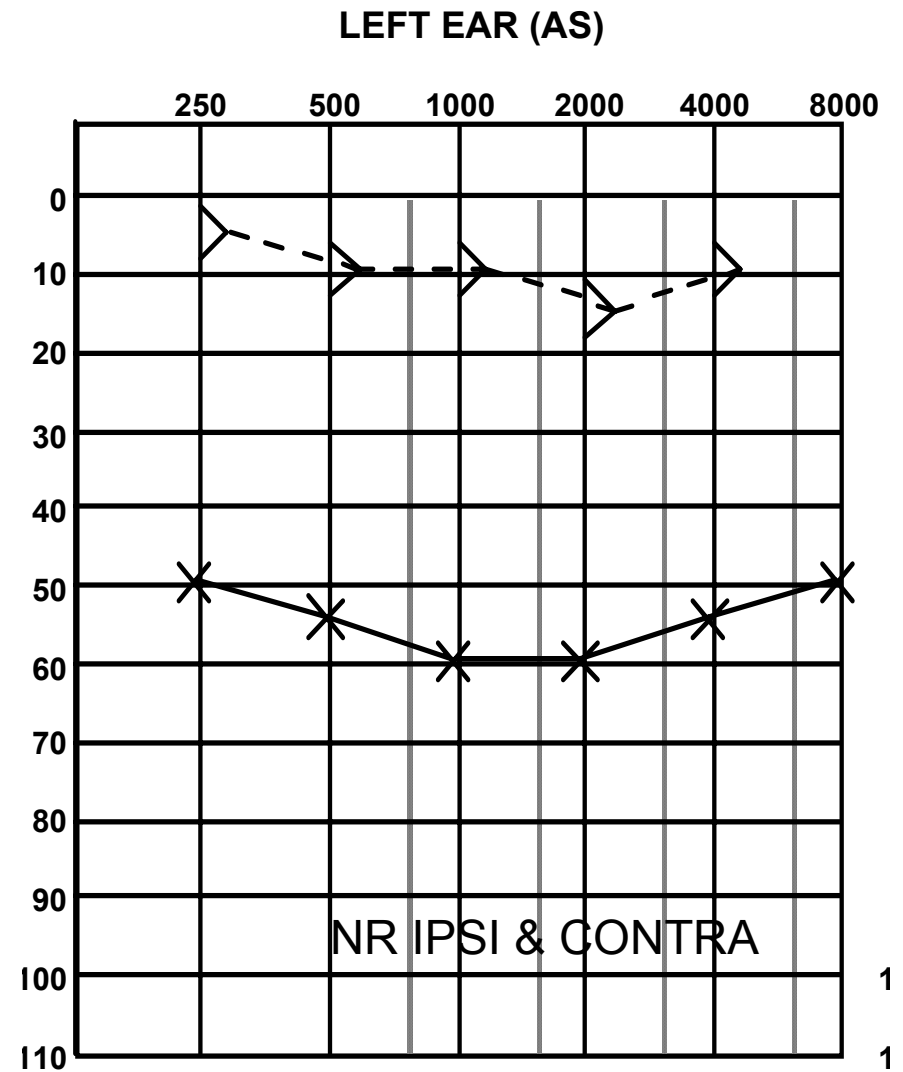


Battle's sign



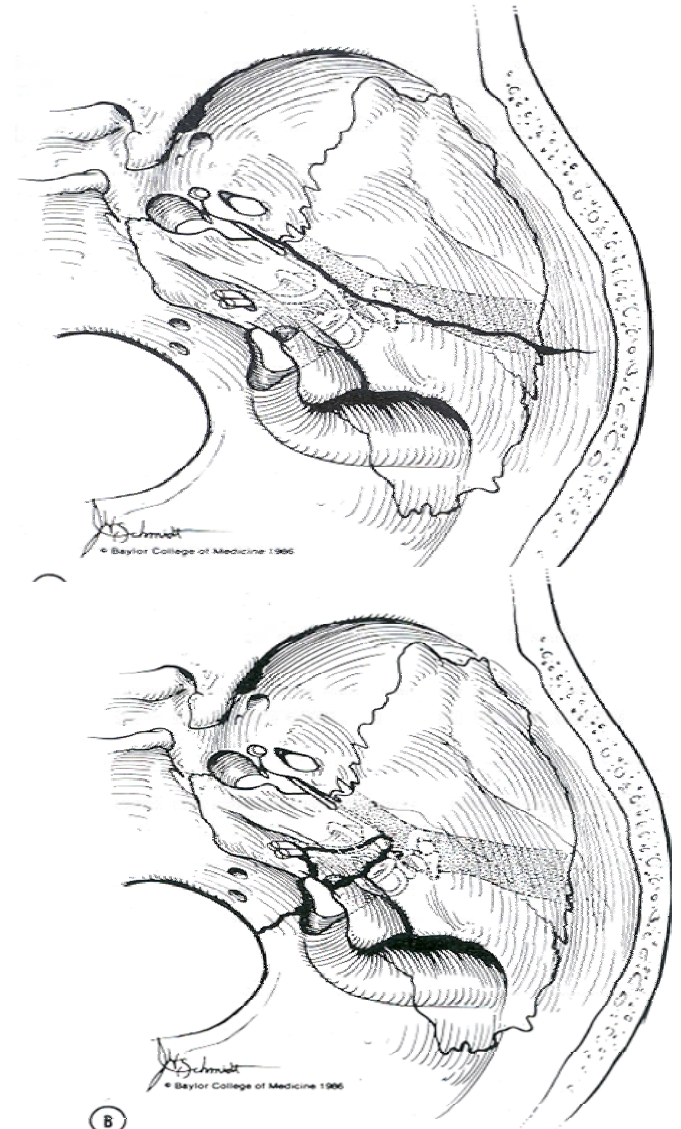


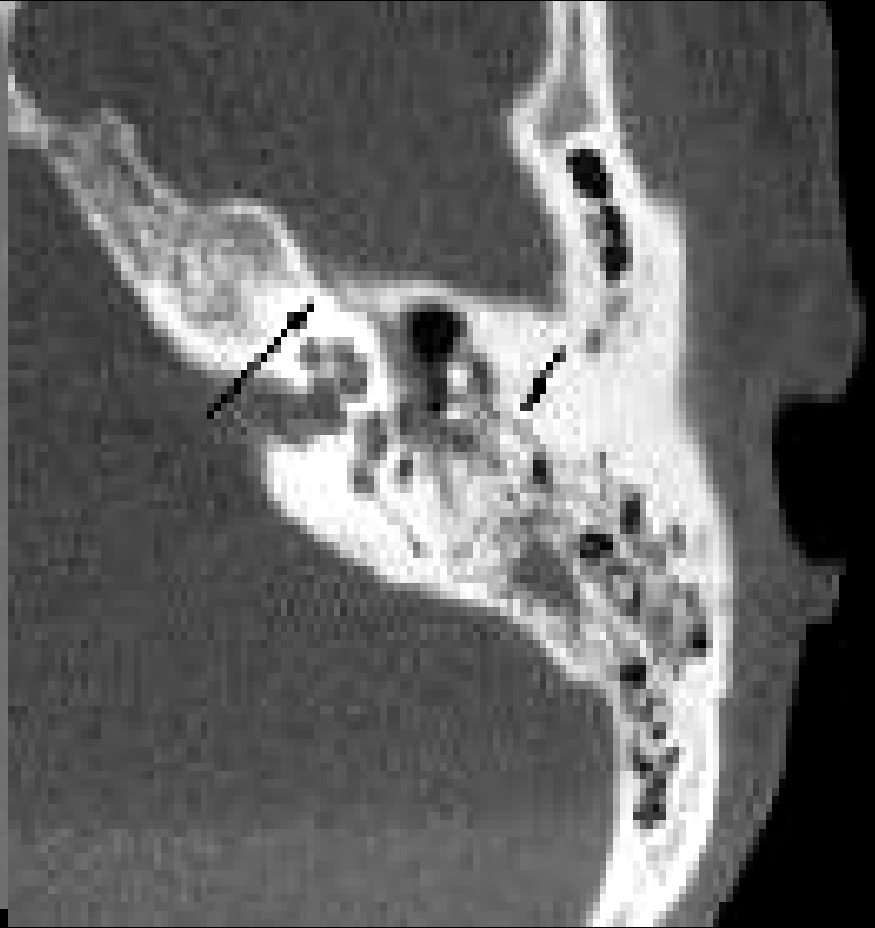
Case

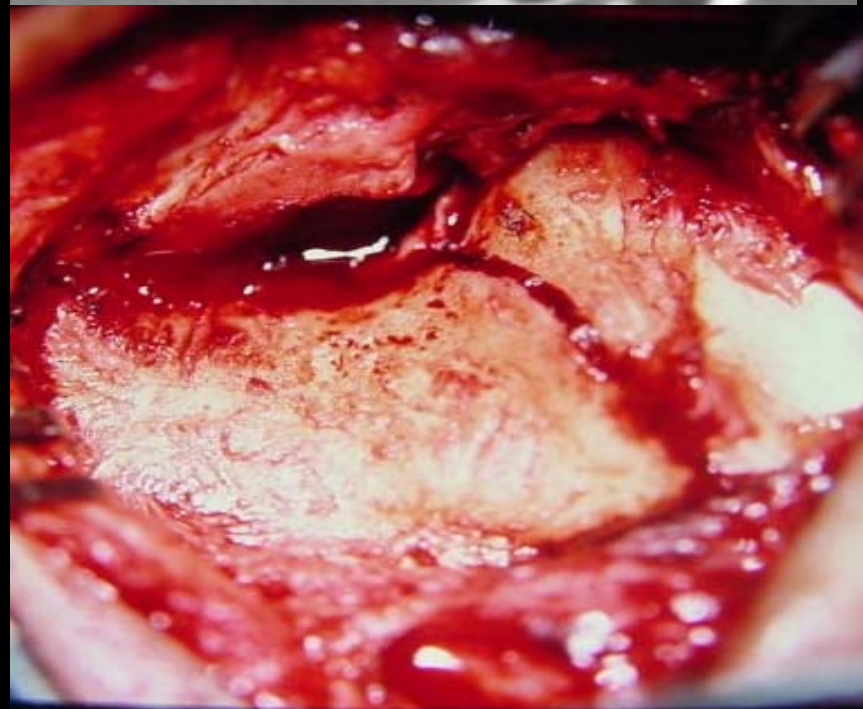
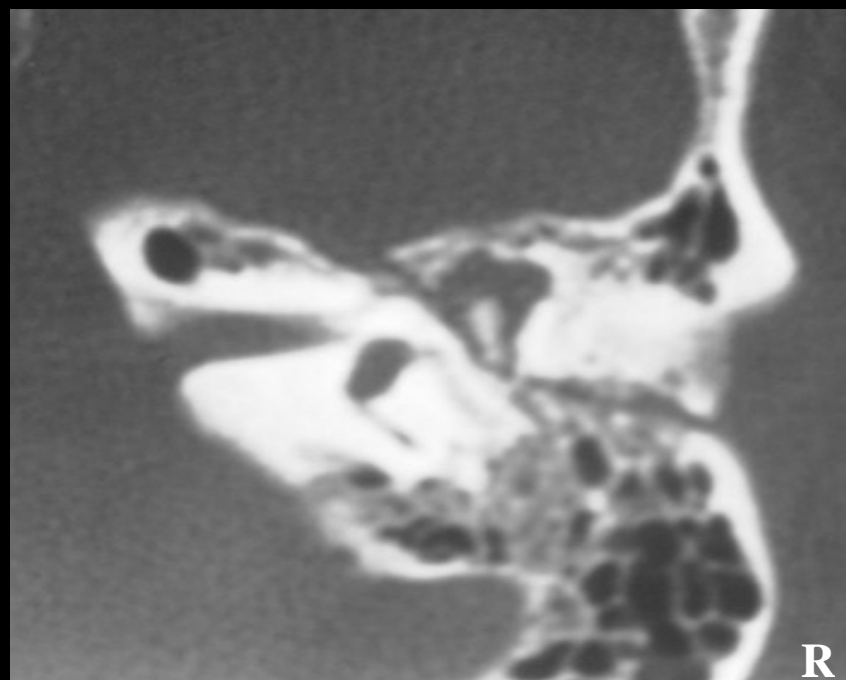


Fractures

- **Longitudinal**
 - 80% of Temporal Bone Fractures
 - 15-20% Facial Nerve involvement
- **Transverse**
 - 20% of Temporal Bone Fractures
 - 50% Facial Nerve Involvement







Facial Nerve Palsy

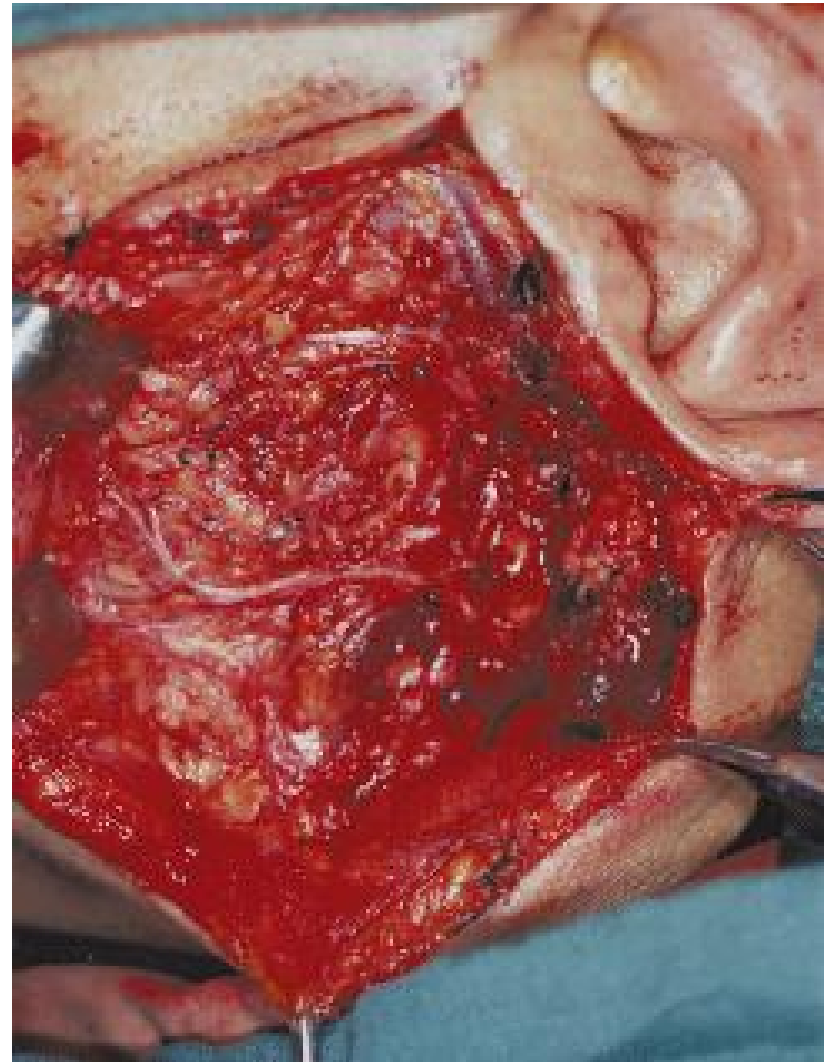
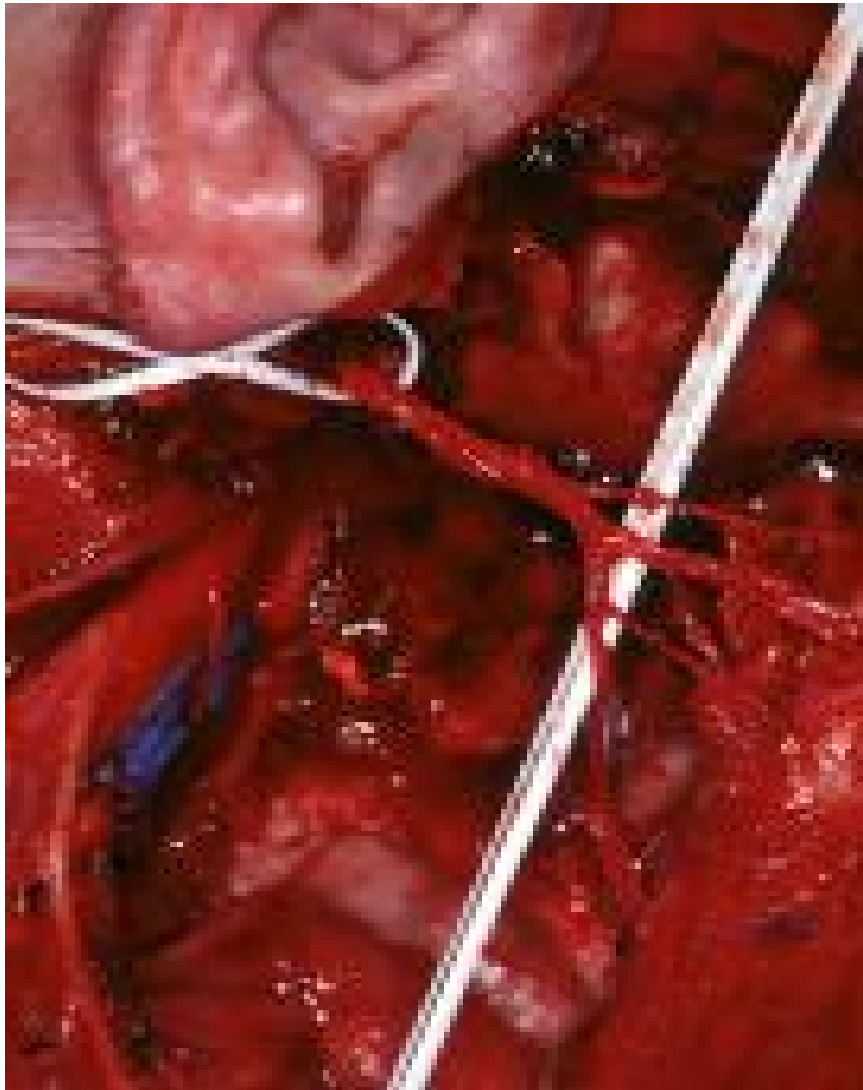
Iatrogenic

- Parotid surgery
- Mastoid surgery
- local anesthesia
- Acoustic neuroma

الاحصاءات الصادرة عن وزارة الصحة

- عام 2004 - 2005
- 896 قضية عرضت على اللجان الطبية الشرعية
- صدرت قرارات إدانة في 428 قضية منها
- إدانة 299 طبيبا من اصل 848 طبيبا مدعى عليهم
- 35 % من عدد القضايا المنظورة

Iatrogenic Facial Nerve Palsy



Iatrogenic Facial Nerve Palsy

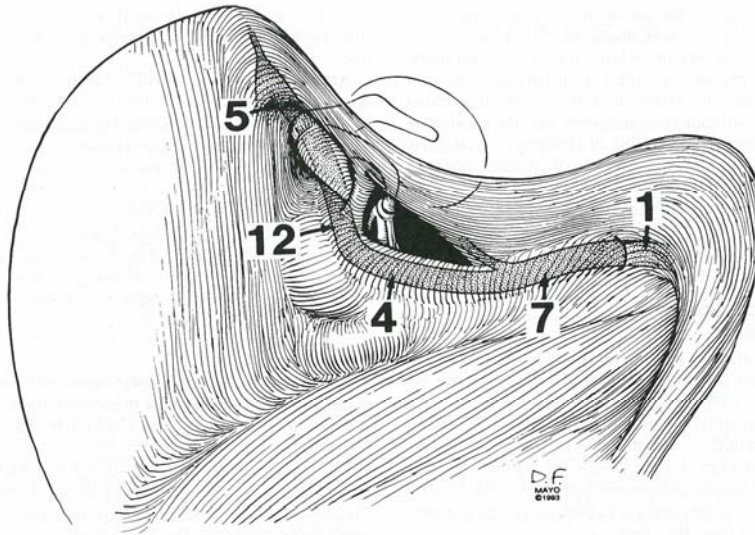


Fig. 1. The course of the facial nerve with a number of injuries for each segment. (By permission of the Mayo Foundation.)



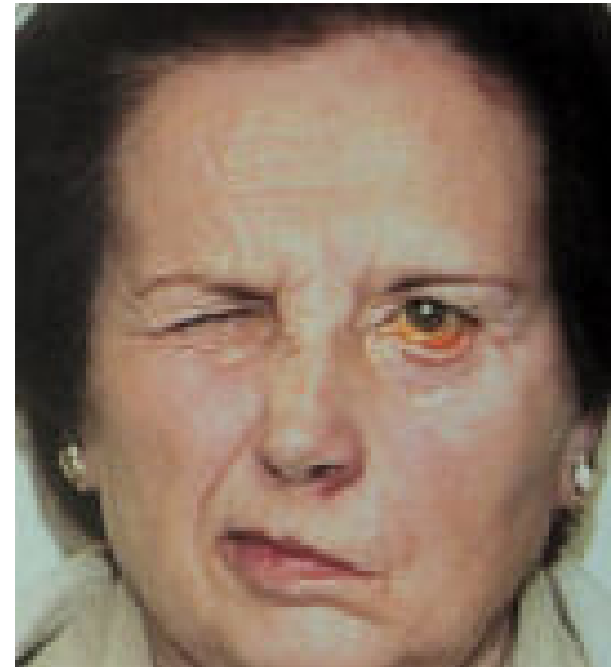
Facial Nerve Palsy

Idiopathic

- Bell's
- Melkersson-Rosenthal
- Guillian-Barre
- MS
- Myasthenia gravis
- Sarcoidosis (Heerfordt's)

Bell's Palsy

- Commonest cause of acute VII paralysis
- Diagnosis of exclusion
- Unilateral facial paralysis
- Sudden onset
- Unknown cause
- LMNL



Bell's Palsy

- Limited duration
- Minimal symptoms
- Spontaneous recovery
- No sensory loss

Bell's Palsy

? Immune or viral

→ Swelling of the nerve

→ Compression and ischemia

→ Complete paralysis

Diagnosis

- Weakness of the entire half of the face
- In doubt → CT and MRI scans
- MRI may show contrast enhancement of the facial nerve

Prognosis and Treatment

- **Complete recovery**
 - 90% Complete recovery
 - Several months
- **Prevent corneal drying**
 - Natural tears
 - Isotonic saline
 - Strips of skin tape to close the eye

Medical Management

- **Corticosteroids**
 - 80 mg/day po
 - Within 24 to 48 h of onset for 1 wk
 - Decreased gradually over the 2nd wk
- **Antivirals (Acyclovir)**
 - Less degrees of facial weakness

Melkersson-Rosenthal

4 Fs

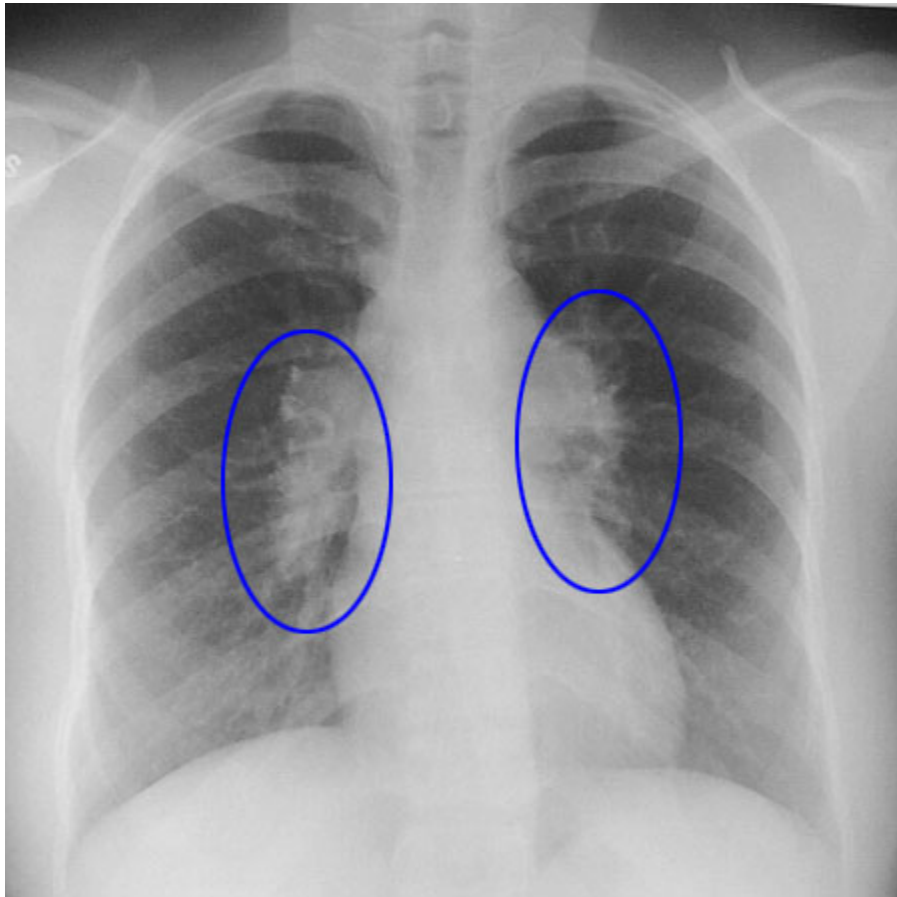
- **F**acial nerve palsy
(Recurrent)
- **F**urrowed tongue
- **F**aciolabial edema
- **F**Hx + ve



Melkersson-Rosenthal



Sarcoidosis (Heerfordt's)



Facial Nerve Palsy

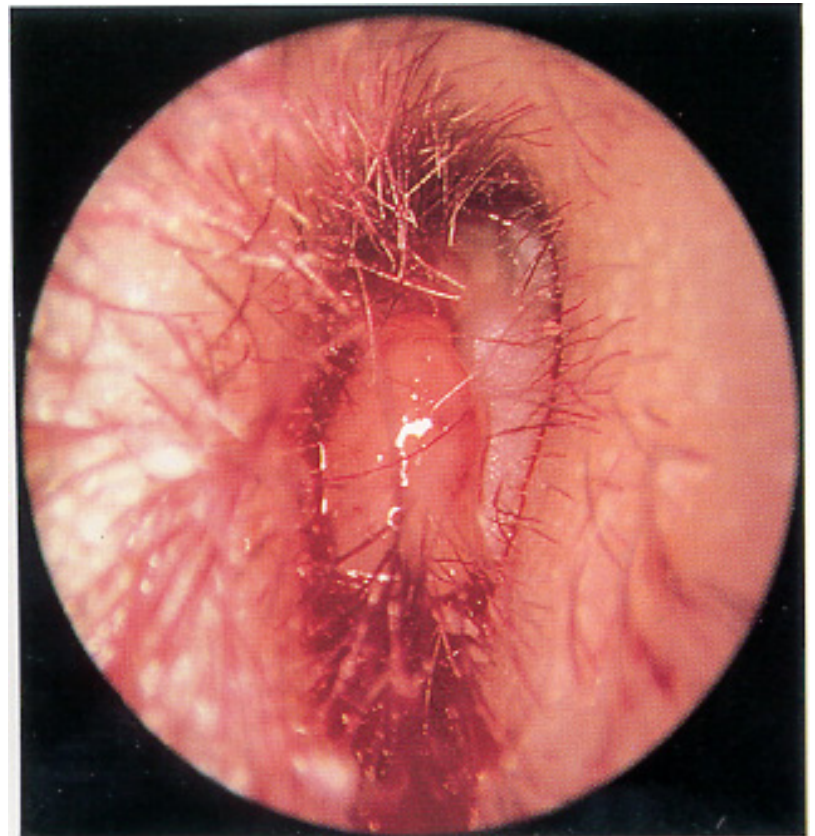
Infection

- Malignant otitis externa
- Otitis media
- Mastoiditis
- Ramsey Hunt (Herpes zoster)
- Encephalitis
- Polio
- Syphilis

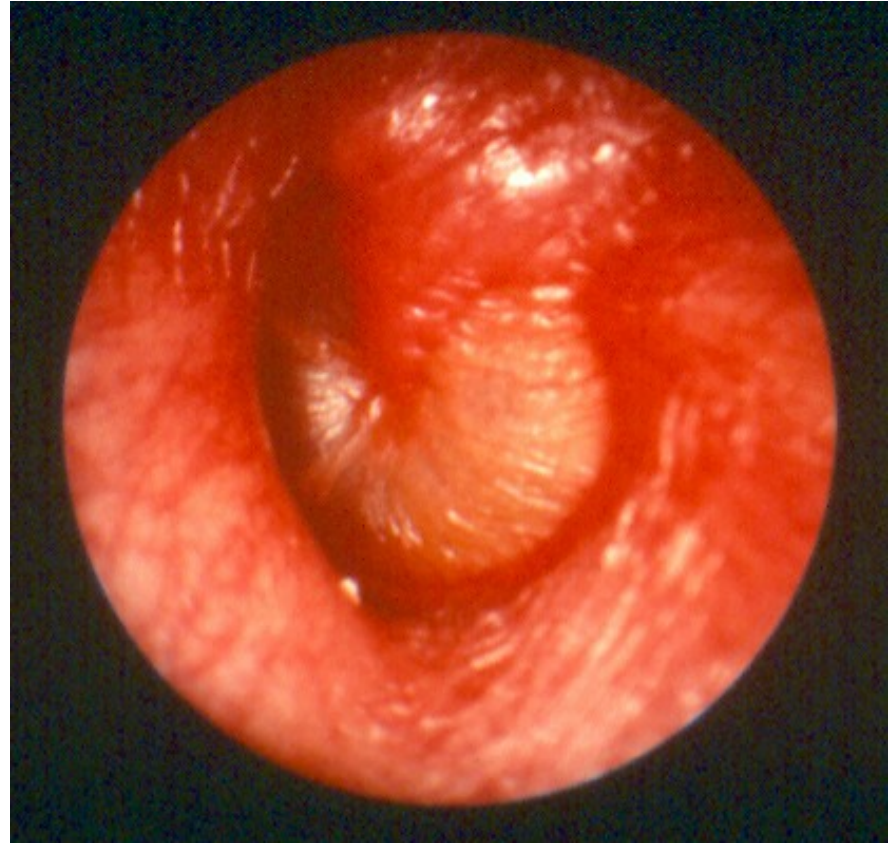
Malignant Otitis Externa

4 Ds

- **D**iabetes mellitus
- **D**ischarge (Purulent)
- **D**iscomfort
- **D**ysfunction Cranial nerve
- Granulation obscured TM



Otitis media





Mastoiditis



Ramsay Hunt

- Herpetiform vesicular eruptions (VZV)
- Painful
- vestibulocochlear dysfunction
- Treatment is equivalent to Bell palsy
- Poor outcome



Facial Nerve Palsy

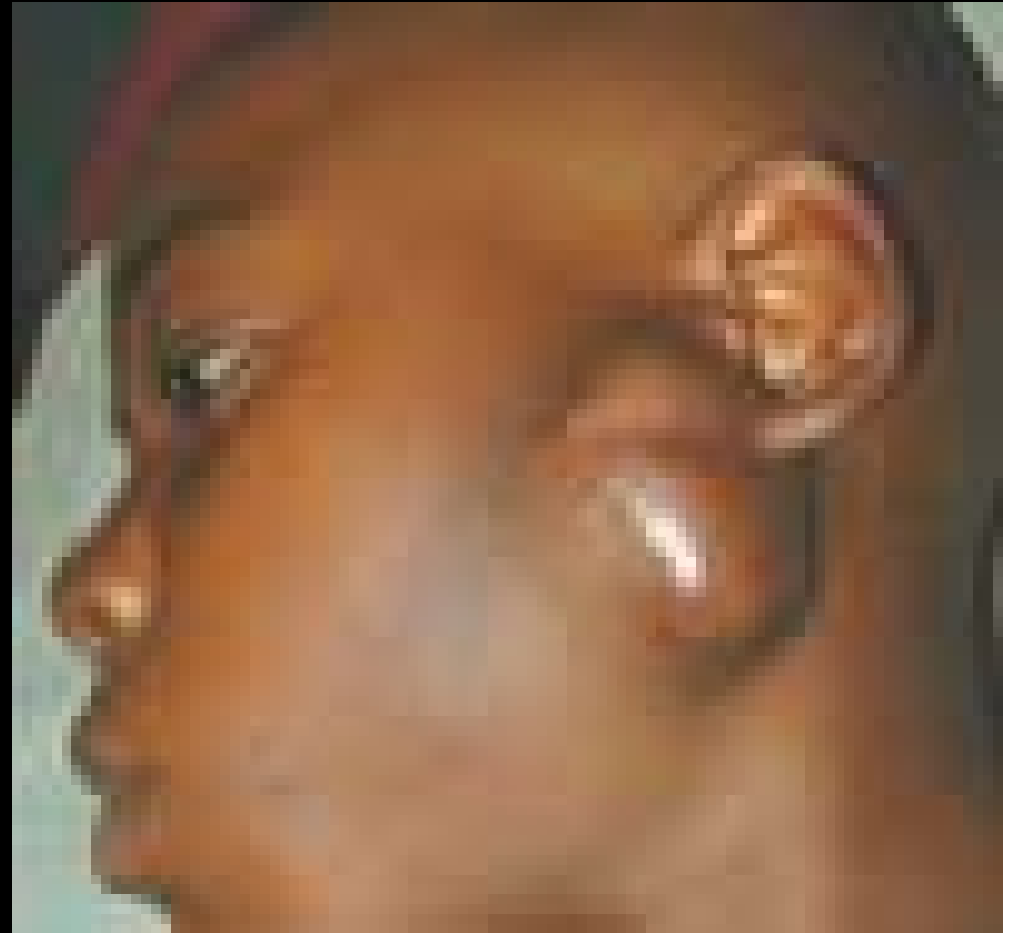
Neoplastic

- Malignant parotid lesion
- Cholesteatoma
- Acoustic neuroma
- CN VII tumor
- Meningioma

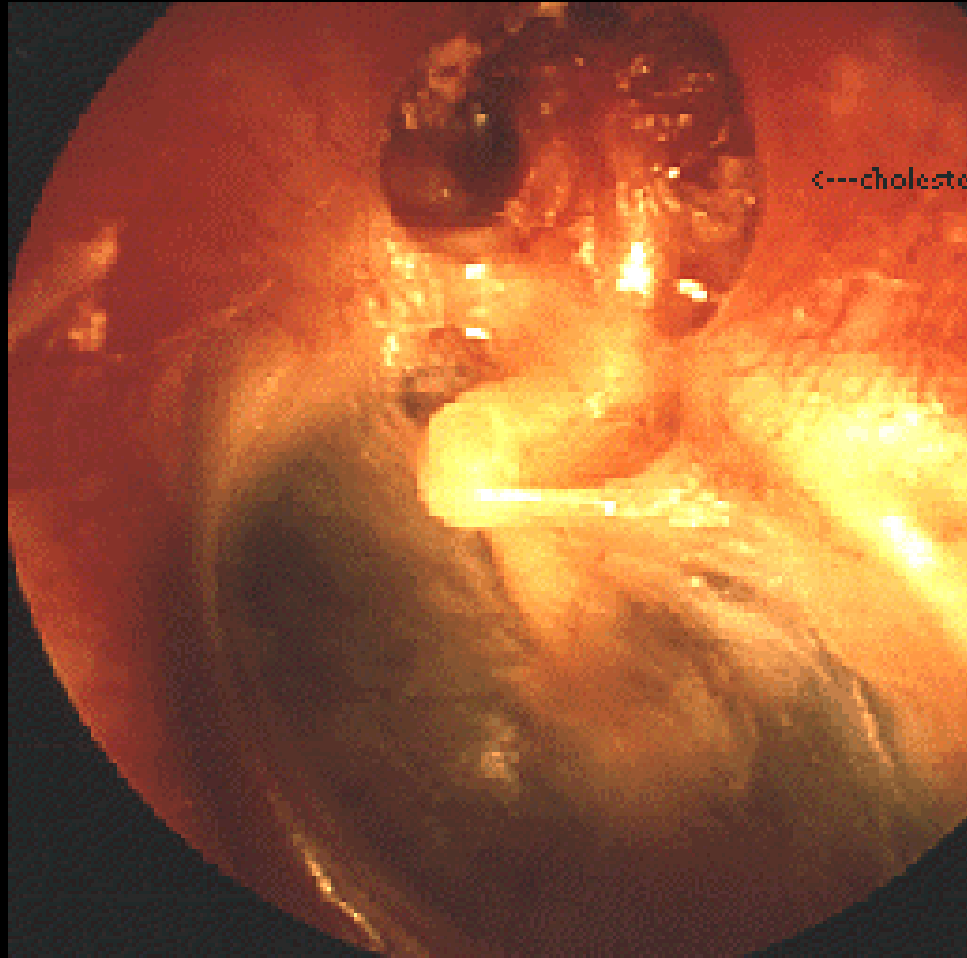
Neoplastic

SPORT → Neoplasm

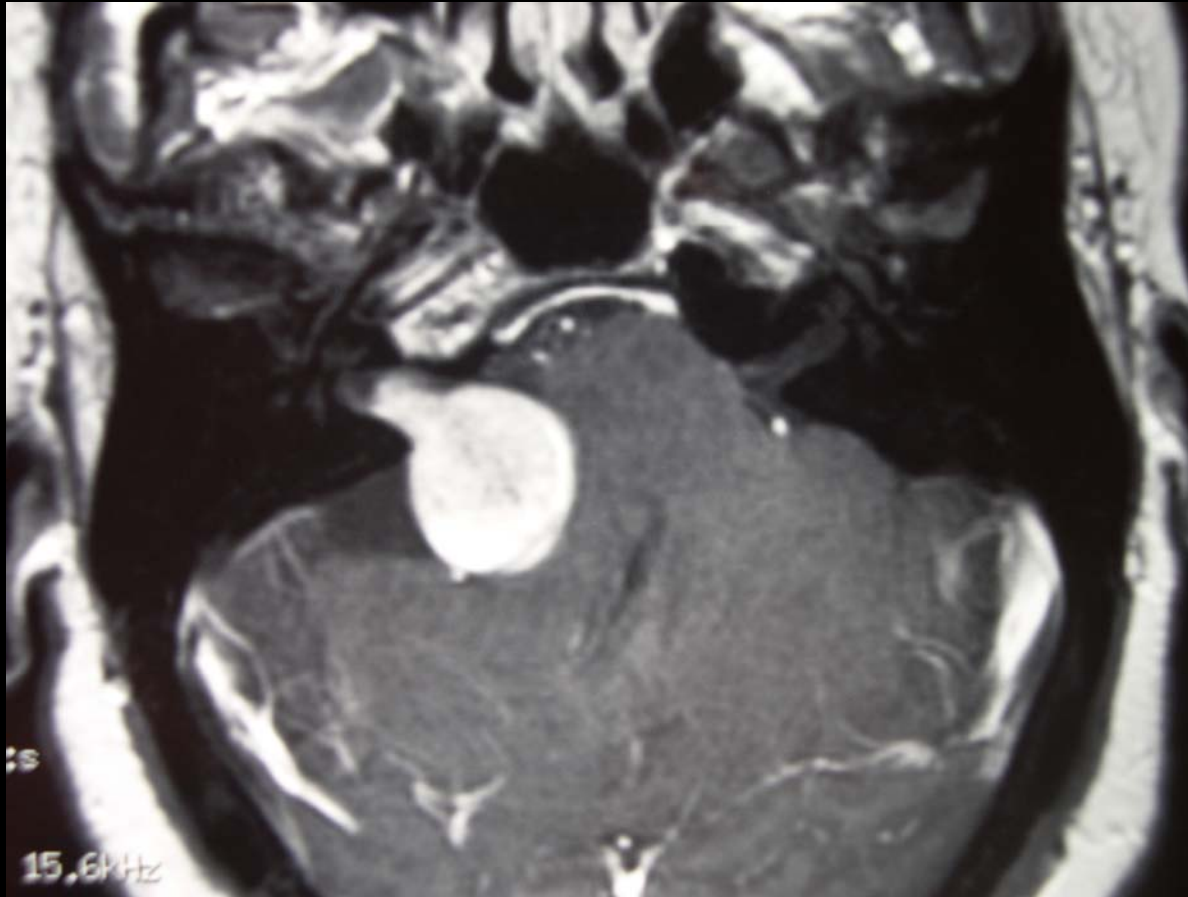
- **S**lowly progressive
- **P**ersistent >4 months
- **O**ther C.N. Ex SNHL
- **R**ecurrent
- **T**umor History



Cholesteatoma



Neoplastic Facial Nerve Palsy



Acoustic neuroma

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Facial Nerve Palsy

Functional deficits

- Lagophthalmos and ectropion
- Oral incompetence
- Nasal obstruction
- Mastication difficulties
- Articulation difficulties



Often severe psychological distress

Goals of restoration

- Corneal protection
- Facial symmetry at rest
- Symmetric smile
- Oral competence

Facial Nerve Palsy

Dynamic Reanimation

1. Primary repair
2. Interposition nerve grafts
3. Crossover reinnervation procedures
Ansa hypoglossi Hypoglossal & Cross-facial
4. Regional muscle transfer
Temporalis, Masseter & Digastric
5. Microvascular free-flap
Gracilis, Latissimus dorsi & Rectus abdominis

Facial Nerve Palsy

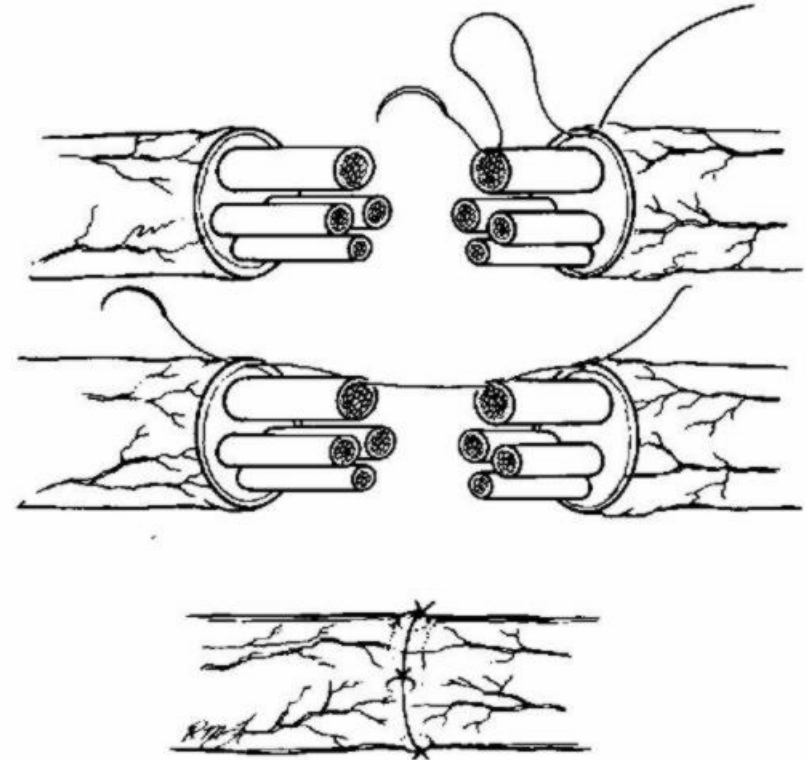
Static Reanimation

- Brow and forehead lift
- Eyelid procedures
 - Gold weight, Spring & Lower lid tightening
- Correction of midfacial deformity
 - Fascia lata, Alloplastic sheets & Facelift
- Lower lip wedge resection
- Botulinum toxin

Restore Neural input

Primary nerve repair

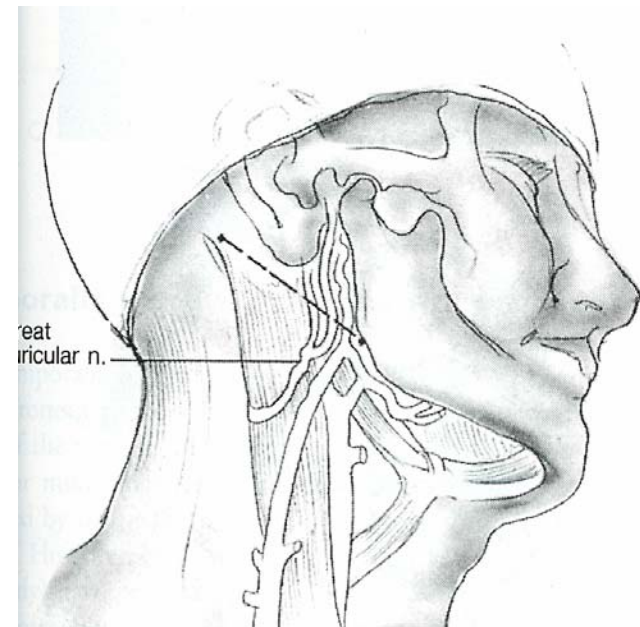
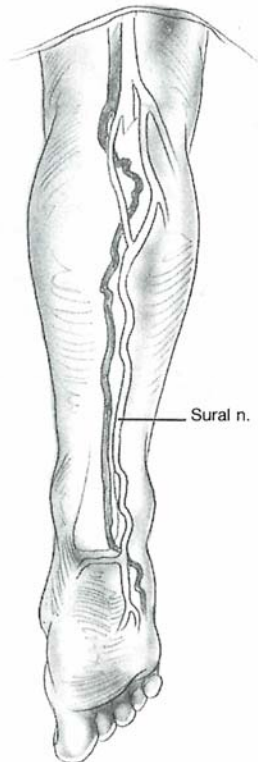
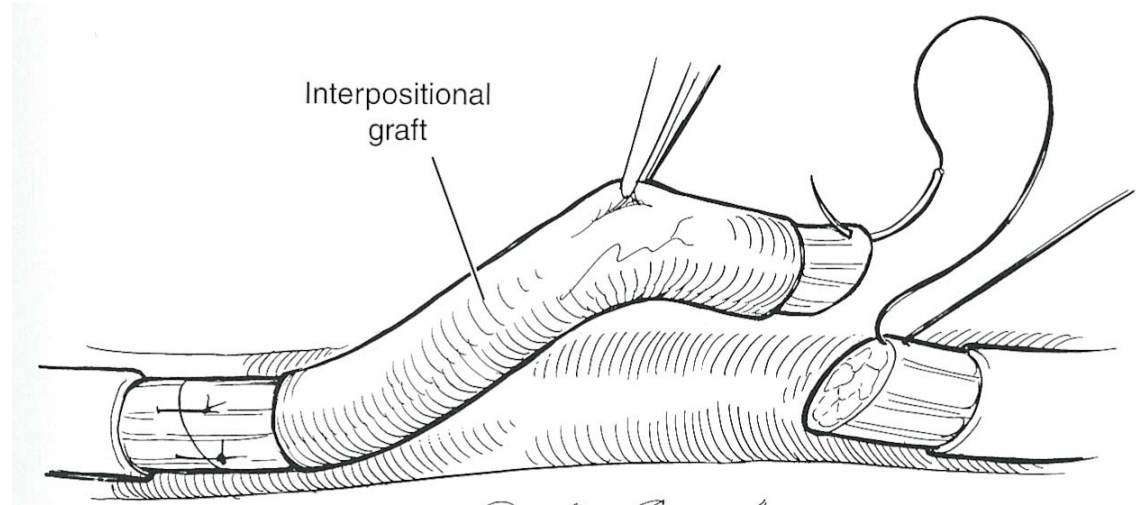
- Performed immediately
- Small gap (<17mm)
- Epineural or perineural
- Magnification
- No tension
- Best outcome
- Expect HB III



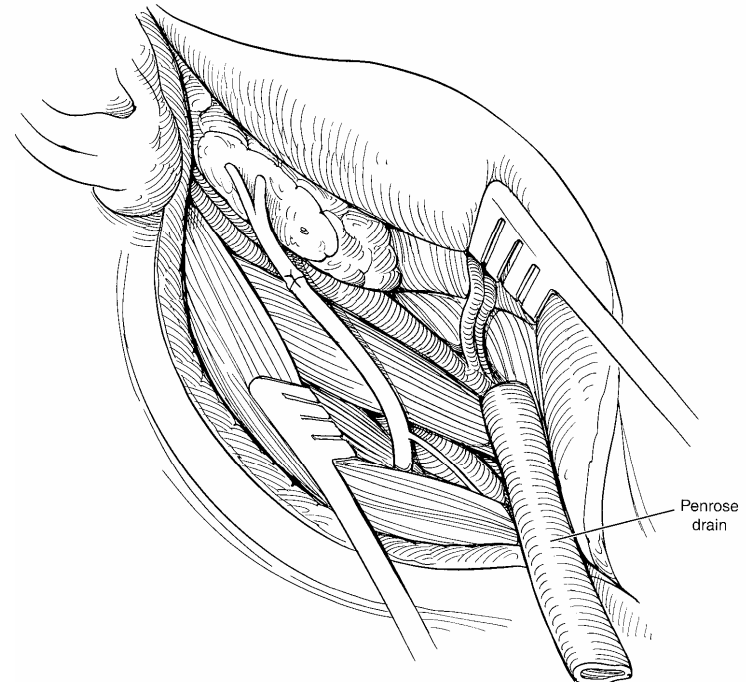
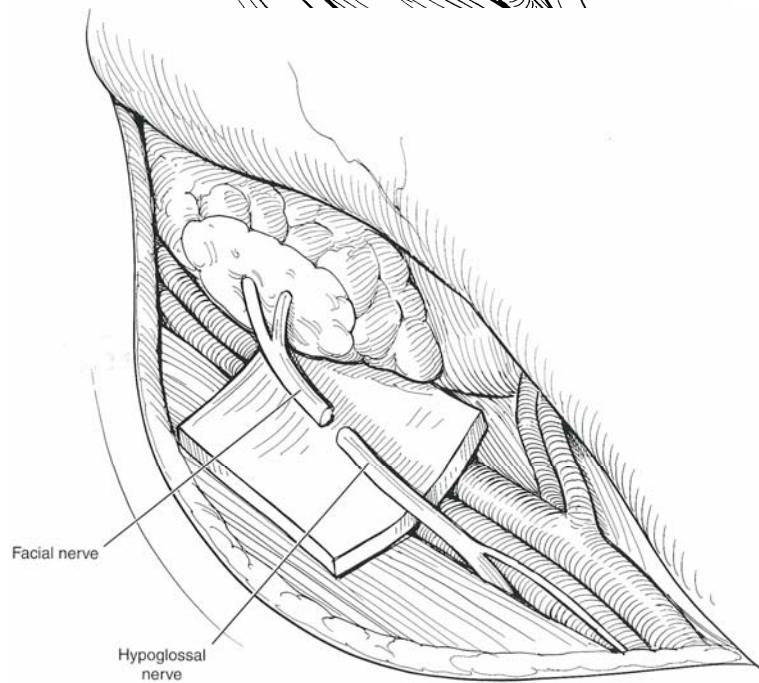
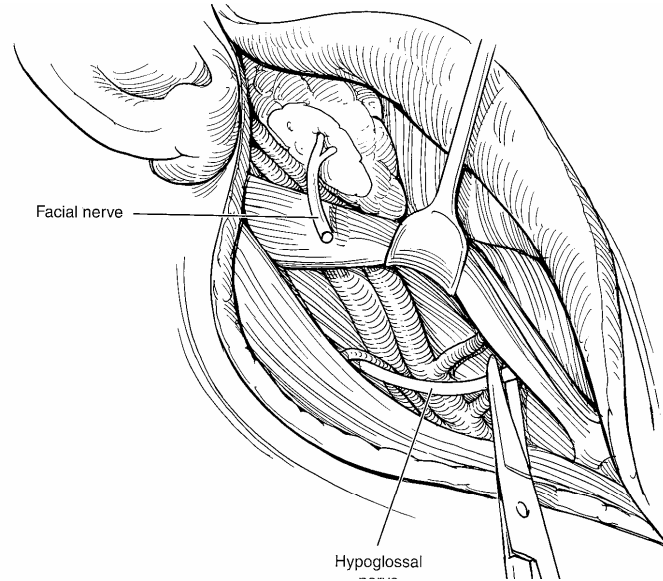
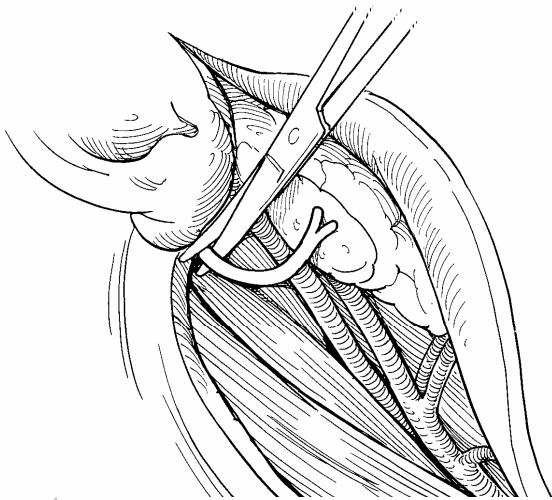
Restore Neural input

Interposition graft

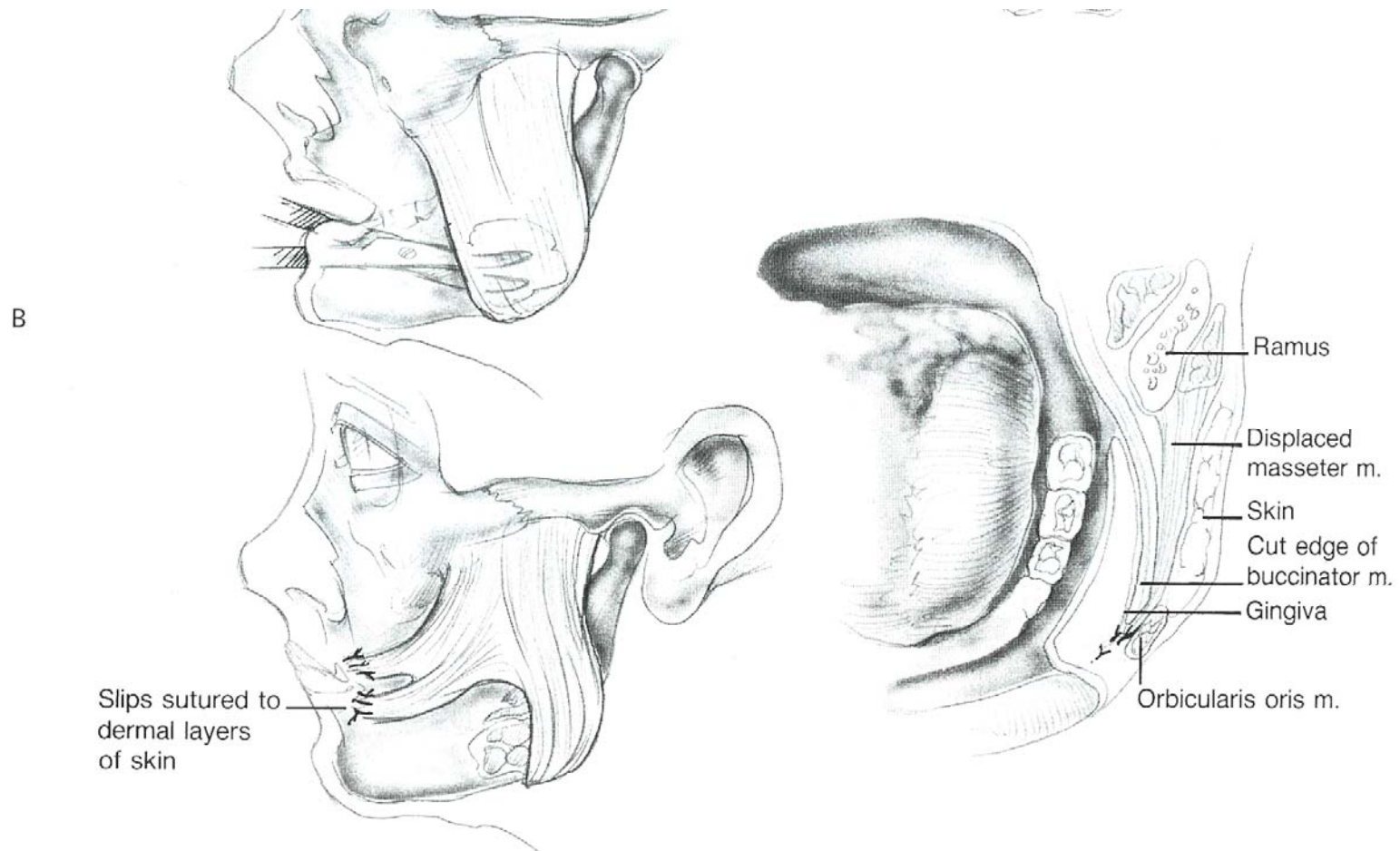
- HB III
- Variable synkinesis
- Improvement over 6 to 18 months



Hypoglossal-facial crossover

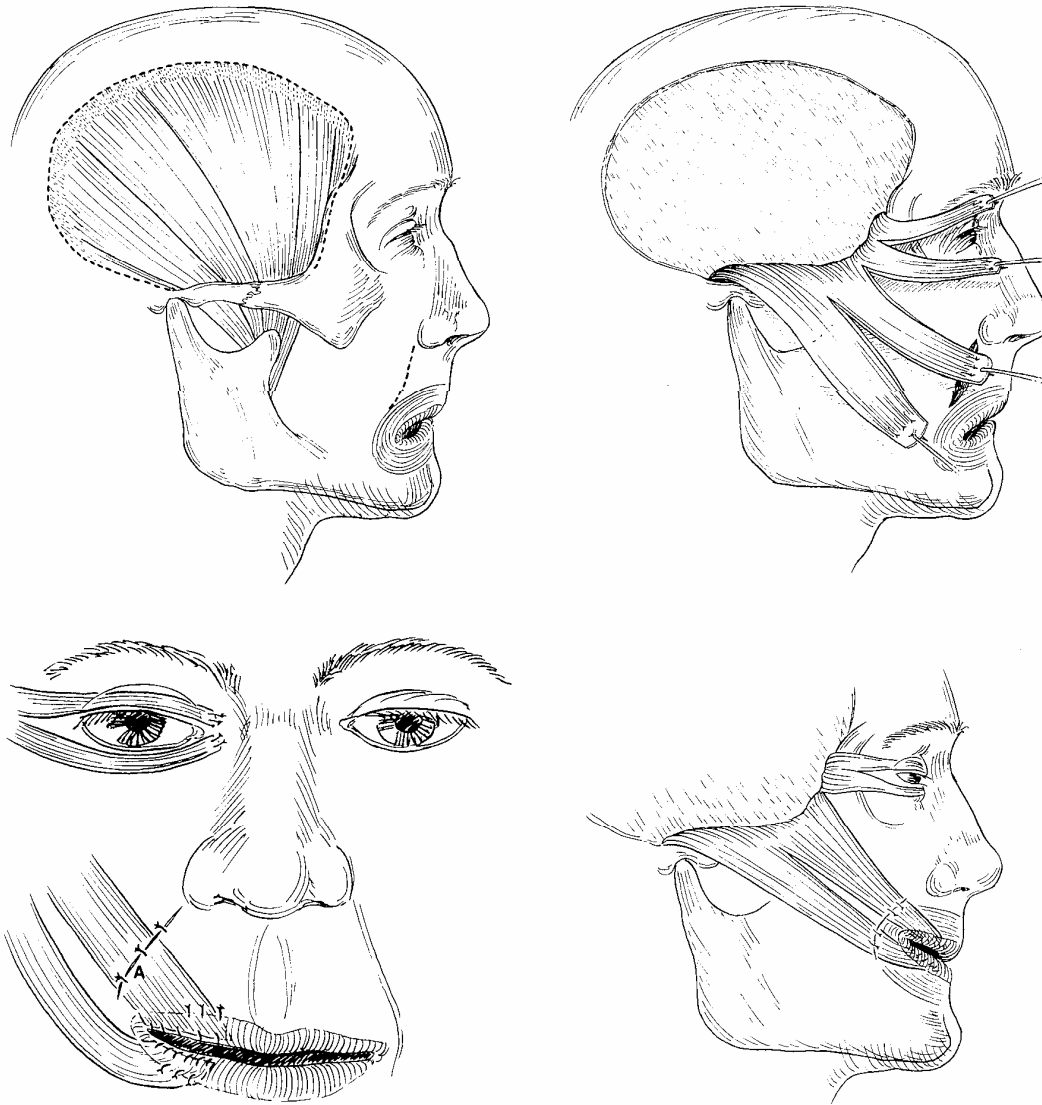


Muscle transposition



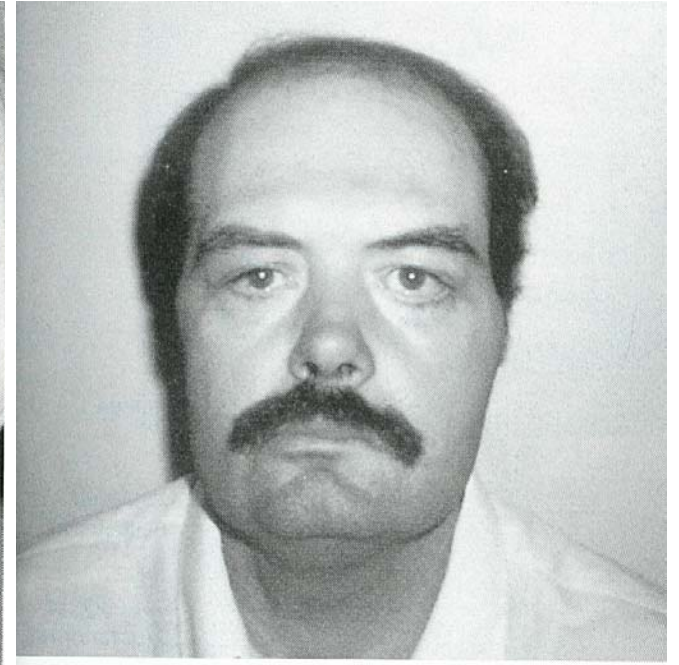
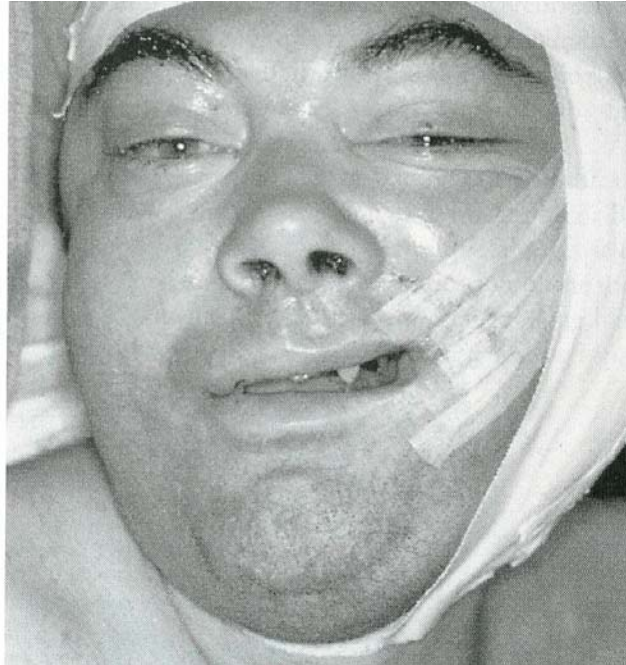
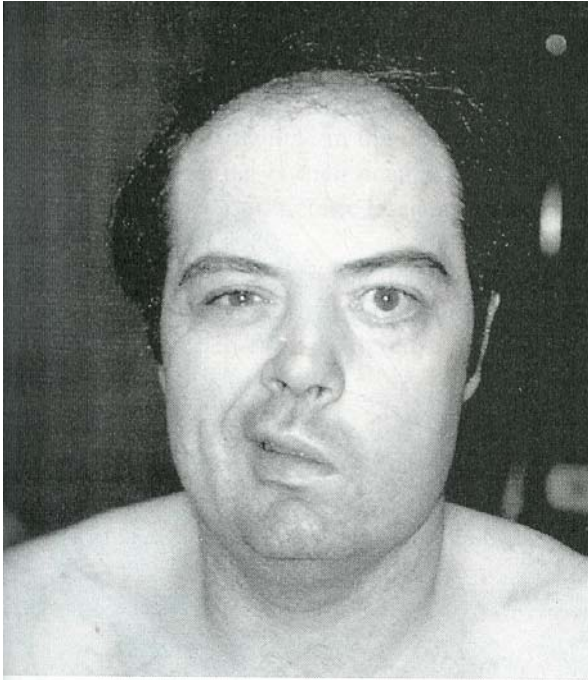
Masseter transfer

Muscle transposition



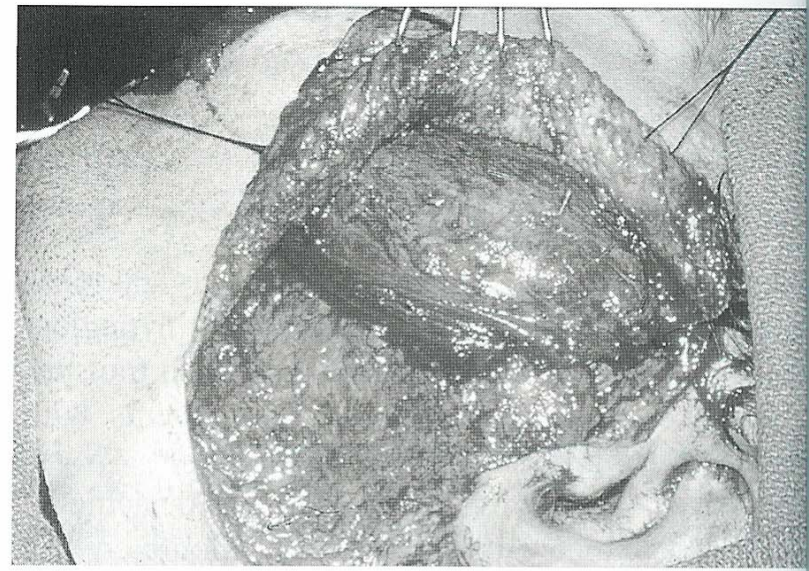
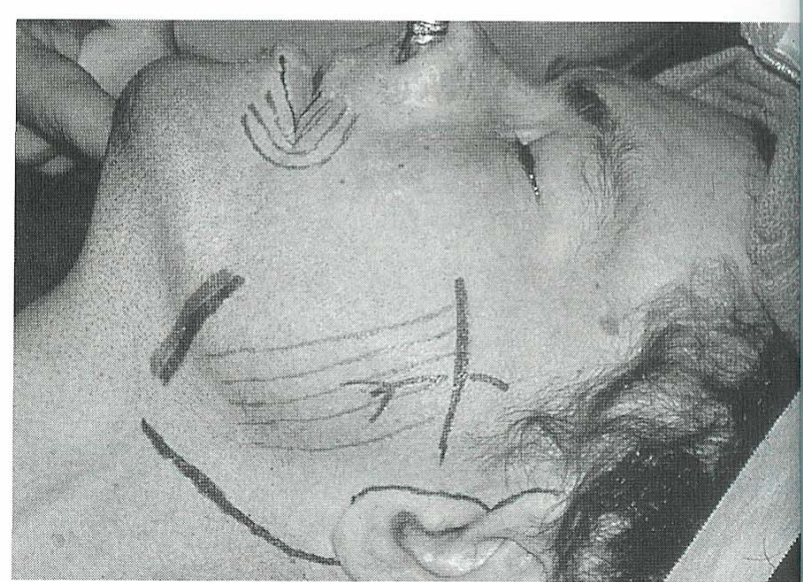
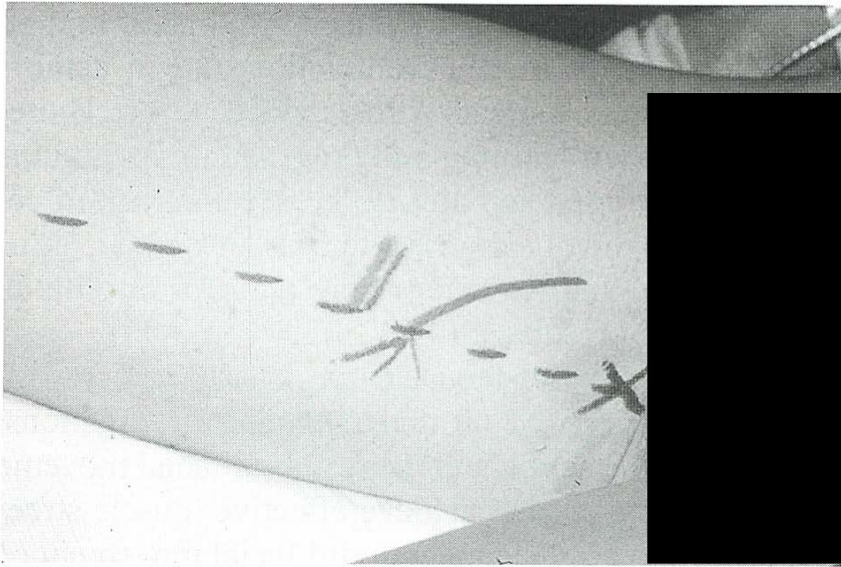
Temporalis transfer

Temporalis Muscle transposition

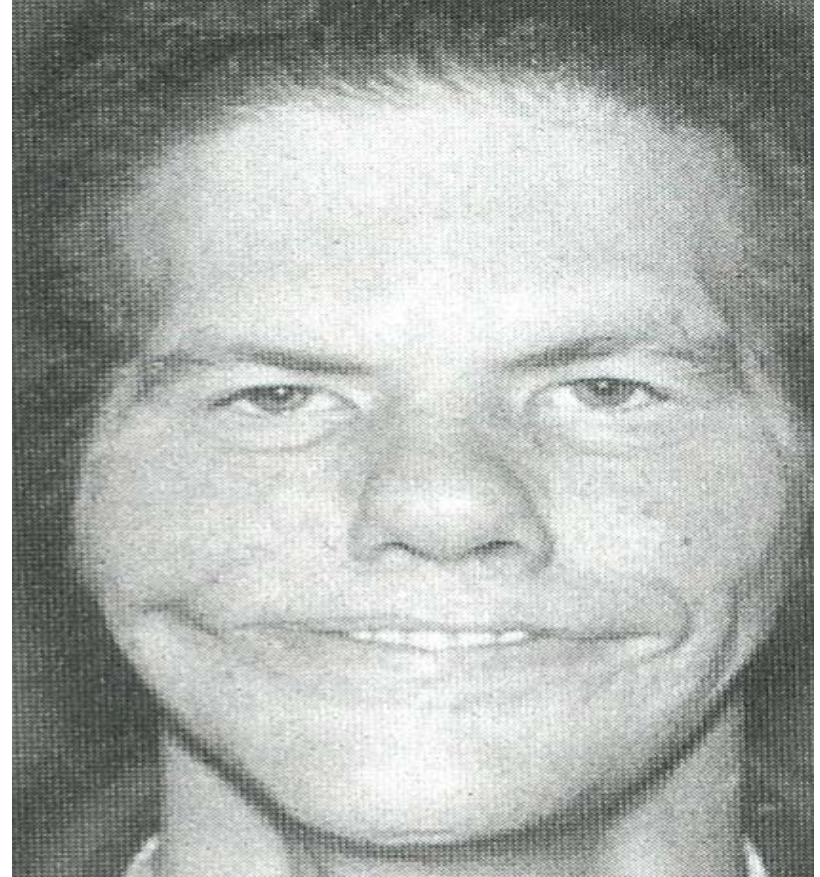
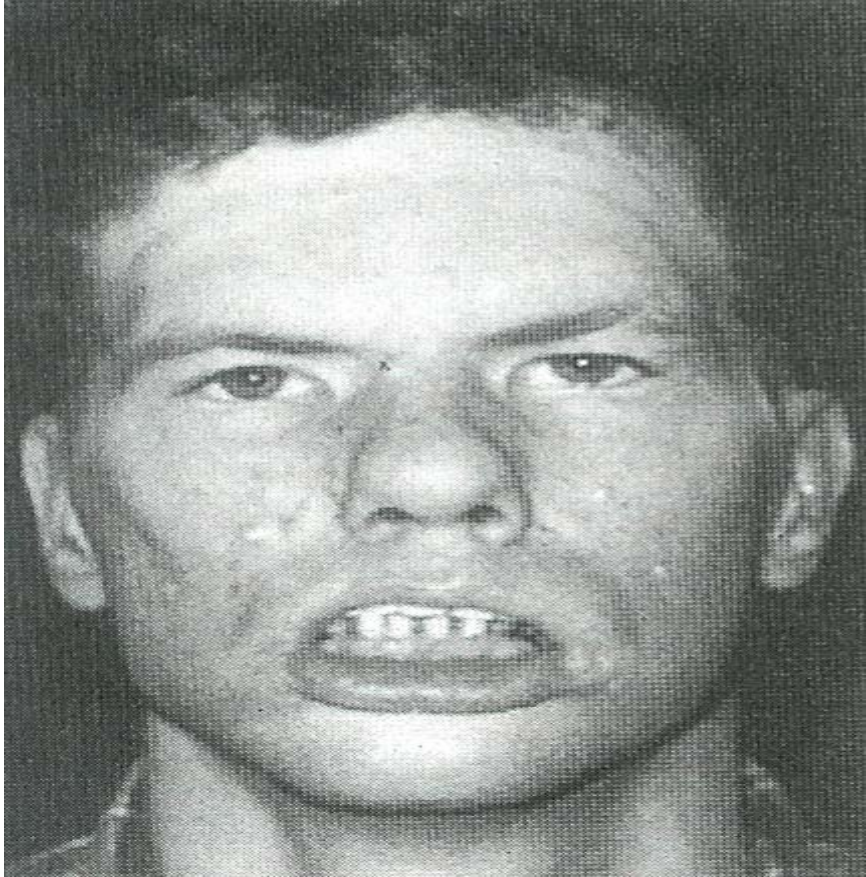


Non-functional facial muscles

Free gracilis

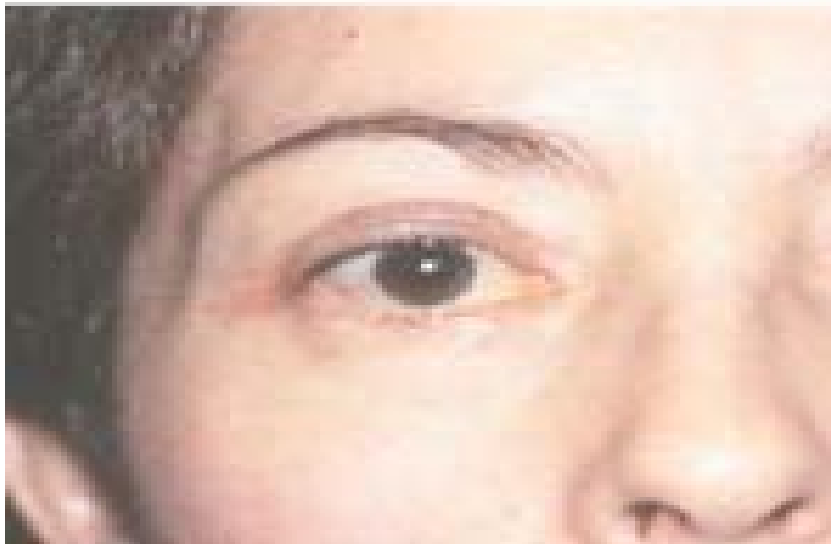


Non-functional facial muscles



Free gracilis trigeminal innervation

Static reanimation



Botulinum Toxin

- Synkinesis and hypertonia
- Advantages
 - Ease of use
 - Selective
- Disadvantages
 - Temporary
 - Repeated every 3 months

Conclusions

- **Facial paralysis sequelae (significant)**

- Functional
- Cosmetic
- Psychological



- **The primary goals of facial reanimation**

- Corneal protection
- Symmetry at rest
- Smile restoration

Conclusions

Primary repair



Cable rafting



CN XII-CN VII anastamosis



Static Reanimation



Microneurovascular

Hyperkinetic → Botulinum toxin

Facial Nerve

- **Embryology**
- **Anatomy**
- **Physiology**
- **Pathology**
 - **Pathophysiology**
 - **Evaluation**
 - **Causes**
- **Treatment**

Thank

You