

Facial Nerve Disorders

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FACIAL NERVE DISORDERS

**FN
PARALYSIS**

**HEMIFACIAL
SPASM**

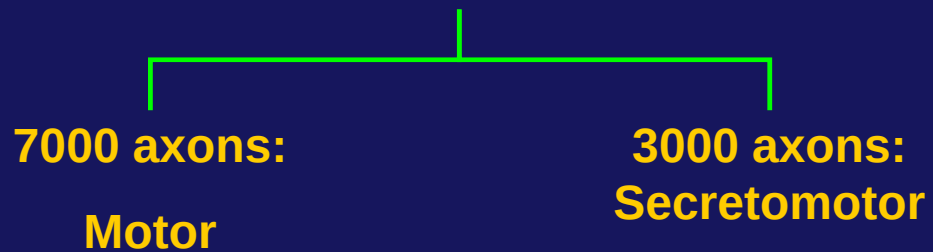
Hemifacial spasm (Involuntary twitches)

- Etiology: Vascular loop compressing the FN at the root exit zone in the CPA = **Neuro-vascular conflict**
- Diagnosis: CT & MRI, Electrophysiology
- Treatment:
 - Medical
 - Surgical: Microvascular decompression via **Retrosigmoid approach**).

FACIAL PALSY



FACIAL NERVE ANATOMY



FACIAL NERVE ANATOMY

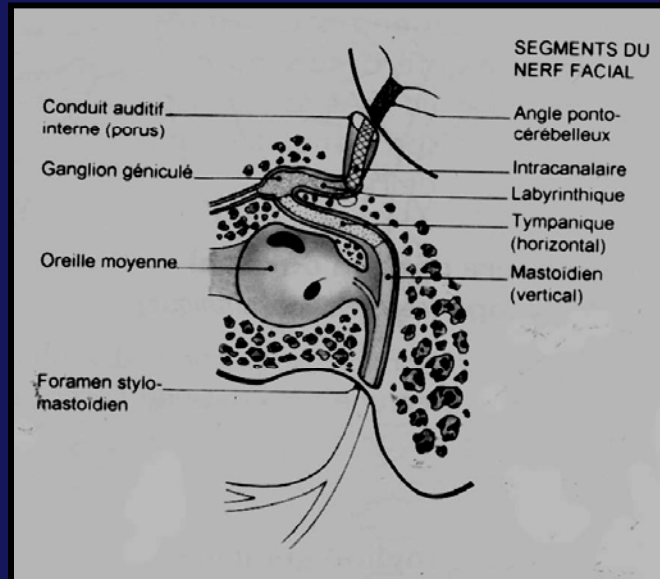
Three nuclei supply the FN:

- A- The motor nucleus: in the pons. Sup. Part: bilateral innervations from the motor cortex, inferior part: unilateral crossed cortical innervations.
- B- The superior salivatory nucleus: parasympathetic secretory fibers to lacrimal glands, nasal glands, submandibular, sublingual and palatal salivary glands.
- C- The nucleus of the tractus solitarius: receives taste sensation.

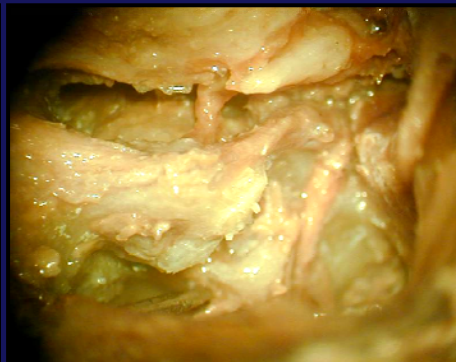
FACIAL NERVE ANATOMY

- It arises from the inferior border of the pons (pontomedullary sulcus) crosses the CPA to enter the IAC.
- Anatomical segments:
 - 1- Intracranial segment
 - 2- IAC segment
 - 3- Labyrinthine segment which ends by the geniculate ganglion
 - 4- Tympanic (horizontal) segment
 - 5- Mastoid (vertical) segment which ends by the stylomastoid foramen.

FN ANATOMY



FN ANATOMY



FACIAL NERVE ANATOMY

Branches:

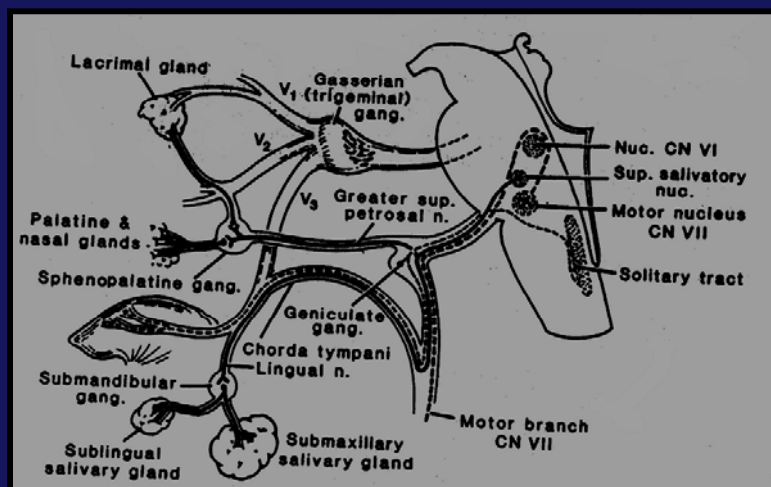
A- Intra-temporal branches:

- 1- Greater superficial petrosal (parasympathetic secretory)
- 2- Nerve to stapedius muscle
- 3- Chorda tympani (Taste)

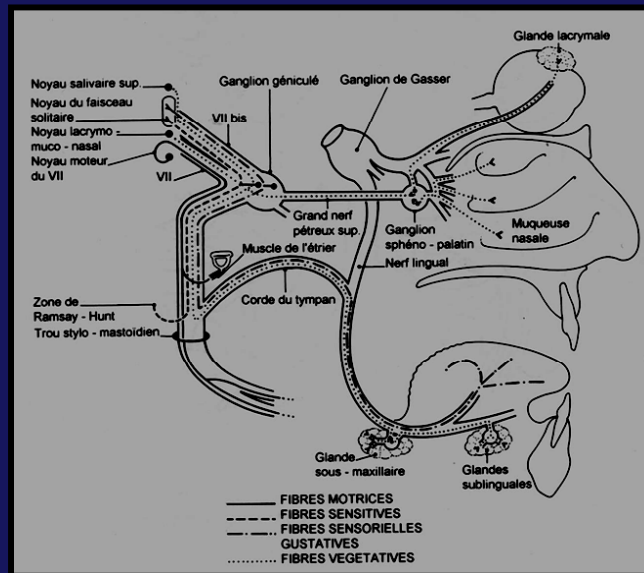
B- Extra-temporal branches:

- 1- Post auricular nerve
- 2- Nerve to stylohyoid & posterior belly of digastric
- 3- Cranio-temporal division
- 4- Cranio-cervical division

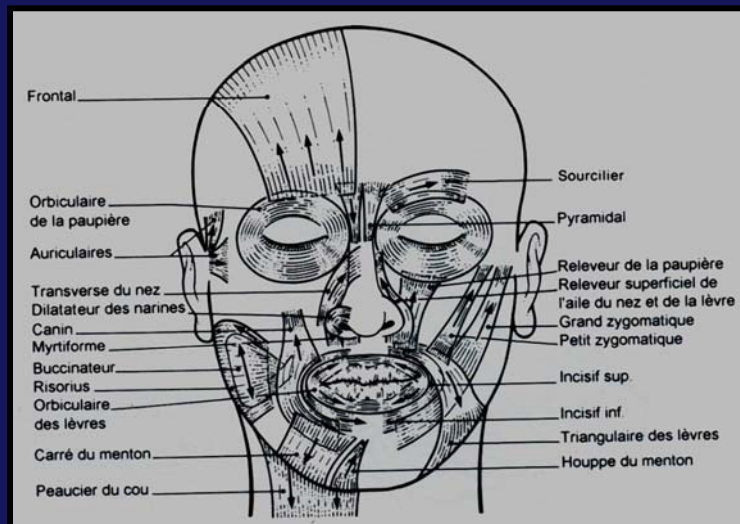
FN ANATOMY



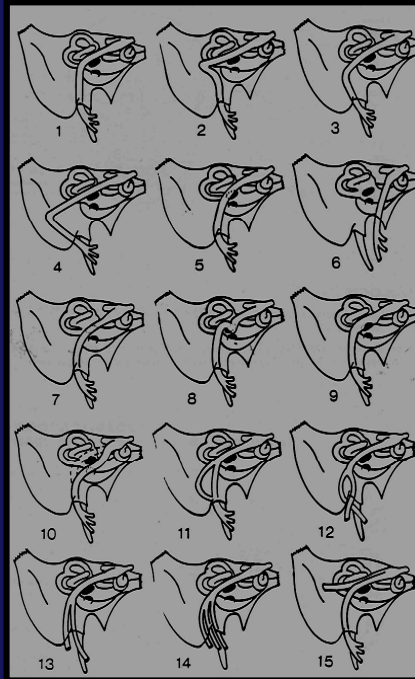
FN ANATOMY



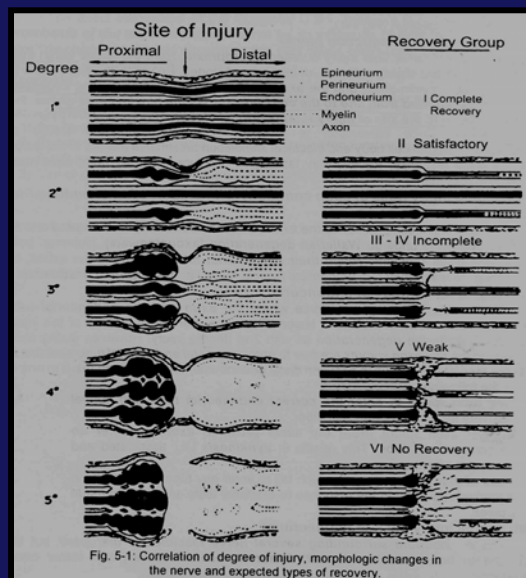
FN ANATOMY



ANATOMICAL VARIATIONS



Physiological Consideration



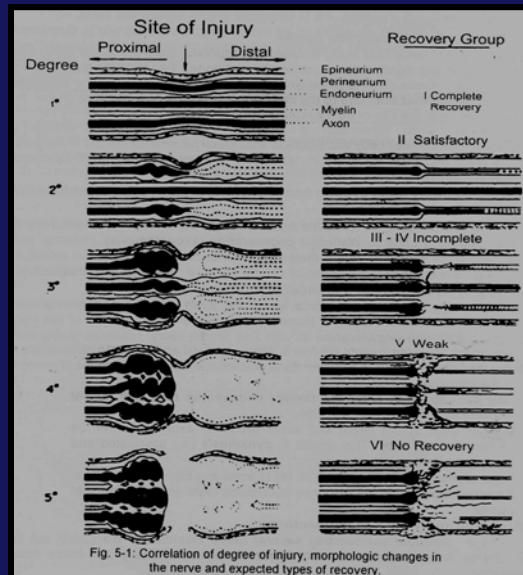
Physiological Consideration

1. **Neuropraxia:** Physiologic block, **No anatomical disruption**, temporary, lasts few days and full return of function is expected. The axoplasm can still be transported from and to the cell body across the blocked area and so; the nerve fiber distal to the site of injury retains normal electrical response.
2. **Axonotmesis:** Axon sheath is intact but the axon is divided. i.e. more severe lesion. **Distal degeneration (Wallerian)** occurs. Epineurium is intact.
3. **Neurotmesis:** Epineurium enclosing all nerve fascicles is also torn. Regeneration is the worst and traumatic neuroma may develop.

Physiological Consideration

Seddon Classification	Sunderland Classification	Pathophysiologic Process
Neuropraxia	I	Physiologic block
Axonotmesis	II	Axons disrupted
	III	Axons and endoneurium disrupted
	IV	Axons, endoneurium, & perineurium disrupted
Neurotmesis	V	Complete transection

Correlation of degree of injury, morphologic changes in the nerve and expected types of recovery



DIAGNOSIS

- What is the lesion?
- Where is the lesion?
- Degree of the lesion:
- Causes of the lesion:

DIAGNOSIS

What is the lesion?

Is the face paralyzed or not?

Inspection of the face movement.

Testing for facial movement and emotional movement. (Laughing; blinking, wrinkling, closing eyes, whistling, grinning and blowing of the cheeks).

DIAGNOSIS

- Where is the lesion?

Lesions can be either :

1. Supra-nuclear (UMNL),
2. Nuclear,
3. Infra-nuclear (LMNL).

Where is the lesion? UMNL vs LMNL

Difference	Supra-Nuclear UMNL	Infra-Nuclear LMNL
Type of paralysis	Spastic	Flaccid
Distribution	Lower face	Whole face
Emotional Movement	Free	Paralyzed
Other signs	Crossed hemiplegia	-ve

UMNL vs LMNL



DIAGNOSIS

Where is the lesion?

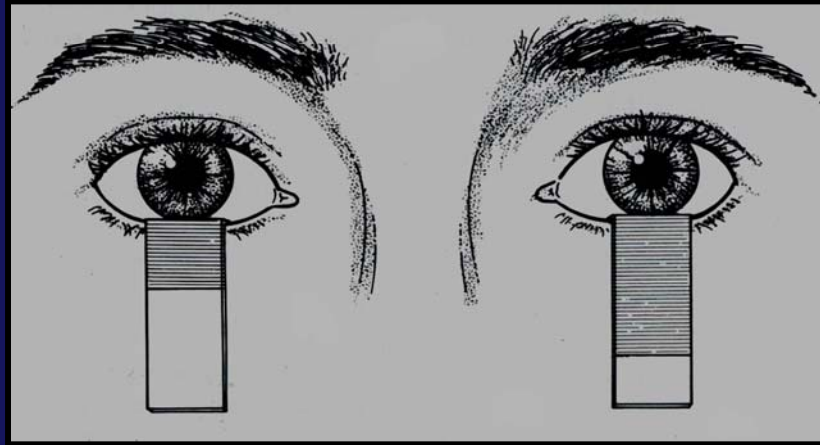
i- **Nuclear lesions** are associated by crossed hemiplegia, crossed hemianesthesia, other cranial nerve palsies specially VI. Lacrimation, salivation and taste are normal.

ii- **LMNL** : FN may be affected at different sites of its course.

Topographic diagnosis

1. Schirmer's tear test
2. Stapedius reflex
3. Evaluation of Taste
4. Submandibular salivary flow

Schirmer's Tear Test



DIAGNOSIS

Degree of the lesion

1. Maximum nerve excitability test (Hilgers test)
2. Electroneuronography (ENoG)
3. Electromyography (EMG)

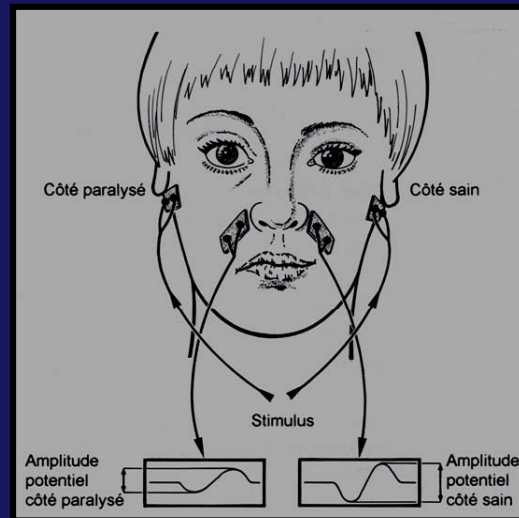
Electrophysiologic Tests

1- **Maximum nerve excitability test** (Hilger's test): The response on the involved side is compared to the normal side. The idea is that the distal segment of a completely cut nerve may continue to conduct when stimulated by a faradic current (distal to the cut) for as long as 24-72 hours. The response then disappears due to Wallerian degeneration. Ideally testing is started on the third post onset day.

Electrophysiologic Tests

2- **Electroneuronography (ENOG)** = Evoked electromyography: Similar to maximum stimulation test in which the evoked CAP are recorded. The height of the action potential is compared with the good side and a percentage comparison is made. It is a quantitative test. Degeneration of more than 90% means recovery is poor.

Electro-diagnosis Electroneuronography (ENOG)



Electrophysiologic Tests

3- **Electromyography (EMG)**: The paralyzed side is explored by the EMG needle while the patient is attempting to move it.

In the first 10 days, the presence of voluntary CAP indicates less than total transaction. After 10-14 days, the presence of fibrillation indicates denervation. After 10 weeks have passed, **the test is prognostic**. These action potentials can be found a week or two before the clinical evidence of recovery.

Causes of the lesion

Supra-nuclear or nuclear: Hemorrhage; vascular; encephalitis; tumors, cerebral palsy;

Infra-nuclear:

1. Congenital: poor facial muscular development
2. Inflammatory: Malignant ext. otitis; AOM, Ch.OM, cholesteatoma, Herpes zoster oticus (Ramsay Hunt syndrome), spirochetes (Lyme disease)
3. Traumatic: Fracture base, forceps delivery,
4. Toxic: Diphtheria, tetanus,..
5. Metabolic: Diabetes
6. Neoplastic: 1ry tumor: FN neuroma; 2ry tumors of middle ear and parotid and CPA.
7. Iatrogenic: mastoid, parotid, CPA surgery
8. Idiopathic: Bell's palsy

COMPLICATIONS

A- Complications due to FN paralysis:

- 1- Drooling
- 2- Eye complication: exposure keratitis; corneal ulcer; panophthalmitis.
- 3- Facial contractures (fixed shortening of the muscles)
- 4- Psychological disturbance, depression, and suicidal tendencies.

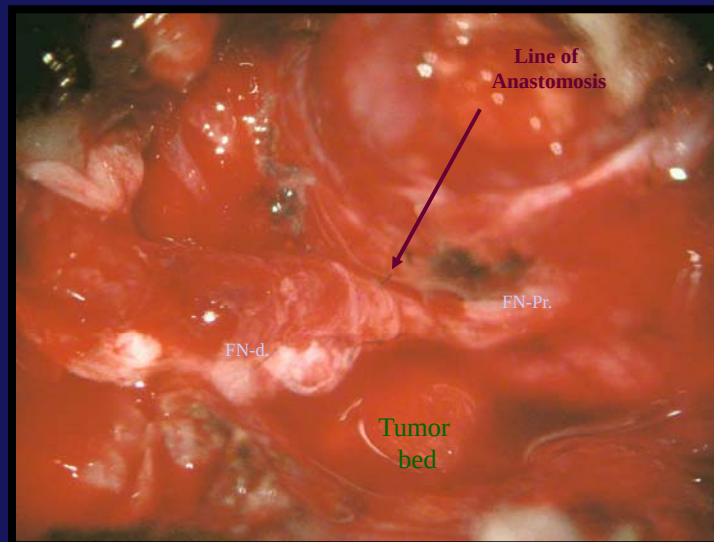
B- Complications due to abnormal regeneration

1. Facial tics and spasms: due to short-circuiting between nerve fibers
2. Abnormal mass movement of the face: Synkinesis.
3. Crocodile tears: due to misdirected salivation fibers to the lacrimal gland.
4. Frey's syndrome: facial flushing and sweating over the parotid during mastication = misdirected salivary fibers to the sweat glands.

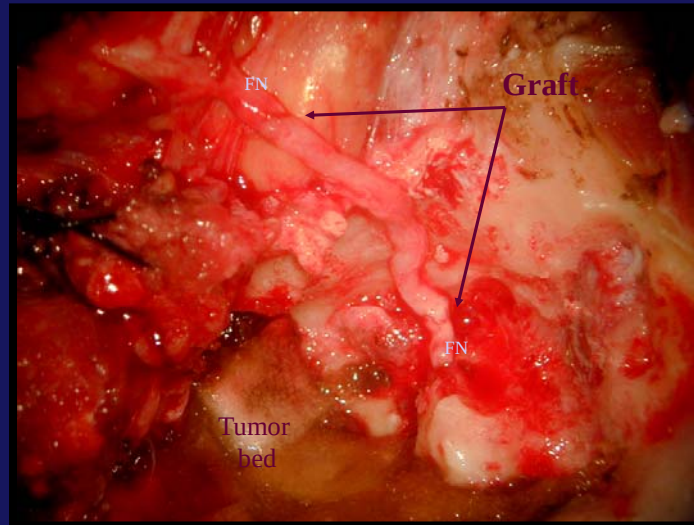
Outlines of Treatment

- 1- Treatment of the cause
- 2- Treatment of the complication: eg. Gold weight for protection of the cornea; Facial plastic surgery for the contractures.
- 3- Treatment of the facial paralysis by facial re-animation surgery meant to:
 - a- Restoration of anatomical integrity of the FN. Eg. FN decompression; **anastomosis and grafting**. May be indicated in Bell's palsy, Herpes zoster oticus, acute or chronic otitis media, trauma, and tumors
 - b- Restoration of the functional integrity of the neuromuscular system of the face: includes:
 - i. nerve substitution technique e.g. Facial-hypoglossal anastomosis; and
 - ii. muscle substitution techniques e.g. Masseter or temporalis muscle transfer.
- 4- **Facial rehabilitation**: e.g. Massage, heat and facial exercises.

Facial Nerve Reconstruction End-to-End Anastomosis



Facial Nerve Reconstruction Sural Nerve Cable Graft



BELL'S PALSY

Bell's Palsy

Defined as the sudden occurrence of a flaccid facial paralysis (LMNL) in an apparently healthy individual. It is the commonest cause of intratemporal causes of facial paralysis.

- Incidence: 1/5000 per year.

It is the most common form of FN paralysis.

It is attributed to sudden exposure to cold.

Bell's Palsy

- Etiology: Due to VIRAL causes (Activation of Herpes Simplex).

- Pathogenesis: Segmental demyelination followed by 2ry edema and compression.

- Clinical picture: Sudden onset of FN paralysis of LMN type. Pain in the ear is noted in over half of patients. Recovery starts even without treatment in most cases within few days up to 3 weeks.

Bell's Palsy

- **Prognosis:** 71% complete recovery; 25% recovers with slight sequelae; and 4% with severe sequelae. Not a single patient who does not show some recovery.
- **Diagnosis:** It's a diagnosis of exclusion.

Treatment of Bell's Palsy

A- Conservative treatment is helpful in 96% of cases.

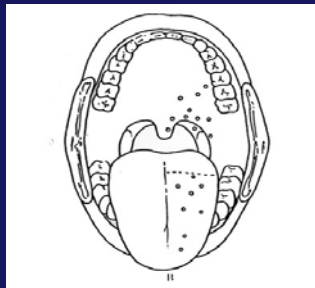
1. Zovirax (800 mg 5 x daily for ONE week) + Cortisone therapy
2. Physiotherapy treatment: massage, heat, and facial exercises.
3. Dark eye glasses and artificial tears. Protection of the eye.

B- **Surgical treatment:** For complete paralysis with more than 90% degeneration by ENOG within 6 days: Decompression of the FN (specially the entry of the nerve into the Fallopian canal) through Middle Cranial Fossa.

Herpes Zoster Oticus

Herpes Auricularis & Facial palsy (Ramsy Hunt)

- 5-15% of acute facial palsy
- Palsy appears 2-7 days
- 30-50% show incomplete recovery
- Diffuse lymphocytic infiltration..?
- Vesicles may also affect palate & anterior 2/3 of tongue



Herpes Zoster Oticus

- The FN appears to be more severely damaged in herpes zoster oticus than with idiopathic facial palsy. Only 30% of patients will recover normal function, and thus 70% experience some sequelae.

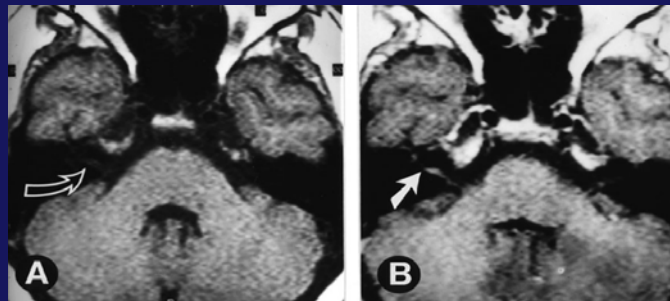
Herpes Zoster Oticus

Ramsay Hunt Syndrome consists of

- Facial paralysis;
- Auditory and vestibular dysfunction associated with
- Painful herpetic vesicles of the auricle and the EAC.

Herpes Auricularis & Facial palsy (Ramsy Hunt)

MRI + Gadolinium shows enhancement
at labyrinthine segment



Treatment of Ramsy Hunt syndrome

- 1) Acyclovir (Zovirax) should be started as early as possible (800 mg 5 times daily for a week) +
- 2) Oral steroids 1mg/kg/day for 2 weeks
- 3) Decompression if degeneration is more than 90% in 2 weeks.

FN TRAUMA

FN TRAUMA

1. **Accidental:** eg. Fracture of the petrous temporal bone:
2. **Iatrogenic** (Unintentional surgical injury)
3. **Surgical** (unavoidable injury during surgery)

TRAUMA

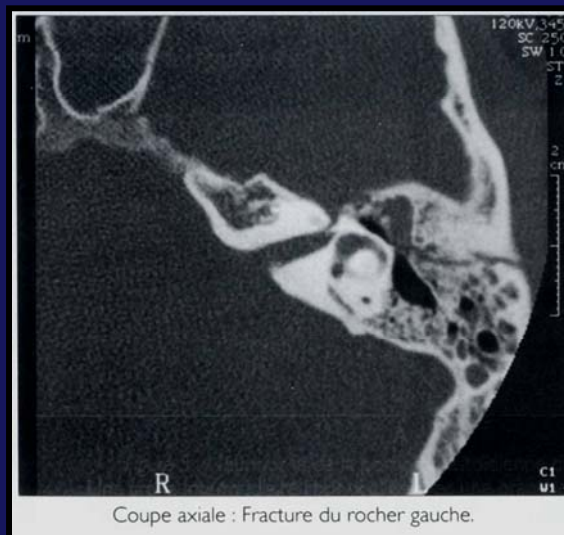
Accidental: eg. Fracture of the petrous temporal bone:

- a- 10% of cases of longitudinal fractures
- b- 40% of cases of transverse fractures.

The site of the lesion is commonly at the geniculate ganglion.

c- Extratemporal trauma is not common. Occasionally, direct trauma may damage the nerve.

Temporal Bone Fracture



TRAUMA

Iatrogenic (Unintentional surgical injury)

- a- Incision of a postauricular abscess in infant. Incision must be placed high.
- b- Classical cortical & radical mastoidectomies
- c- Congenital ear surgery
- d- Surgery of CPA.

Intraoperative Facial Nerve Monitoring (IOM) is of great help to prevent surgical trauma during difficult otological/neurotological surgery.

TRAUMA

Surgical (unavoidable injury during surgery)

Impossible to preserve the FN during surgery as in some cases of malignancies, Tumors of the CPA, extensive cholesteatomas, ...

Management: Diagnosis:.. electric testing;
Medical steroids; Surgical Exploration..

Thank You

Thank You

Thank You

Thank You

Prof. Dr. M. Badreldine,