

The Facial Nerve

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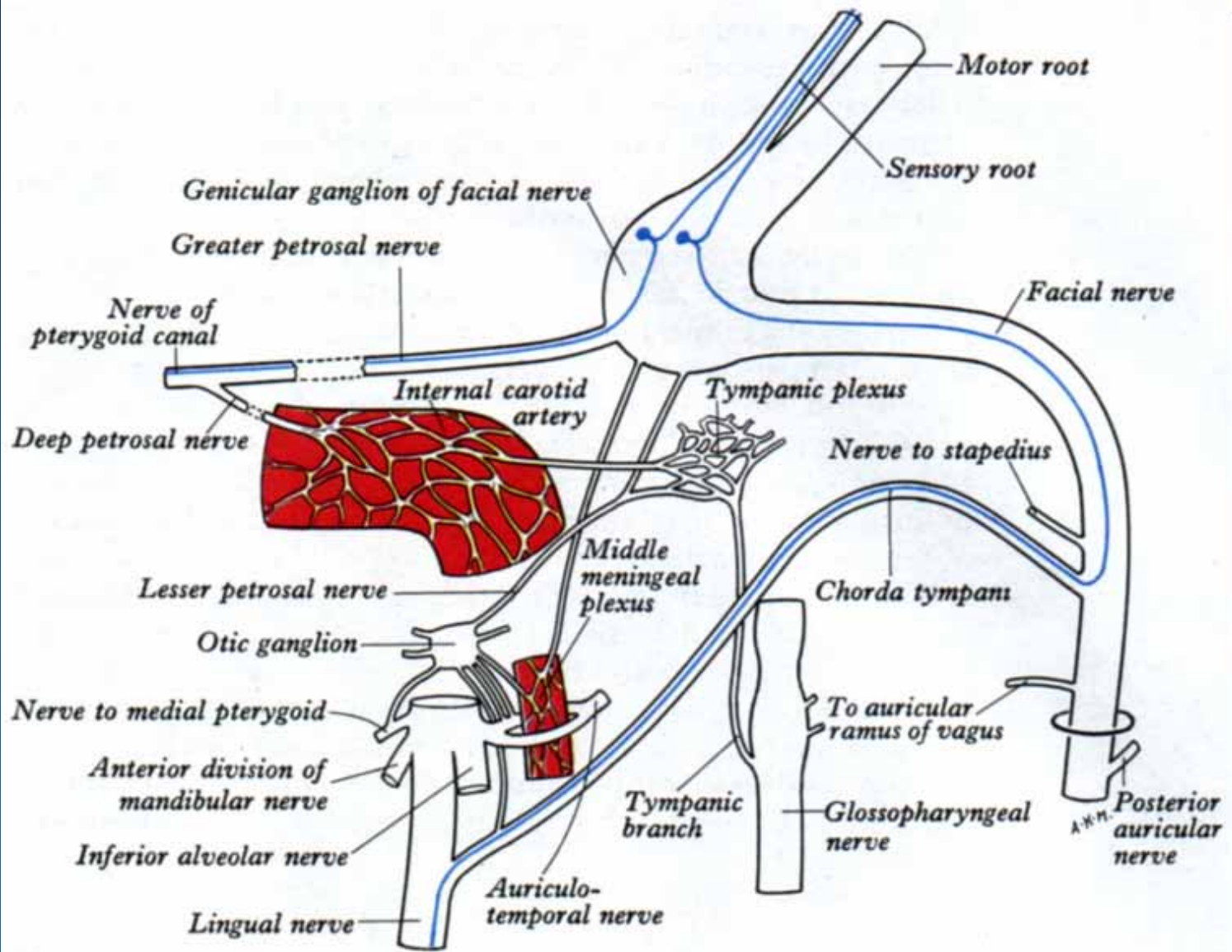
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Introduction

- The facial nerve has a complex course through temporal bone and parotid gland
- Components:
 - Motor
 - Sensory (N. Intermedius)
 - Secretomotor (parasympathetic)
- Facial nerve nucleus situated in pons
- Nerve fibres turn around the nucleus of the 6th nerve in the brainstem

Anatomy

- Fibres from contralateral hemisphere supply the nucleus in the pons
- Motor fibres run from the ipsilateral hemisphere and supplies the portion of nucleus that supplies the forehead
 - Upper motor neuron innervation of the forehead is bilateral



Anatomy *(continued)*

- Emerge from brainstem at lower border of pons between olive and inferior cerebellar penduncle
- Crosses cerebellopontine angle and enters temporal bone through the internal auditory canal

Anatomy *(continued)*

- Structures found in internal auditory canal:
 - Facial nerve
 - Vestibulo cochlear nerve
 - Nervus intermedius
 - Internal auditory artery and vein
- Runs through fallopian canal in a lateral direction, between cochlea and vestibule

Anatomy *(continued)*

- Separated from middle cranial fossa by thin layer of bone
- Reaches medial wall of epitympanic recess, turns sharply backwards at the first genu: geniculate ganglion
- Branch: greater superficial petrosal nerve
- Course through temporal bone: Labyrinthine portion

Anatomy *(continued)*

- From geniculate ganglion the nerve tuns posteriorly and slightly inferiorly
- Bony fallopian canal forms a cylindrical ridge, inferior to the lateral semi-circular canal and superior to the oval window (with stapes) and promontory: Tympanic portion
- Anterior limit of nerve: processus cochleariformis with tensor tympani tendon

Anatomy *(continued)*

- In bony floor of additus the nerve makes a gradual turn (second genu) and turns inferiorly to commence the vertical segment: Mastoid postion
- Branches in middle ear: chorda tympani; stapedius
- Runs inferiorly to stylomastoid foramen surrounded by mastoid air cells

Anatomy *(continued)*

- Emerges from stylomastoid foramen
- Runs forward between deep and superficial lobe of parotid salivary gland
- Divides into five branches:
 - Temporal
 - Zygomatic
 - Buccal
 - Mandibular
 - Cervical

General

- Damage to facial nerve results in facial weakness and cosmetic deformity
- Level of damage determines clinical picture
- Upper motor neuron vs lower motor neuron
- Forehead often spared in upper motor neuron lesions

General *(continued)*

- Degree of recovery dependent on extent of nerve damage
- International system for degree of facial nerve weakness
- House-brackmann grading system:
 - Six grades: I – VI
 - Grade I: normal function
 - Grade VI: no movement



'Relax' Note slightly wider palpebral fissure on right eye.



'Raise eyebrows' Note reduced furrowing of forehead on the right.



Testing of facial nerve function

- To determine site of facial nerve injury
- Relies on knowledge of facial nerve branches

Testing of facial nerve function *(continued)*

Branches:

- Greater superficial petrosal nerve:
 - Lachrymation
Test: Schirmer test
- Nerve to stapedius:
 - Stapedius reflex
Test: Audiometrical evaluation
- Chorda tympani nerve:
 - Taste
Test: Testing taste

Electrodiagnosis

- To decide if lesion will recover is paramount
- Electrical testing helpful to determine status of nerve and to predict potential for recovery
- Tests of nerve conductivity and can show degeneration as early as three days after injury
- Nerve stimulated through skin with an electrode

Electrodiagnosis *(continued)*

- Minimal excitability test
- Maximal stimulation test (MST)
- Electroneuronography (ENoG)
- Strength-duration curves (SD curves)
- Electromyography
- Compound action potential after stimulation

Electrodiagnosis *(continued)*

- Stimulating electrode over stylomastoid foramen; recording electrode in region of nasolabial fold
- Normal side compared to abnormal
- Difference in amplitude is directly proportional to degree of degeneration eg. 25 reduction = 75% degeneration
- Not useful for 72 hours after injury

Electrodiagnosis *(continued)*

Electromyography:

- Measurement of electrical activity in muscle useful to demonstrate survival of motor units
- Implies preservation of some intact fibres
- Shows presence of fibrillation potentials, indicating denervation: indication of recovery before it is clinically apparent
- Not helpful for recent onset

Electrodiagnosis *(continued)*

- Thus: all electrical testing limited by fact that it cannot provide an indication of status of facial nerve in immediate post injury state

Diagnosis of facial paralysis

- Most causes idiopathic
- Potentially treatable causes must be excluded
- Goal of diagnosis to arrive at prognosis and treatment

Management

- Time of onset:

Recent onset after trauma:

- Surgically explore and repair within 3 - 6 weeks

Late onset after trauma:

- Conservative - steroids

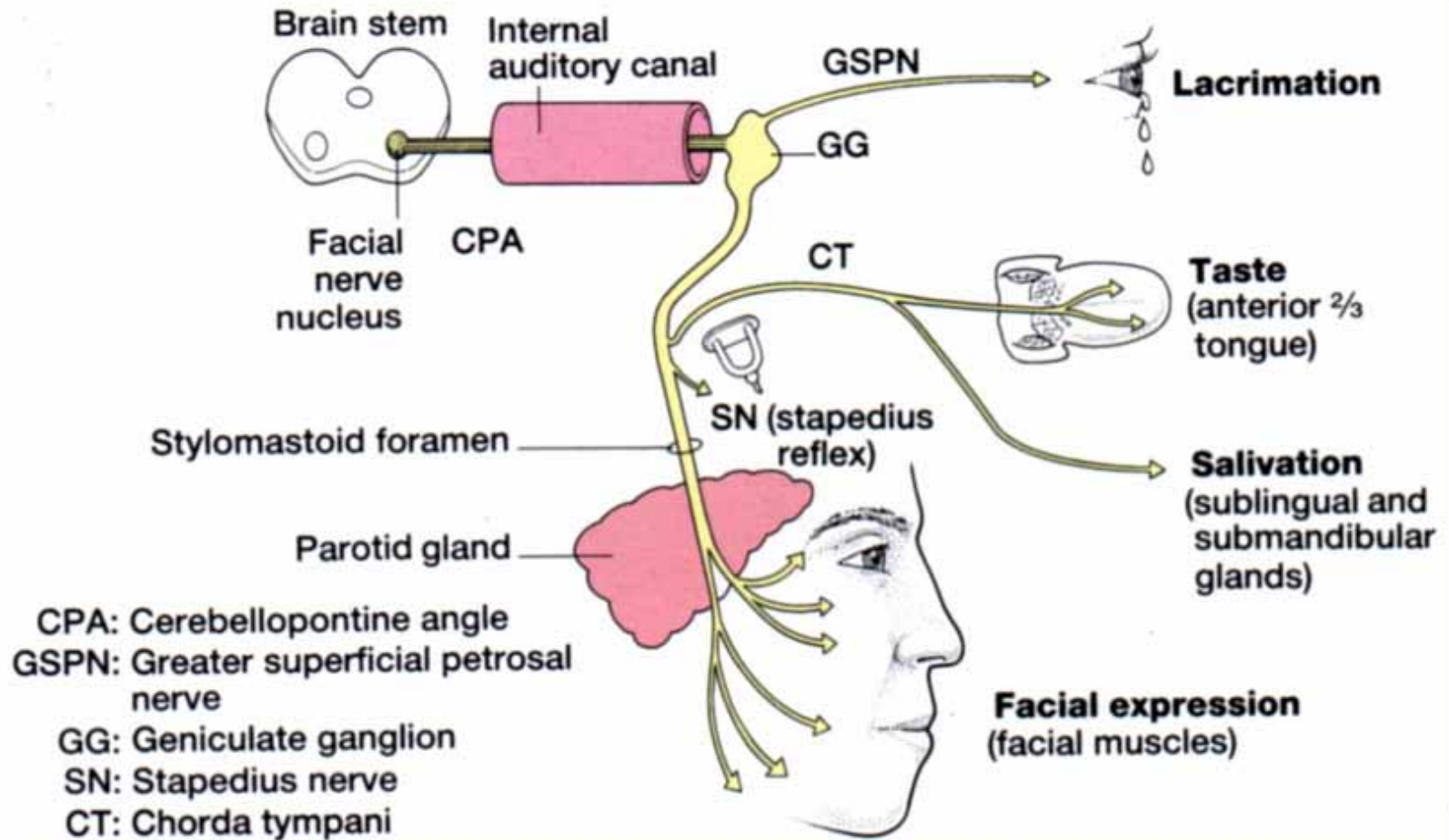
Causes of facial nerve

- Upper motor vs lower motor

Rules:

- Congenital vs acquired
- Immediate vs delayed

Site Intracranial	Aetiology Acoustic neuroma CVA* Brain stem tumour*
Intratemporal	Bell's palsy Herpes zoster oticus Middle ear infection Trauma <ul style="list-style-type: none">– surgical– temporal bone fracture
Extratemporal	Parotid tumours
Miscellaneous	Sarcoidosis, polyneuritis



Congenital

- May be traumatic or inherited/ developmental

Traumatic:

- Difficult delivery
- Forceps
- Large infant

Treatment:

- Usually resolves
- EMG will differentiate between traumatic and inherited/developmental

Inherited

- Myotonic dystrophy:
 - Autosomal dominant
 - Progressive muscle wasting
 - Mental impairment
 - Facial nerve paralysis early sign
- Albers-Schoenberg: disease
 - Autosomal recessive pattern
 - Disorder of bone metabolism
 - Bone density increases
 - Primary bone resorption decreases
 - Osteopetrosis of bony canals with cranial nerve compression

Developmental

- Moebius syndrome: cranial nerve abnormalities
- Charge syndrome: facial nerve dysfunction
- Oculo-auriculo-vertebral syndrome (OAV)
- Congenital unilateral lower lip palsy (CULLP)
 - Hypoplasia of depressor anguli oris muscle

Acquired

- Infections causes:
 - Bell's palsy
 - Ramsay hunt syndrome
- Bell's palsy:
 - Idiopathic
 - Lower motor neuron
 - Spontaneous resolution within 3 months: ?Herpes virus
- Treatment:
 - Anti-virus
 - Steroids
 - Artificial tears

Ramsay Hunt syndrome

- Herpes zoster
- Pain, vesicles, facial nerve paralysis
- Can involve CN VII

Treatment:

- Anti-viral
- Steroid
- Artificial tears

Ramsay Hunt syndrome *(continued)*

Suppurative otitis media

- With or without cholesteatoma
- Compression of nerve
- Sign of complication

Treatment:

- Medical: anti-biotics
- Surgical: Mastoidectomy

Neoplasms

- Tumours of facial nerve: Schwannoma
- Acoustic neuroma:
 - CN VIII
 - Excision puts facial nerve at risk

Diagnosis:

- Unilateral hearing loss
- MRI

Treatment:

- Watchful waiting
- Surgery
- Radiotherapy

Parotid gland tumours

- Adenoid cystic carcinoma: perineural spread

Treatment:

- Surgery
- Radiotherapy: neutrons

Traumatic

- Surgery: Iatrogenic
- Skull base fractures
- Sharp injuries

Iatrogenic

- Surgery for removal of tumours
- Complication of middle ear surgery

Sharp injuries:

- Any form of sharp injury to facial region
Treatment: primary anastomosis

Skull base fracture

- Signs of BOS fracture:
 - Battleship sign
 - Raccoon eyes
 - Glasgow coma scale reduced
- Two types: Transvers and longitudinal
- Check for:
 - Facial palsy
 - Hearing loss
 - CSF leak

Treatment: Surgery vs conservative

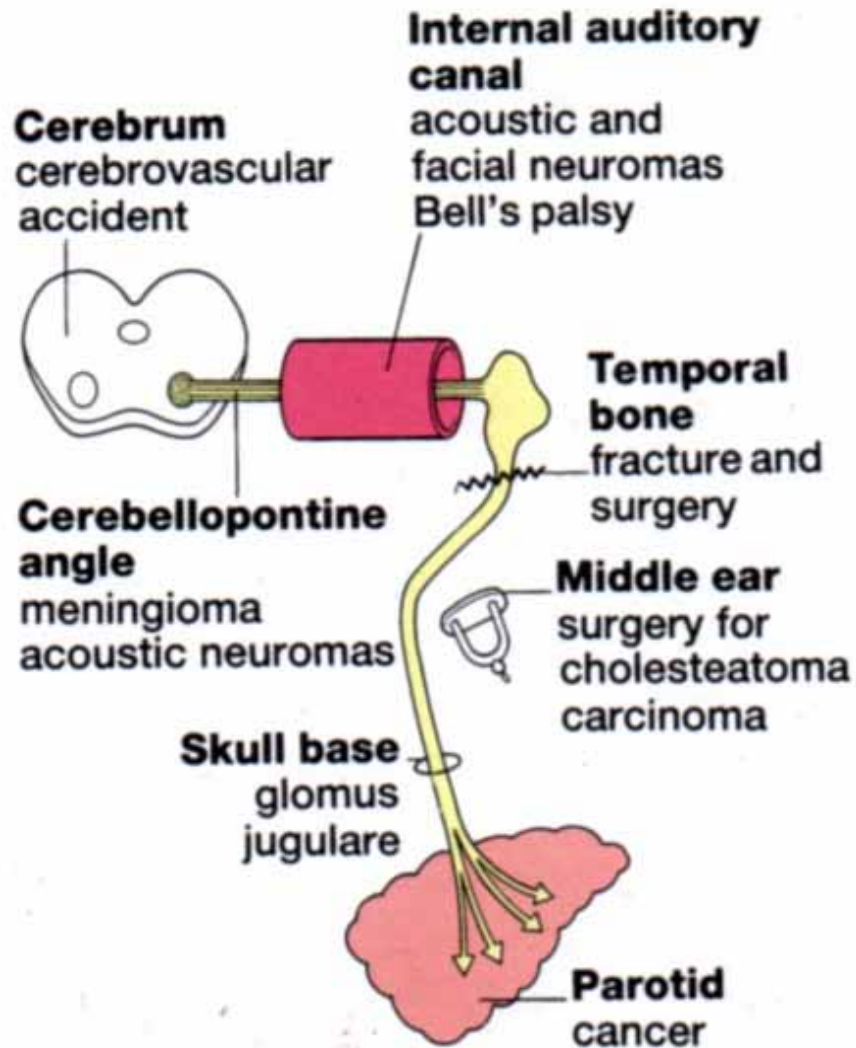


Fig. 4 Pathologies causing facial paralysis.