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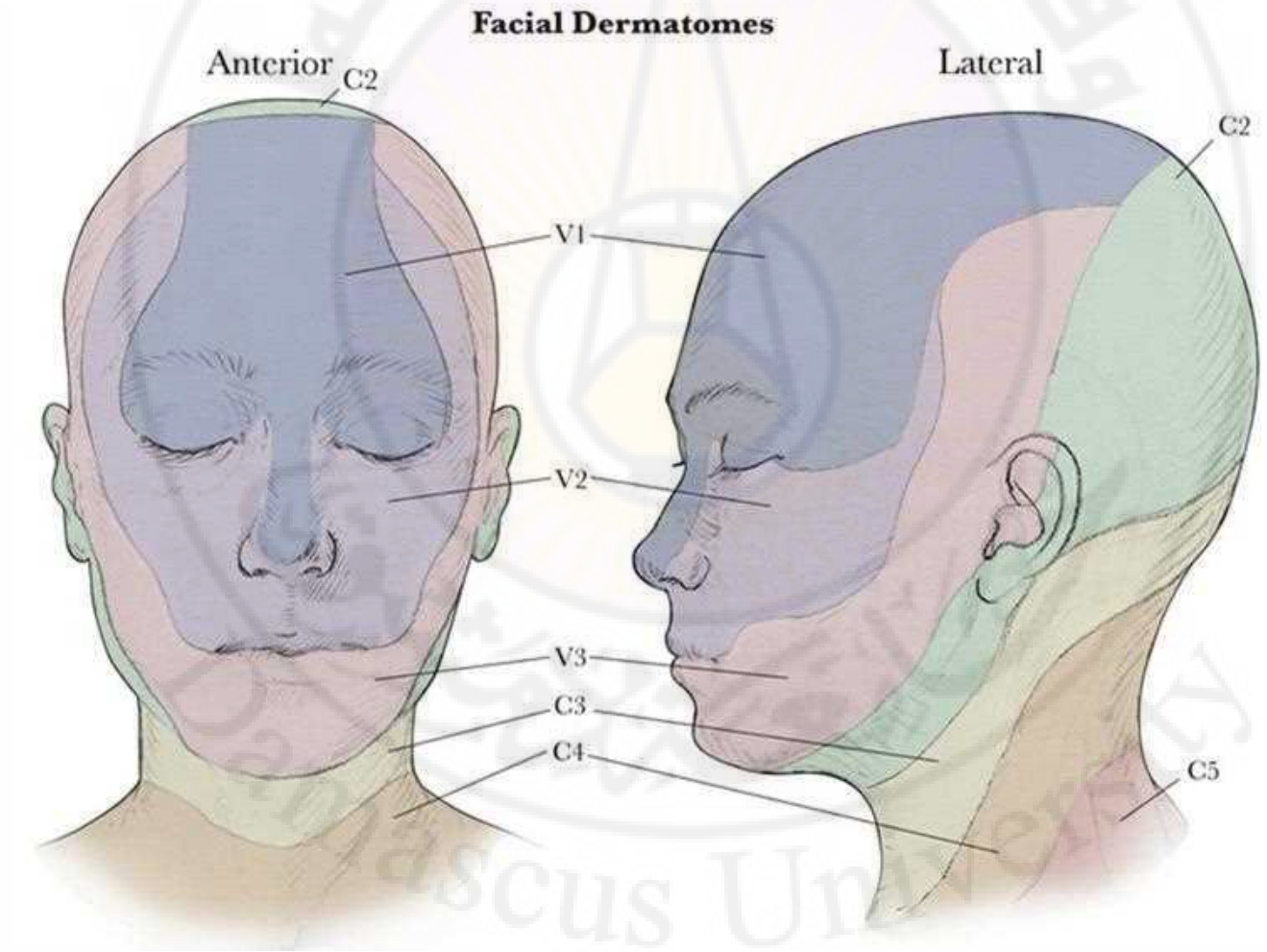
اضطرابات الأعصاب القحفية ٢

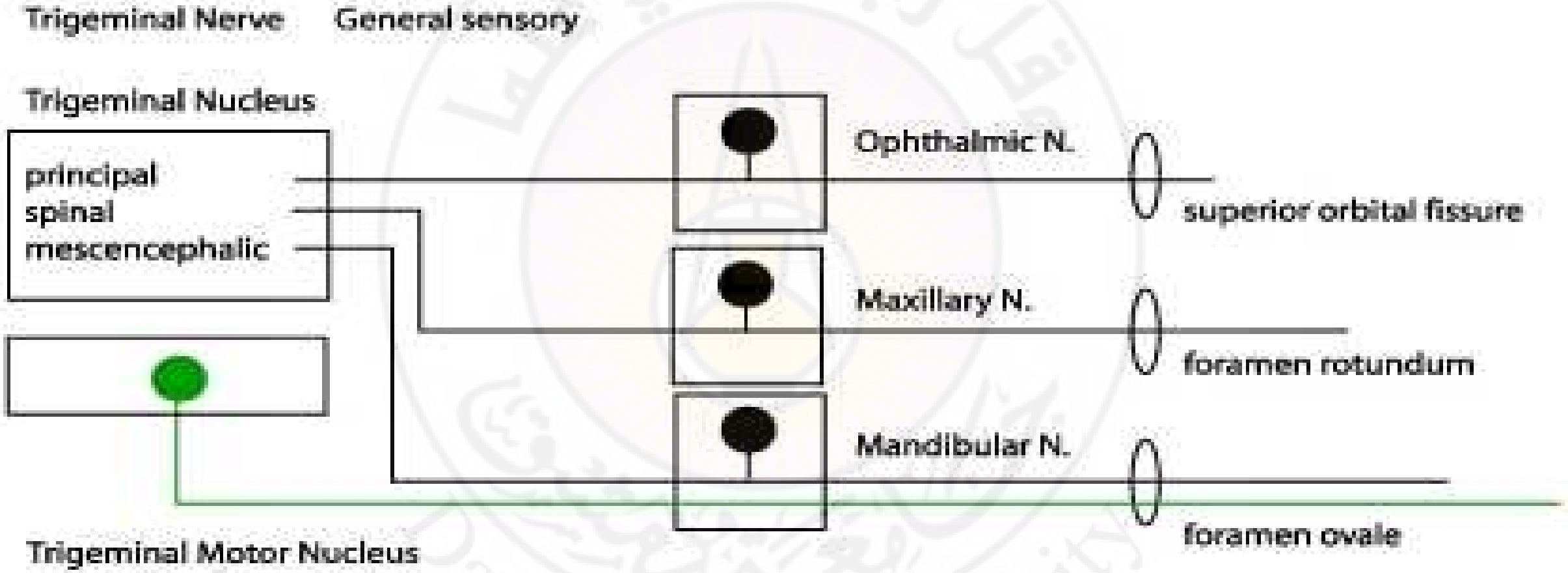
ا.د. محمد شحاده آغا

MD MRCP (London) FRCP (Edin)

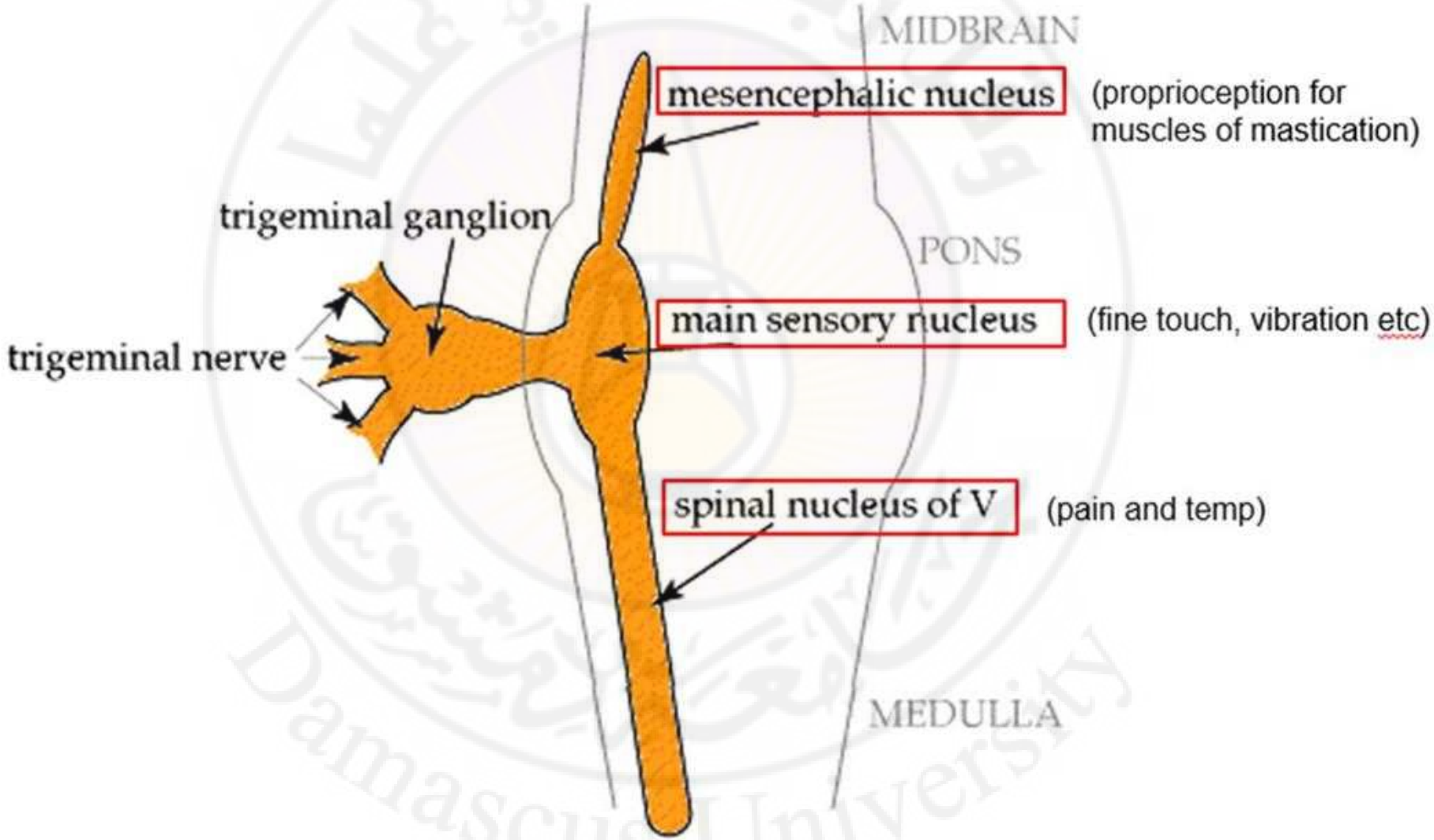
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V Trigeminal Nerve

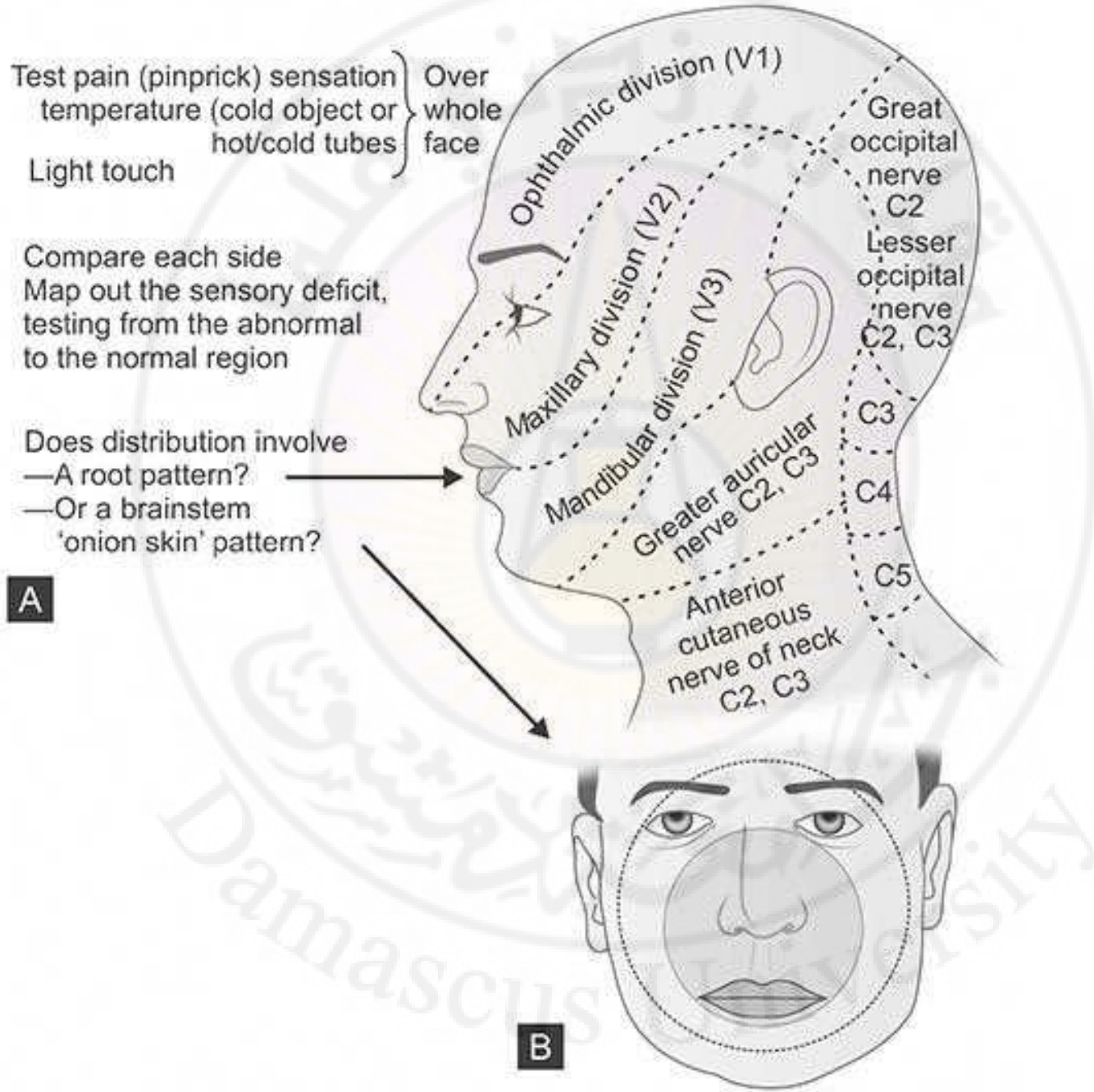



Trigeminal Nerve
General sensory
Trigeminal Nucleus
principal
spinal
mescencephalic
Ophthalmic N.
Maxillary N.
Mandibular N.
superior orbital fissure
foramen rotundum
foramen ovale
Trigeminal Motor Nucleus
Trigeminal Nerve Branchial Motor

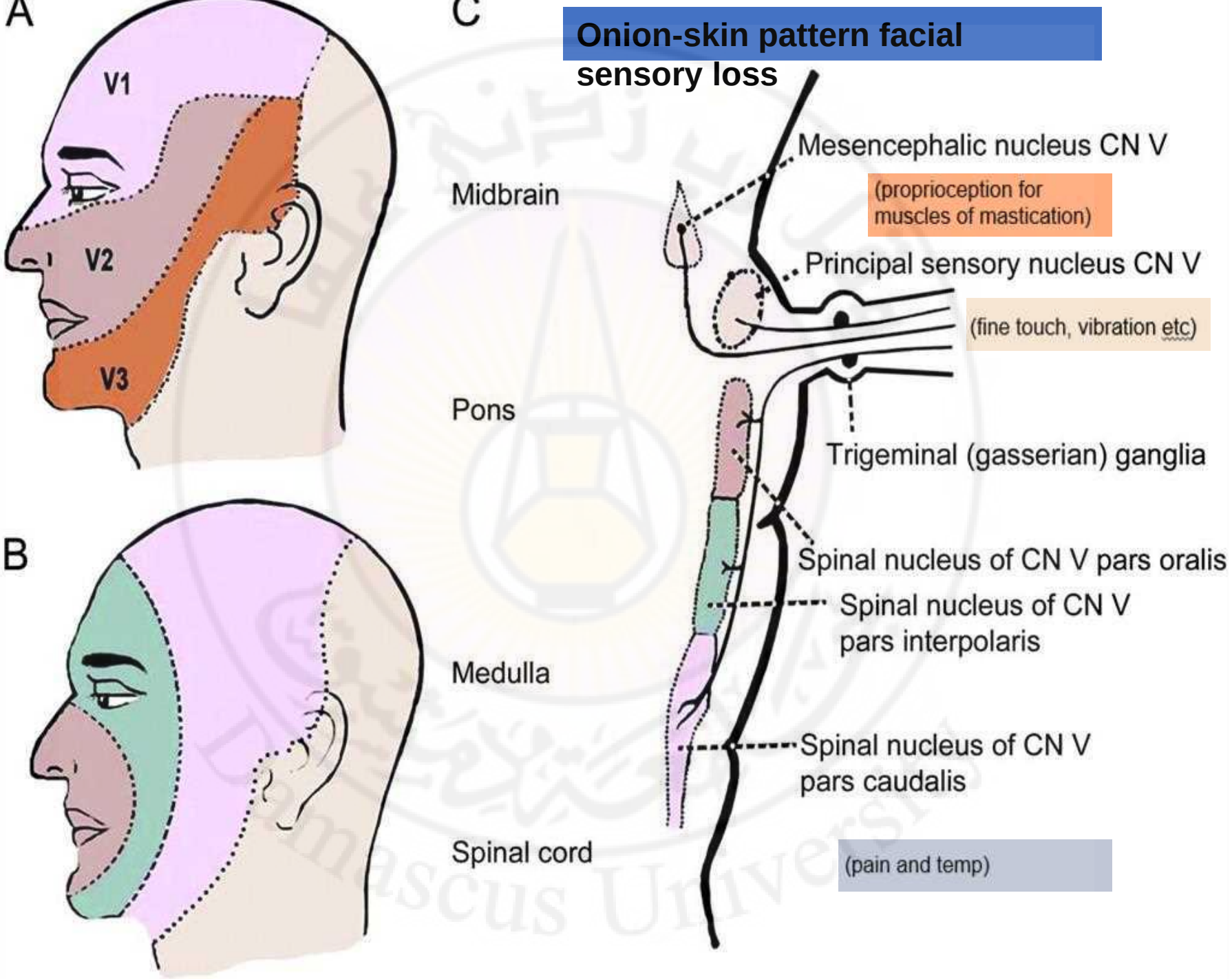
Three main divisions for the trigeminal nucleus



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Test pain (pinprick) sensation
temperature (cold object or hot/cold tubes
Light touch
Over whole face
Compare each side
Map out the sensory deficit, testing from the abnormal to the normal region
Does distribution involve
—A root pattern?
—Or a brainstem 'onion skin' pattern?
A
Ophthalmic division (V1)
Maxillary division (V2)
Mandibular division (V3)
Great occipital nerve C2
Lesser occipital nerve C2, C3
C3
Greater auricular nerve C2, C3
C4
Anterior cutaneous nerve of neck C2, C3
C5
B

Onion-skin pattern facial sensory loss



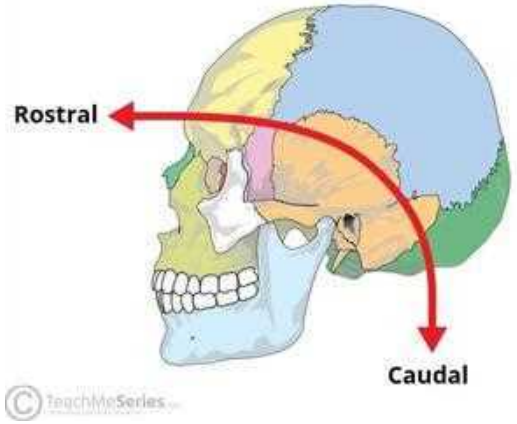
Divisional pattern of sensory loss (A), segmental pattern of sensory loss (B), and schematic diagram of the trigeminal system in the brainstem (C)

Physical examination revealed graded loss of pain and temperature over the left half of her face with central sparing (an onion-skin distribution)

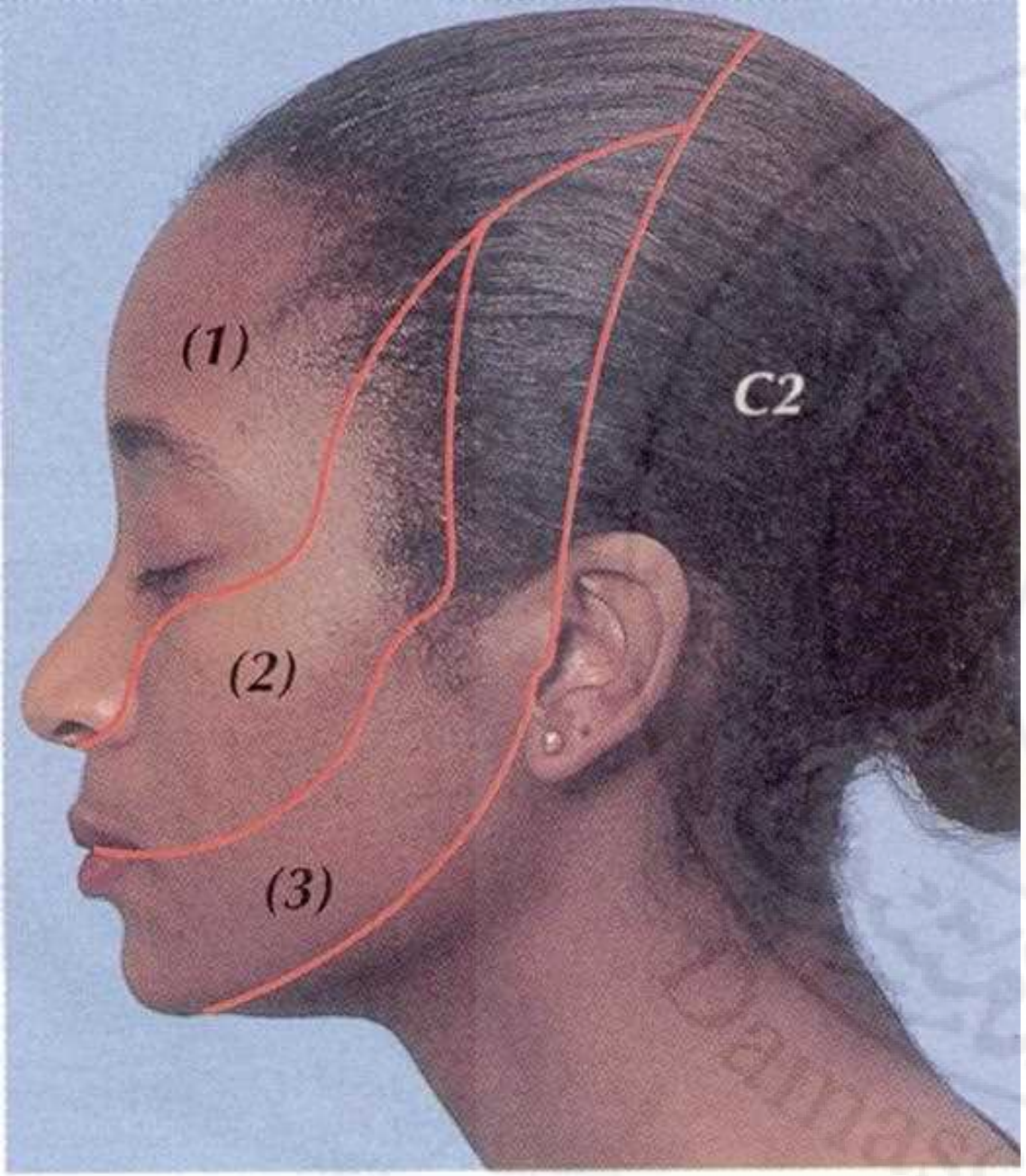


onion-skin pattern of sensory loss

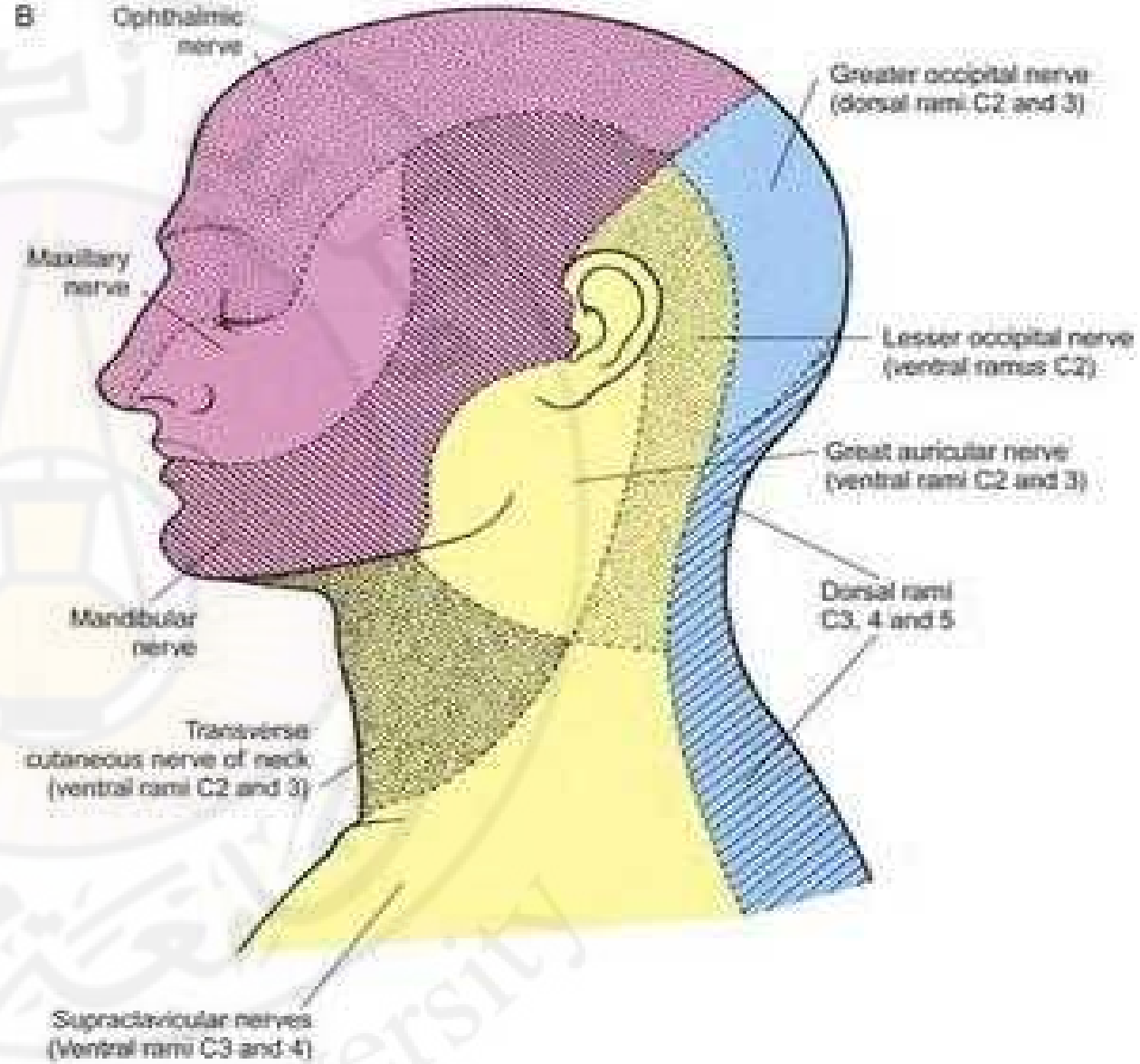
- Lower medullary or upper cervical spinal nuclear lesions result in sensory disturbance that affects the peripheral (lateral) forehead, cheek, and jaw (onion-skin pattern of sensory loss).
- This onion-skin segmental distribution reflects the rostral-caudal somatotopic arrangement of the cutaneous distribution of the spinal nucleus (e.g., perioral area -rostral; lateral face -caudal).



This segmental pattern of trigeminal sensory loss, in contrast to the divisional pattern, reflects the rostral-caudal somatotopic arrangement in the spinal tract nucleus of the trigeminal nerve with the perioral area represented rostrally and the lateral face caudally and helps in anatomic localization.



العصب V الحسي



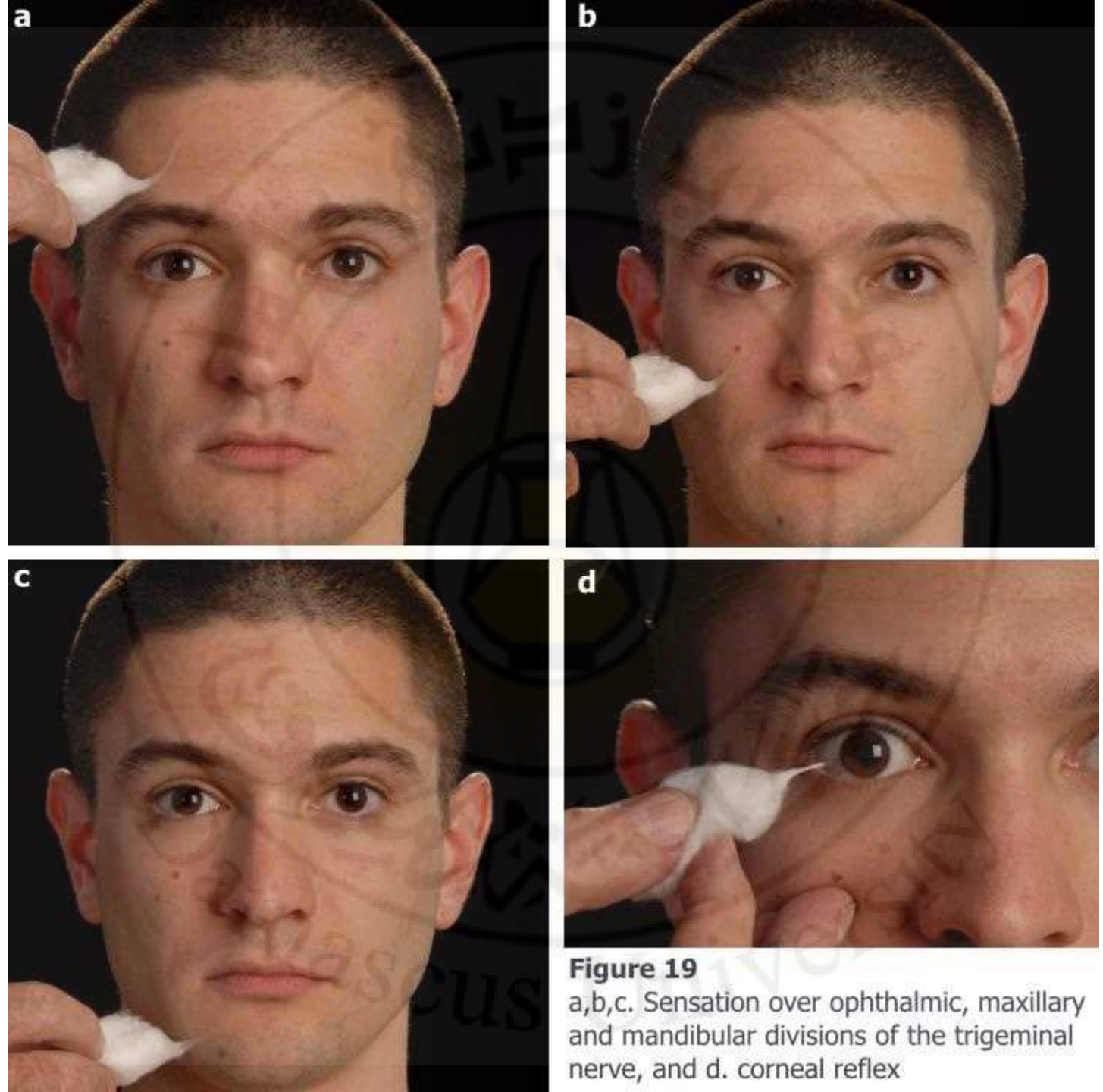
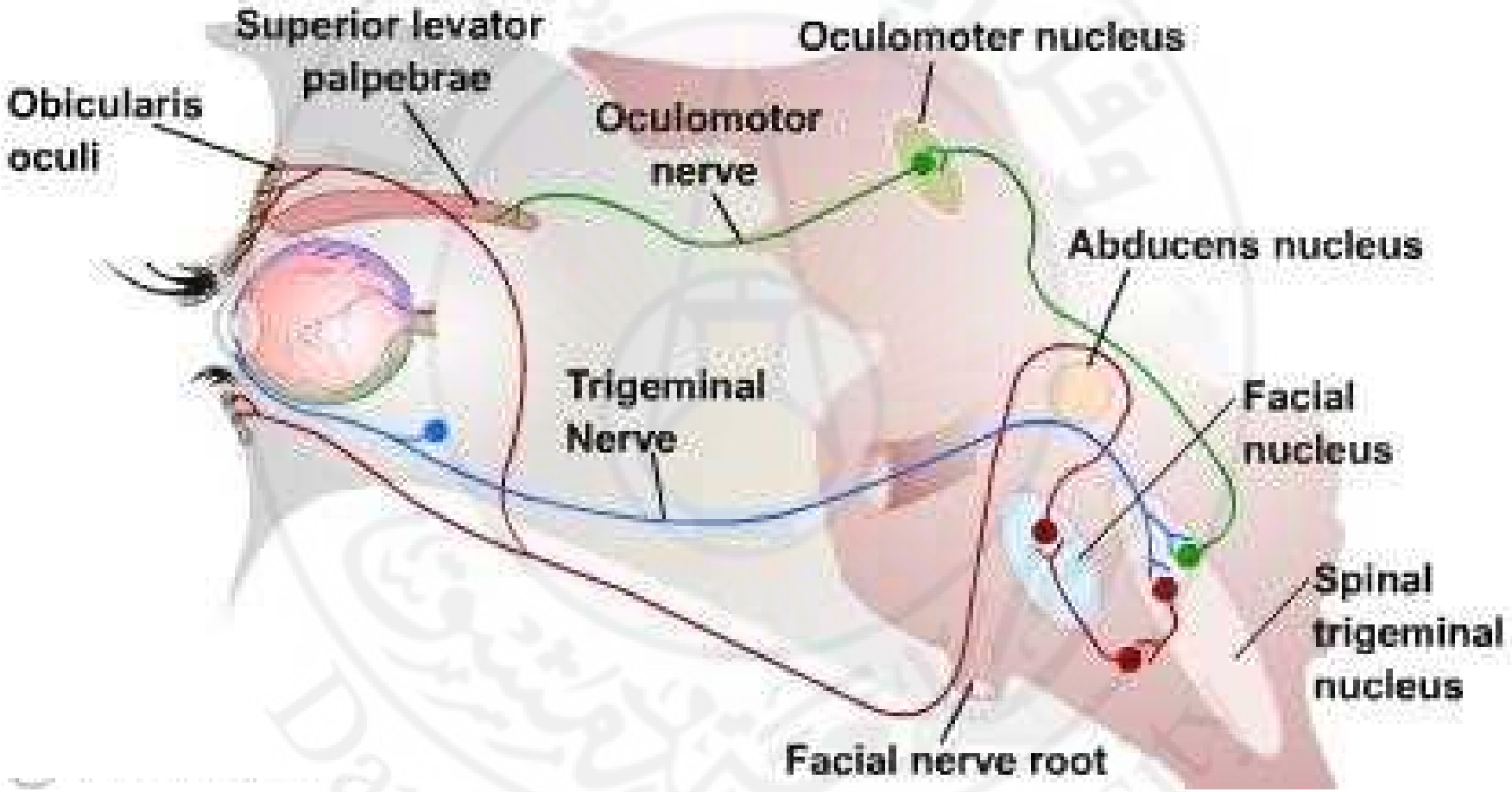
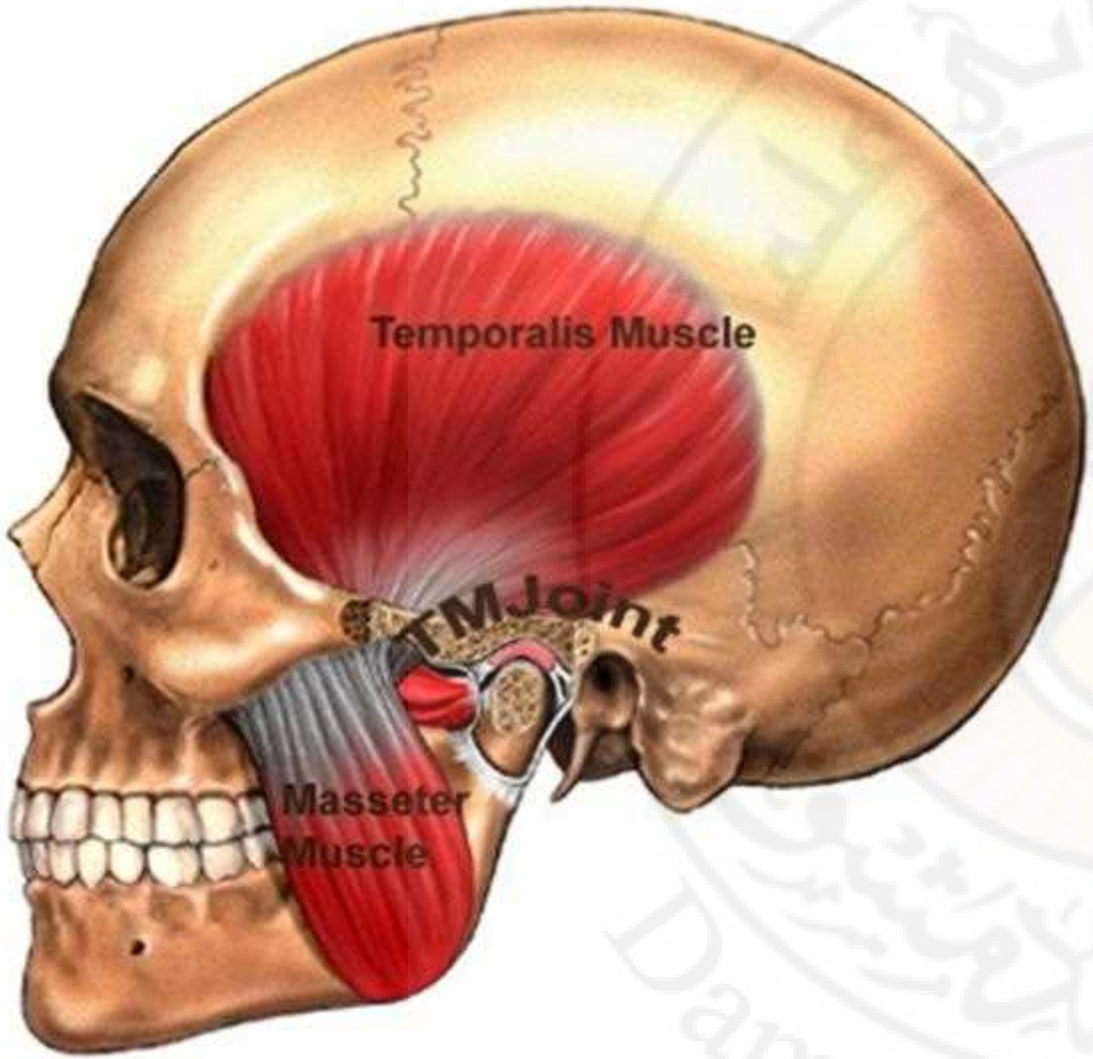


Figure 19
a,b,c. Sensation over ophthalmic, maxillary and mandibular divisions of the trigeminal nerve, and d. corneal reflex






Superior levator palpebrae
Oculomoter nucleus
Obicularis oculi
Oculomotor nerve
Abducens nucleus
Trigeminal Nerve
Facial nucleus
Spinal trigeminal nucleus
Facial nerve root



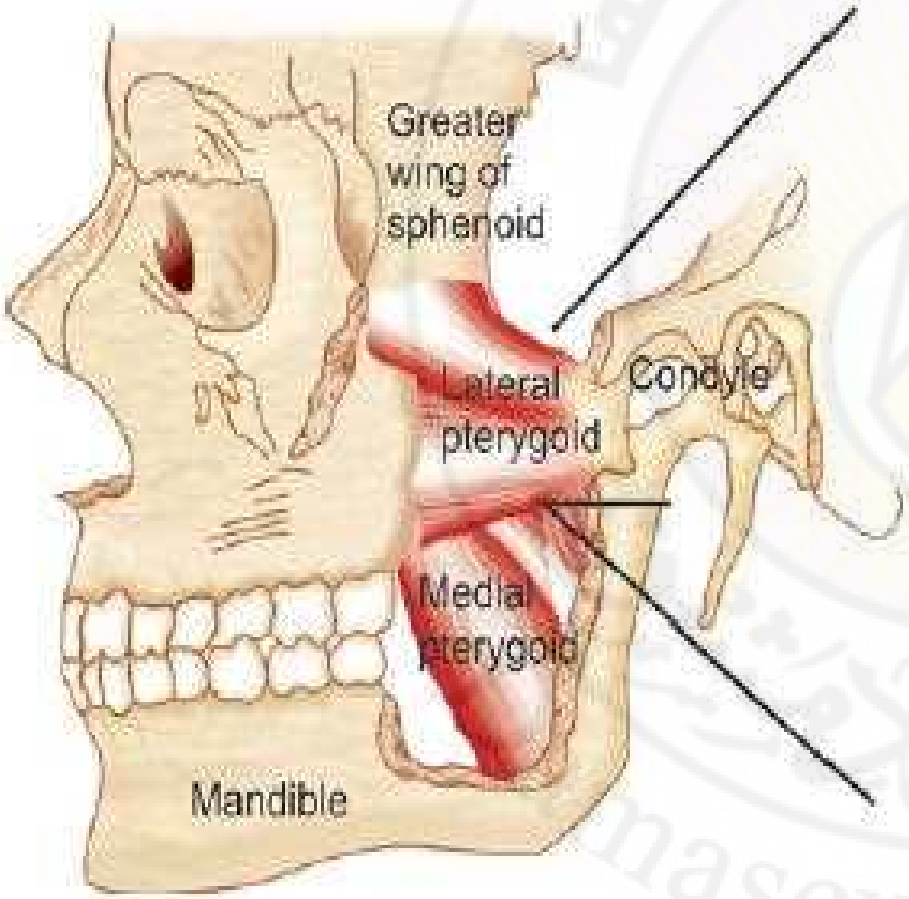


Masseter muscles



Temporalis muscles

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Greater wing of sphenoid
Lateral pterygoid
Condyle
Medial pterygoid
Mandible





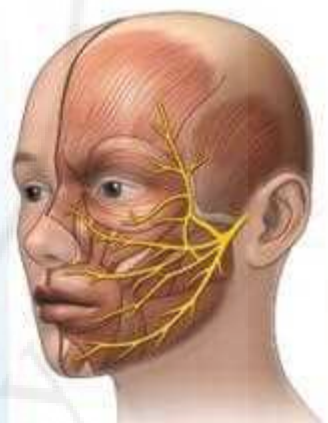
اصابة بجهة واحدة: الفم ينحرف إلى الجهة الضعيفة عند فتحه
اصابة مزدوجة: يبقى الفم مفتوحا وهابطا أثناء الراحة



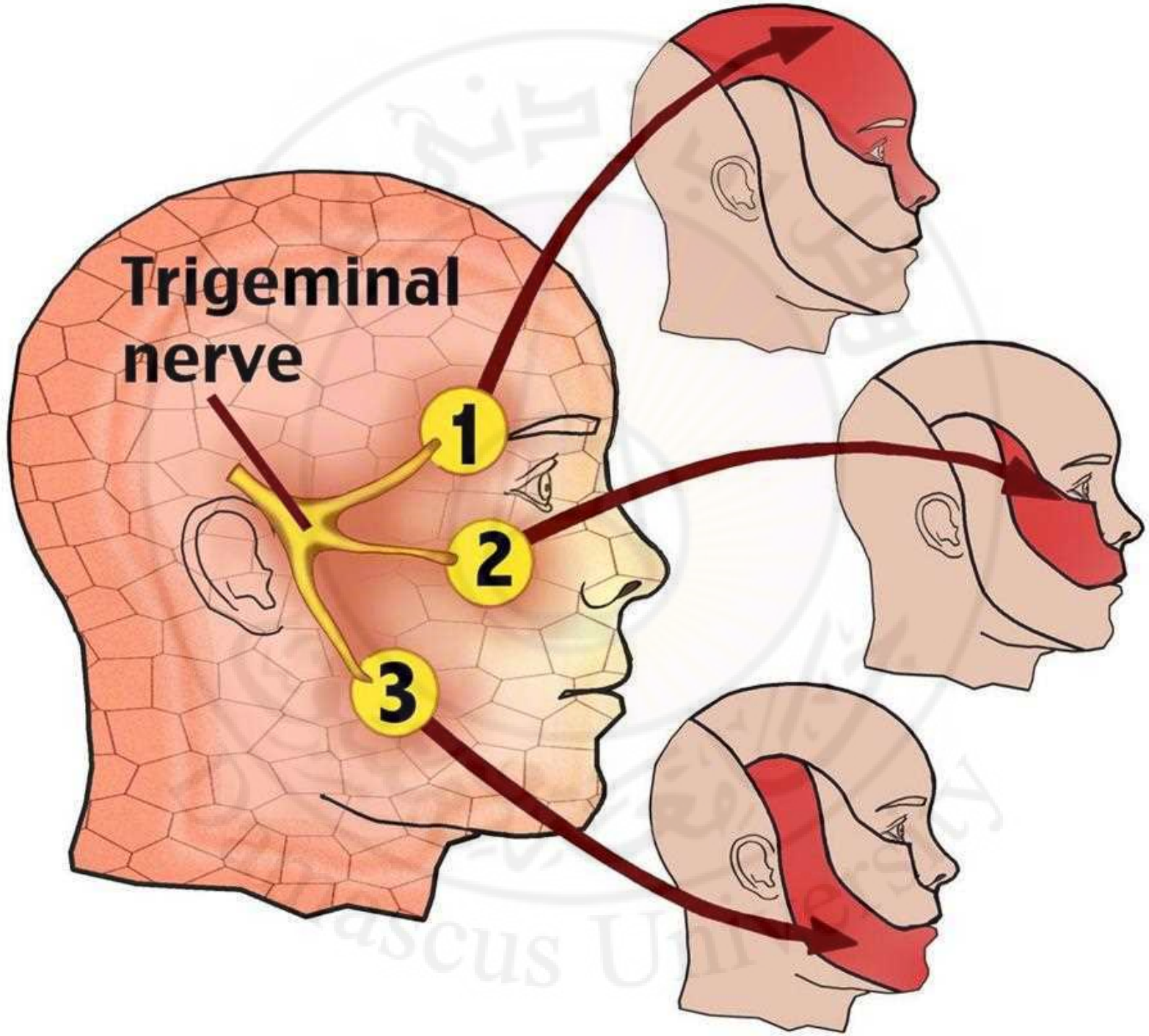


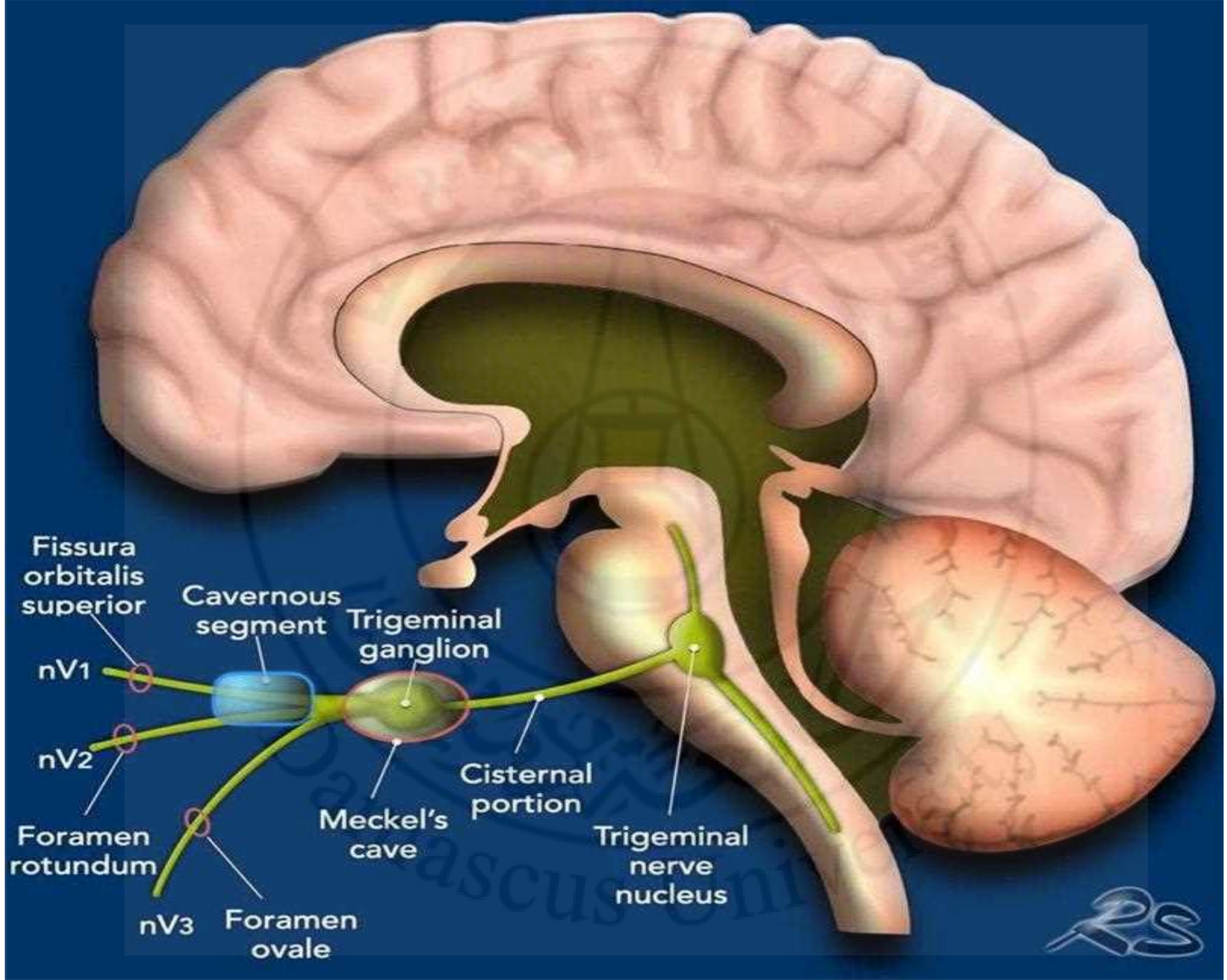
Symptoms of Trigeminal Neuralgia

- Bouts of searing, severe, jabbing and shooting pain
- Pain that feels like an electric shock that is generally triggered by some things like chewing, touching the face, brushing teeth and speaking, smiling, washing your face, talking, drinking, eating, shaving and much more.
- The pain may take a few minutes to last
- Constant burning and aching feeling
- Pains in lips, gums, jaw, cheek and less often the forehead and eyes
- This issue becomes more intense and frequent over time



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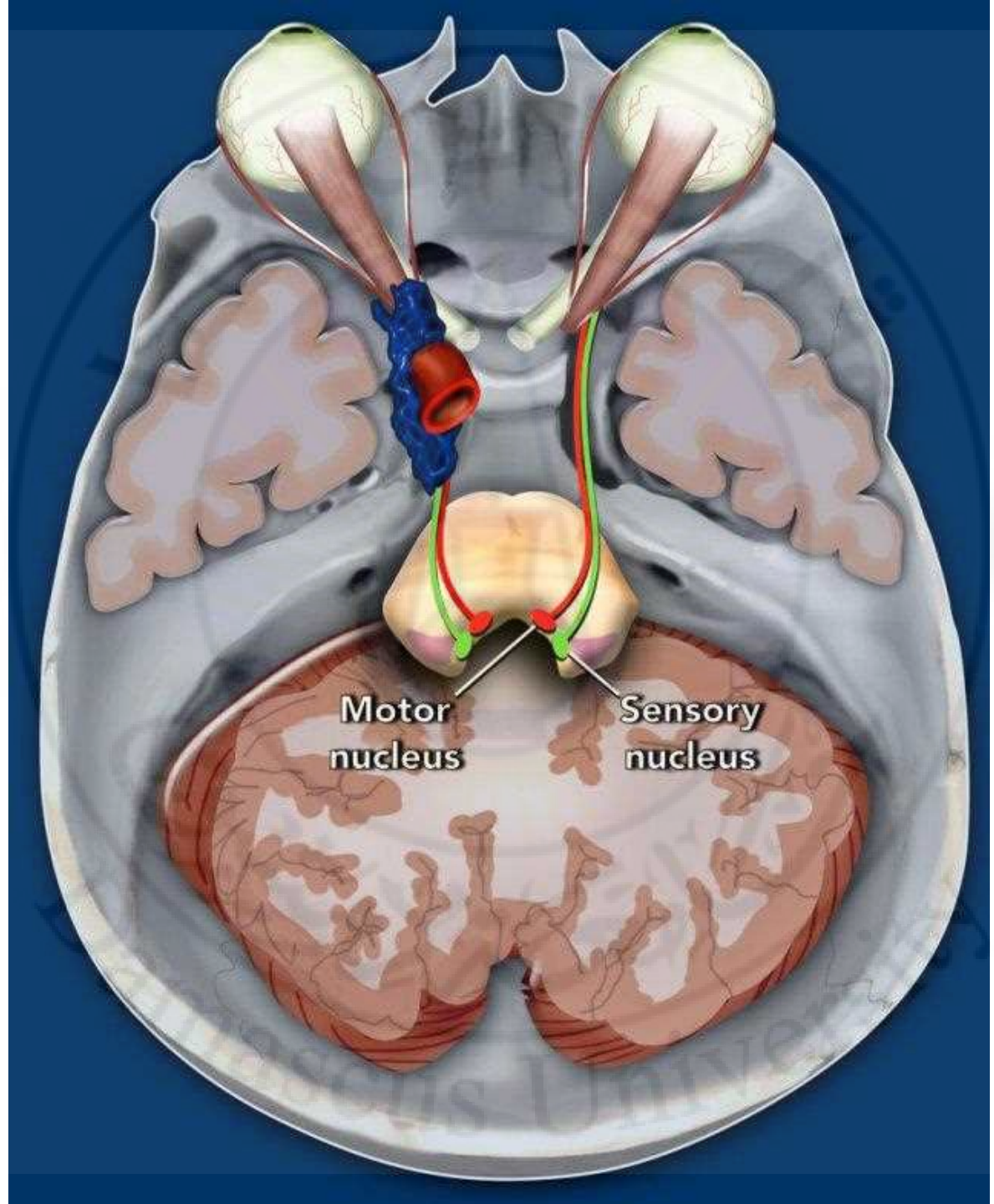

Trigeminal nerve
1
2
3

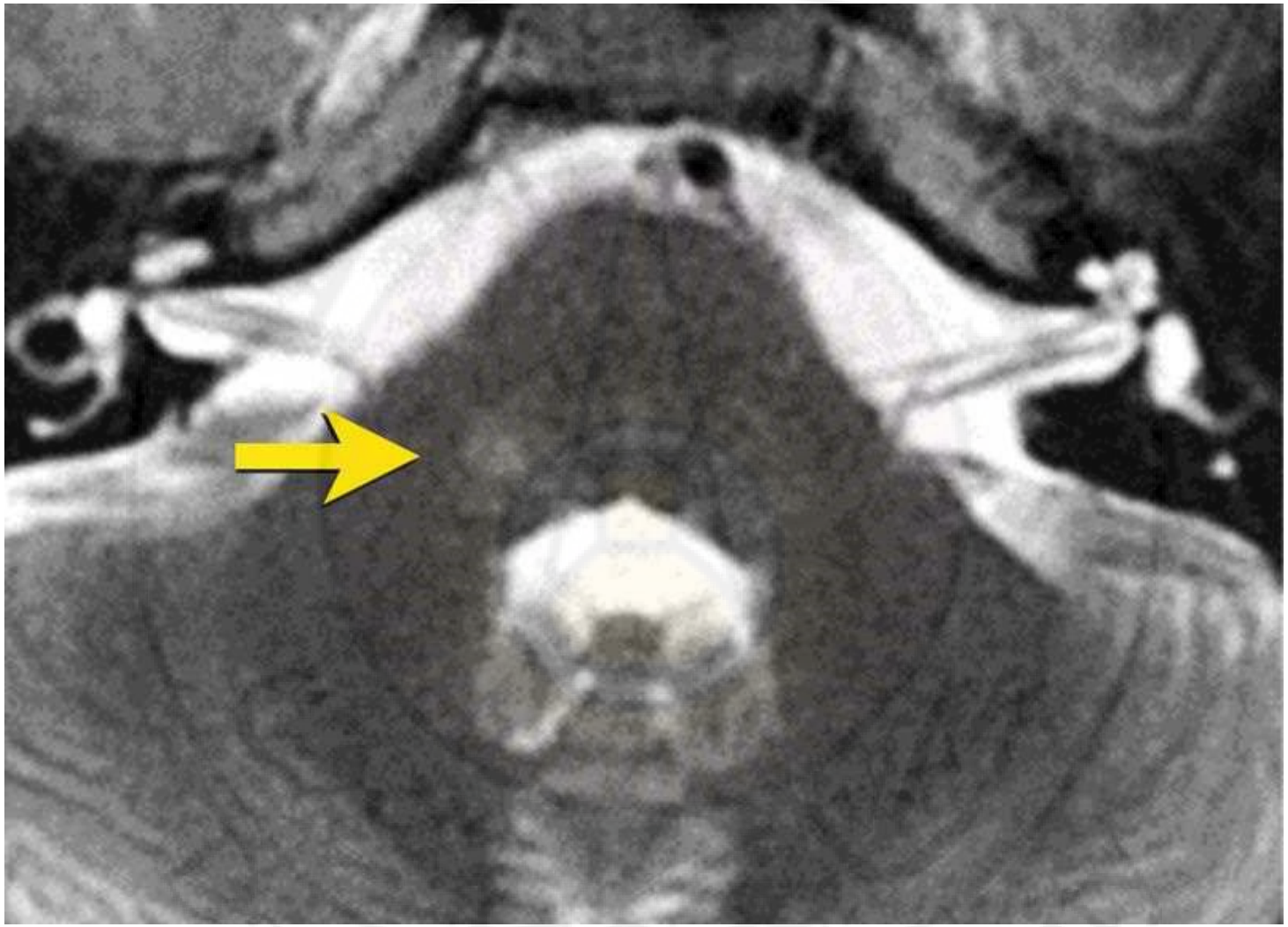

Fissura orbitalis superior
Cavernous segment
Trigeminal ganglion
nV1
nV2
Foramen rotundum
nV3
Foramen ovale
Meckel's cave
Cisternal portion
Trigeminal nerve nucleus

Dd Brainstem segment

- Demyelinisation: MS
- Neoplasm: metastases, glioma
- Vascular: cavernoma, infarction, AVM
- Infection: rhombencephalitis

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Motor
nucleus
Sensory
nucleus



The axial T2W image shows a hyperintense lesion at the trigeminal nucleus (arrow).
This may be a sign of demyelination, for instance in multiple sclerosis

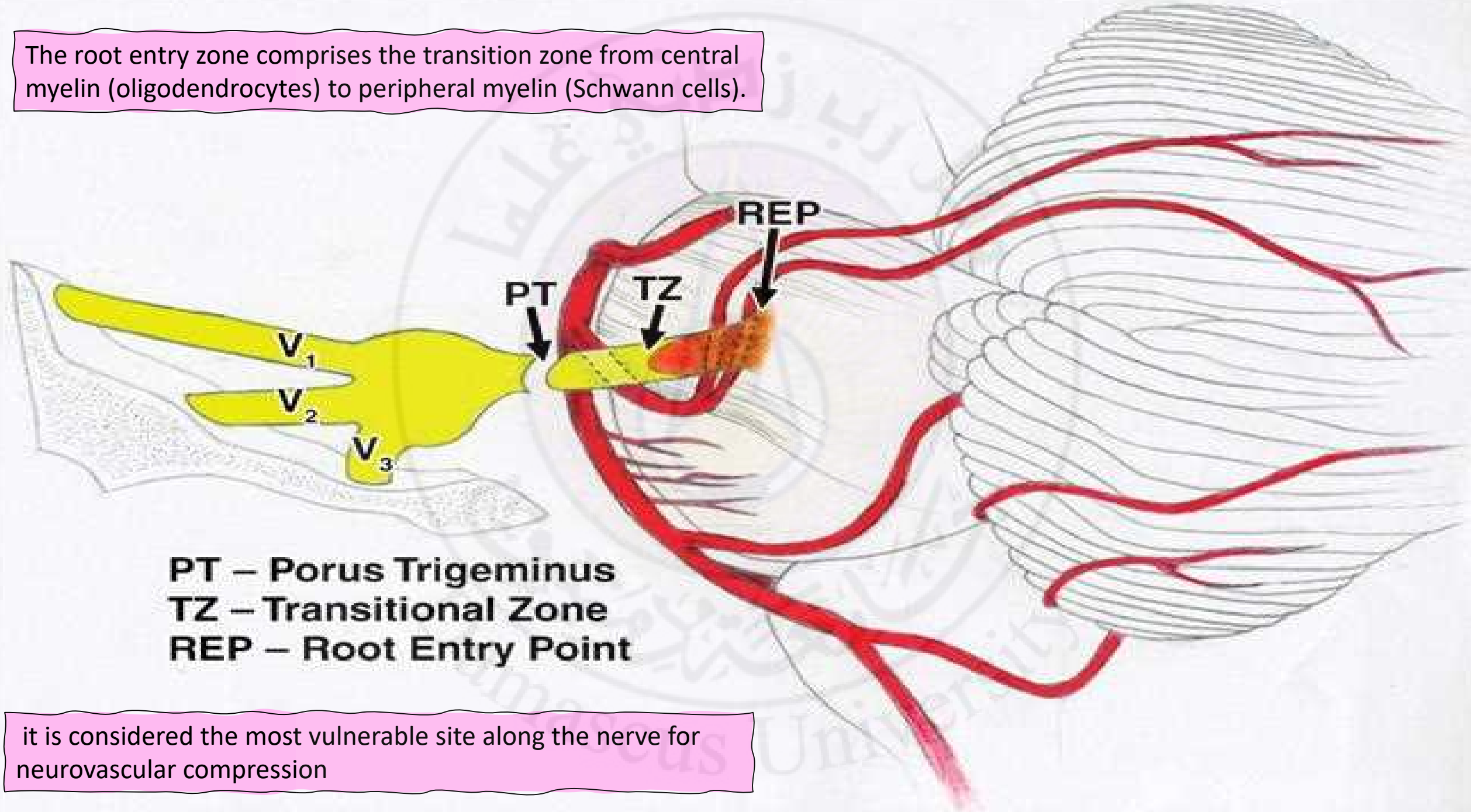
Dd Cisternal segment

- Vascular: neurovascular compression
- Neoplasm:
  - schwannoma
  - meningioma
  - epidermoïd
  - perineural spread
- Infection / inflammation: neuritis, meningitis, apicitis (from the petrous bone)

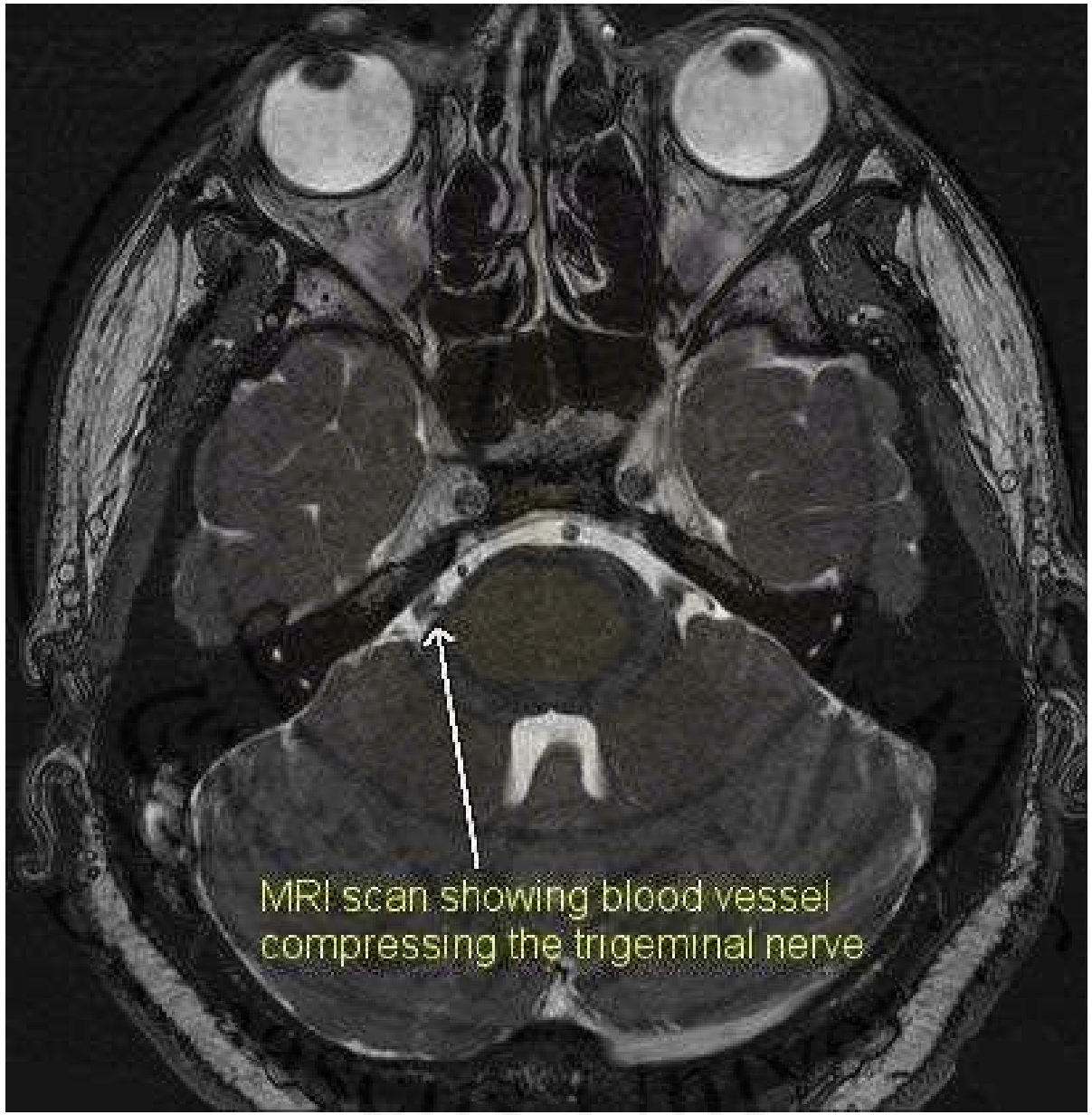
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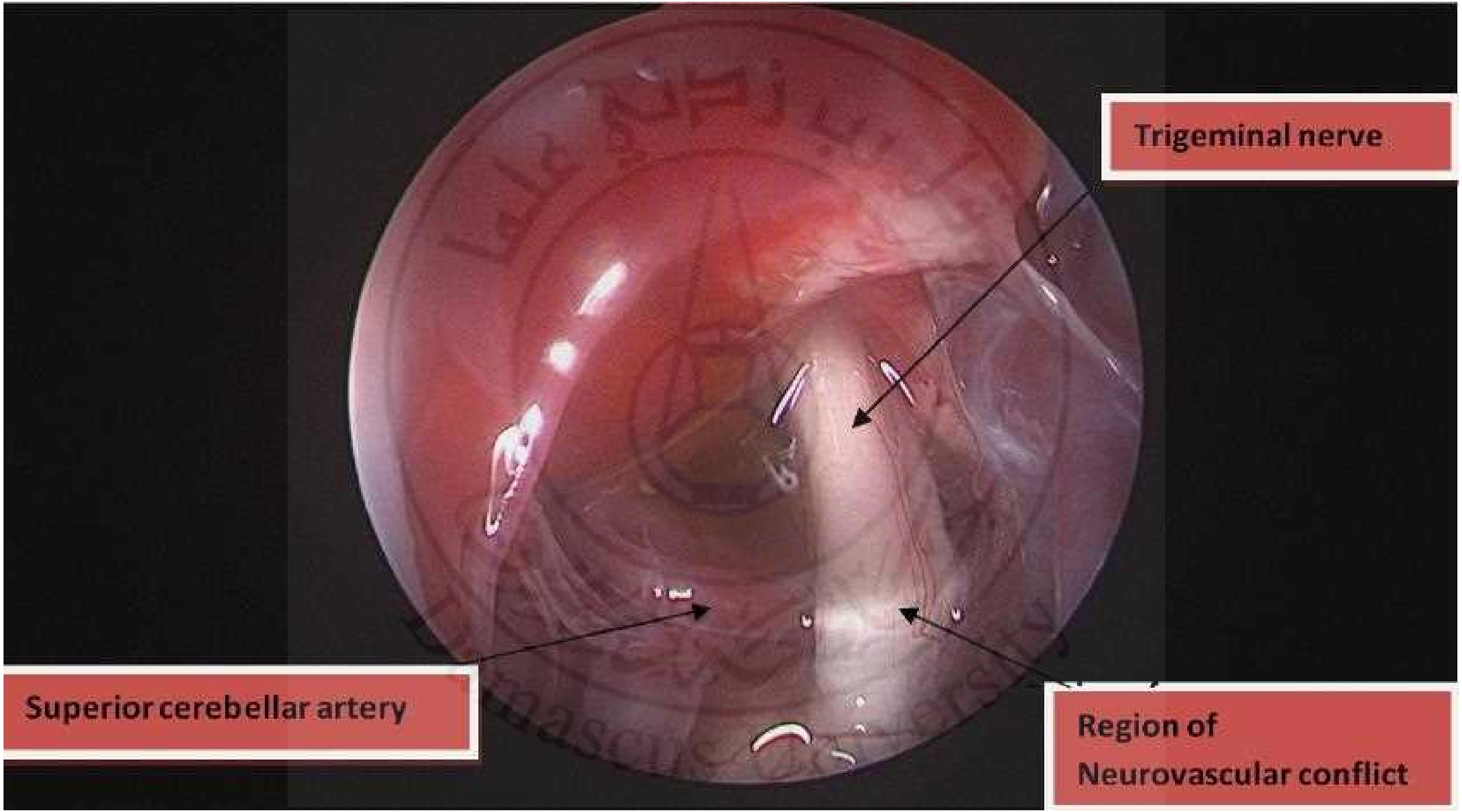


The root entry zone comprises the transition zone from central myelin (oligodendrocytes) to peripheral myelin (Schwann cells).



it is considered the most vulnerable site along the nerve for neurovascular compression

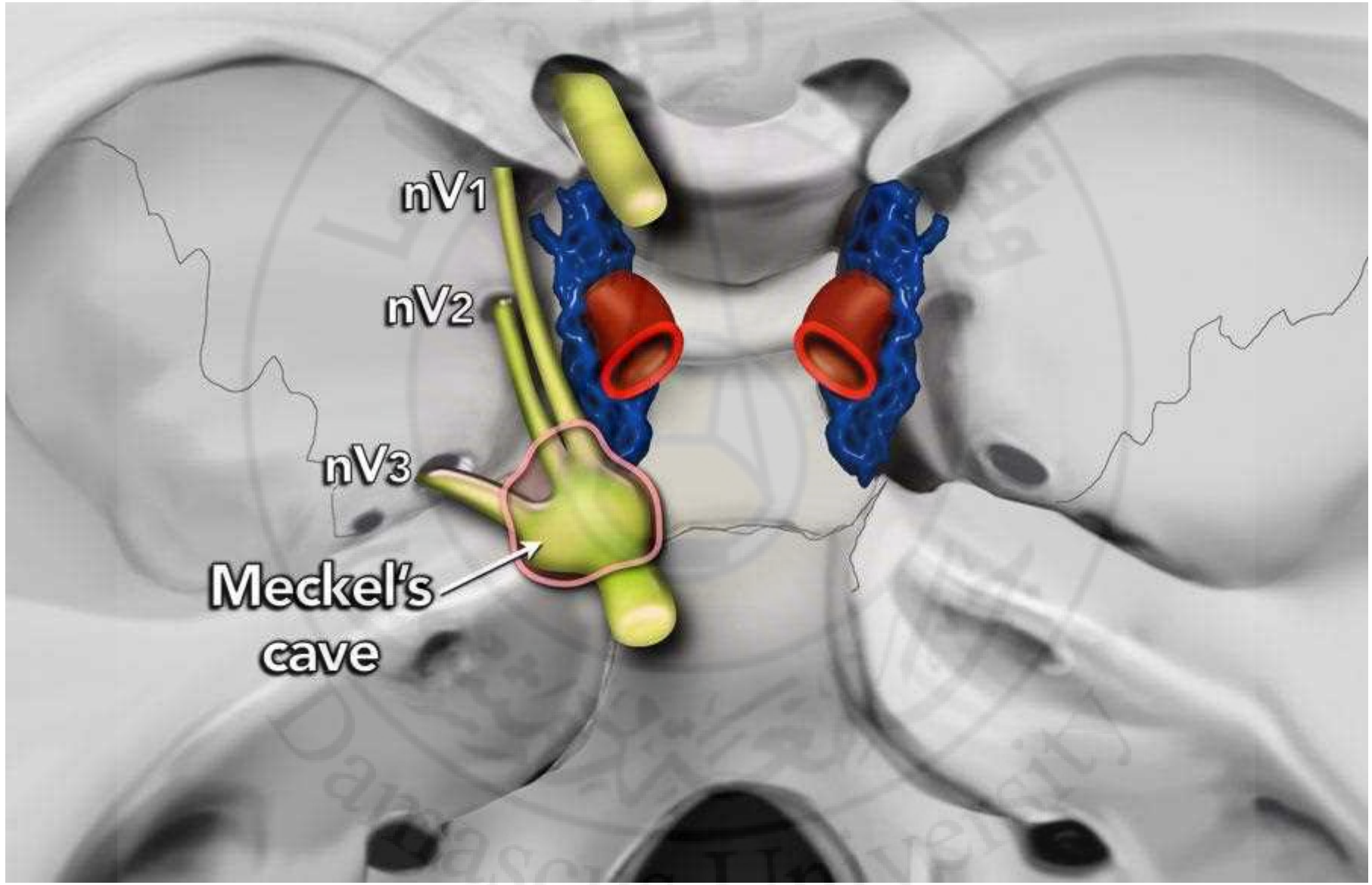

MRI scan showing blood vessel
compressing the trigeminal nerve

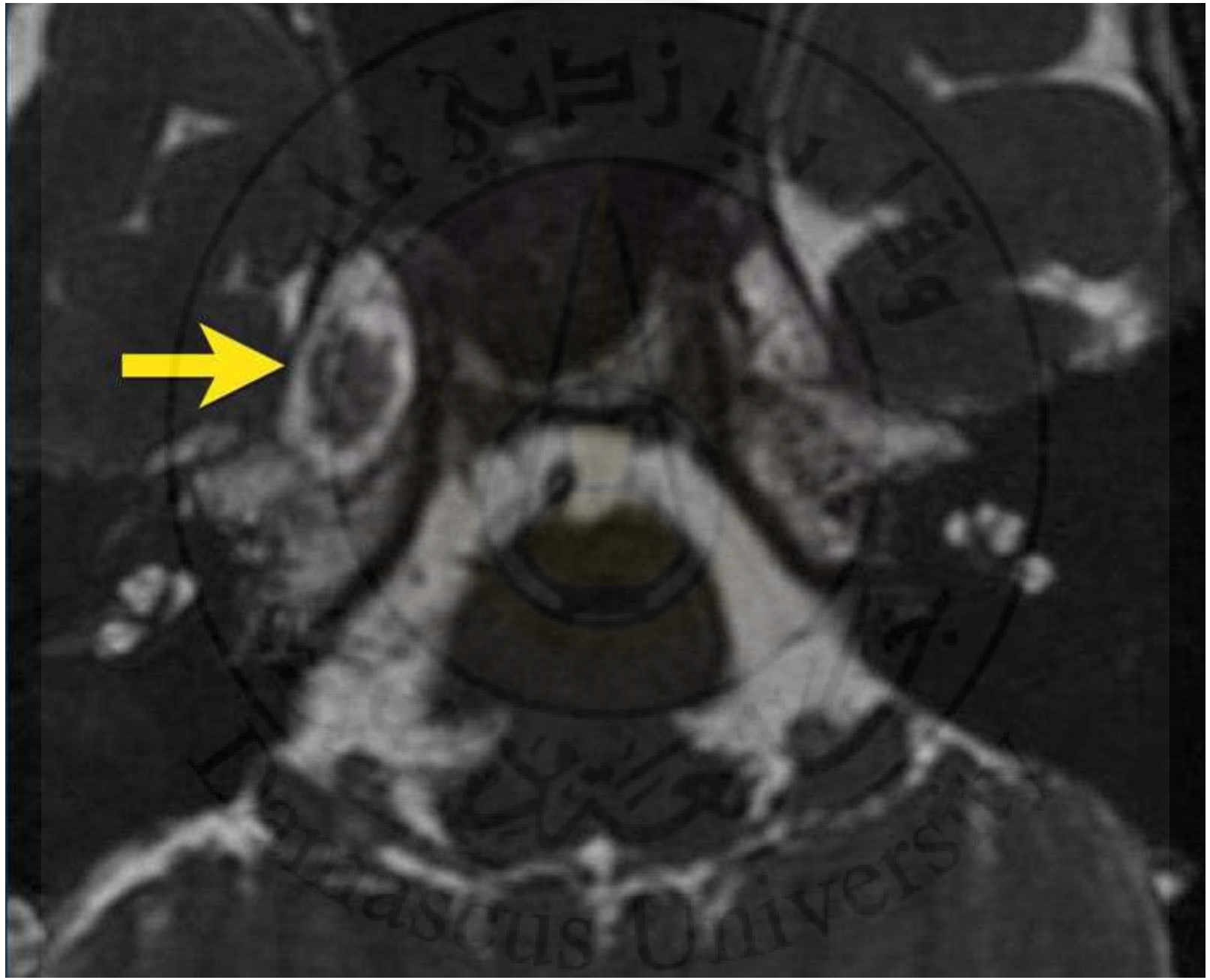

Trigeminal nerve
Superior cerebellar artery
Region of
Neurovascular conflict

Dd Meckel's cave segment

Neoplasms
- schwannoma,
- meningioma,
- epidermoïd
- perineural spread
- skull base lesion

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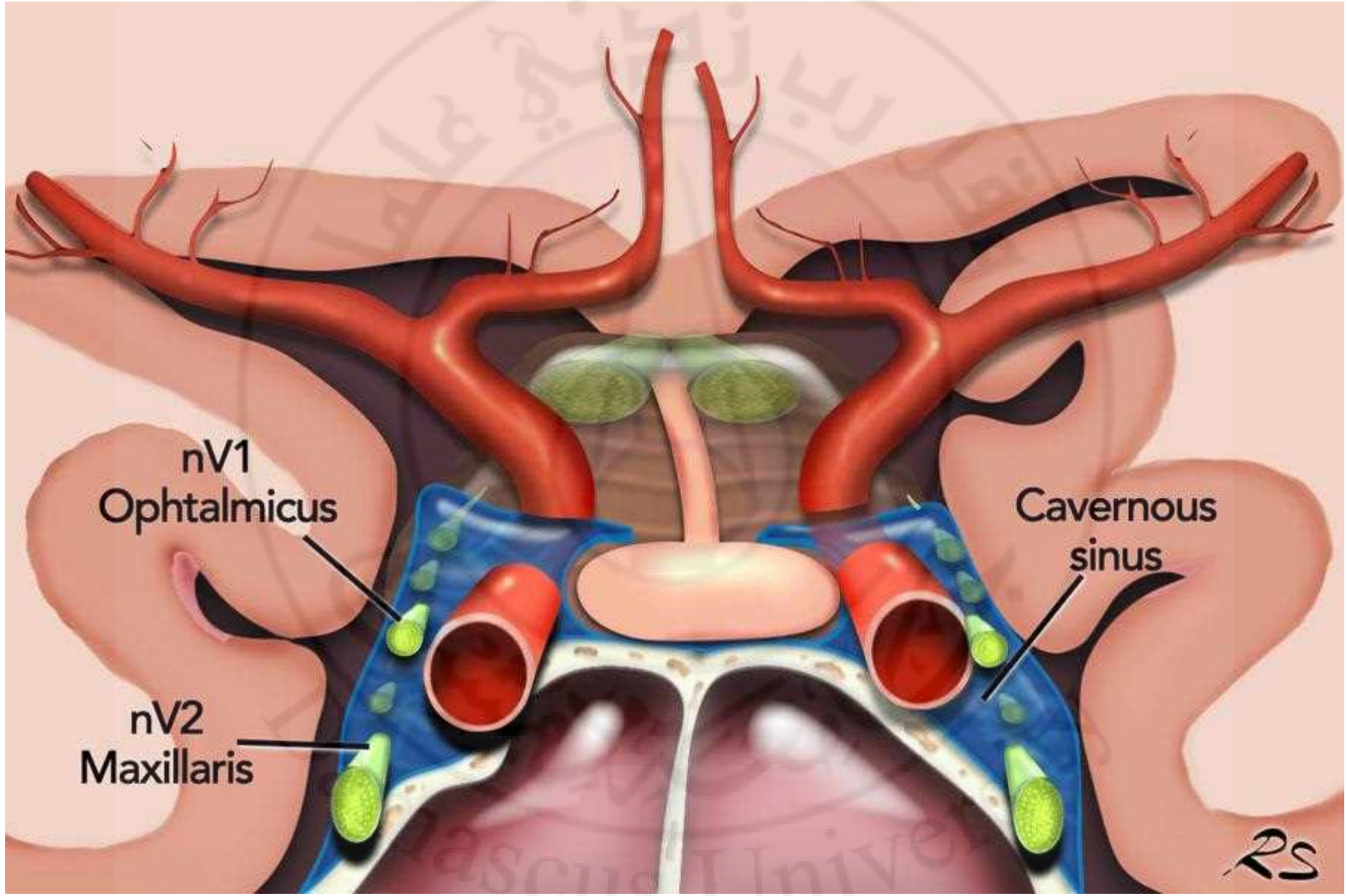

nV1
nV2
nV3
Meckel's
cave

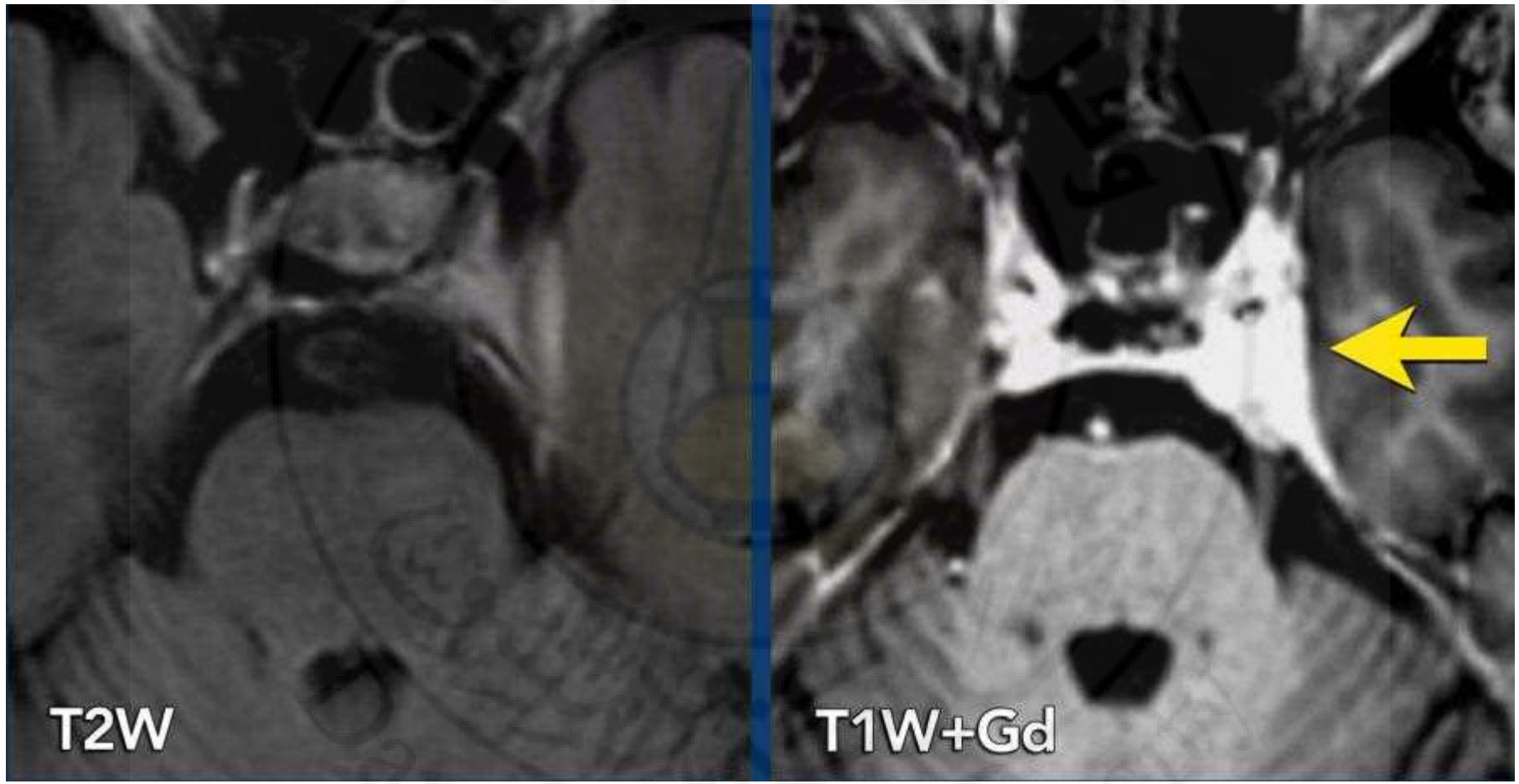


Dd Cavernous segment

- Neoplasm:
  - Schwannoma
  - meningioma
  - metastasis
  - perineural spread
  - skull base lesions
- Vascular: aneurysm
- Infection / inflammation: Tolosa-Hunt

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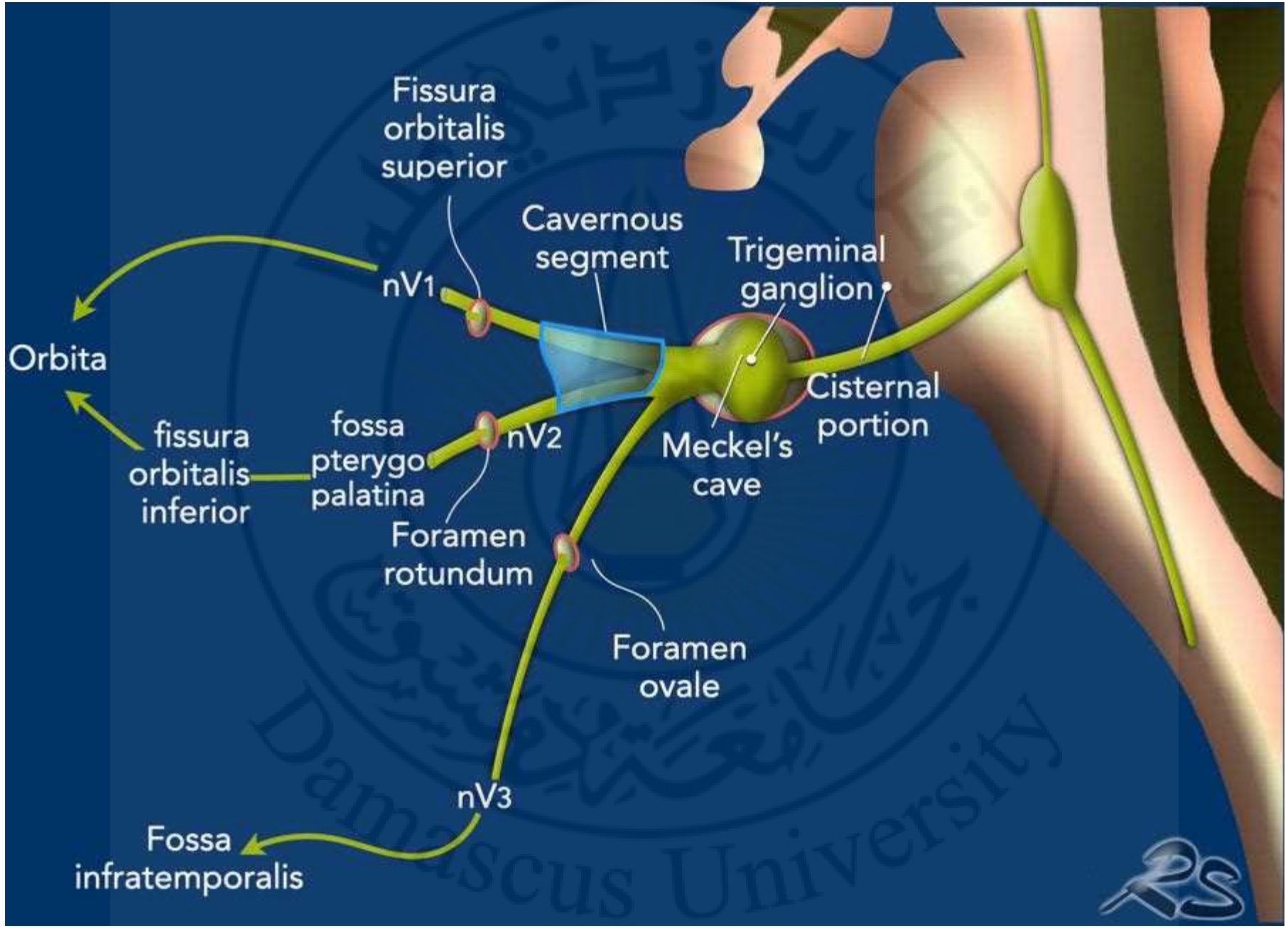

nV1
Ophtalmicus
nV2
Maxillaris
Cavernous
sinus
RS

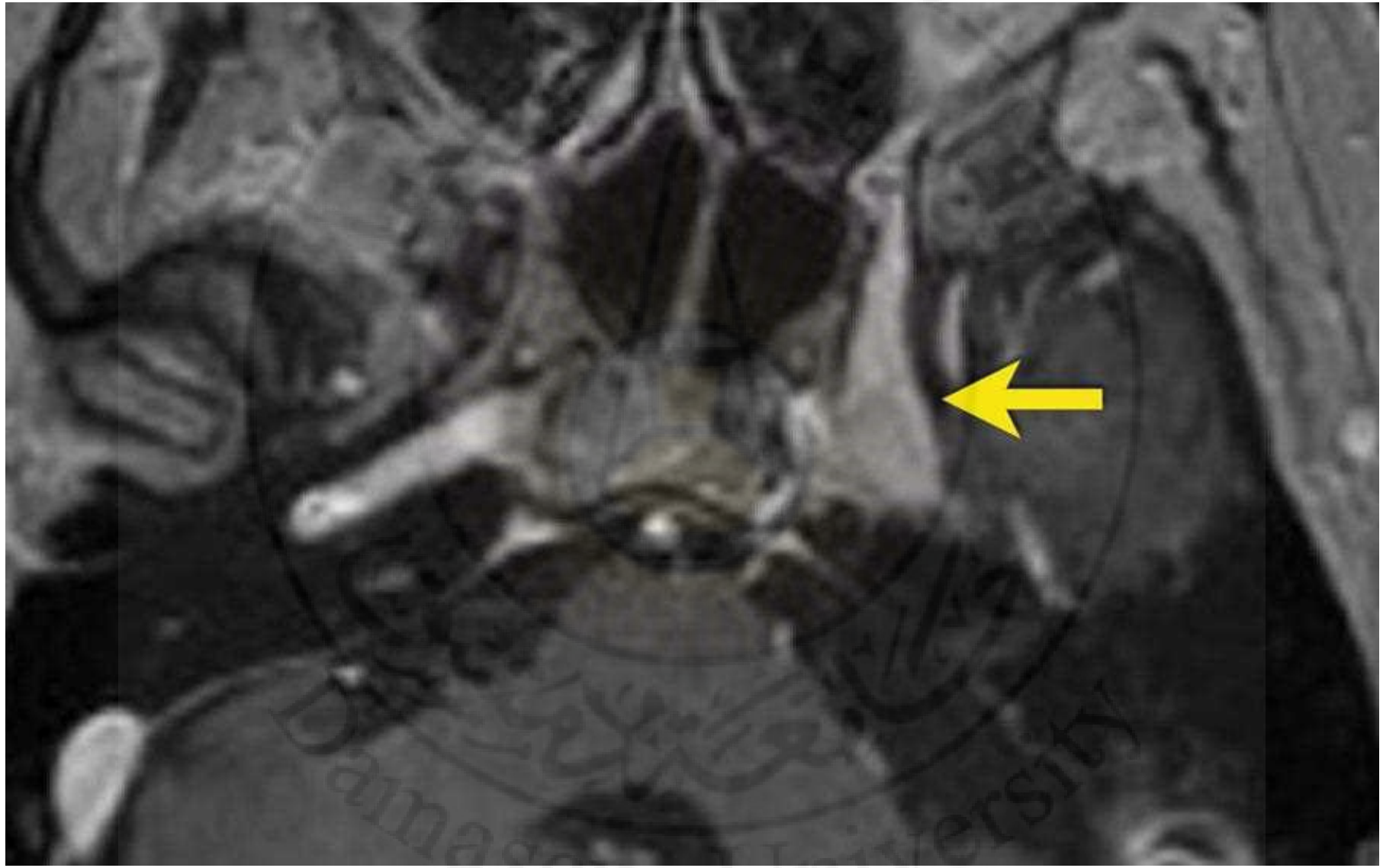

T2W
T1W+Gd

Dd Peripheral segment

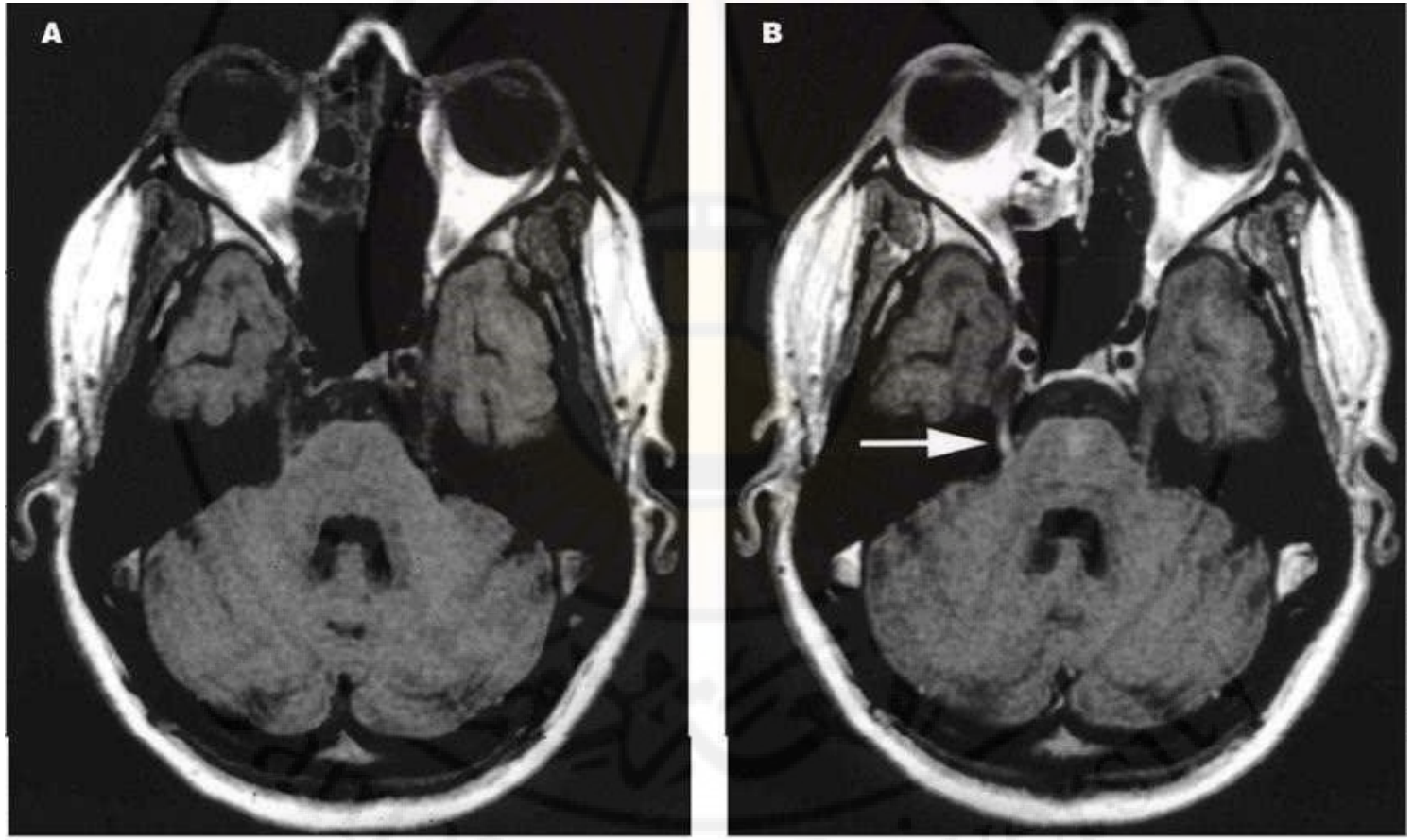
Neoplasms	- perineural spread, - schwannoma, - neurofibroma
Infection inflammation	- sinonasal

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Fissura orbitalis superior
Cavernous segment
Trigeminal ganglion
nV1
Orbita
Cisternal portion
fissura orbitalis inferior
fossa pterygo palatina
nV2
Meckel's cave
Foramen rotundum
Foramen ovale
nV3
Fossa infratemporalis



Enhancement of the trigeminal nerve on MRI in patients with multiple sclerosis



Herpes Zoster (V1 Distribution of Trigeminal Nerve)

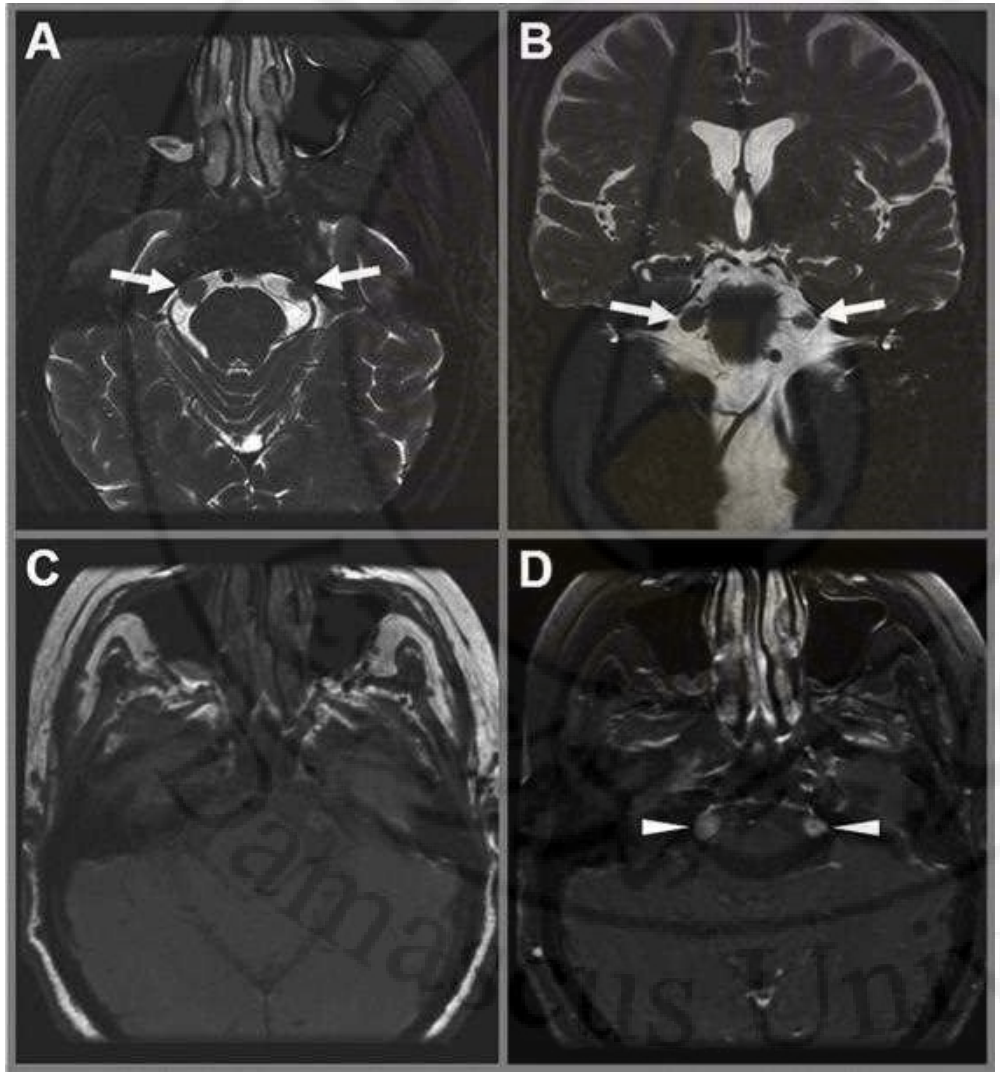


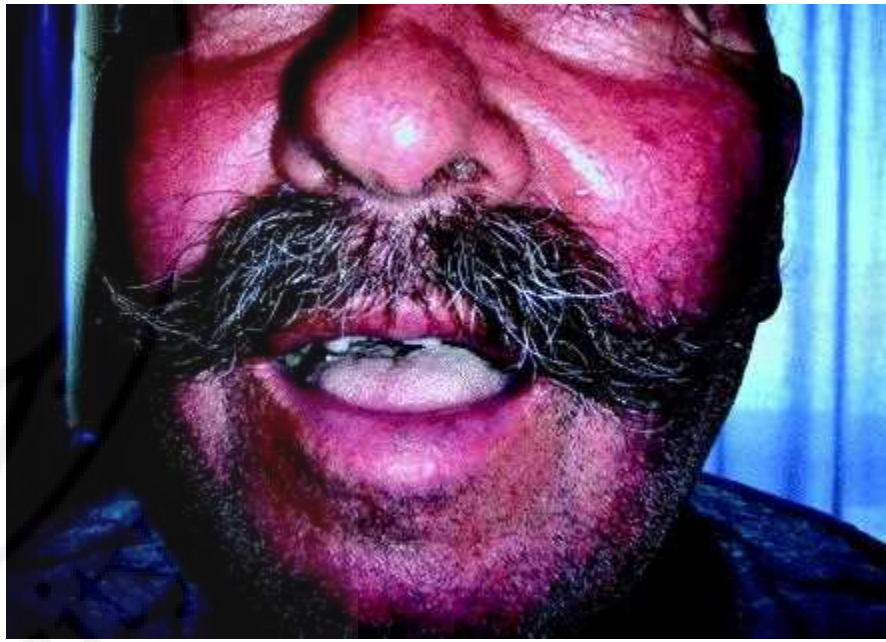

Red Flag Warning

Bilateral Neuralgia



A 73-year-old man with a history of non-Hodgkin lymphoma

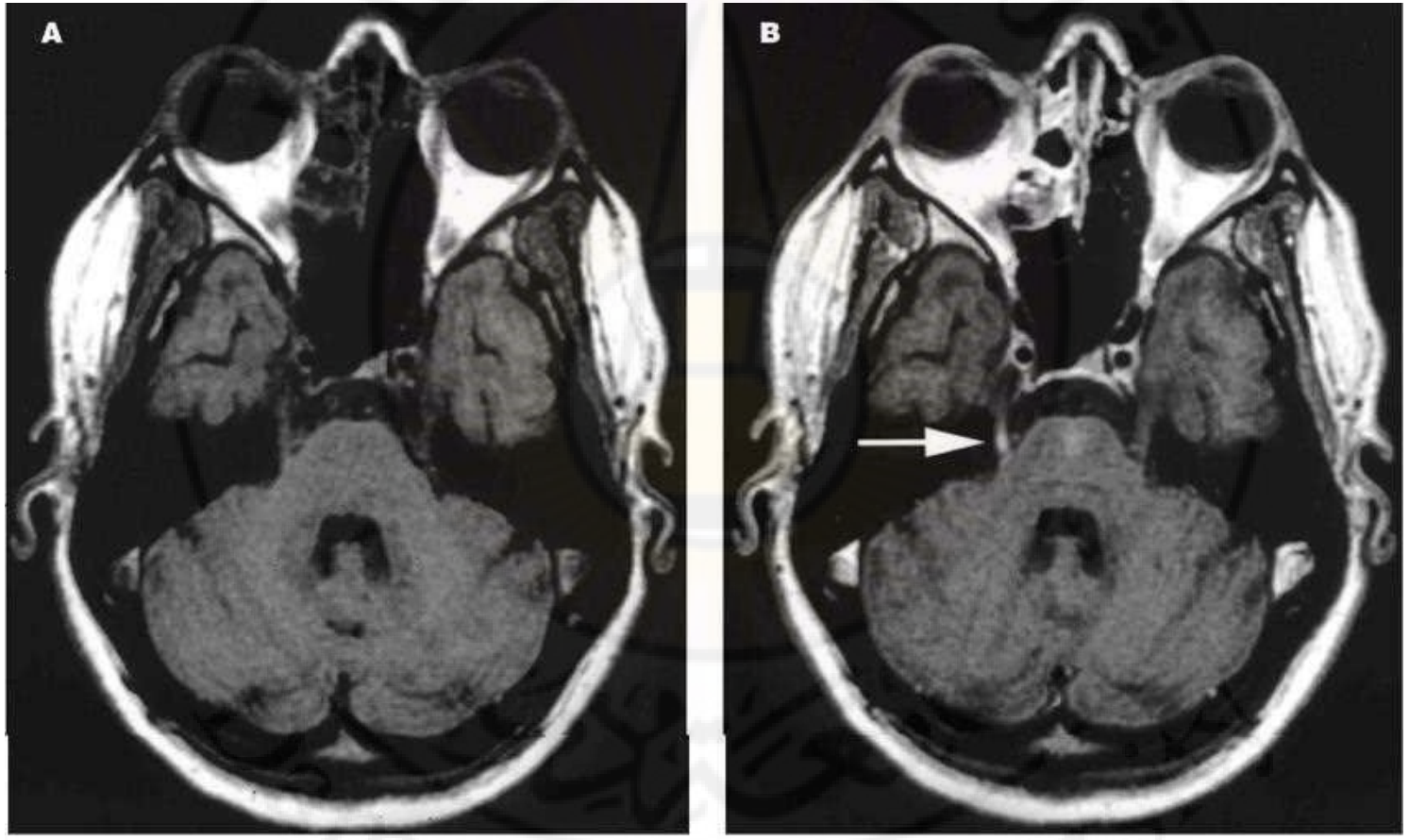




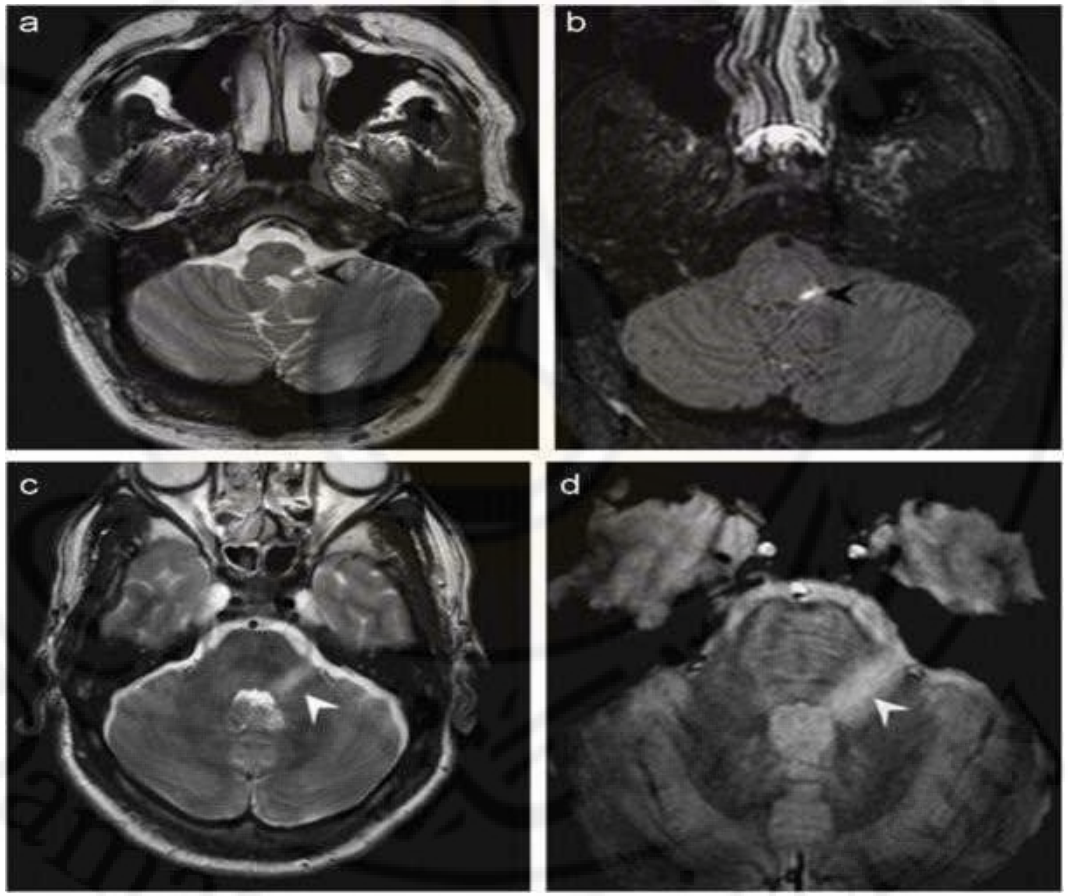
Neuralgia in young Patient



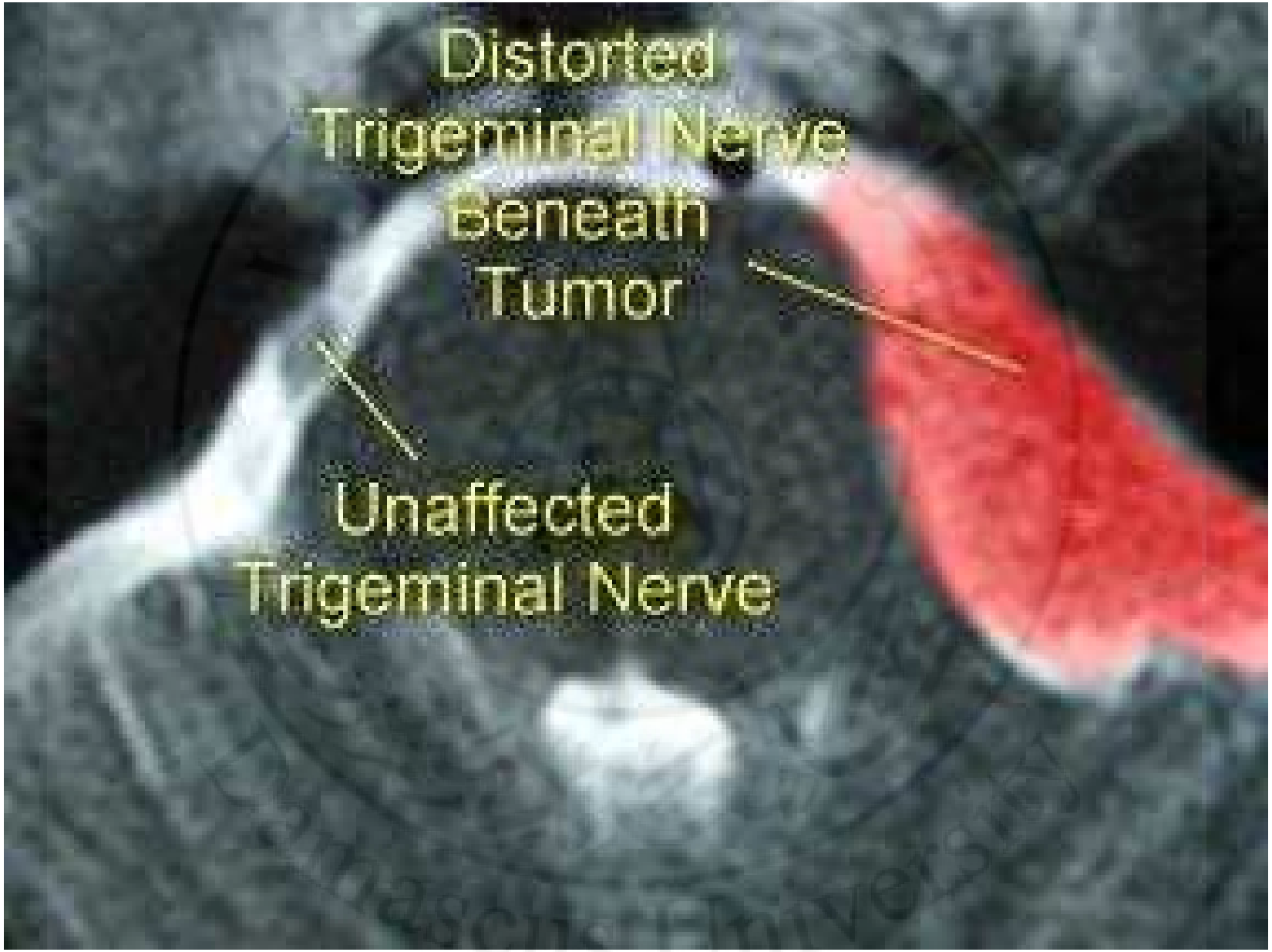
Enhancement of the trigeminal nerve on MRI in patients with multiple sclerosis



Enhancement of the trigeminal nerve on MRI in patients with multiple sclerosis



Trigeminal Neuralgia in the first branch

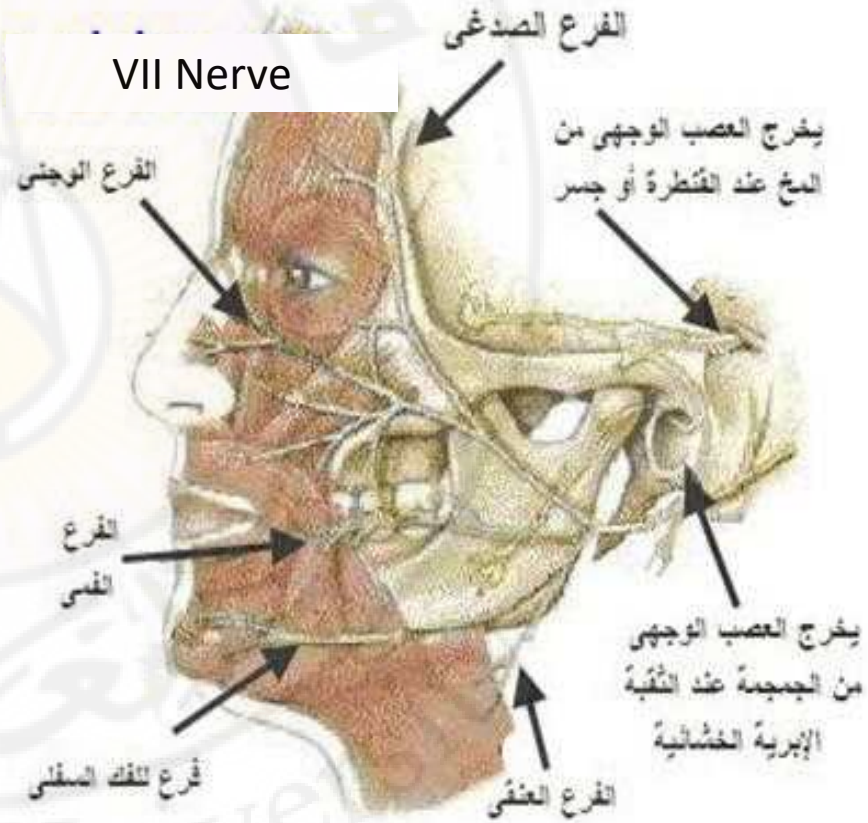

Distorted
Trigeminal Nerve
beneath
Tumor
Unaffected
Trigeminal Nerve

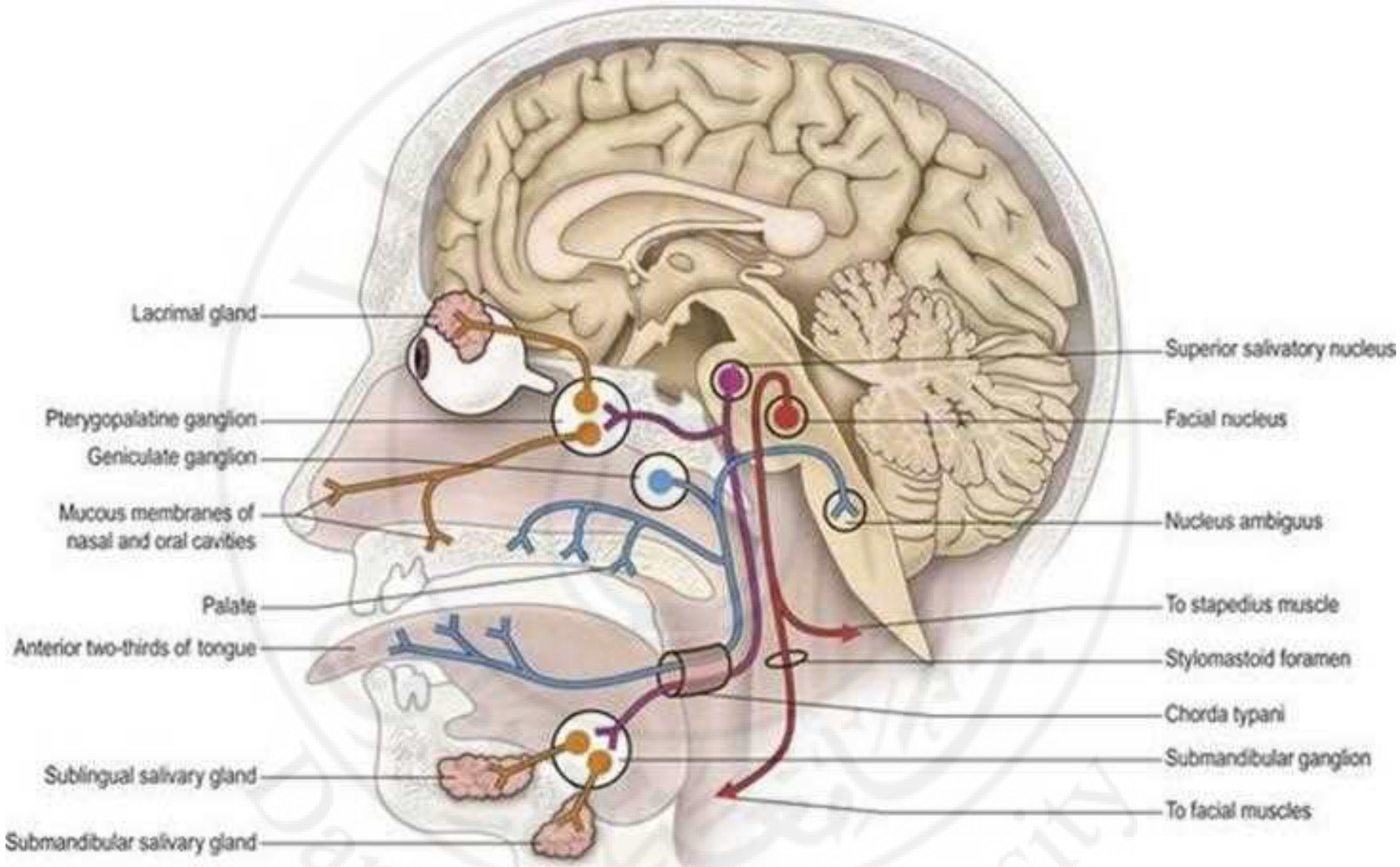
العصب السابع (الوجهي)



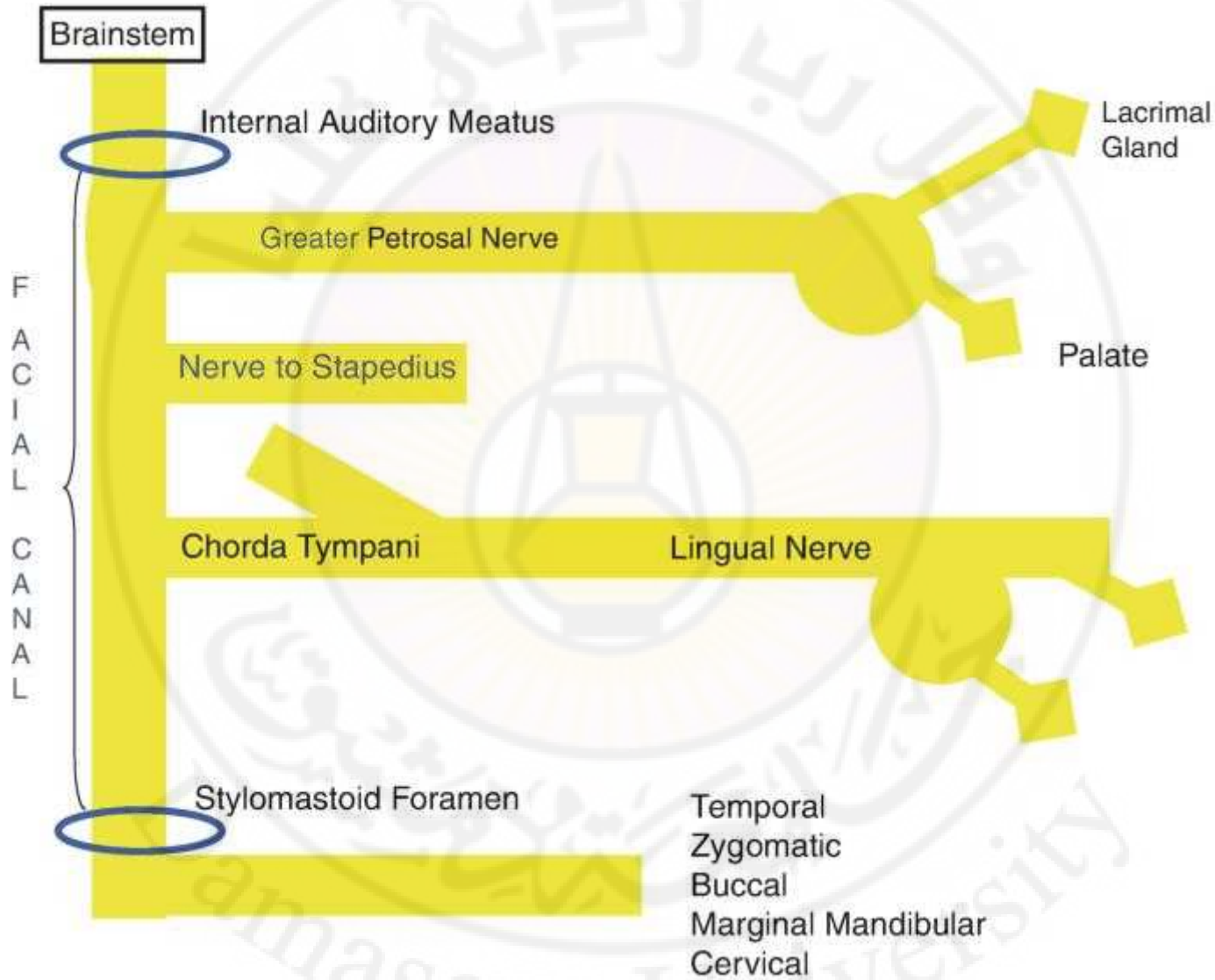
العصب السابع (الوجهي)







Pons To Parotid.


Brainstem
Internal Auditory Meatus
Lacrimal Gland
Greater Petrosal Nerve
Palate
FACIAL CANAL
Nerve to Stapedius
Chorda Tympani
Lingual Nerve
Stylomastoid Foramen
Temporal
Zygomatic
Buccal
Marginal Mandibular
Cervical

Clinical Examination of the facial nerve

Motor

- Frontalis,
- Corrugator Supercilii
- Orbicularis oculi
- Buccinator
- Orbicularis Oris
- Platysma



Ask the patient to close his eyes tightly & try to open them by applying gentle upwards pressure (orbicularis oculi).

Ask the patient to show his teeth & look for any deviation of the angle of the mouth (orbicularis oris).

Ask the patient to puff out his cheeks & tap your finger on his inflated cheek (buccinator).

Ask the patient to whistle.

Check the (platysma) by asking the patient to clench teeth.

فحص العصب السابع



Crease up the forehead



Keep eyes closed against resistance



Reveal the teeth



Puff out the cheeks

فحص العصب السابع





Figure VII–15 Clinical tests for the muscles of facial expression. A, Frontalis muscle. B, Orbicularis oculi muscle. C, Orbicularis oris muscle.

- **Testing the temporal branch:** patient is asked to frown and wrinkle his or her forehead
- **Testing the Zygomatic branch:** patient is asked to close their eyes tightly
- **Testing the buccal branch:** Puff up cheeks (buccinator)/ Smile and show teeth (orbicularis oris)/ Tap with finger over each cheek to detect ease of air expulsion on the affected side

فحص العصب السابع

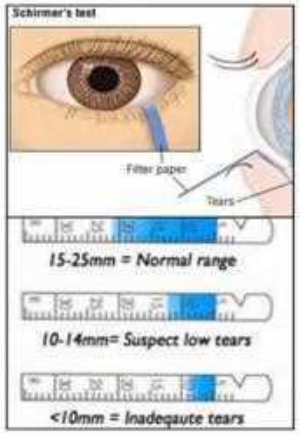
Examination of Sensory Functions

- Hypesthesia of posterior wall of EAM: proximal CN VII lesions
- Taste on anterior two-thirds of the tongue: sweet/salty/bitter/sour



Examination of Secretory Functions

- History and observation: tearing/salivation
- Lacrimal and nasolacrimal reflex



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Loss of
nasolabial fold


Loss of forehead
wrinkles

Bell's Sign



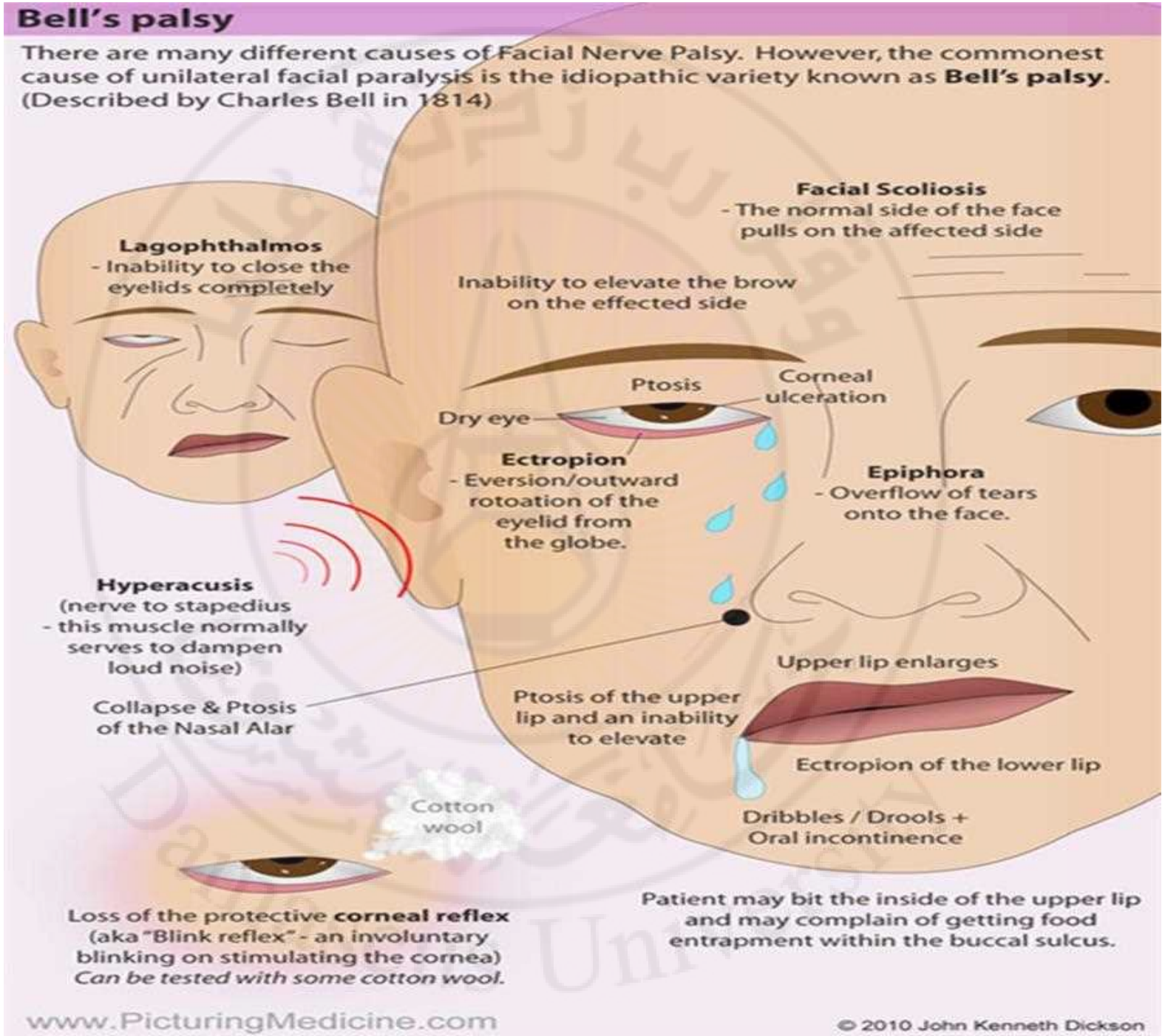
Sir Charles Bell

(1829):THE DISCOVERY OF THE NERVE OF FACIAL EXPRESSION

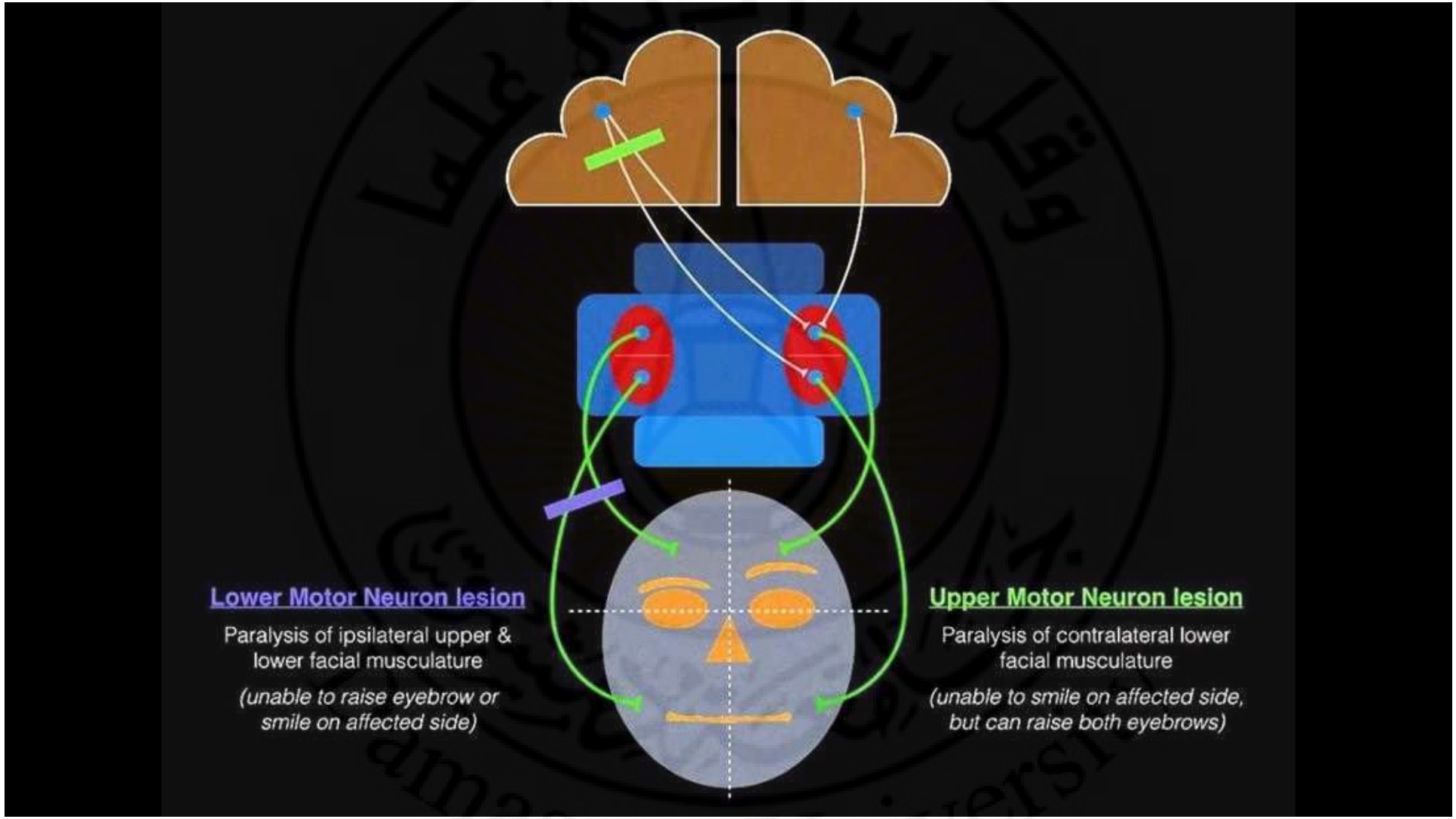
- **Scottish surgeon, anatomist & artist**
- **Book "*Anatomy of facial expression for artists*"**

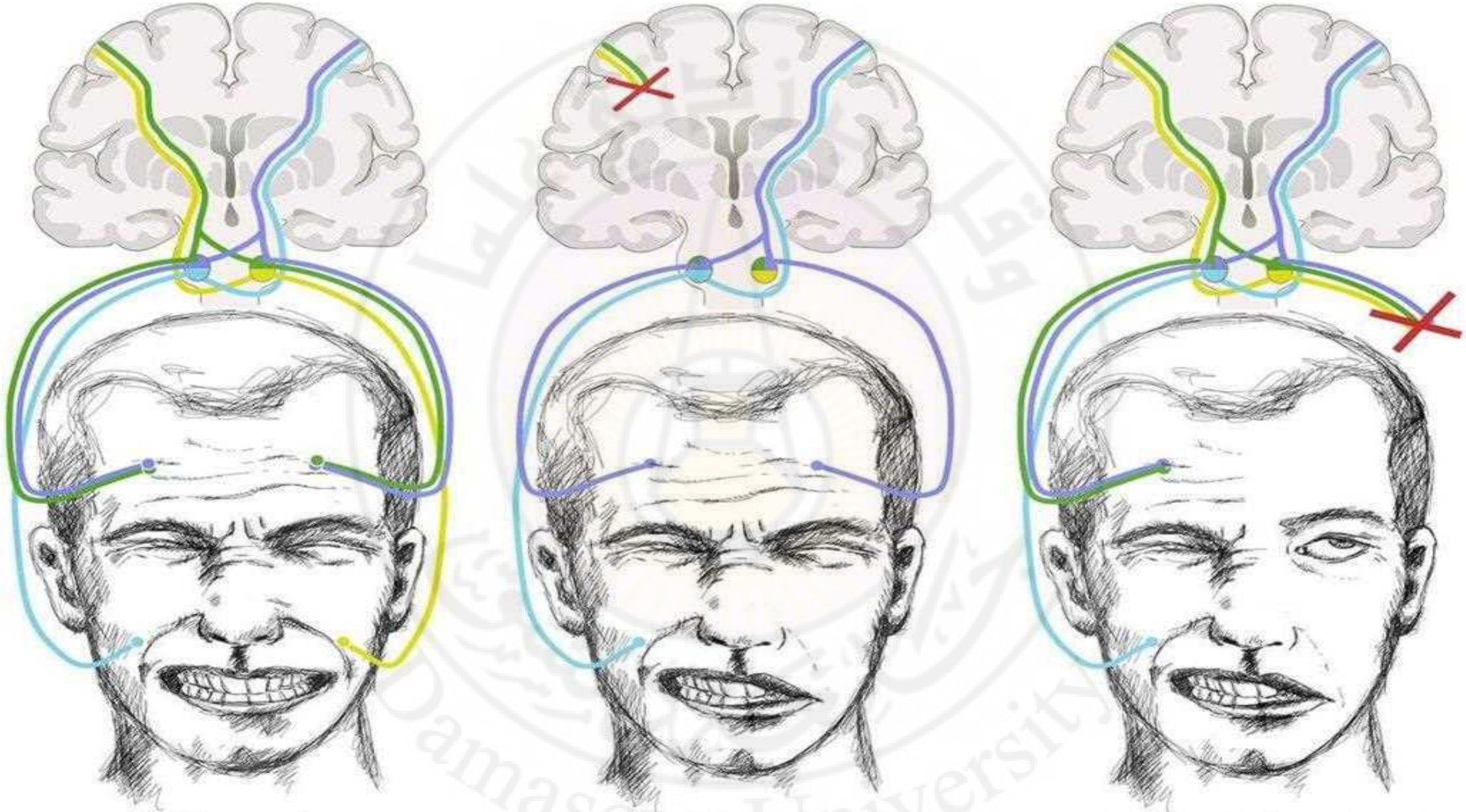
Bell's palsy

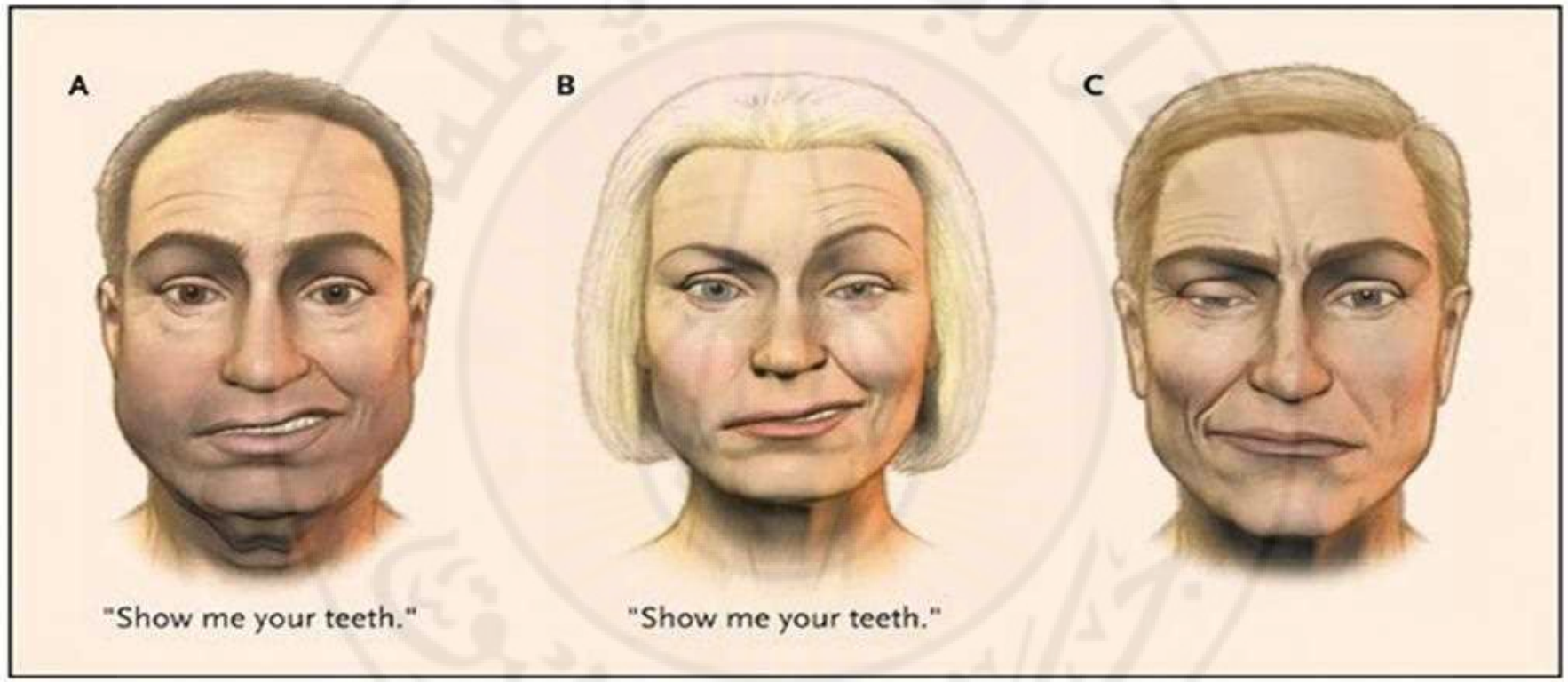
There are many different causes of Facial Nerve Palsy. However, the commonest cause of unilateral facial paralysis is the idiopathic variety known as **Bell's palsy**. (Described by Charles Bell in 1814)



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Lower Motor Neuron lesion
Paralysis of ipsilateral upper & lower facial musculature
(unable to raise eyebrow or smile on affected side)
Upper Motor Neuron lesion
Paralysis of contralateral lower facial musculature
(unable to smile on affected side, but can raise both eyebrows)

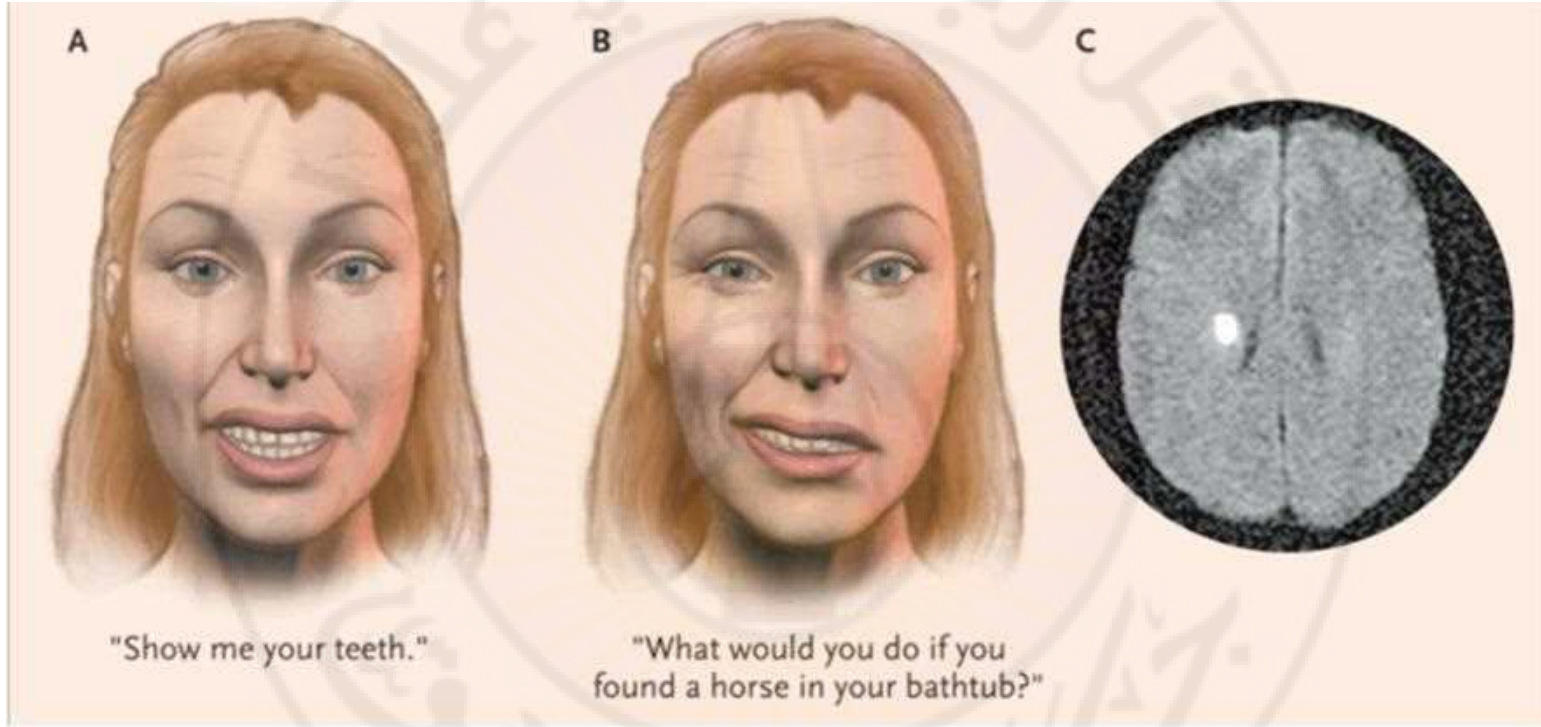

Normal
Central facial palsy
(supranuclear lesion)
Peripheral facial palsy



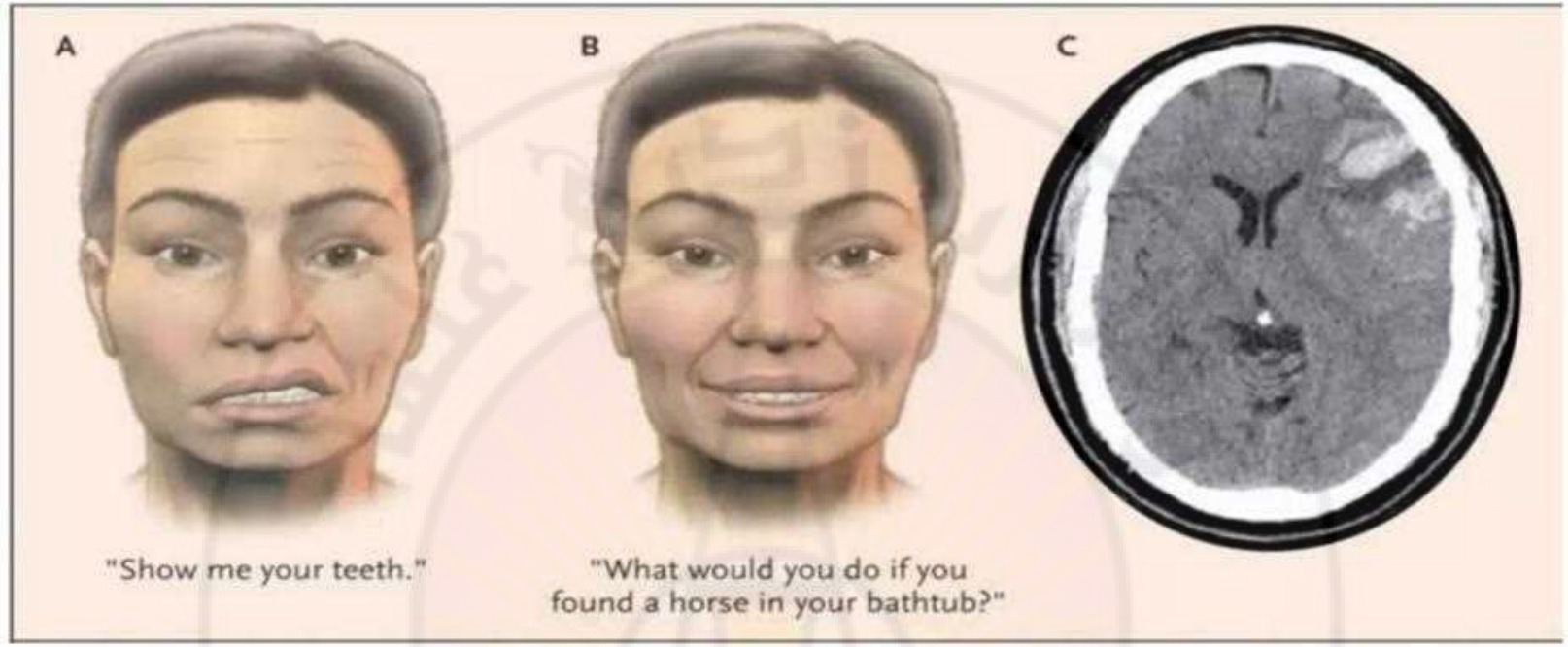
Central and Peripheral Facial Weakness.



The facial weakness is more marked during the voluntary than involuntary response. This indicates a cortical lesion



The involuntary response unmasks a more pronounced lesion. This indicates a deeper lesion.



Voluntary Central Facial Weakness > Mimetic (Involuntary) Central Facial Weakness



Mimetic (Involuntary) Central Facial Weakness > Voluntary Central Facial Weakness





شلل العصب الوجهي بإصابة عصبون علوي



شلل العصب الوجهي



ثنائي الجانب



وحيد الجانب

Facial nerve palsy

Lower motor neurone (forehead muscles affected)

Upper motor neurone (forehead muscles not affected)
for example, cortical or brainstem infarct, intracranial tumour

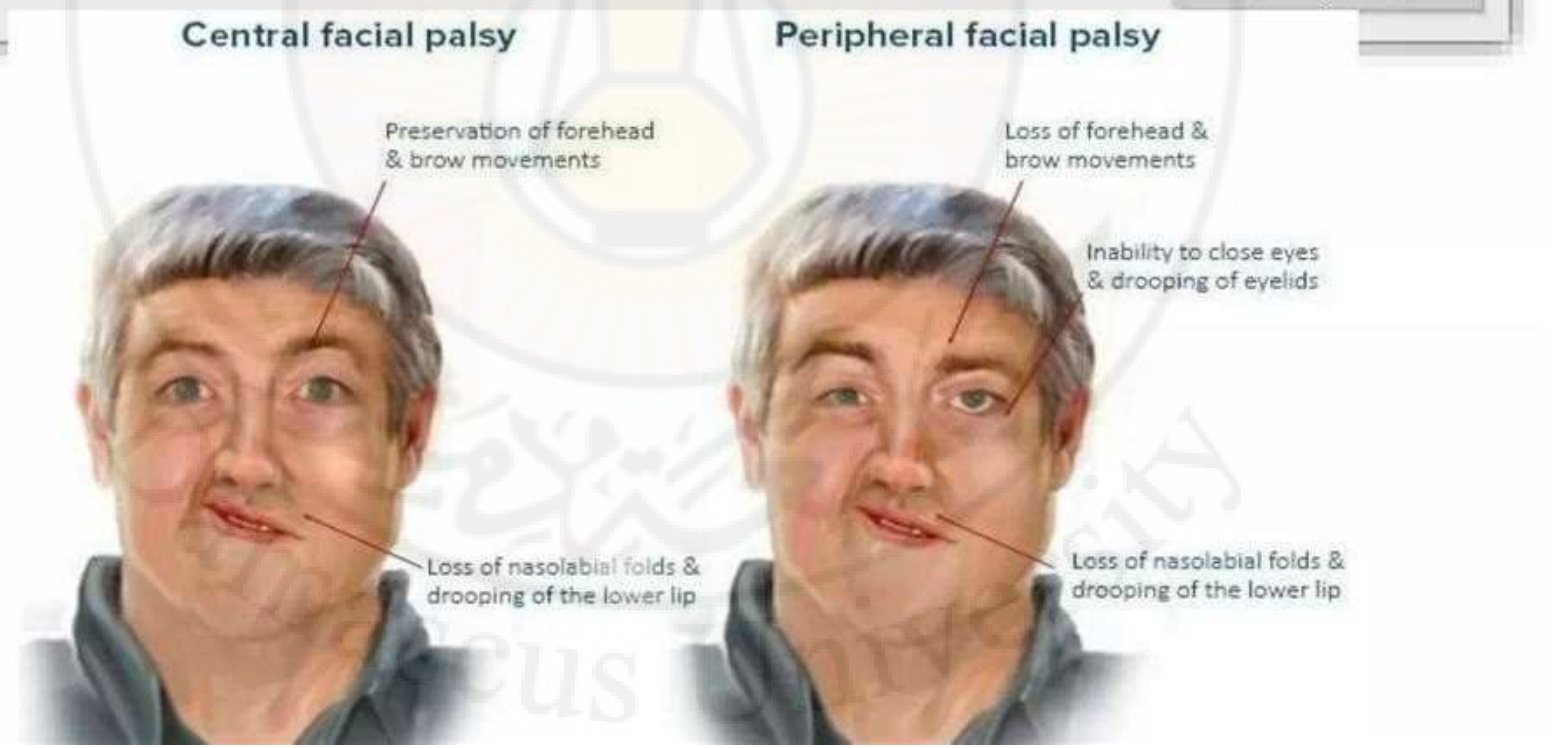
Idiopathic (59-70%)
Bell's palsy

Traumatic (10-23%)
Temporal bone fracture
Iatrogenic (post-surgical)
Sharp/blunt facial trauma
Birth canal trauma

Viral (4.5-7%)
Herpes zoster virus
(Ramsay Hunt syndrome)

Neoplastic (2.2-5%)
Acoustic neuroma
Parotid malignancy

Other (3-5%)
Acute or chronic
otitis media
Malignant otitis externa
Lyme disease*
Misdiagnosed†

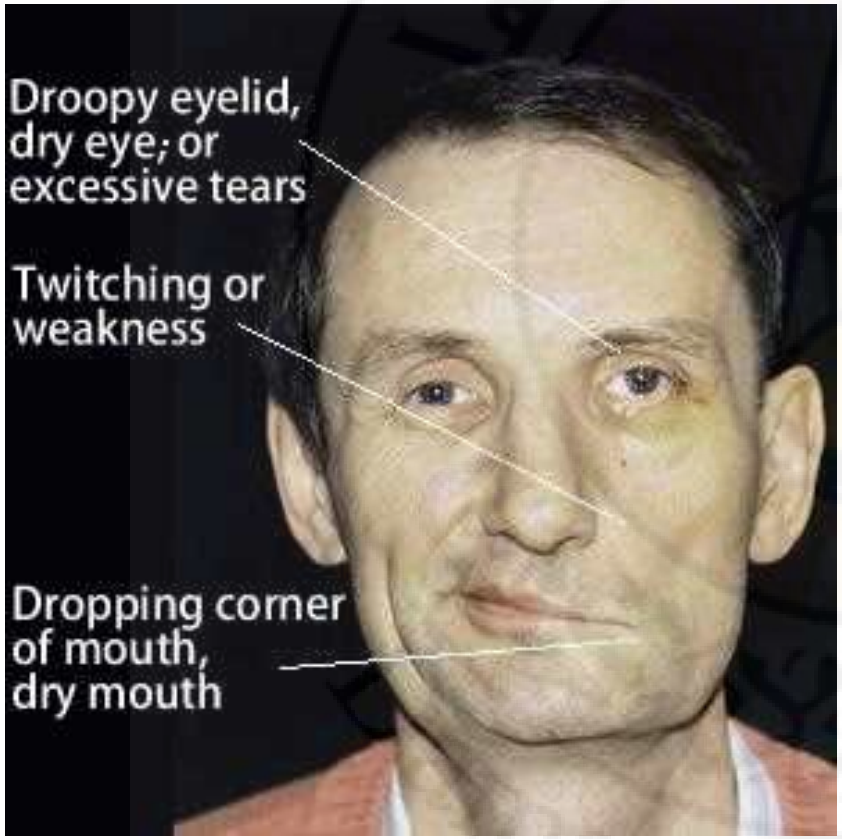


اصابة العصب السابع بجهة واحدة
شلل بل



Anatomic arrangement of the facial nerve and muscles. For clarity, the nerve is depicted on the right side of the face and the facial muscles on the left.

اصابة العصب السابع بجهة واحدة
شلل بل

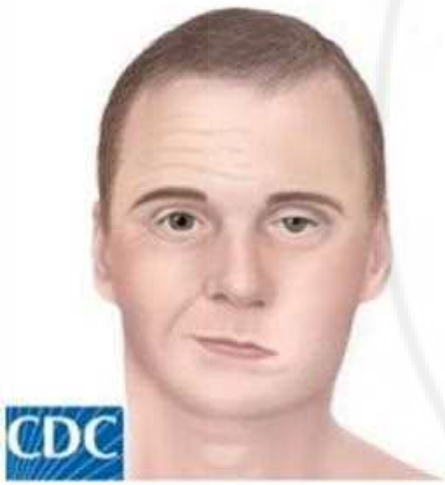




أعراض شلل الوجه النصفي(شلل بيل)

BELL'S PALSY

Most common cause of unilateral facial paralysis



DIAGNOSIS	CLINICAL - classically a cranial nerve 7 palsy. The forehead is involved (cannot wrinkle)	
CONSIDER	CVA (one case report of isolated CN7 palsy with pontine hemorrhage) - do a thorough neuro exam as most CVAs with facial droop have something else abnormal on neuro exam Lyme disease - treat if in endemic area Herpes simplex/zoster	
TREATMENT	CORTICOSTEROIDS - Strong evidence for improvement	Prednisone 1 mg/kg/day (up to 60 mg) x 6 days followed by 10 day taper
	ANTIVIRALS (acyclovir, valacylovir) - Weak evidence for modest benefit	Alone no better than placebo, but weak evidence that used with steroids may improve facial recovery.
	SUPPORTIVE CARE	OCULAR LUBRICANT TO PREVENT CORNEAL ABRASIONS MAY NEED TO TAPE EYE SHUT (can't close, subject to trauma and dryness)

@FOAMpodcast

Damascus University

causes of Bilateral Facial nerve palsy →

SCPT

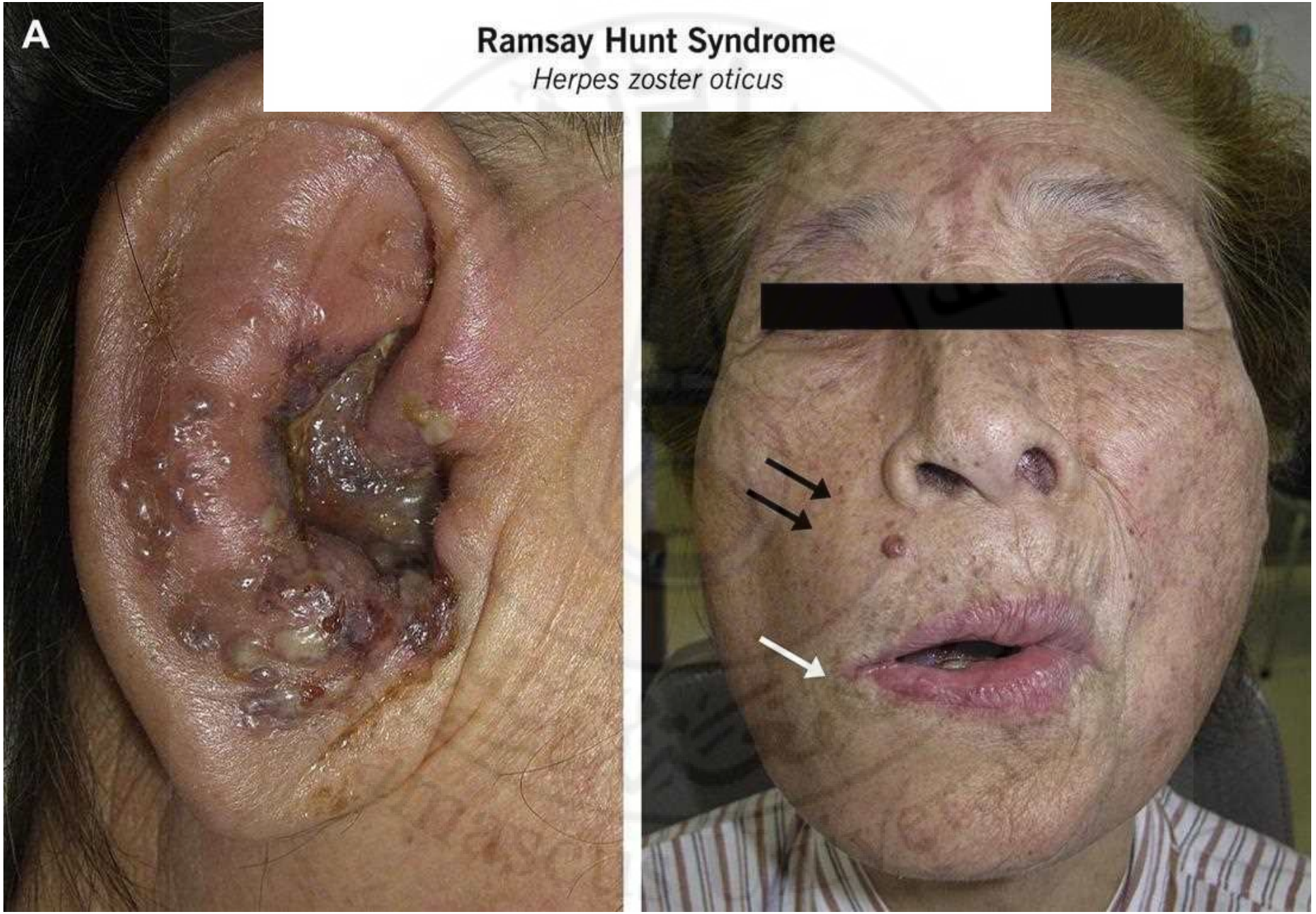
Sarcoidosis

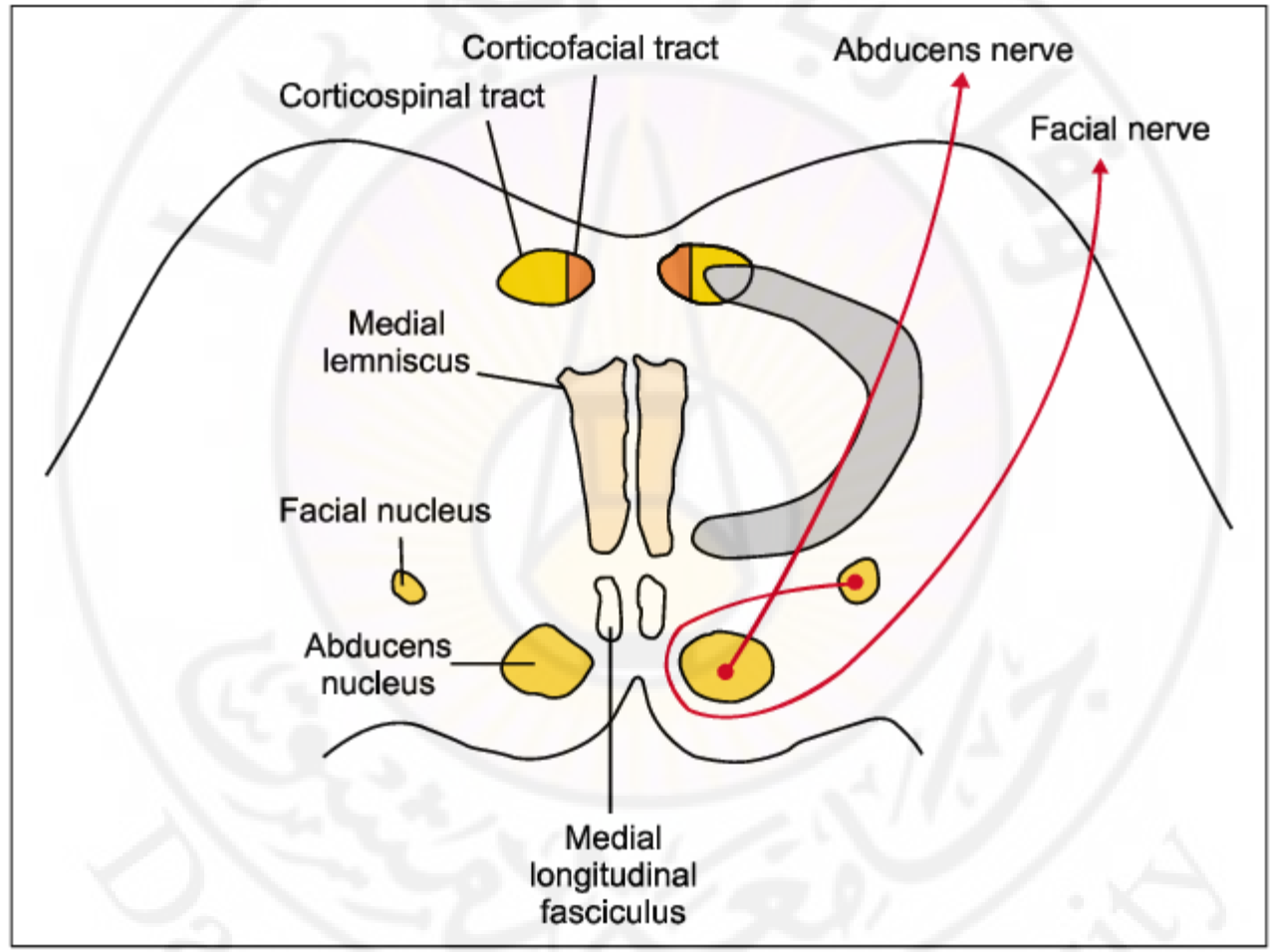
GBS

Polio

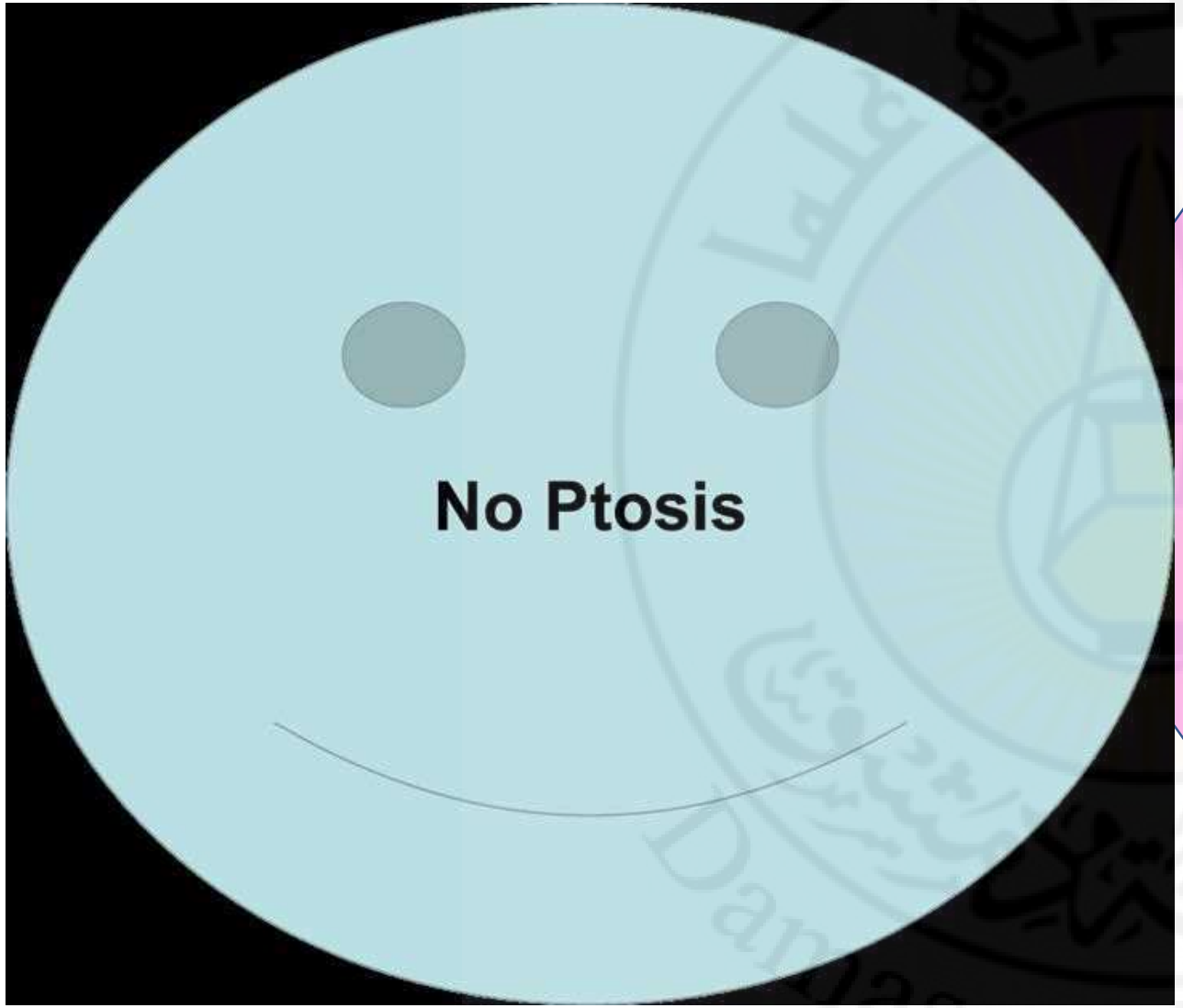
Tick bite → Lyme Disease

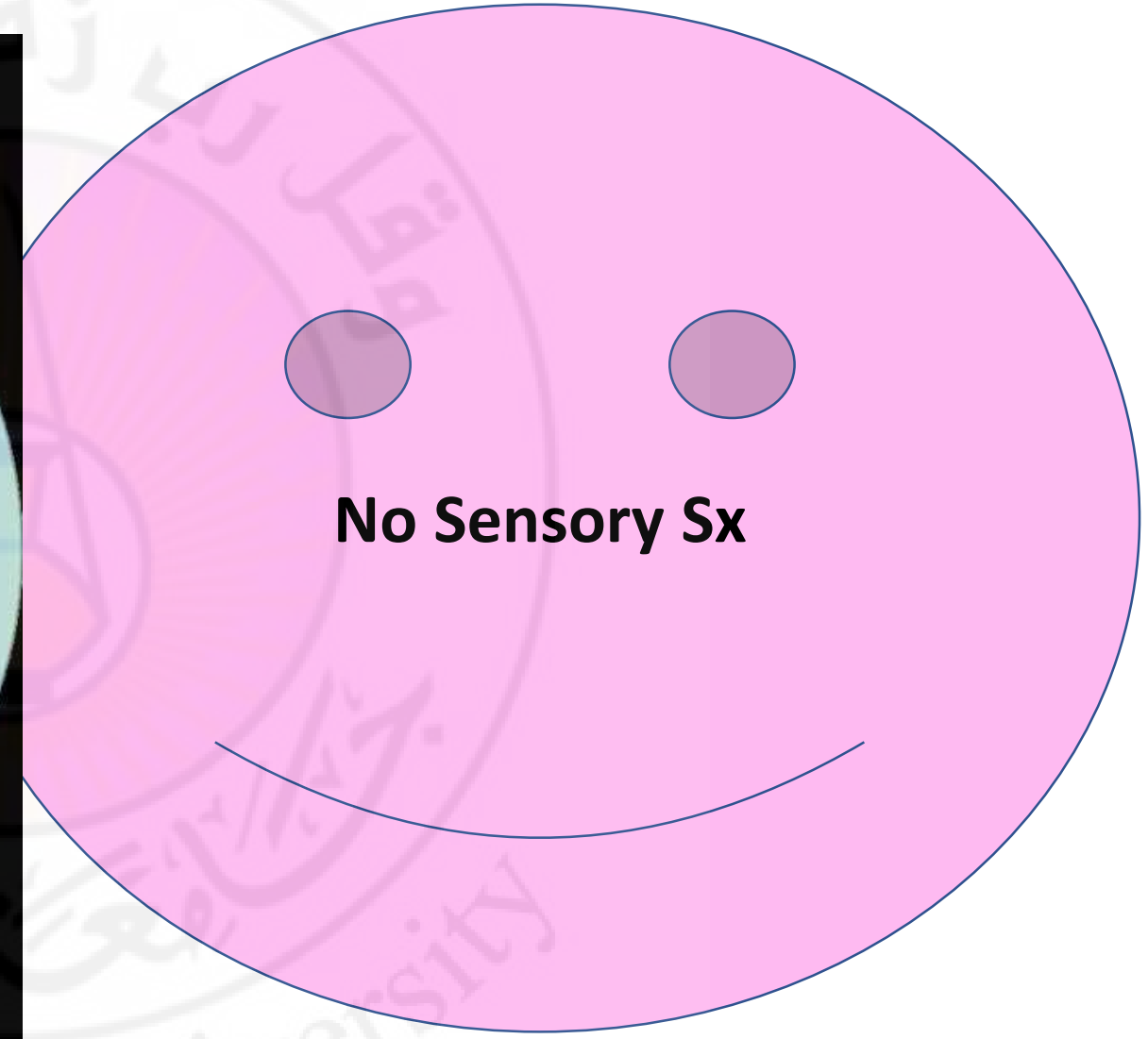


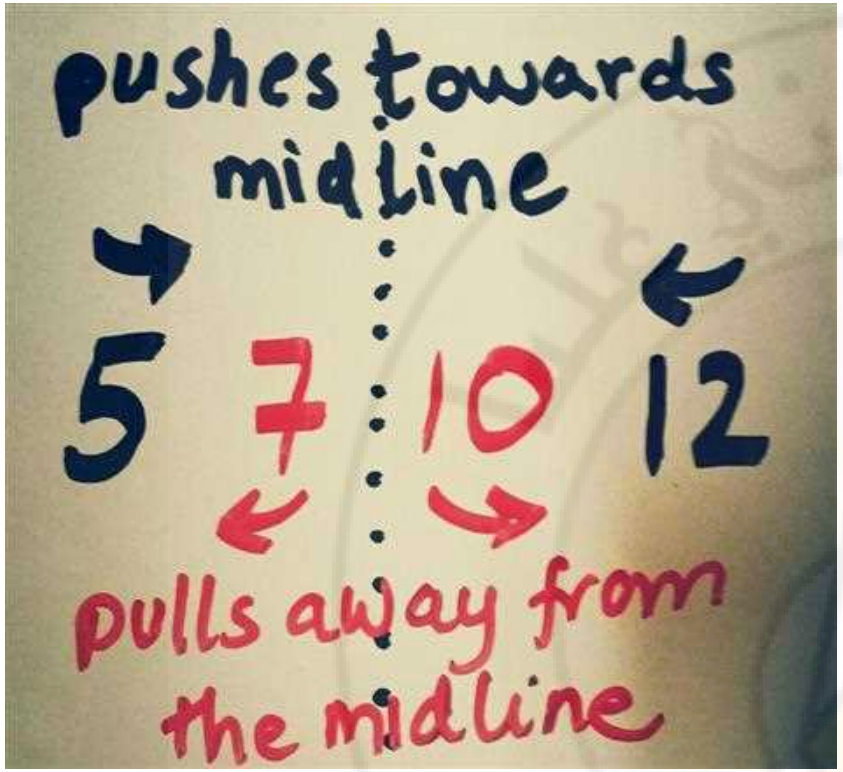

A
Ramsay Hunt Syndrome
Herpes zoster oticus

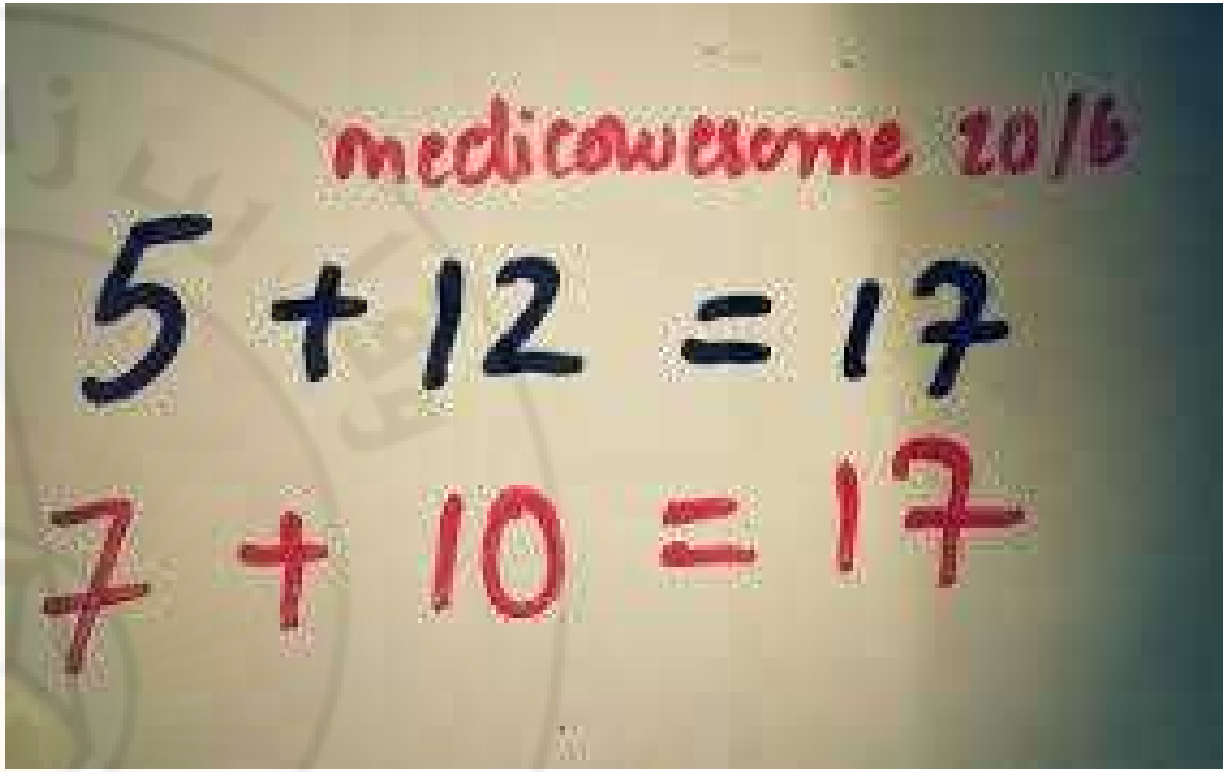

Corticofacial tract
Corticospinal tract
Abducens nerve
Facial nerve
Medial
lemniscus
Facial nucleus
Abducens
nucleus
Medial
longitudinal
fasciculus


WRONG


No Ptosis


No Sensory Sx





CRANIAL NERVE INJURY

SUM MUST 17

12+5=17 TOWARDS PARALYSED SIDE

10+7=17 TOWARDS NORMAL SIDE

12=HYPOGLOSSAL

5=TRIGEMINAL

10=VAGUS

7= FASIAL

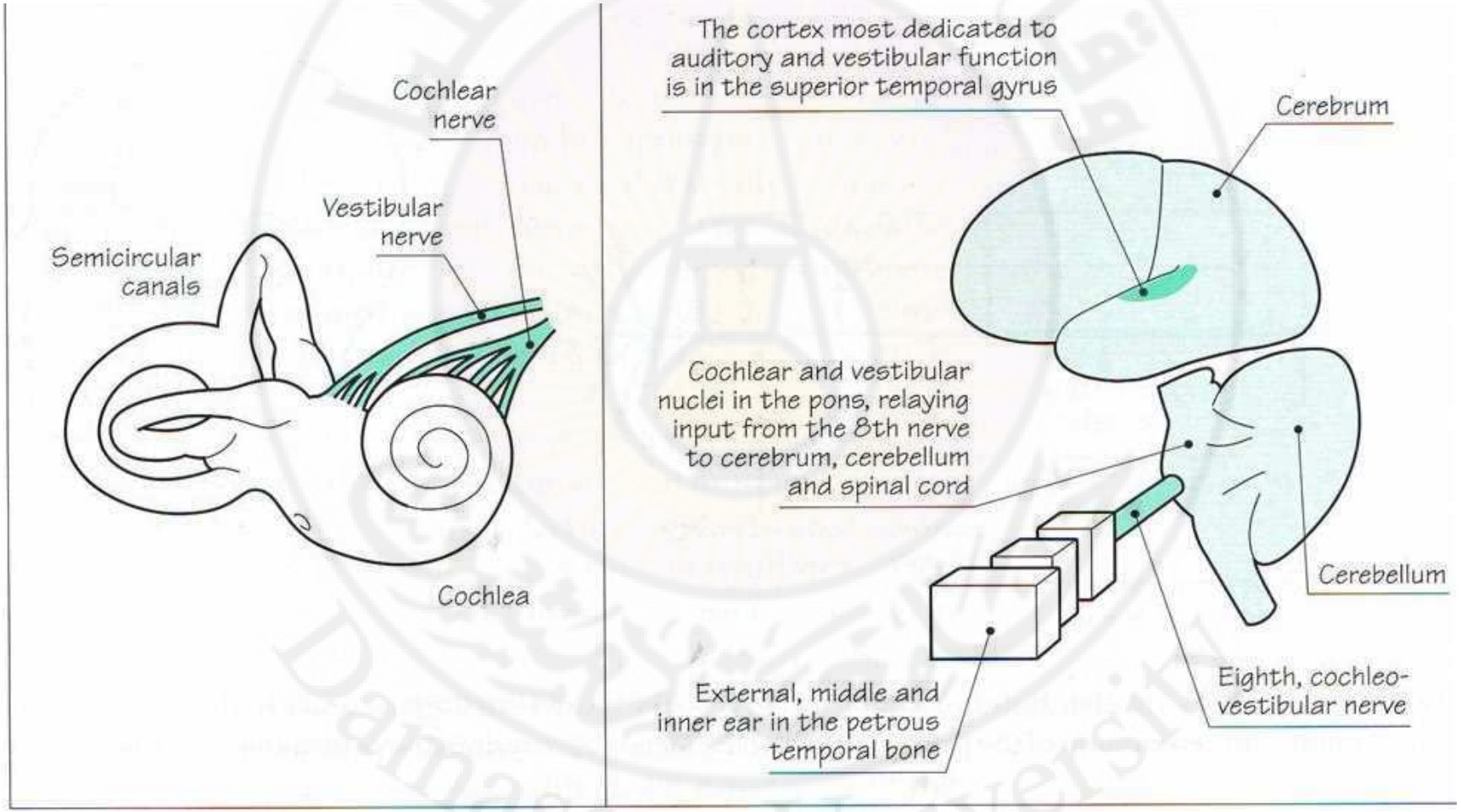
بسم الله الرحمن الرحيم

اضطراب الأعصاب القحفية 3

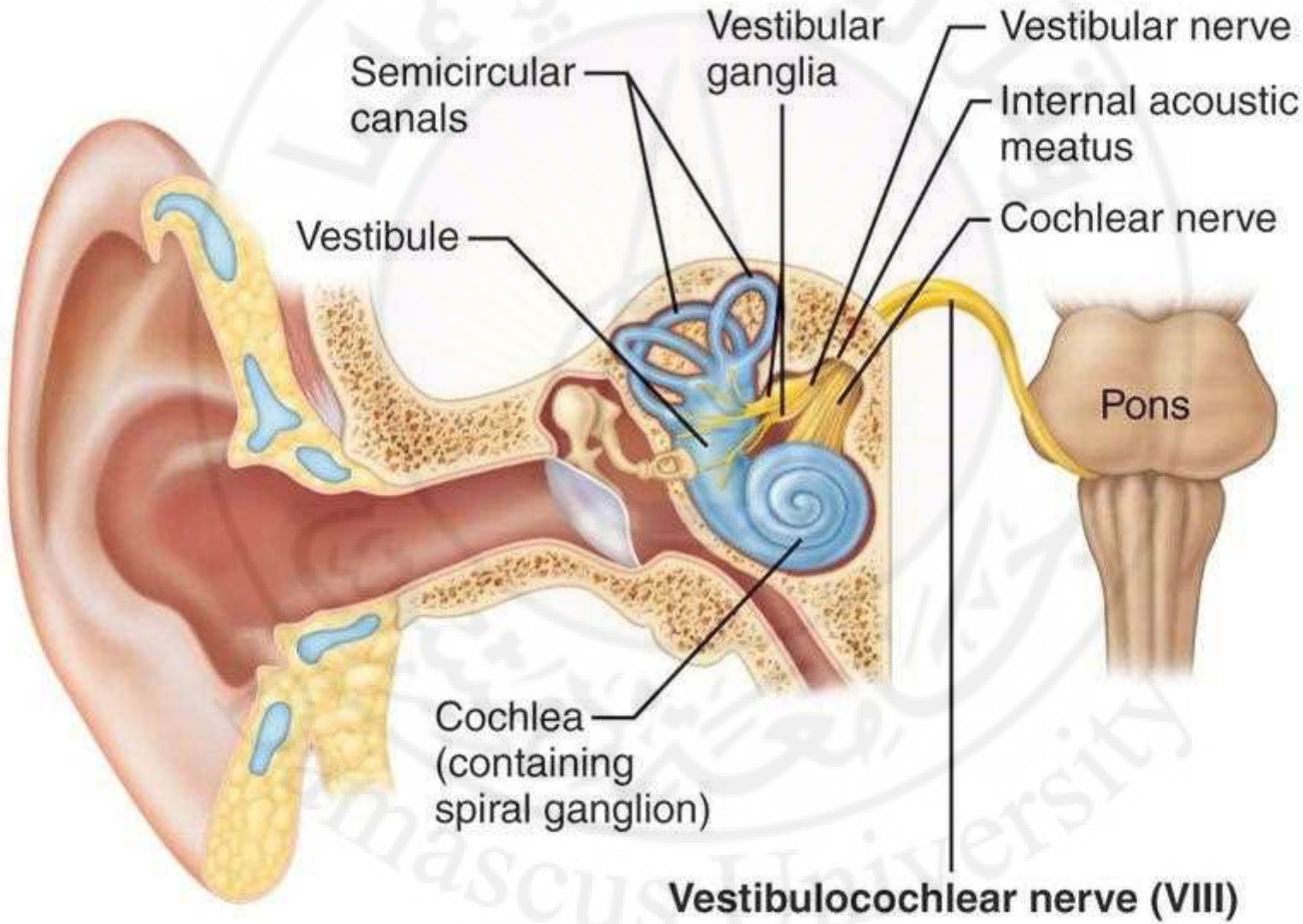
أ.د محمد شحاده آغا

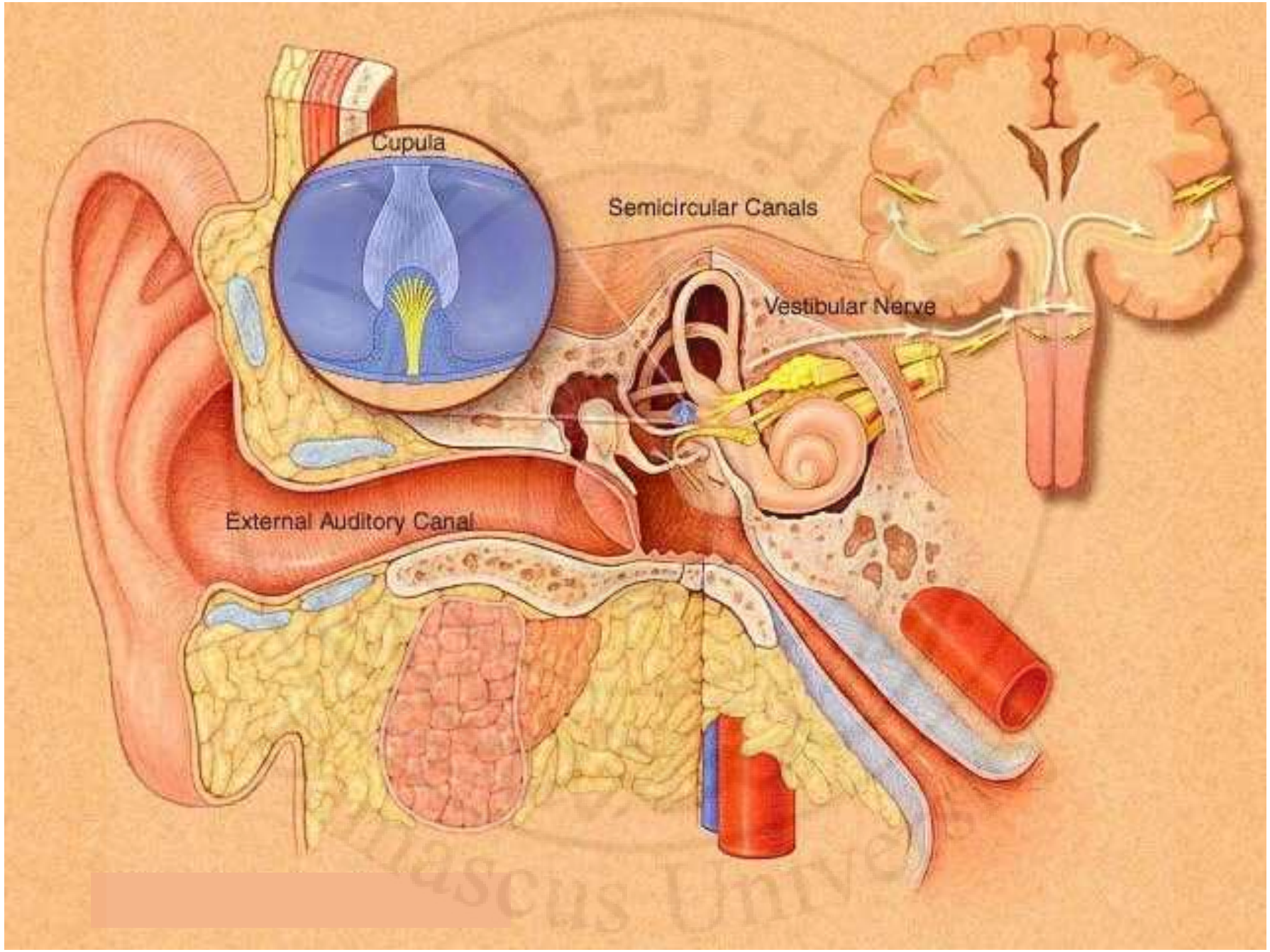
MD MRCP (London) FRCP (Edin)

العصب الثامن (السمعي الدهليزي)

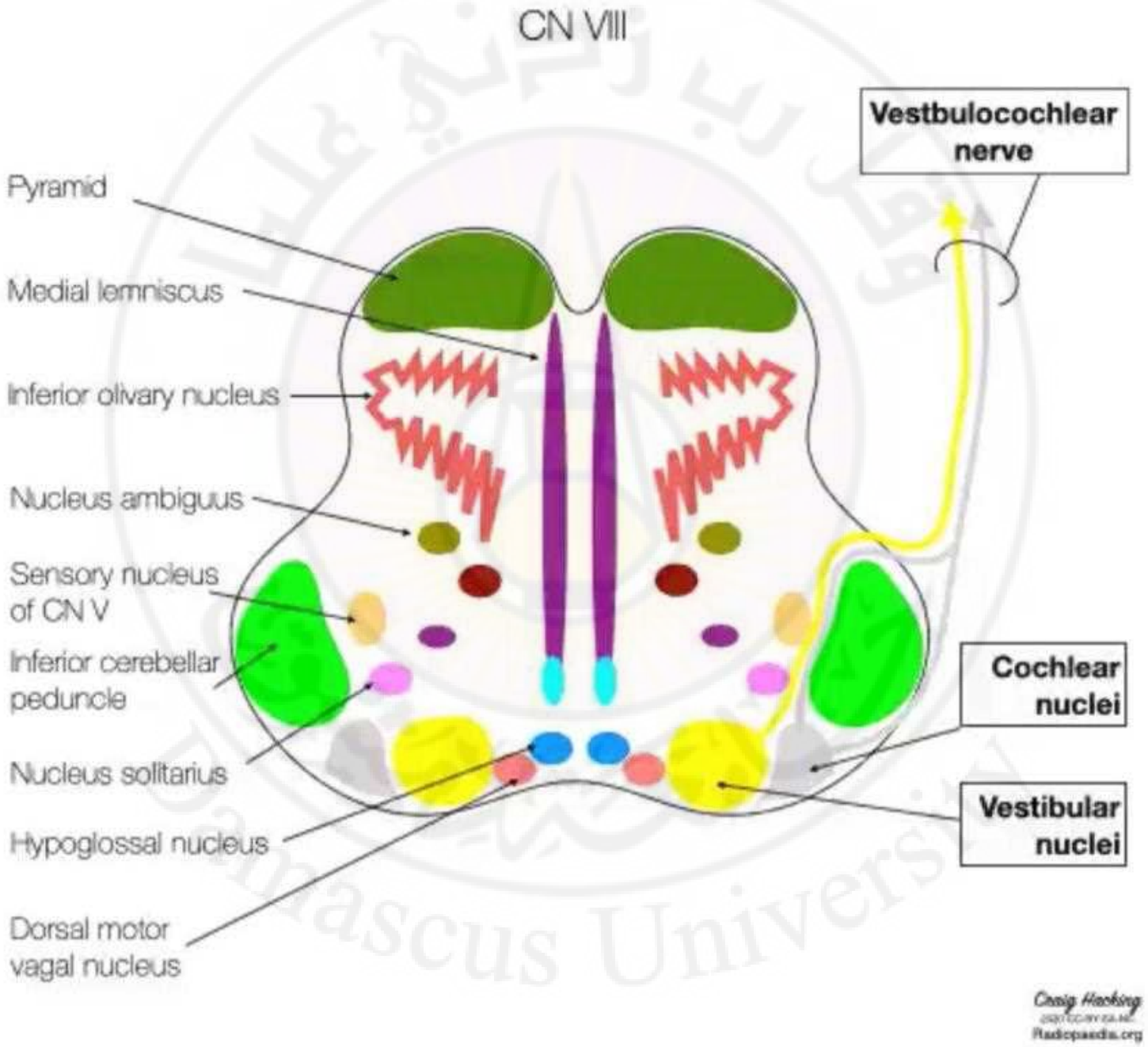


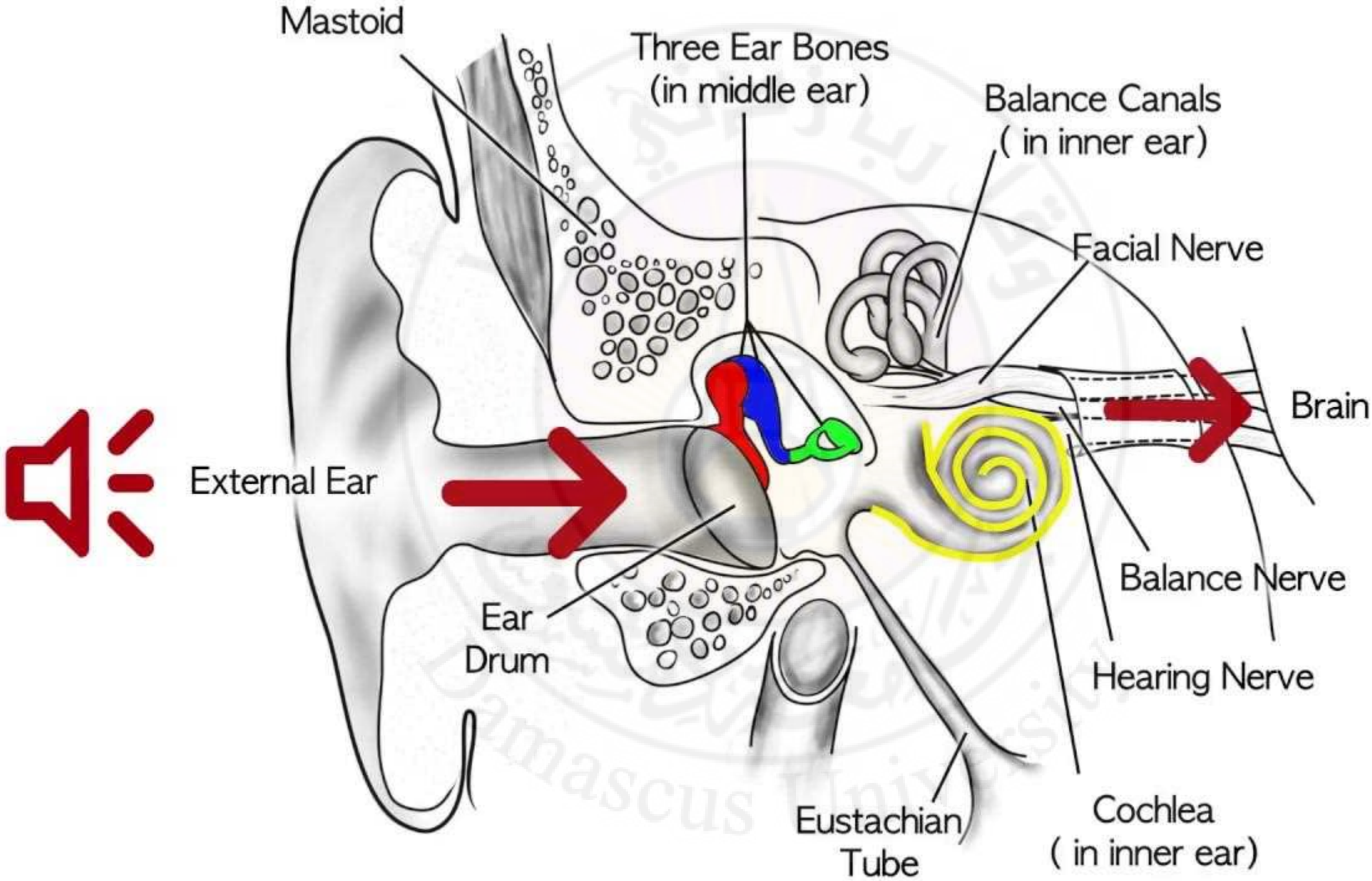
The Vestibulocochlear Nerves - VIII



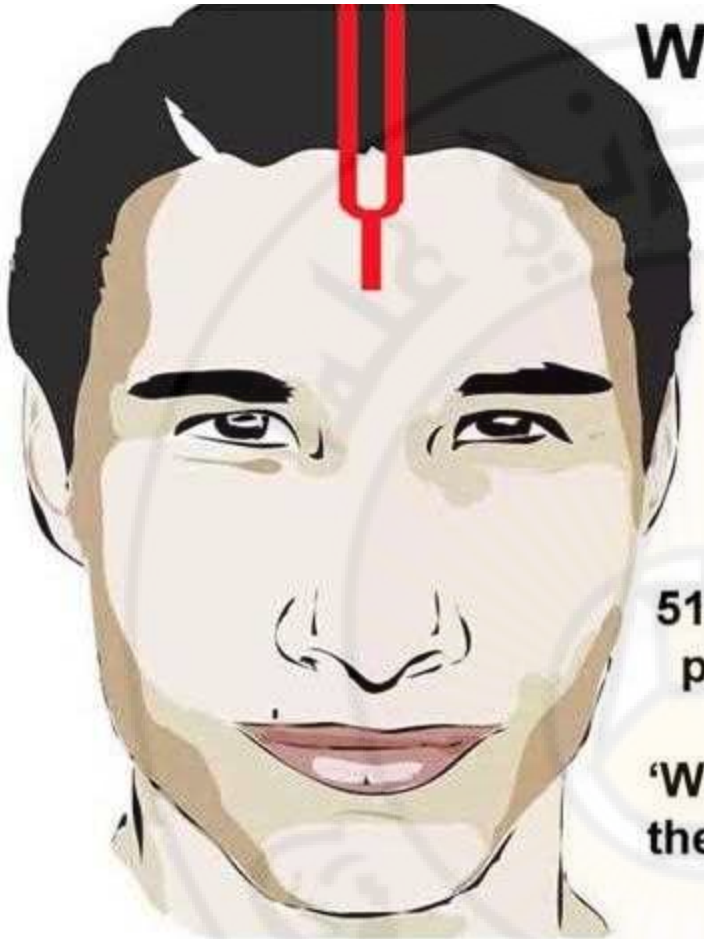

Cupula
Semicircular Canals
Vestibular Nerve
External Auditory Canal

Vestibulocochlear nerve



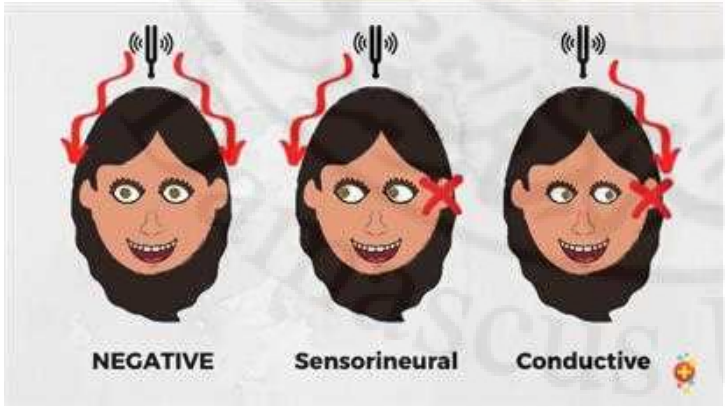

Mastoid
Three Ear Bones
(in middle ear)
Balance Canals
(in inner ear)
Facial Nerve
Brain
External Ear
Ear
Drum
Balance Nerve
Hearing Nerve
Eustachian
Tube
Cochlea
(in inner ear)

Weber's Test



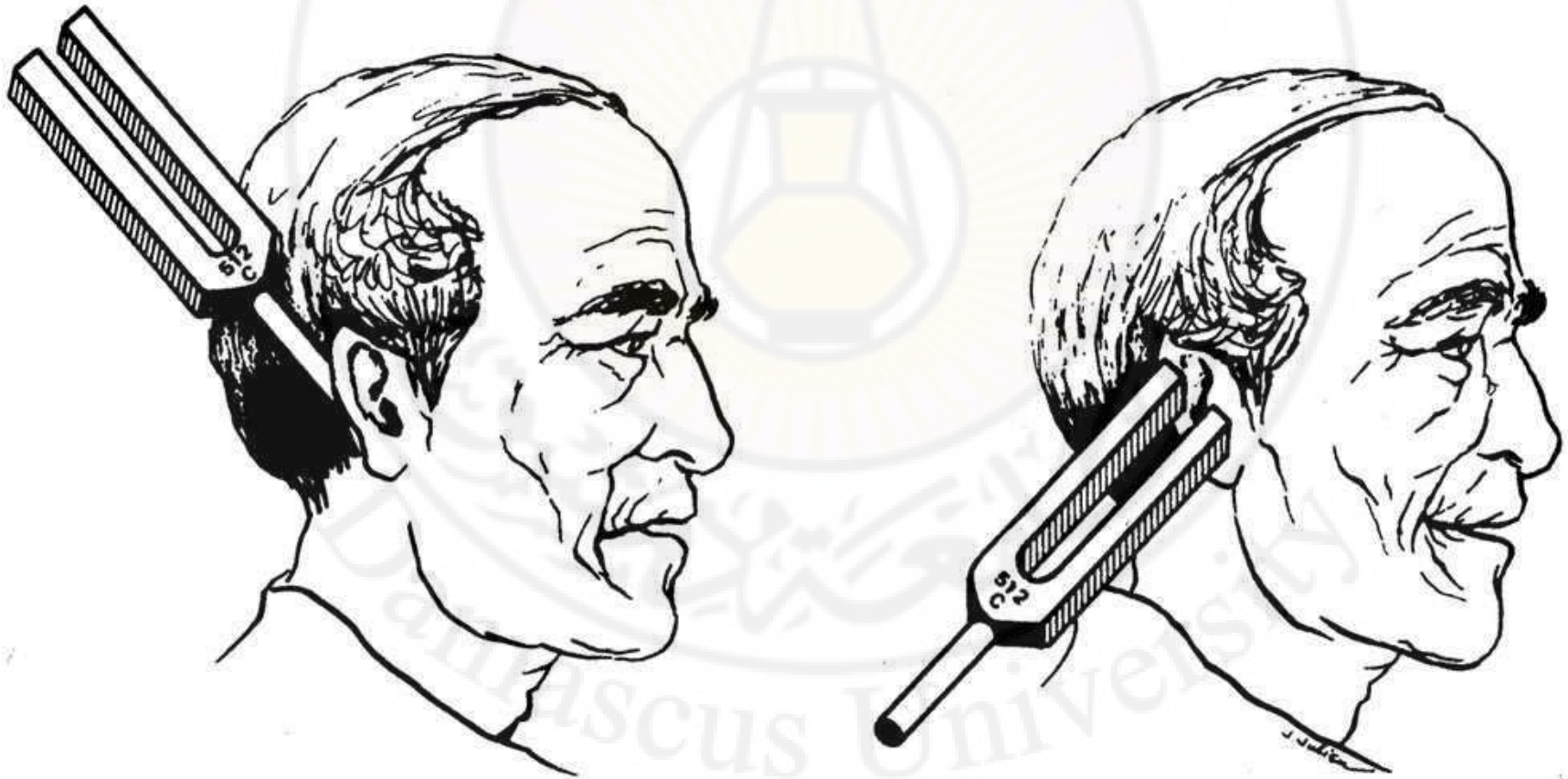
512 Hz Tuning Fork placed in midline.

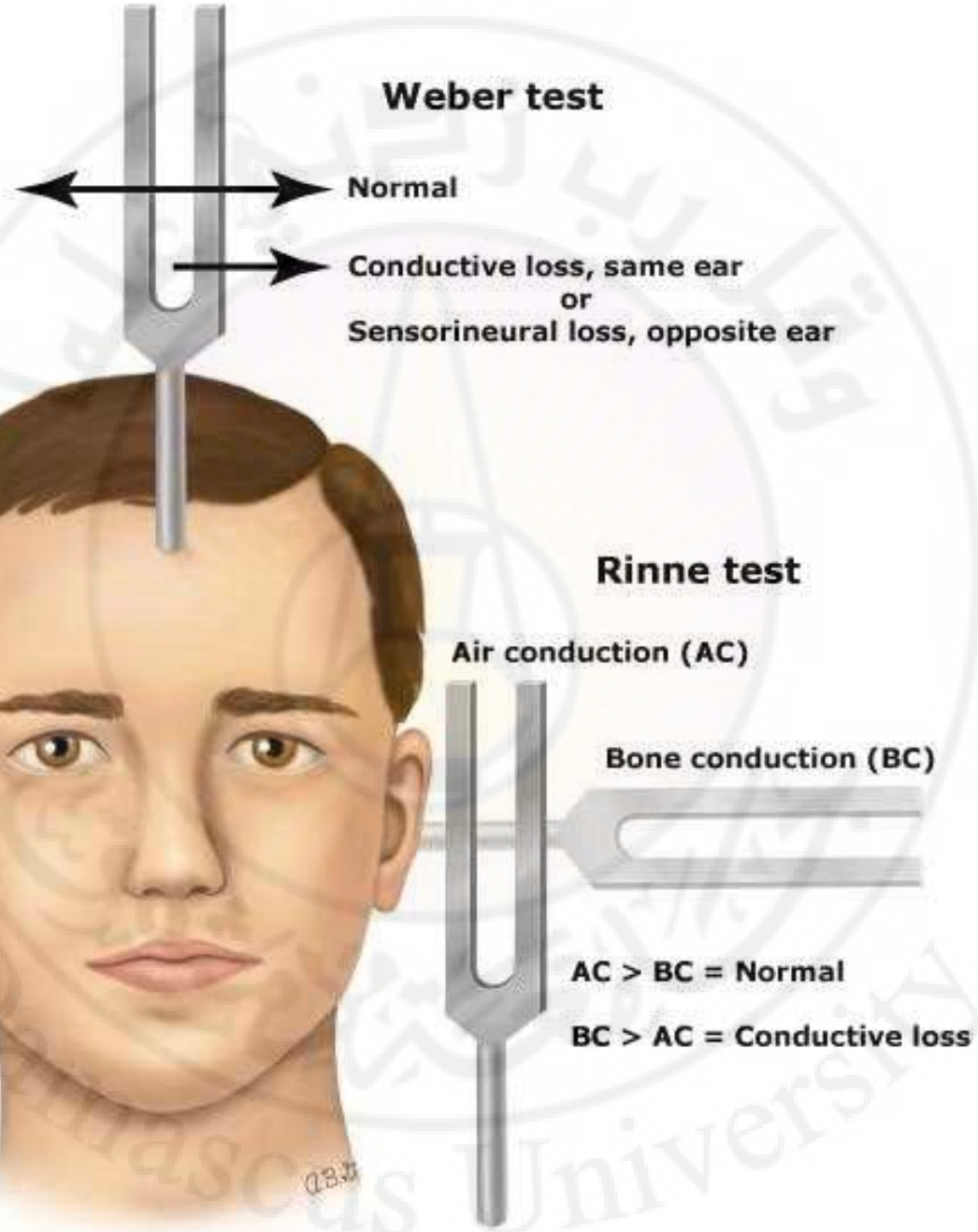
'Where can you hear the buzzing noise?'

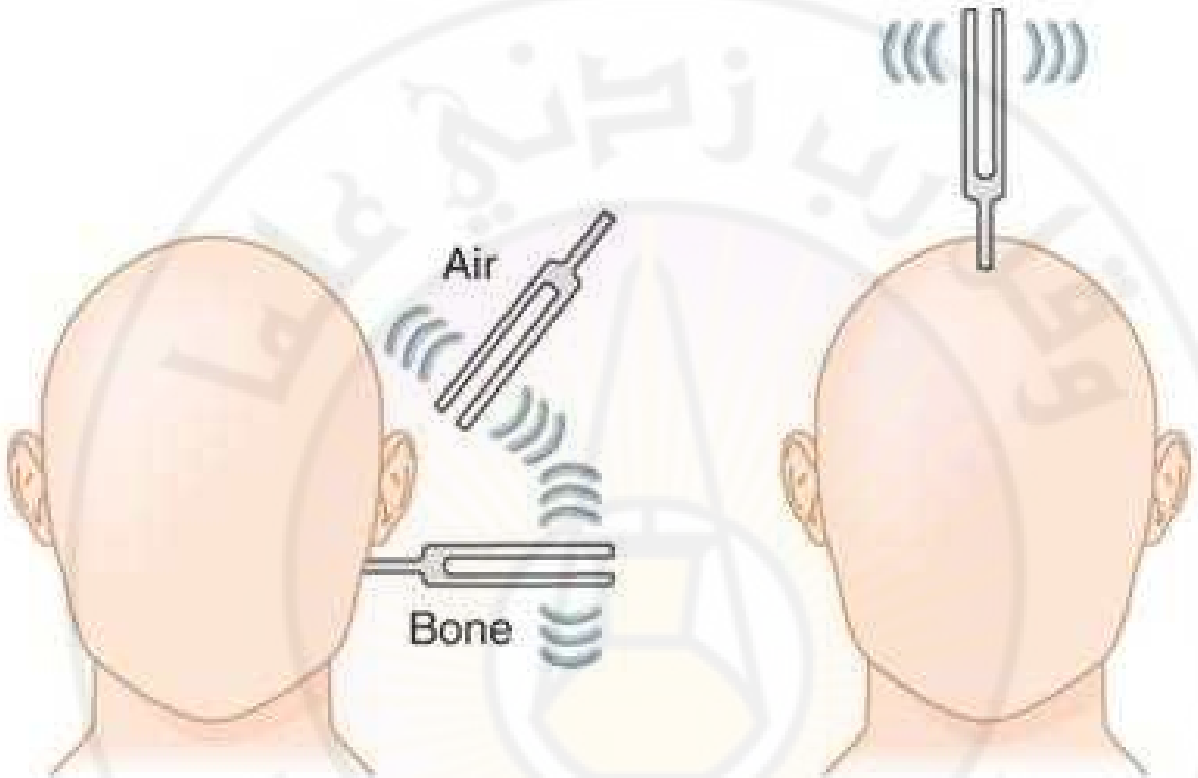


If there is *unilateral* **sensorineural hearing loss**, the Rinne test demonstrates **air > bone conduction**

i.e. air conduction is present after bone conduction is gone (normal)




Weber test
Normal
Conductive loss, same ear
or
Sensorineural loss, opposite ear
Rinne test
Air conduction (AC)
Bone conduction (BC)
AC > BC = Normal
BC > AC = Conductive loss



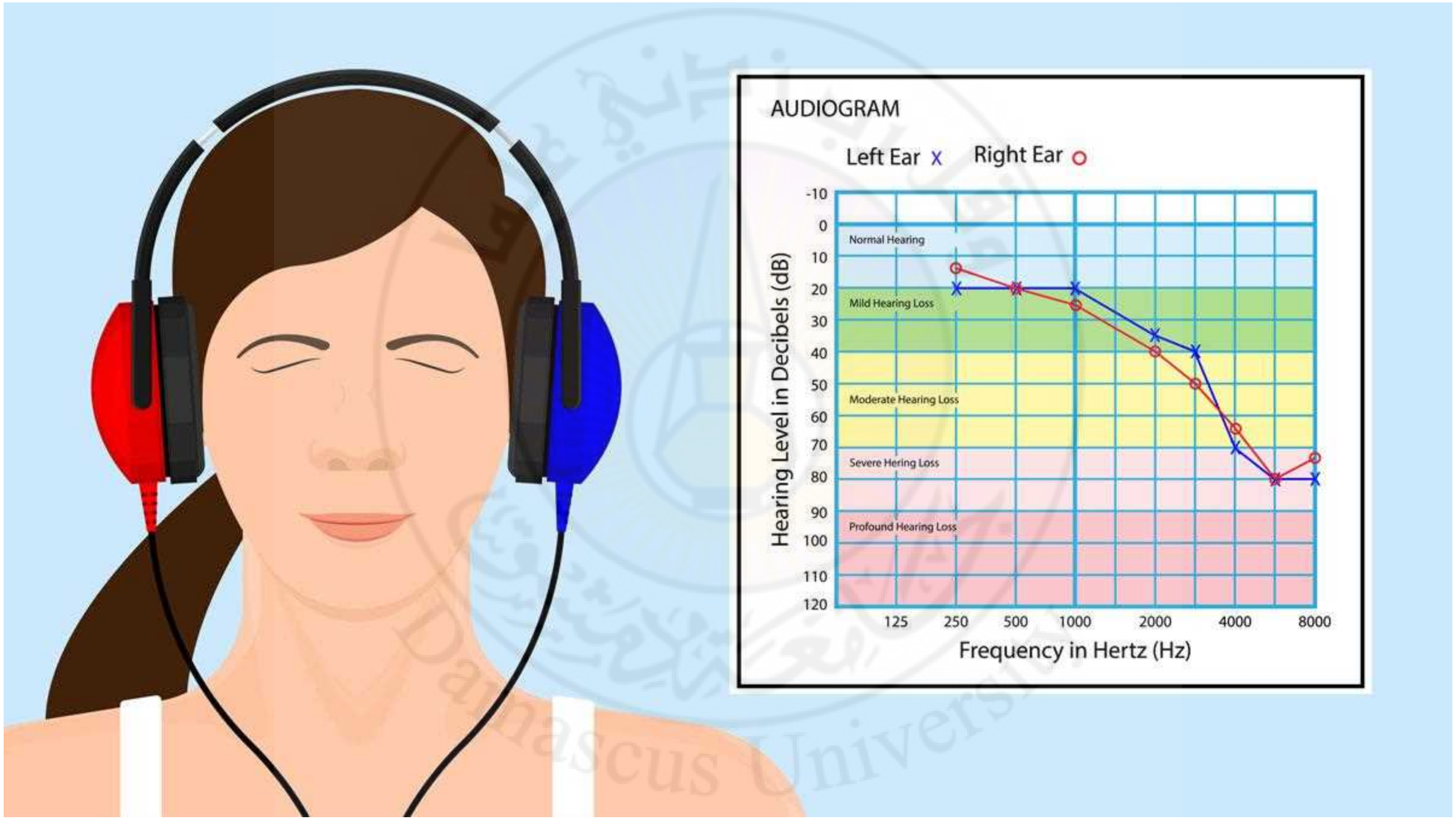
Rinne test

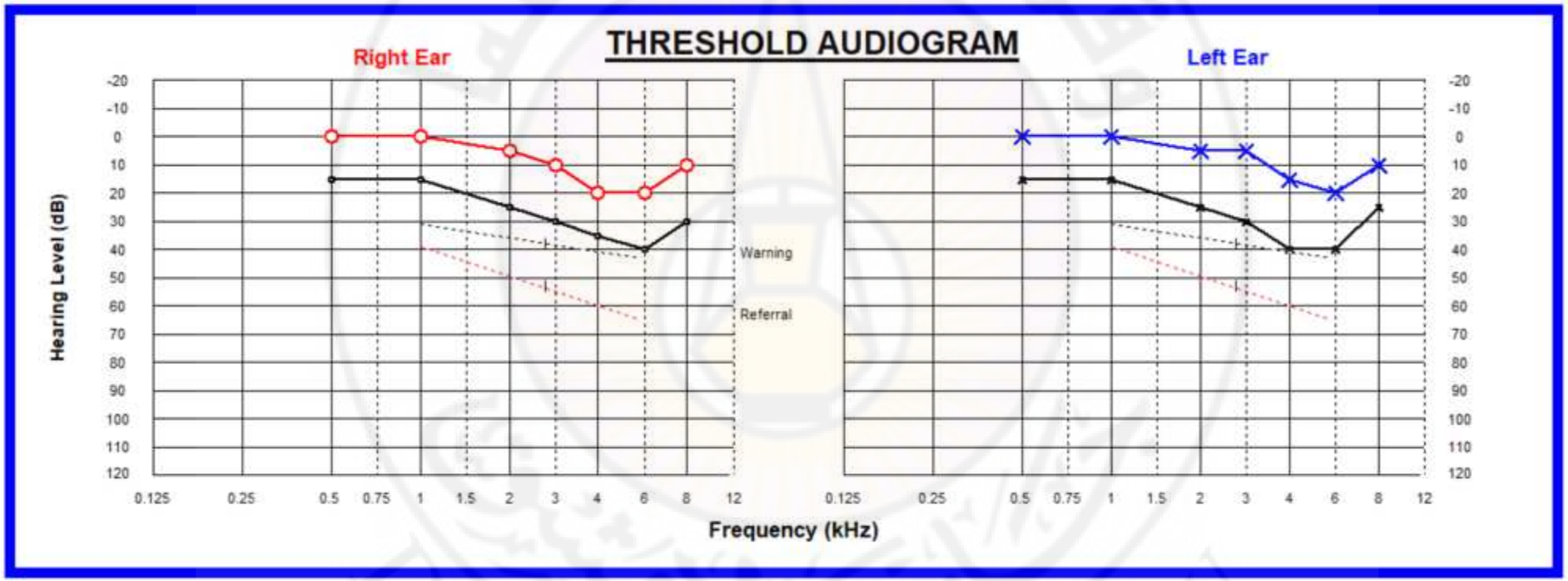
Weber test

Hearing loss	Rinne test (Conduction)	Weber test (Localization)
None	Air > bone	Midline
Sensorineural	Air > bone	Normal ear
Conductive	Bone > air	Affected ear

Symptoms	Signs	Tests
• Deafness • Tinnitus • Vertigo • Loss of balance	• Deafness of sensorineural type • Nystagmus • Positional nystagmus • Ataxia of gait	• Audiometry • Auditory evoked potentials • Caloric responses • Electronystagmography

Damascus University


AUDIOGRAM
Left Ear X
Right Ear O
Hearing Level in Decibels (dB)
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
Normal Hearing
Mild Hearing Loss
Moderate Hearing Loss
Severe Hering Loss
Profound Hearing Loss
125
250
500
1000
2000
4000
8000
Frequency in Hertz (Hz)

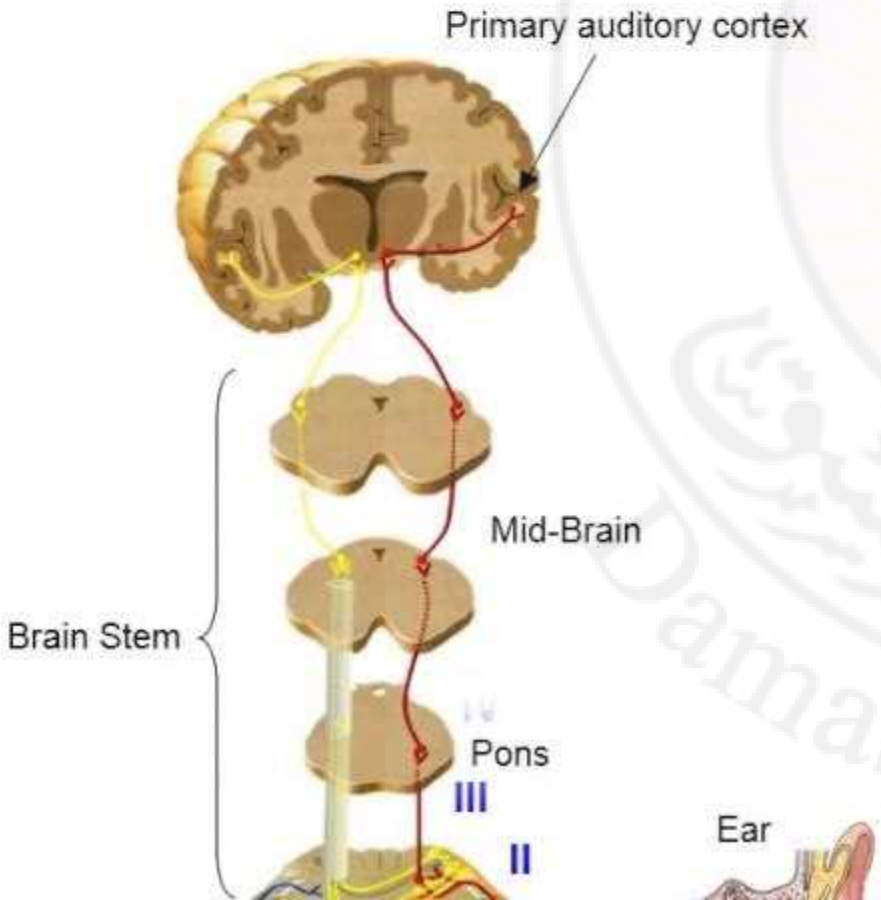

THRESHOLD AUDIOGRAM
Right Ear
Left Ear
Hearing Level (dB)
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
Warning
Referral
0.125
0.25
0.5
0.75
1
1.5
2
3
4
6
8
12
Frequency (kHz)

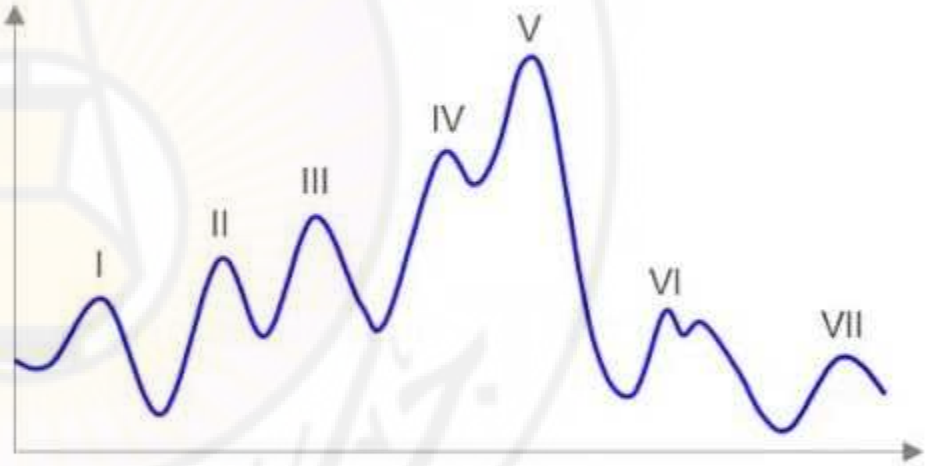
BAER / ABR

ABR : auditory brainstem response

BAER : Brainstem Auditory Evoked Response

ABR/BAERs evaluate the integrity of VIIIth cranial nerve at several levels on a broad range of hearing frequencies (2000 – 4000 Hz)



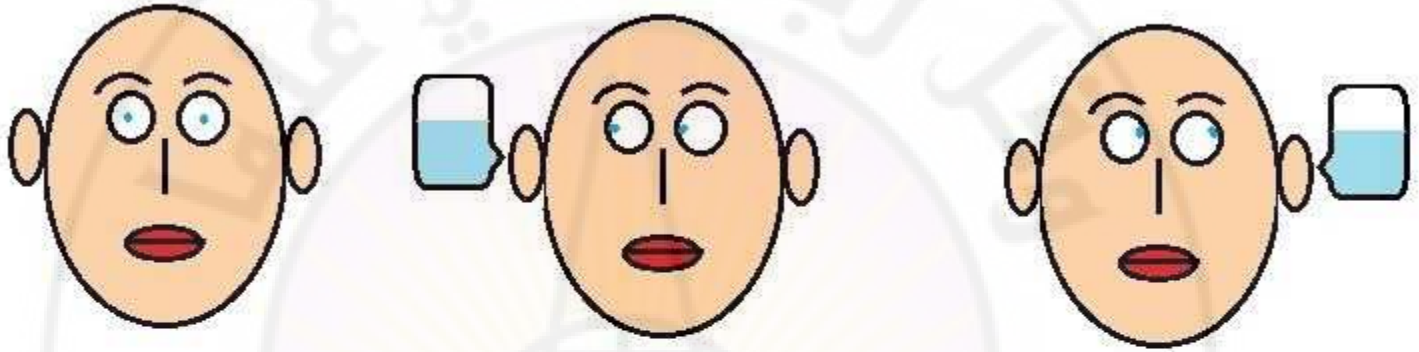


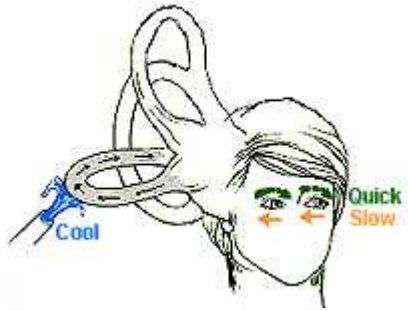
- **I** Distal spiral ganglia and auditory nerve
- **II** Proximal auditory nerve (cochlea nucleus)
- **III** Ventral cochlear nucleus in pons
- **IV** Inferior lateral lemiscus in pons
- **V** Lateral lemiscus in lower mid-brain



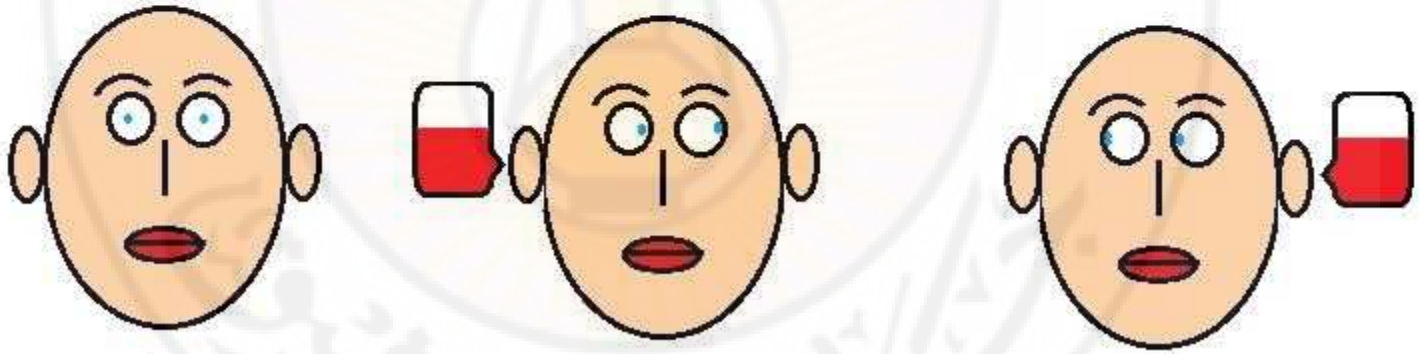
Vestibulo-ocular Reflex

Cold water:

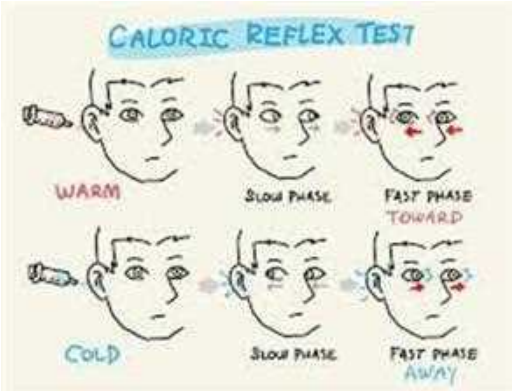




Warm water:



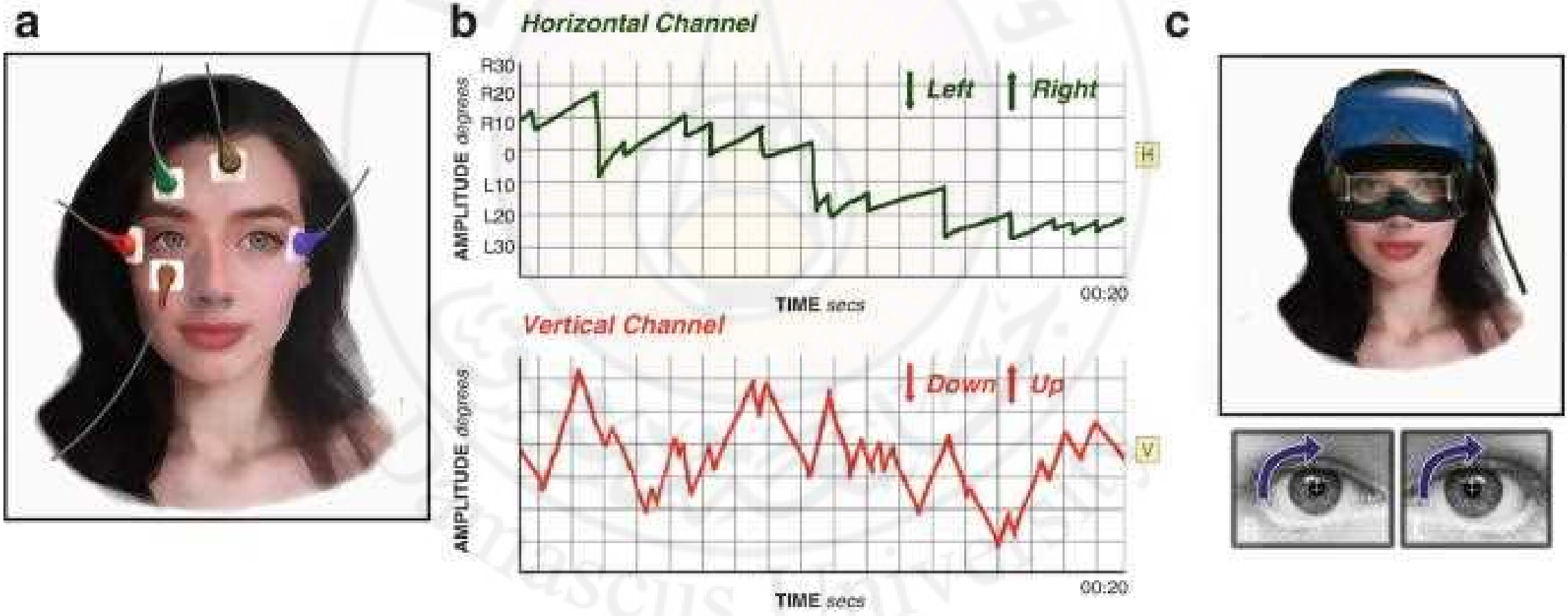


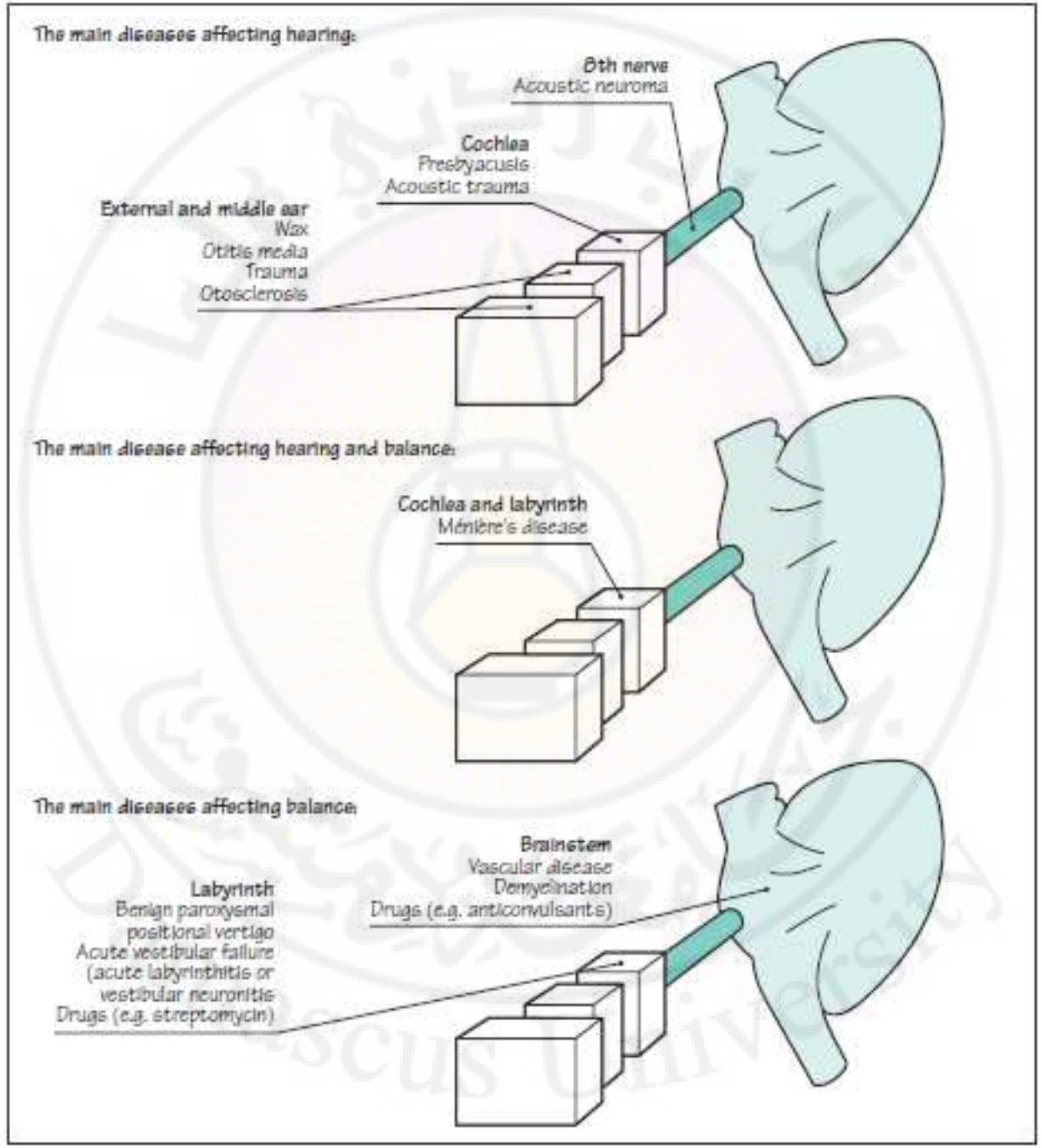


CALORIC TEST

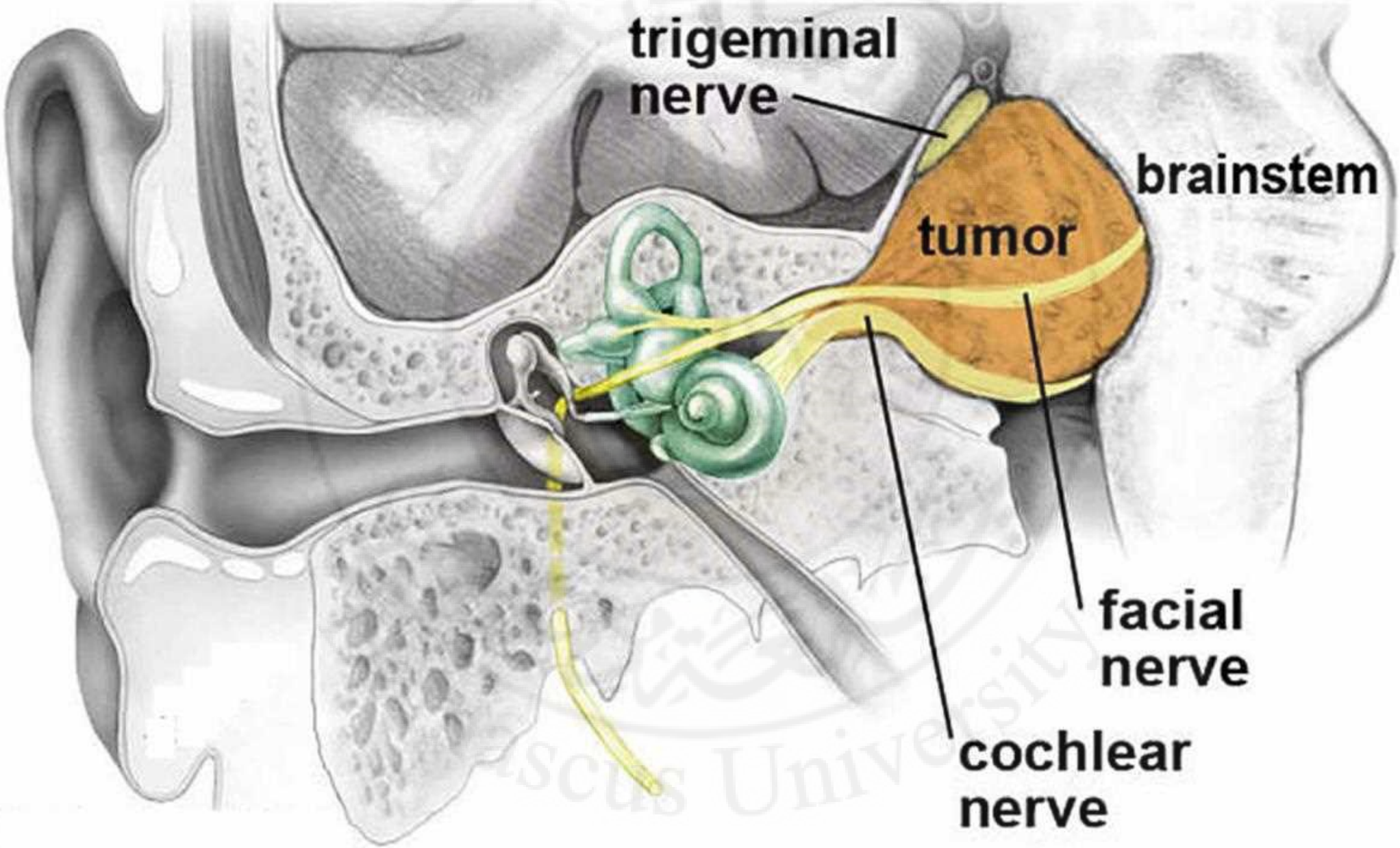
COWS ⇨ **C**old **O**pposite side
Warm **S**ame side

Electronystagmography




The main diseases affecting hearing:
8th nerve
Acoustic neuroma
Cochlea
Presbyacusis
Acoustic trauma
External and middle ear
Wax
Otitis media
Trauma
Otosclerosis
The main disease affecting hearing and balance:
Cochlea and labyrinth
Ménière's disease
The main diseases affecting balance:
Brainstem
Vascular disease
Demyelination
Drugs (e.g. anticonvulsants)
Labyrinth
Benign paroxysmal positional vertigo
Acute vestibular failure (acute labyrinthitis or vestibular neuronitis
Drugs (e.g. streptomycin)

acoustic neuroma



AGE-RELATED HEARING LOSS

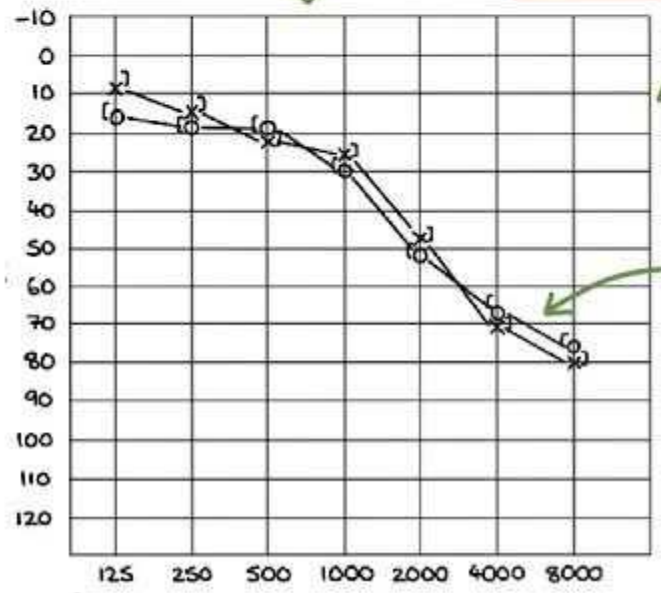
PRESBYCUSIS



BILATERAL

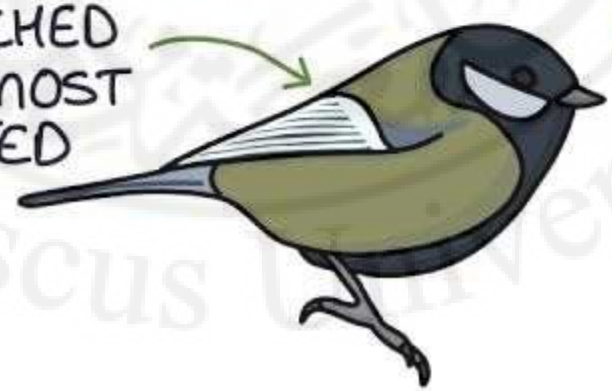


NOISE EXPOSURE

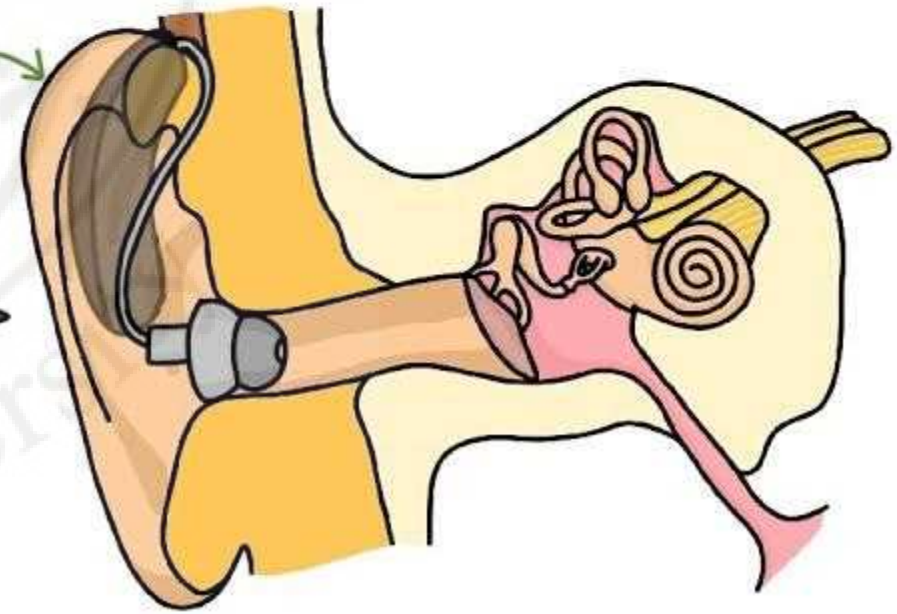


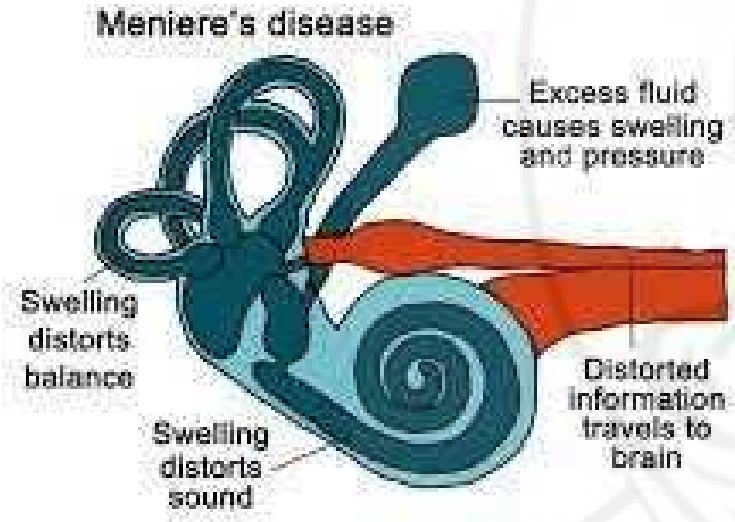
AUDIOGRAM

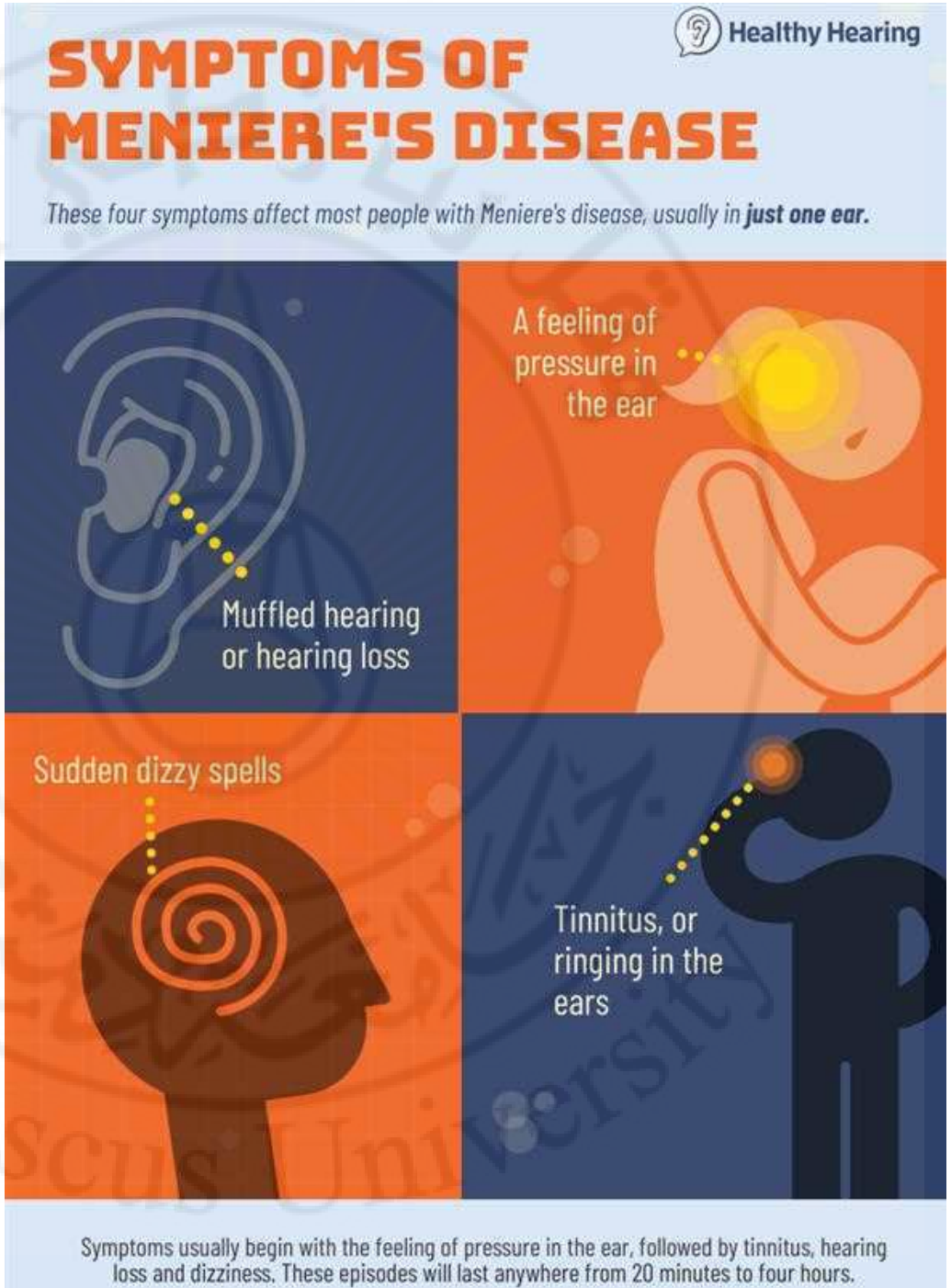
HIGH-PITCHED SOUNDS MOST AFFECTED

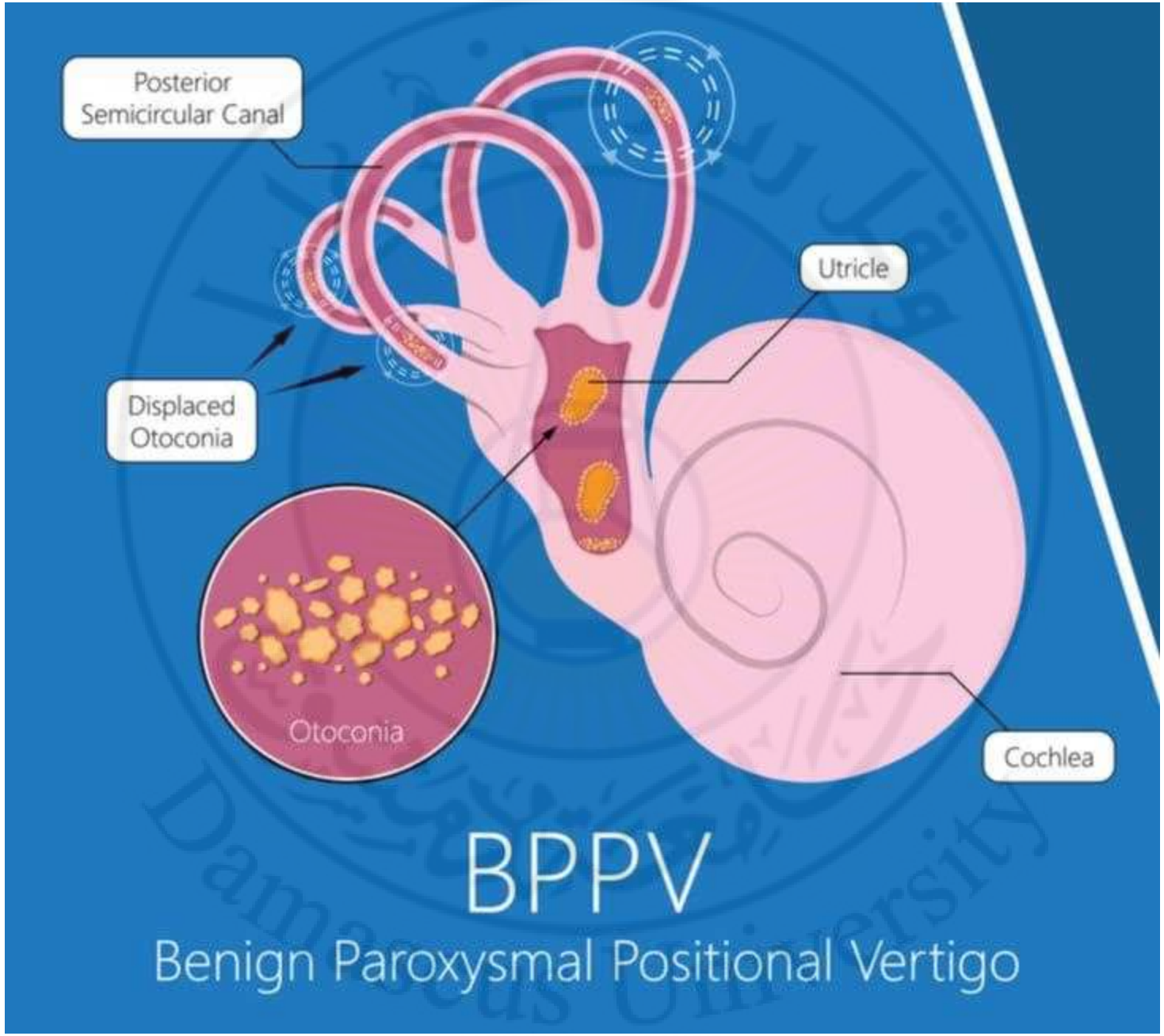


HEARING AID

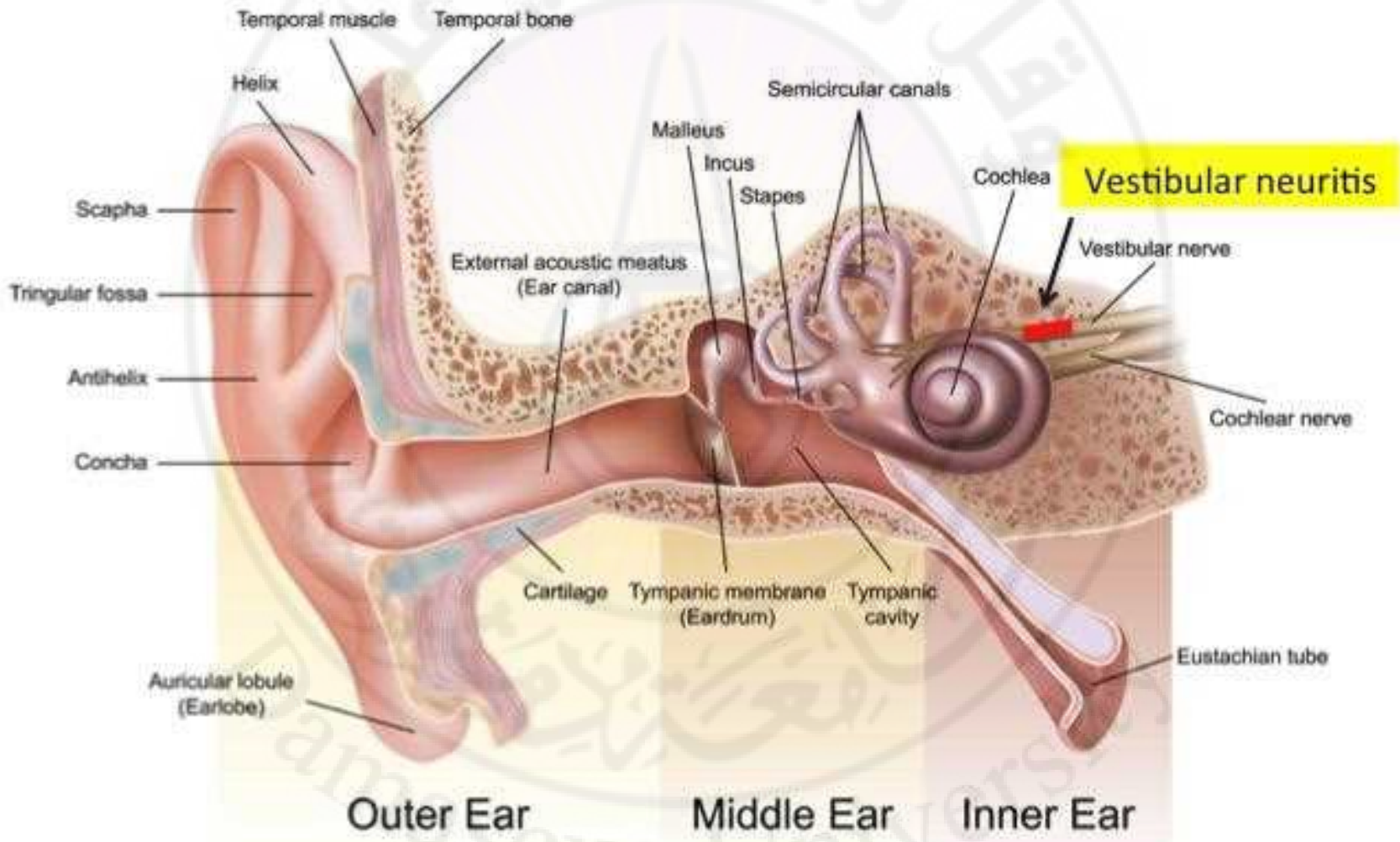



Meniere's disease
Excess fluid causes swelling and pressure
Swelling distorts balance
Distorted information travels to brain
Swelling distorts sound

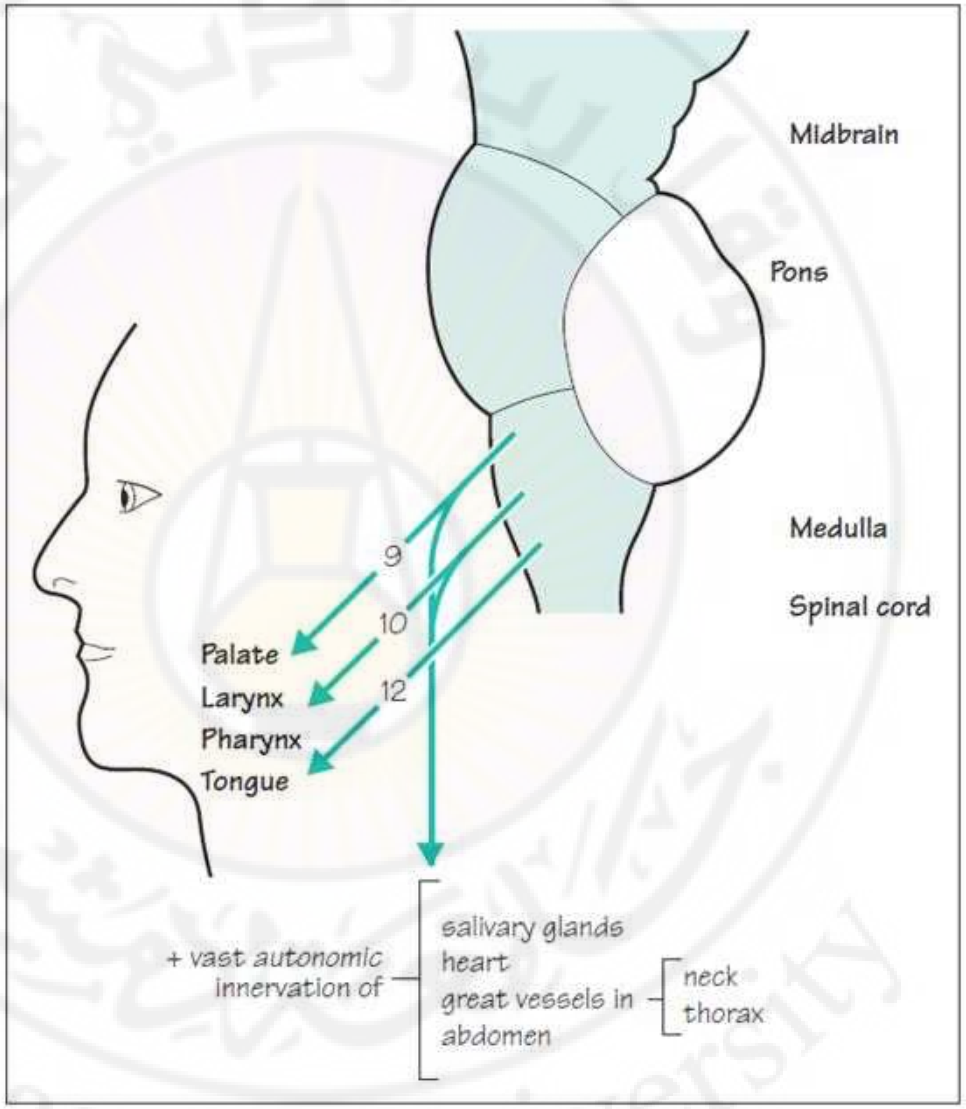

Healthy Hearing
SYMPTOMS OF MENIERE'S DISEASE
These four symptoms affect most people with Meniere's disease, usually in just one ear.
Muffled hearing or hearing loss
A feeling of pressure in the ear
Sudden dizzy spells
Tinnitus, or ringing in the ears
Symptoms usually begin with the feeling of pressure in the ear, followed by tinnitus, hearing loss and dizziness. These episodes will last anywhere from 20 minutes to four hours.


Posterior
Semicircular Canal
Utricle
Displaced
Otoconia
Otoconia
Cochlea
BPPV
Benign Paroxysmal Positional Vertigo

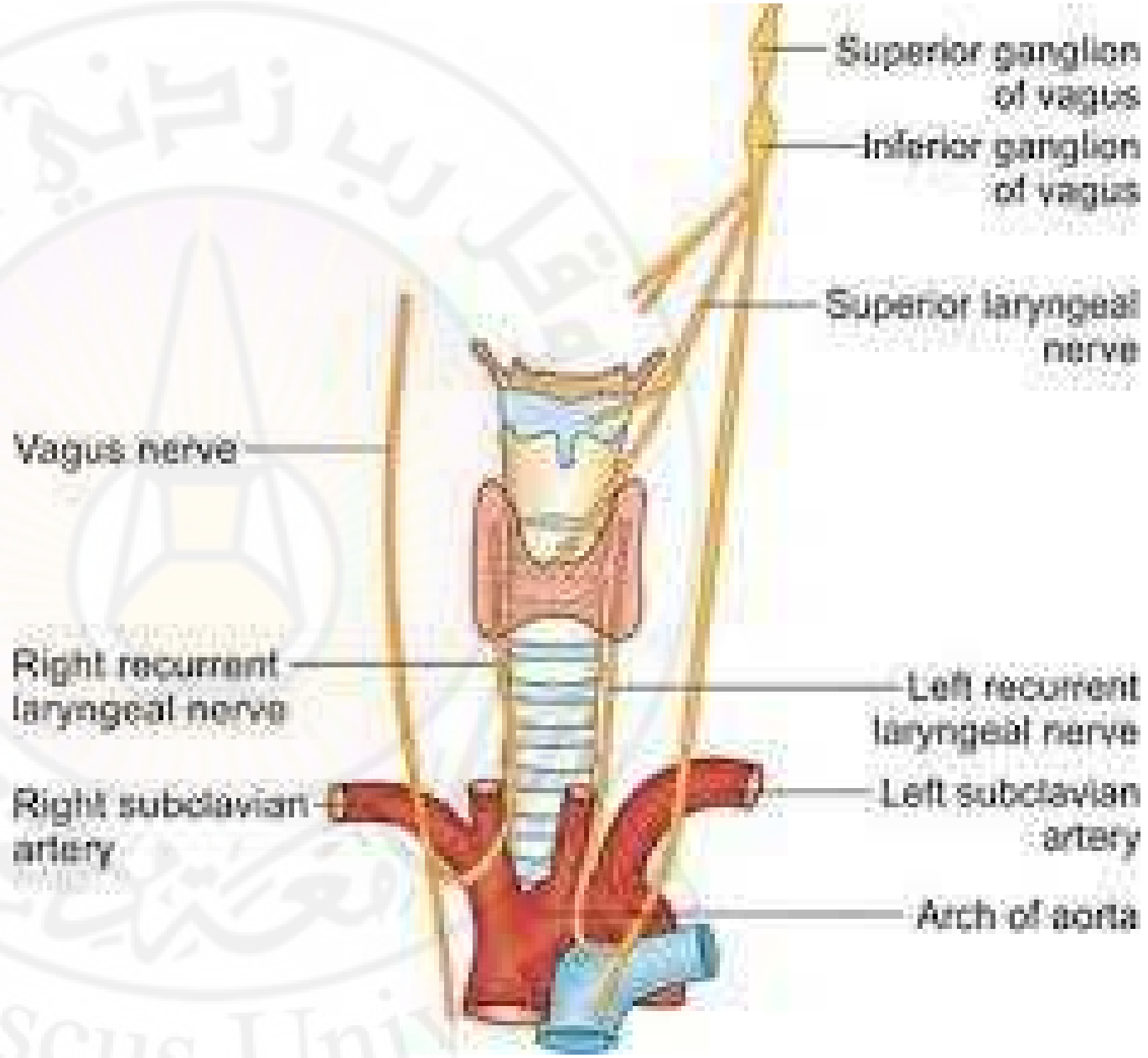
Vestibular neuritis



These three lower cranial nerves are considered in one section of
this chapter for two reasons.
1. Together they innervate the mouth and throat for normal speech and swallowing.
2. They are commonly involved in disease processes together, to give rise to the clinical picture of bulbar palsy.

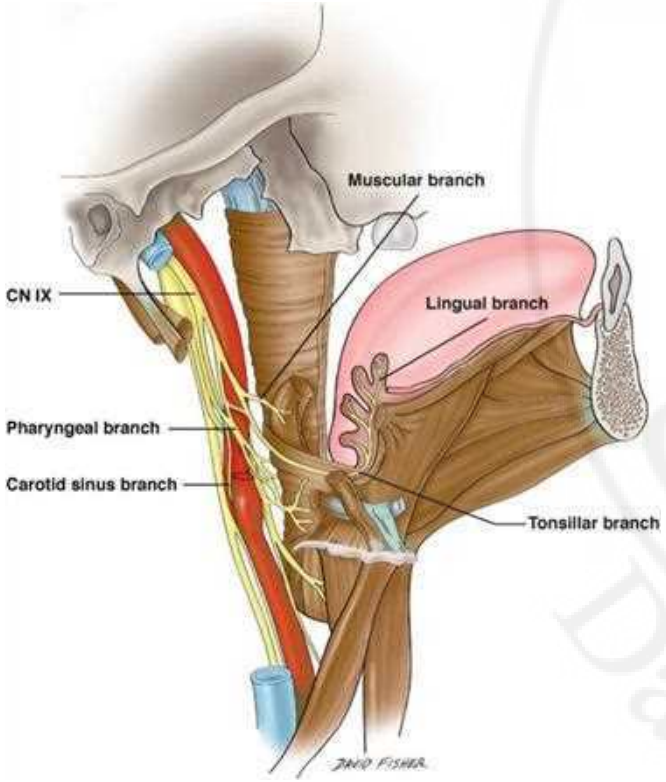


Innervation of the vocal cords by the long, thin, recurrent laryngeal nerves (from the vagus) exposes them to possible damage as far down as the subclavian artery on the right, and the arch of the aorta on the left.

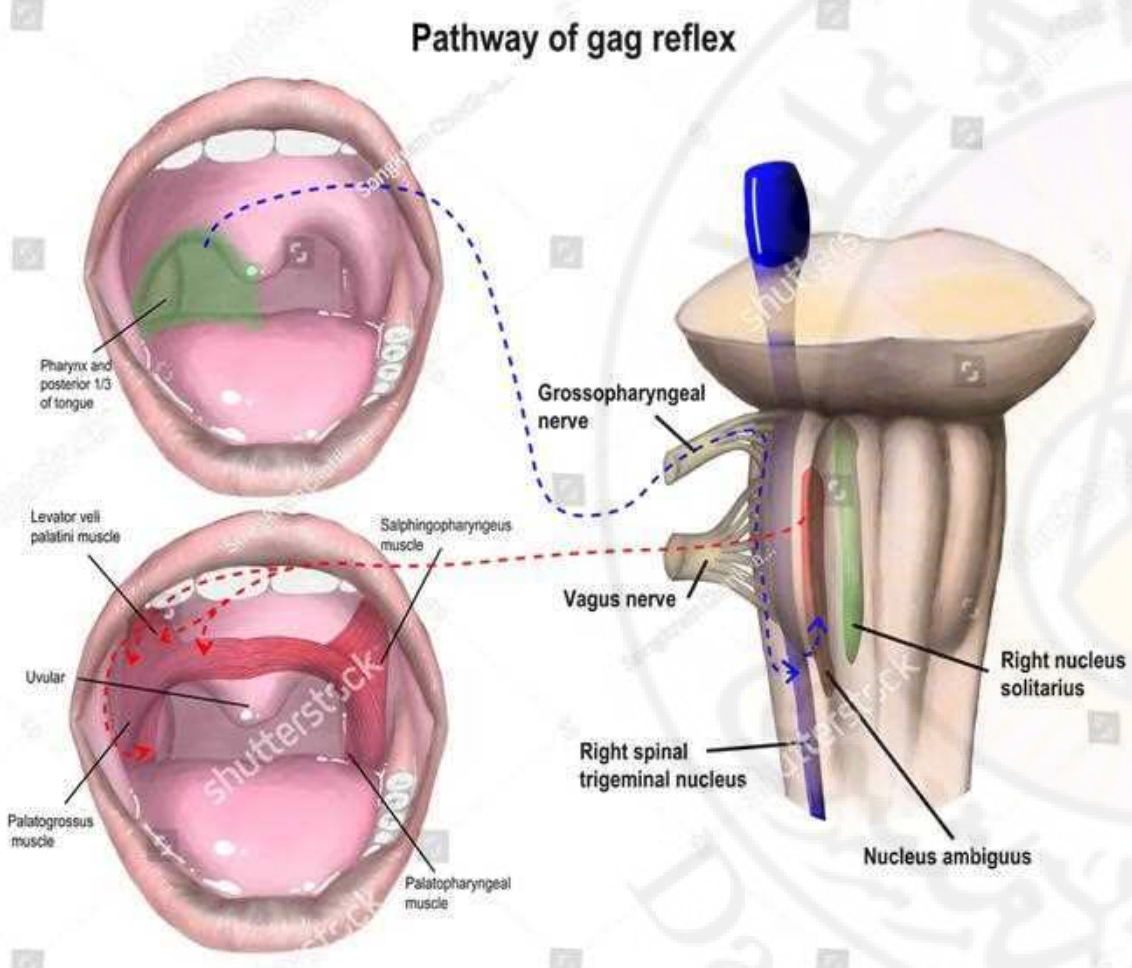


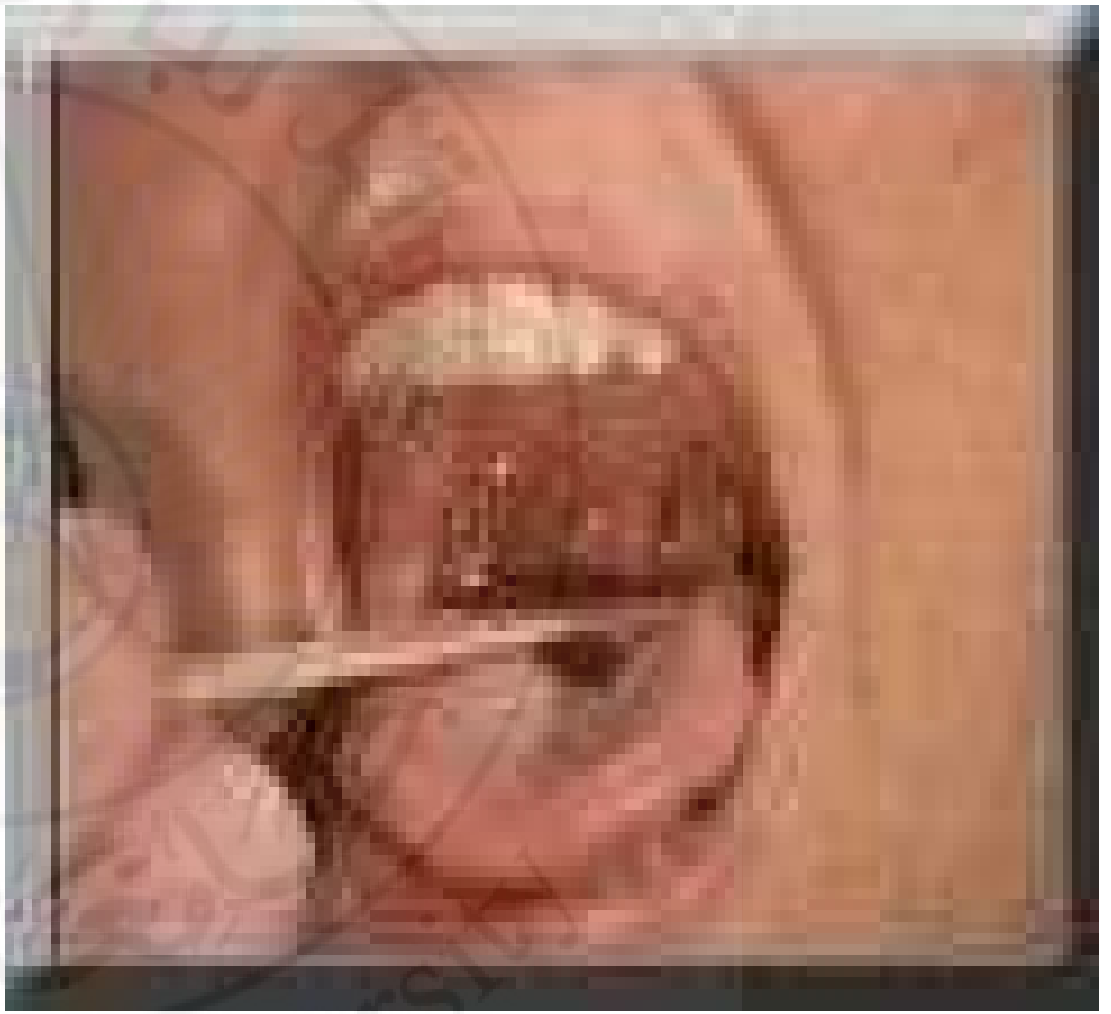
العلامات المؤكدة لإصابة الأعصاب التاسع والعاشر

اصابة المنطقة اللهوية البلعومية



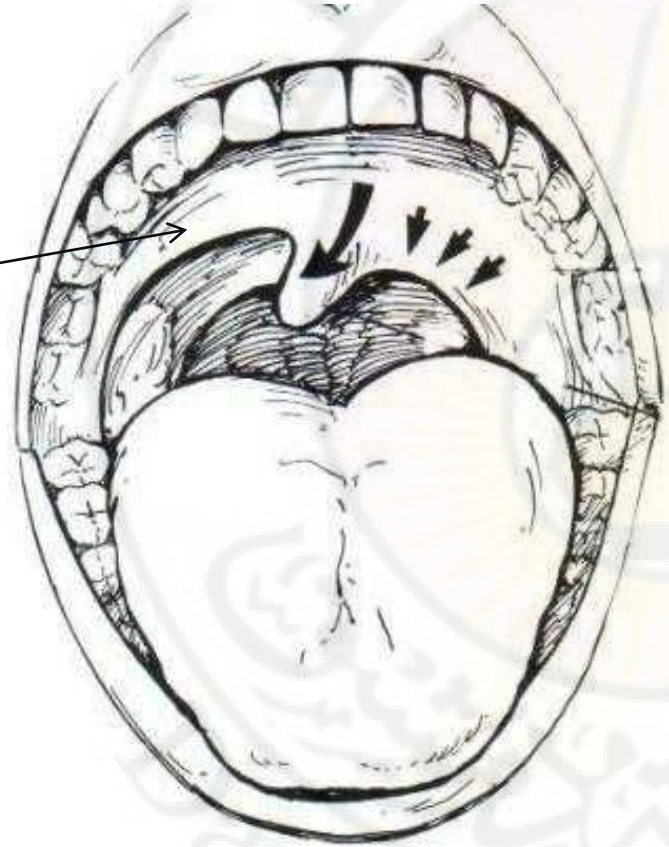
- يتدلى منخفضا بوضعية الراحة بجهة الضعف
- يرتفع للجهة السليمة أثناء التهوع Gag reflex والتصويت
- ينقص منعكس التهوع

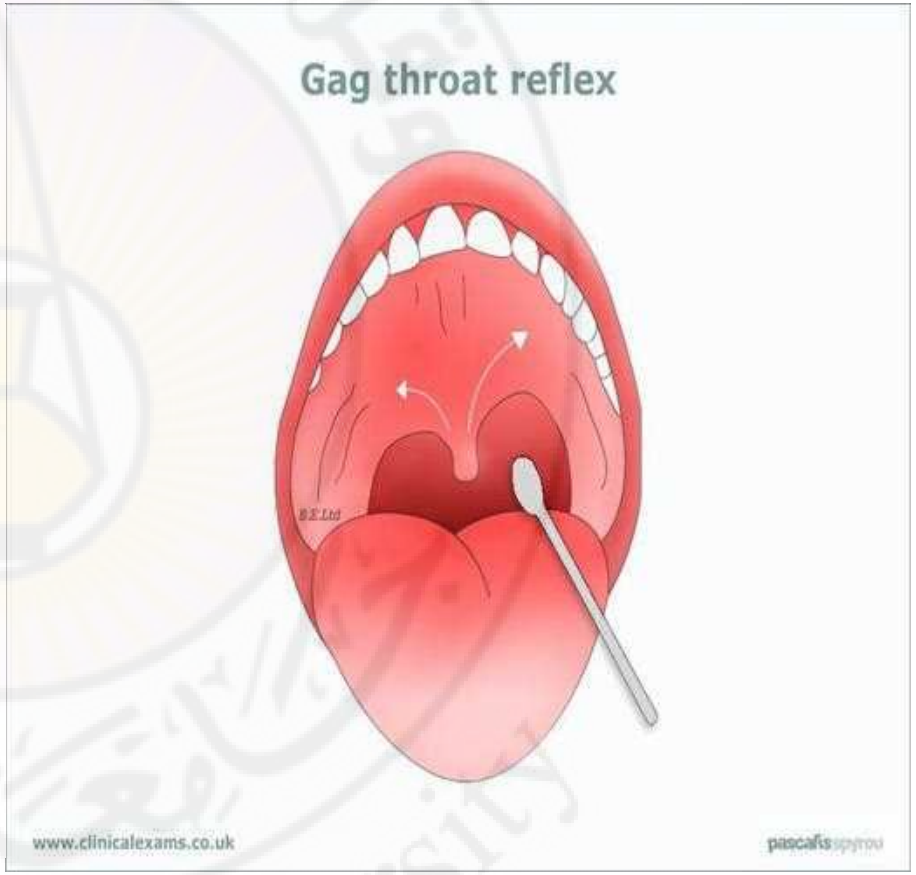

Pathway of gag reflex
Pharynx and posterior 1/3 of tongue
Grossopharyngeal nerve
Levator veli palatini muscle
Salphingopharyngeus muscle
Vagus nerve
Uvular
Right nucleus solitarius
Right spinal trigeminal nucleus
Palatogrossus muscle
Palatopharyngeal muscle
Nucleus ambiguus



منعكس التهوع

الجهة السليمة



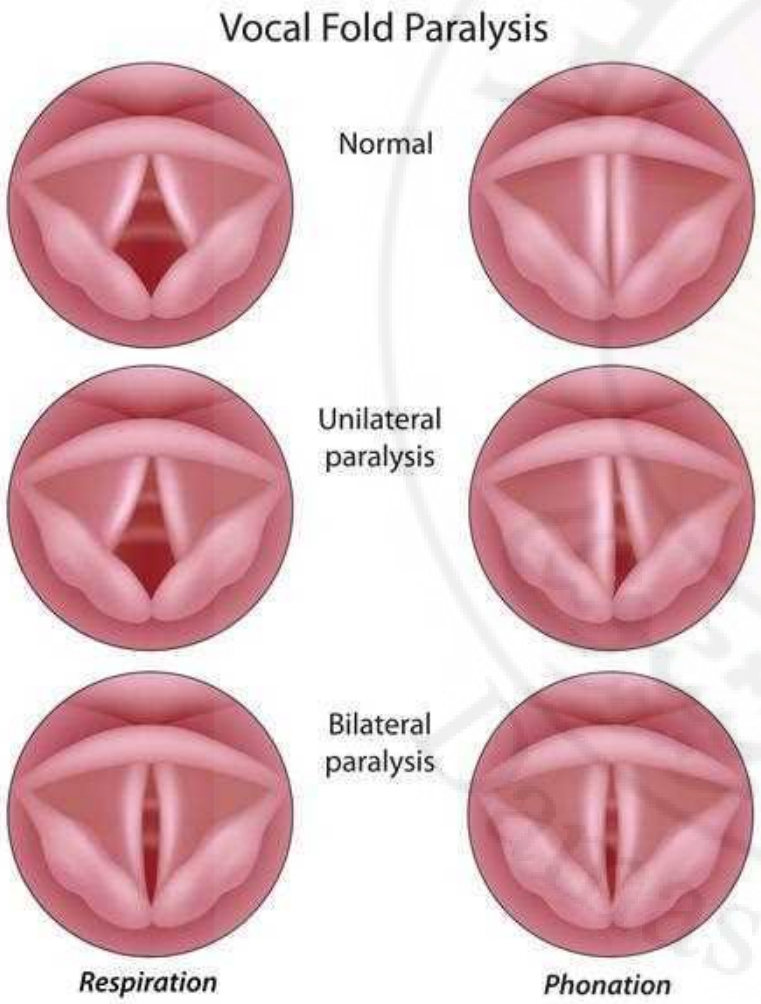


عندما يقول المريض "آه" ترتفع اللهاة للجهة القوية





العلامات المؤكدة لإصابة العصب العاشر (المبهم)



اصابة الحنجرة

- Glottal coup
- السعال ضعيف
- ترتفع الحنجرة الطبيعية أثناء البلع
- شلل الحبلين الصوتين





فحص العصبين التاسع والعاشر





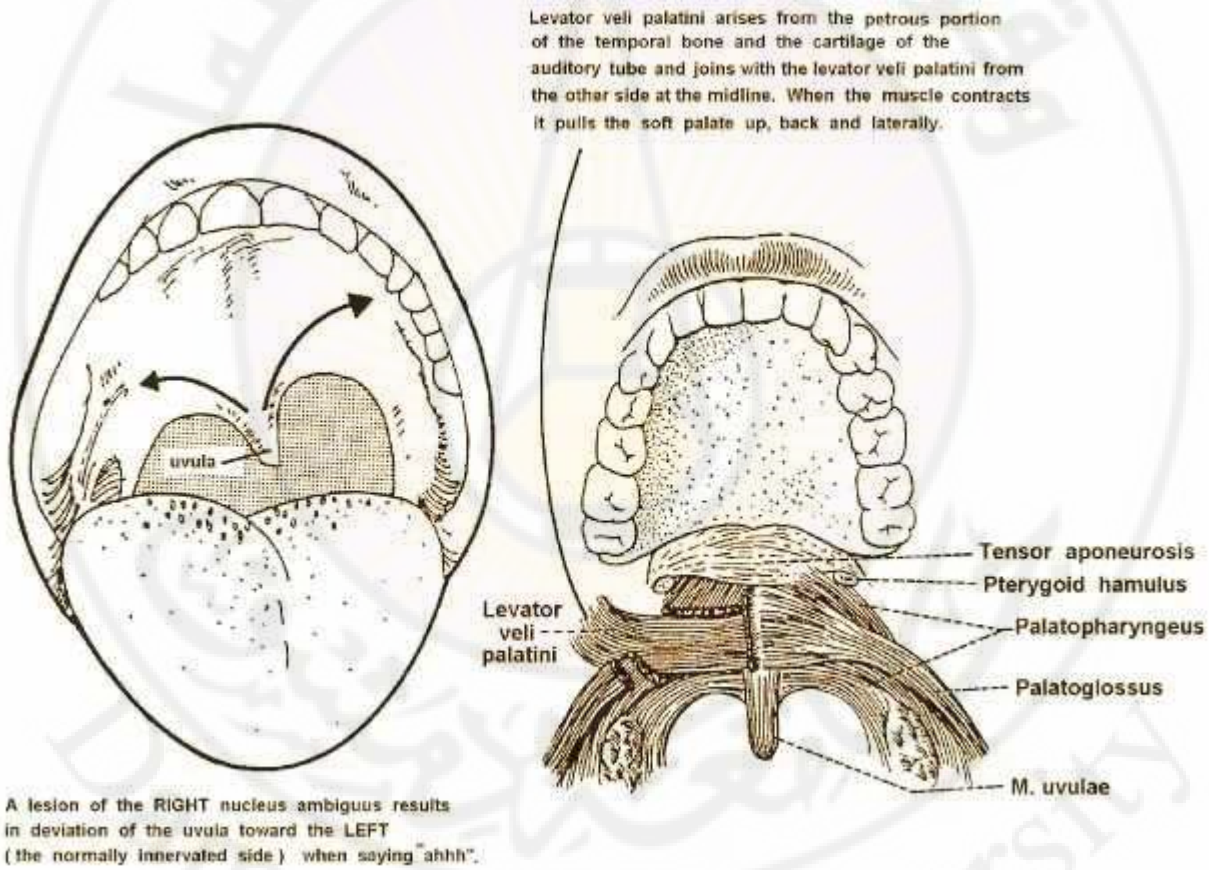
اصابة العصب العاشر (المبهم)



From "Cranial Nerves in Health and Disease" 2002,
© Wilson-Pauwels, Akesson, Stewart, Spacey, B C Decker Inc.

تنحرف اللهاة للجهة السليمة

اصابة العصب العاشر (المبهم)



اصابة العصب العاشر (المبهم)



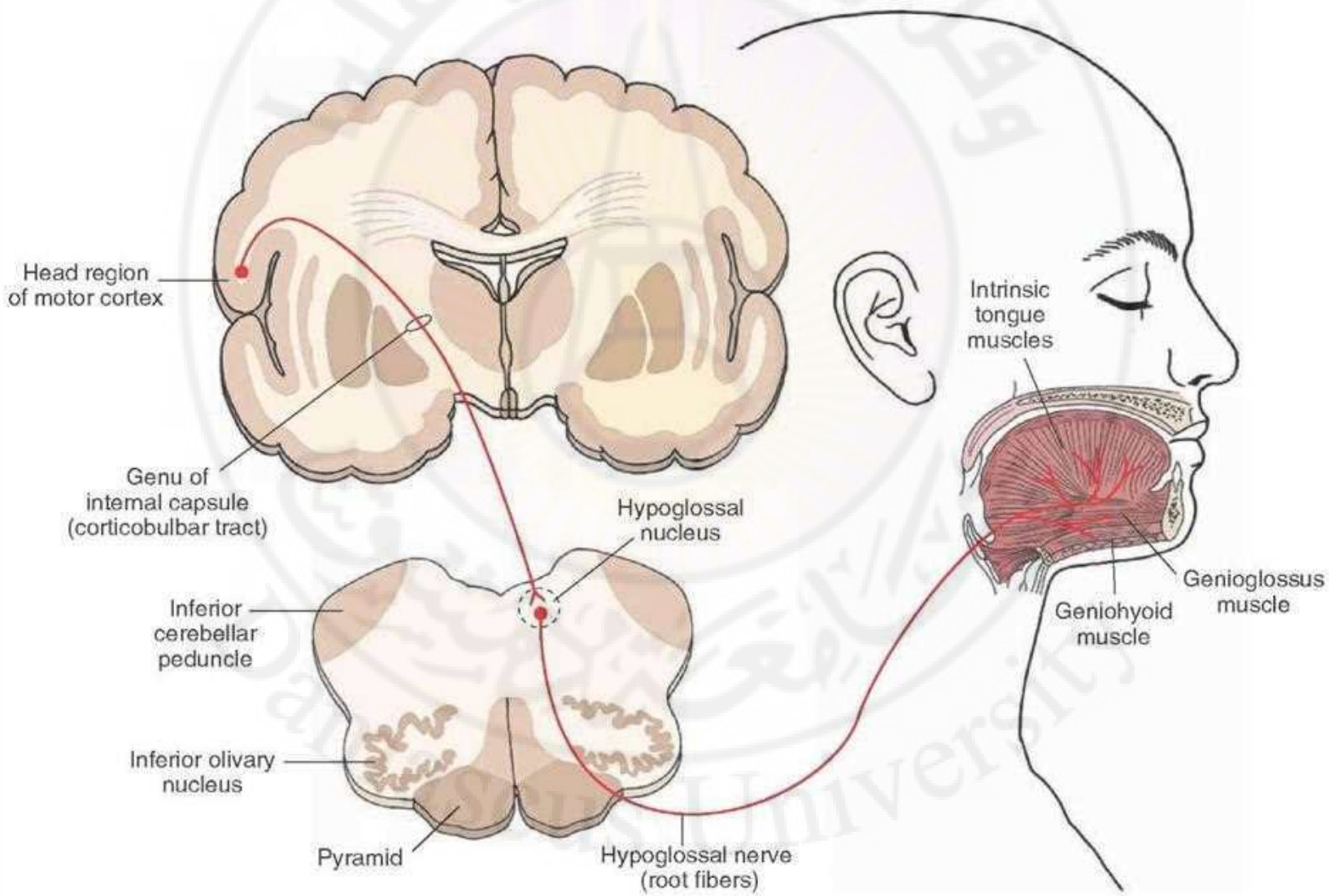
انحراف اللهاة للأيسر (الجهة السليمة)

العلامات المؤكدة لإصابة العصب الثاني عشر (تحت اللساني)

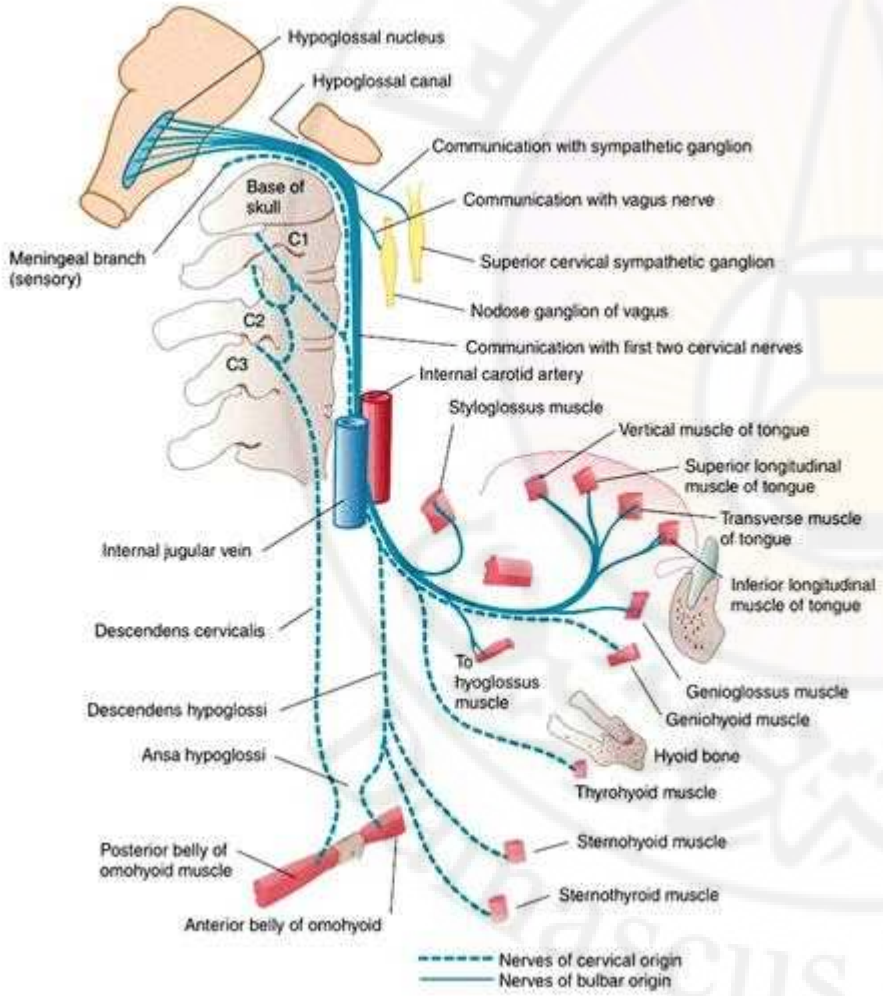
اصابة اللسان

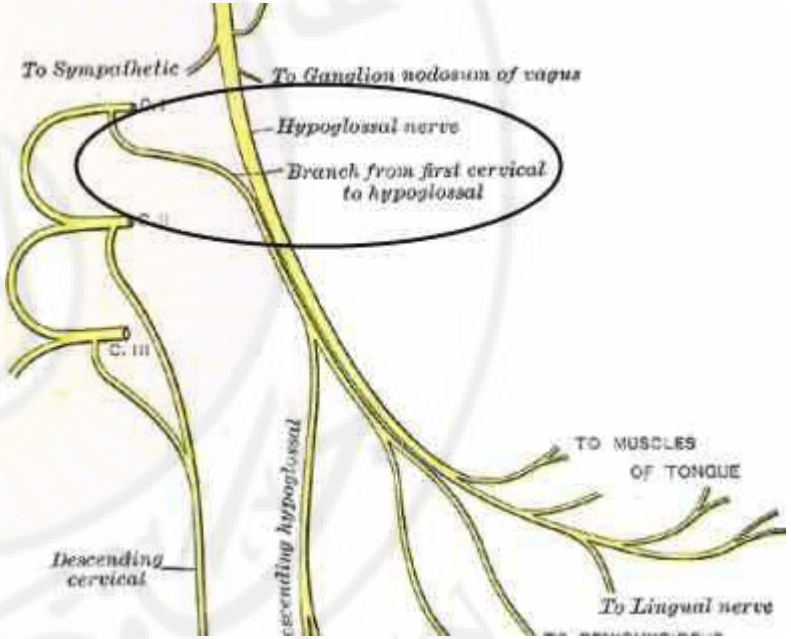
- اللسان ينحرف إلى الجهة المصابة
- هناك تقلصات حزمية وضمور

العصب الثاني عشر (تحت اللساني)



العصب الثاني عشر (تحت اللساني)

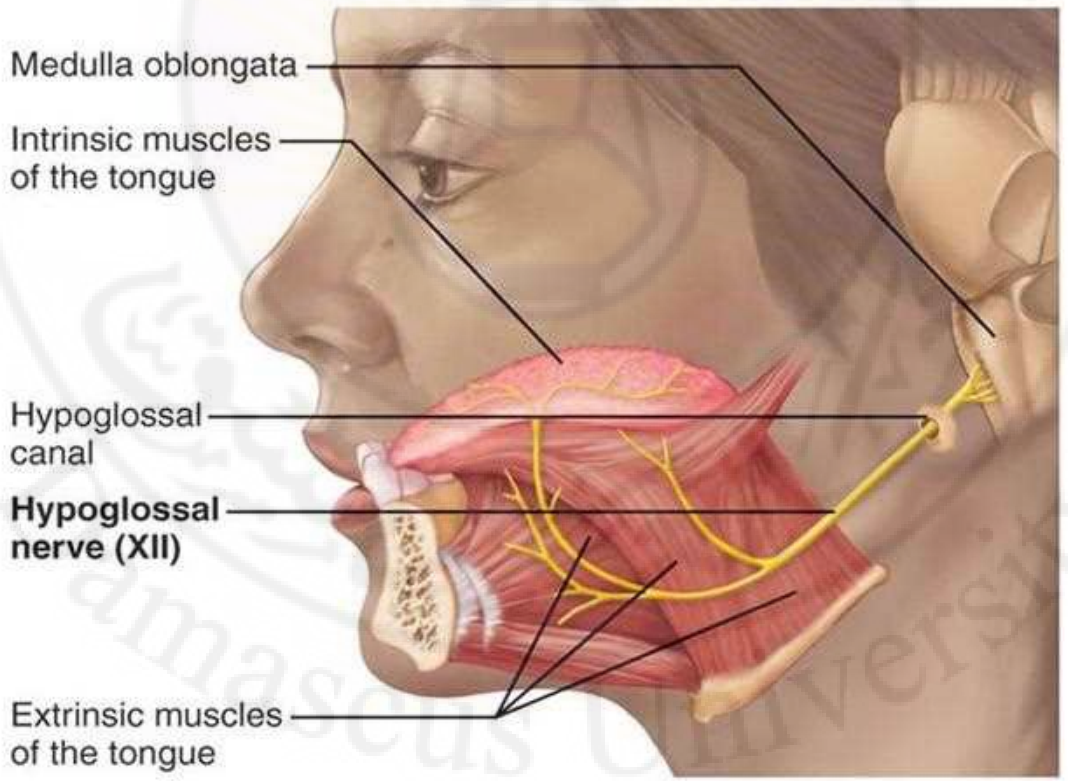




العصب الثاني عشر (تحت اللساني)

The Hypoglossal Nerves - XII

- Runs inferior to the tongue
  - Innervates the tongue muscles



فحص العصب الثاني عشر



Figure XII–8 Testing of the tongue involves **A**, protruding the tongue to observe if it sticks straight out or deviates to the side and **B**, pushing the tongue into the cheek against resistance.

From "Cranial Nerves in Health and Disease" 2002, © Wilson-Pauwels, Akesson, Stewart, Spacey, B C Decker Inc.

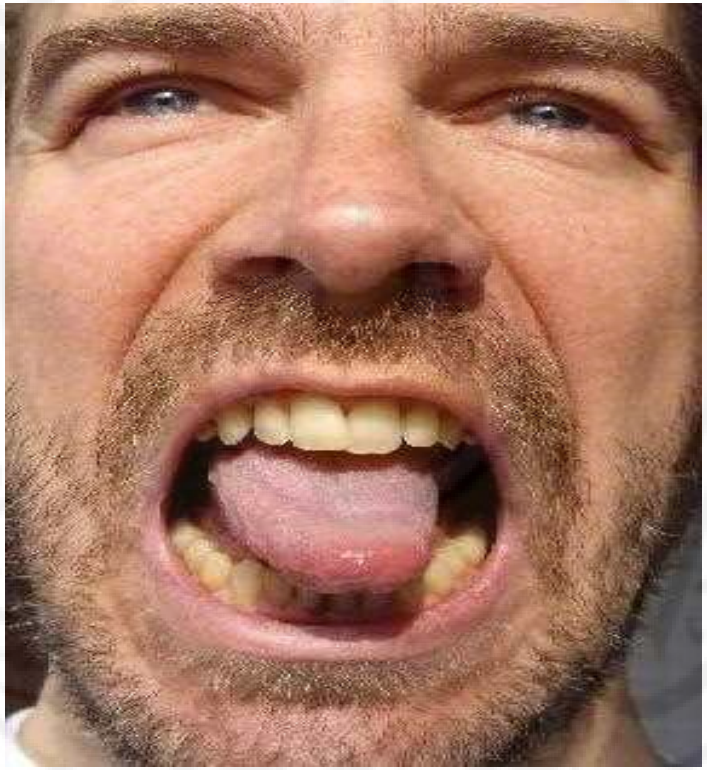
اصابة اللسان (العصب الثاني عشر (تحت اللساني))





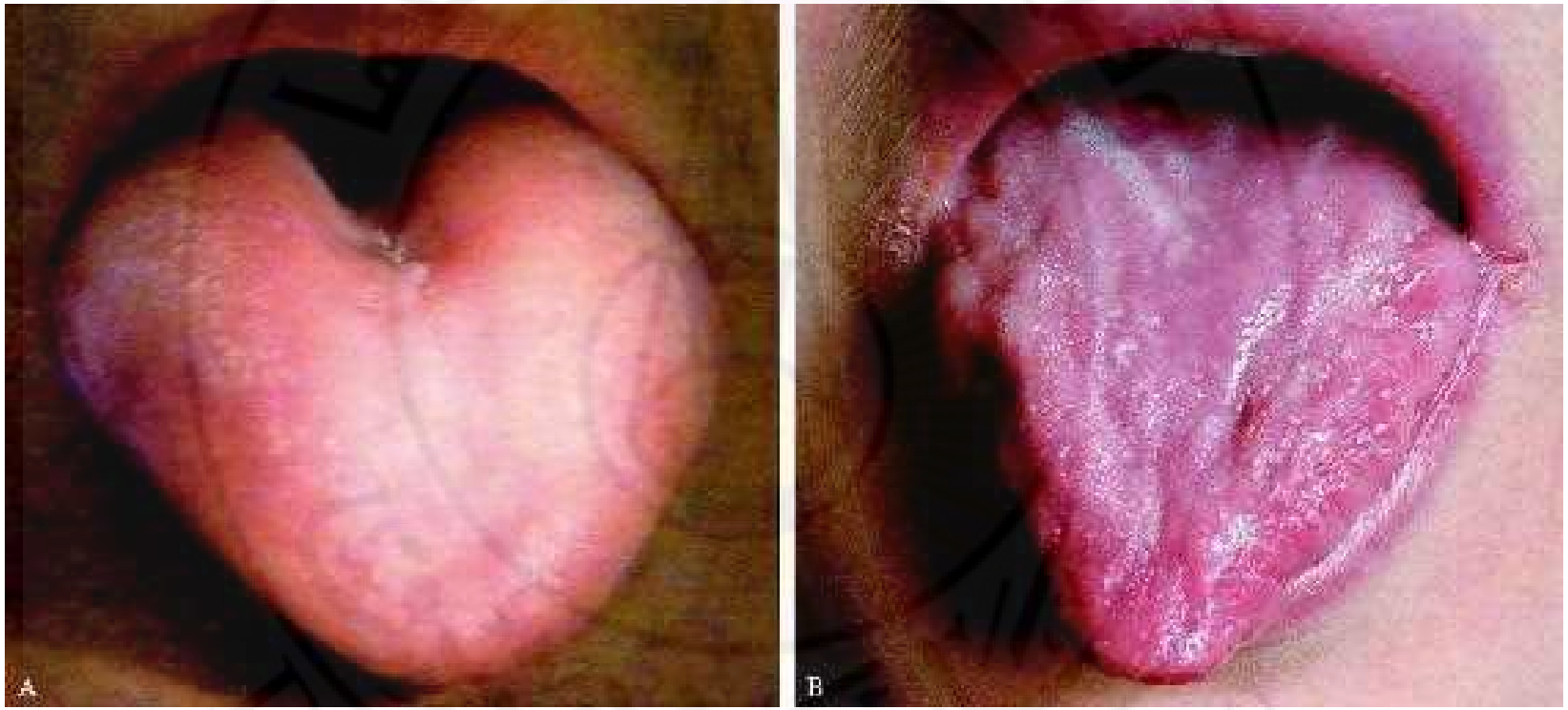
السان ينحرف للجهة المصابة

اصابة اللسان (العصب الثاني عشر (تحت اللساني))



Protruded tongue deviation is a neurological indicator of unilateral weakness effecting the side the tongue deviates to

اصابة اللسان (العصب الثاني عشر (تحت اللساني))

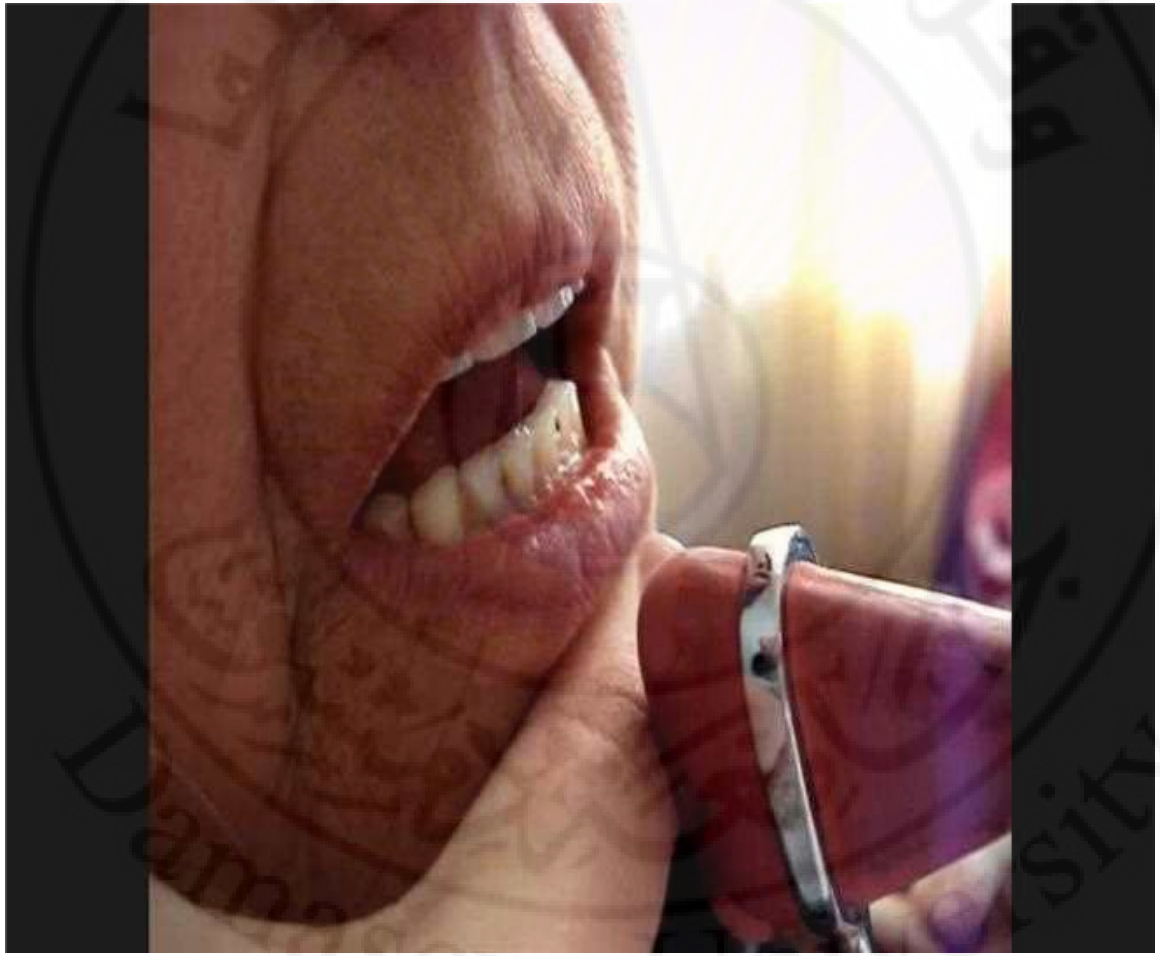


Left: Atrophy of the tongue.
Right: Fasciculations of the tongue



uvulA – Away
Tongue – Towards

المنعكس الفكي



يكون مشتدا في اصابة العصبون العلوي

Bulbar palsy

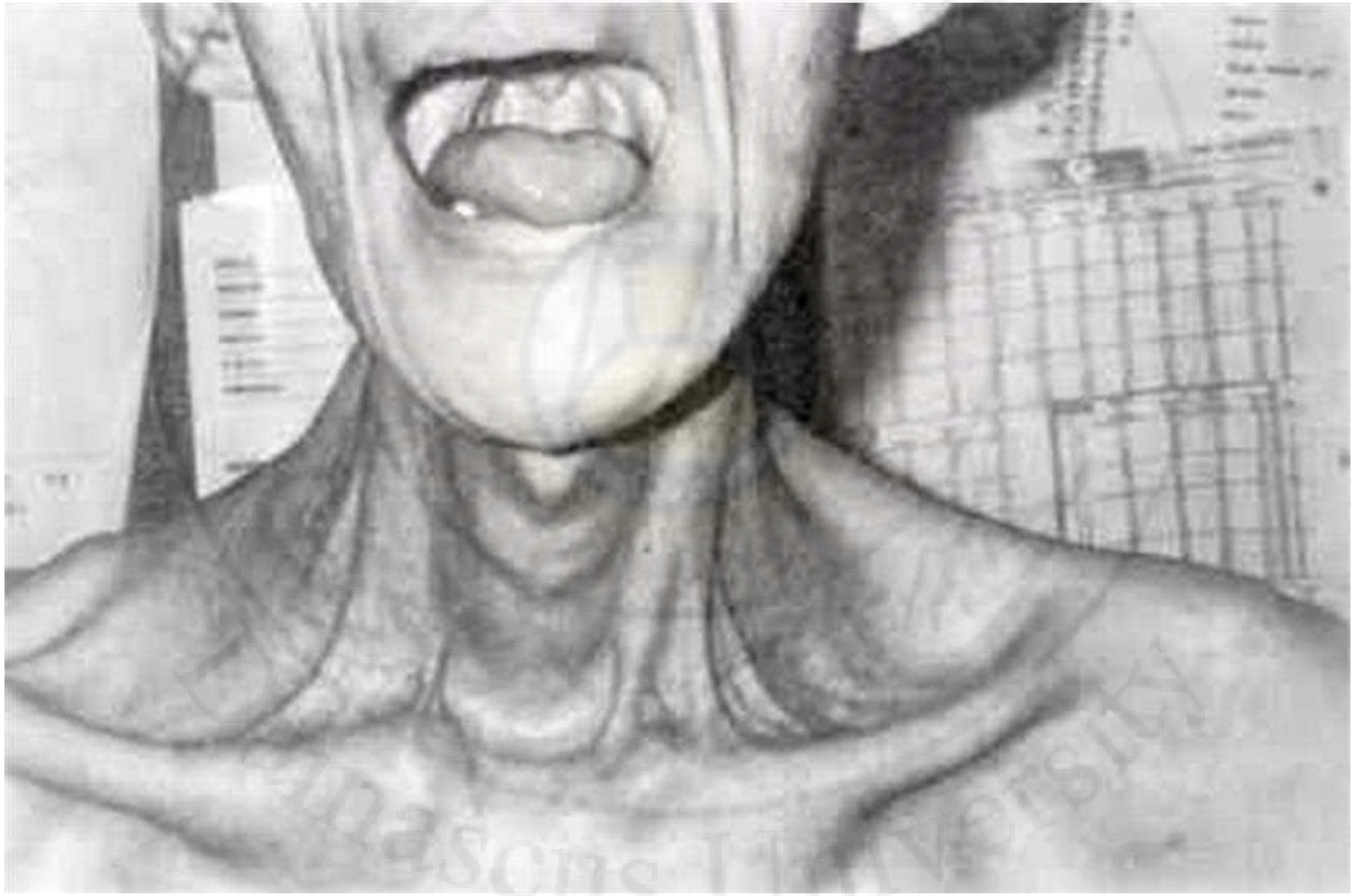
When there is bilateral impairment of function in the 9th, 10th and 12th cranial nerves, the clinical syndrome of bulbar palsy evolves. The features of bulbar palsy are:

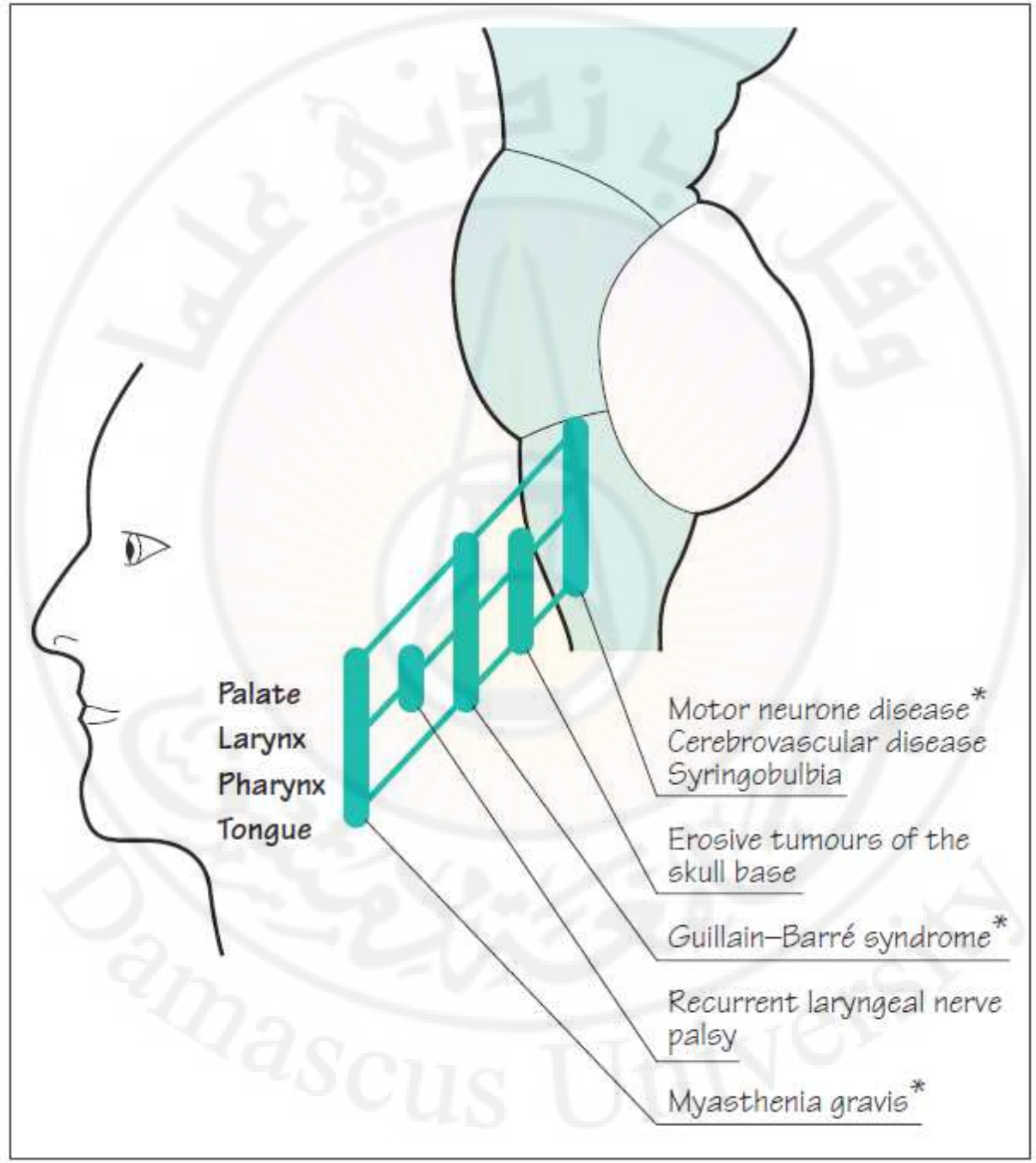
- *dysarthria*;
- *dysphagia*, often with choking episodes and/or nasal regurgitation of fluids;
- *dysphonia* and *poor cough*, because of weak vocal cords;
- *susceptibility to aspiration pneumonia.*

الشلل البصلي

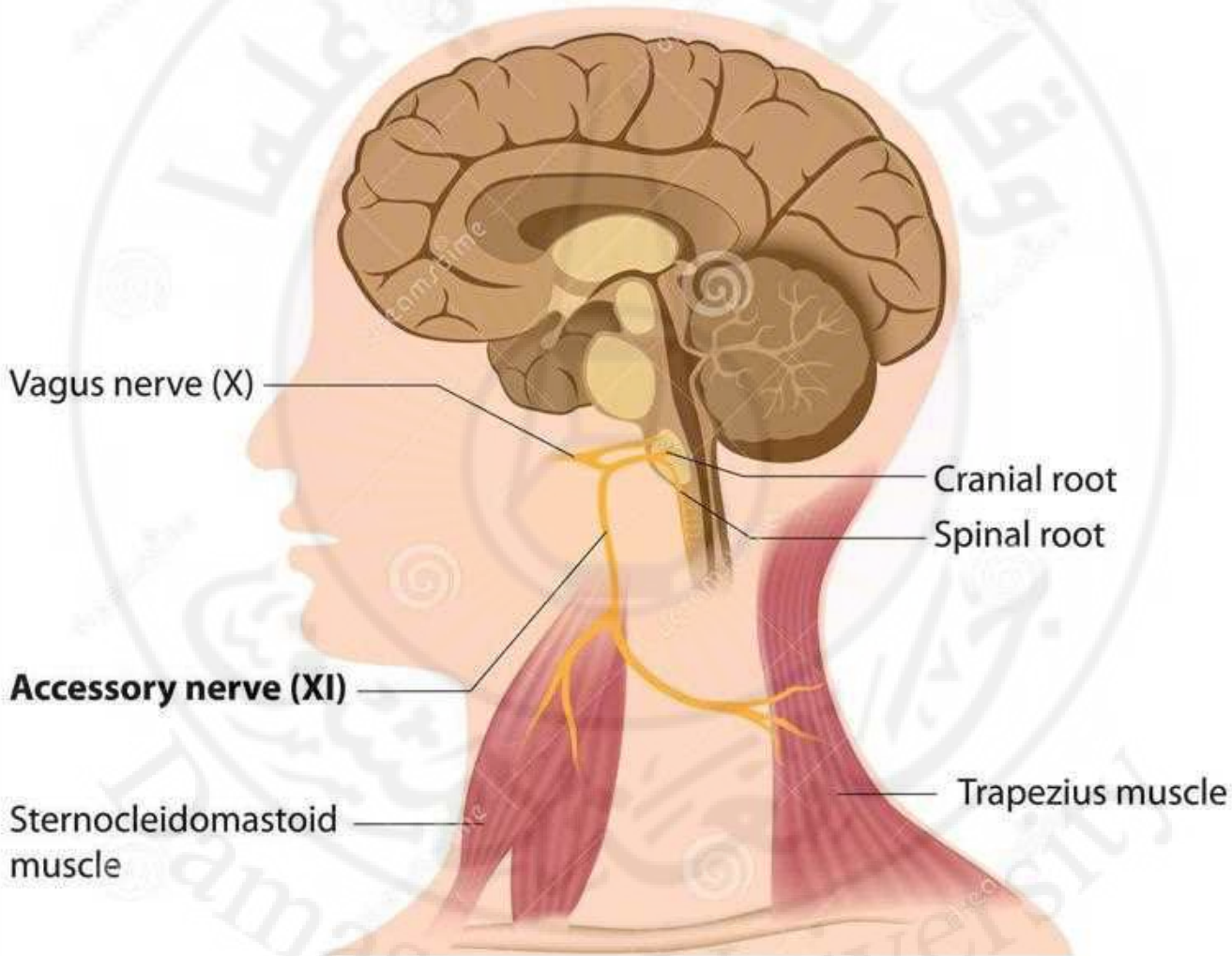


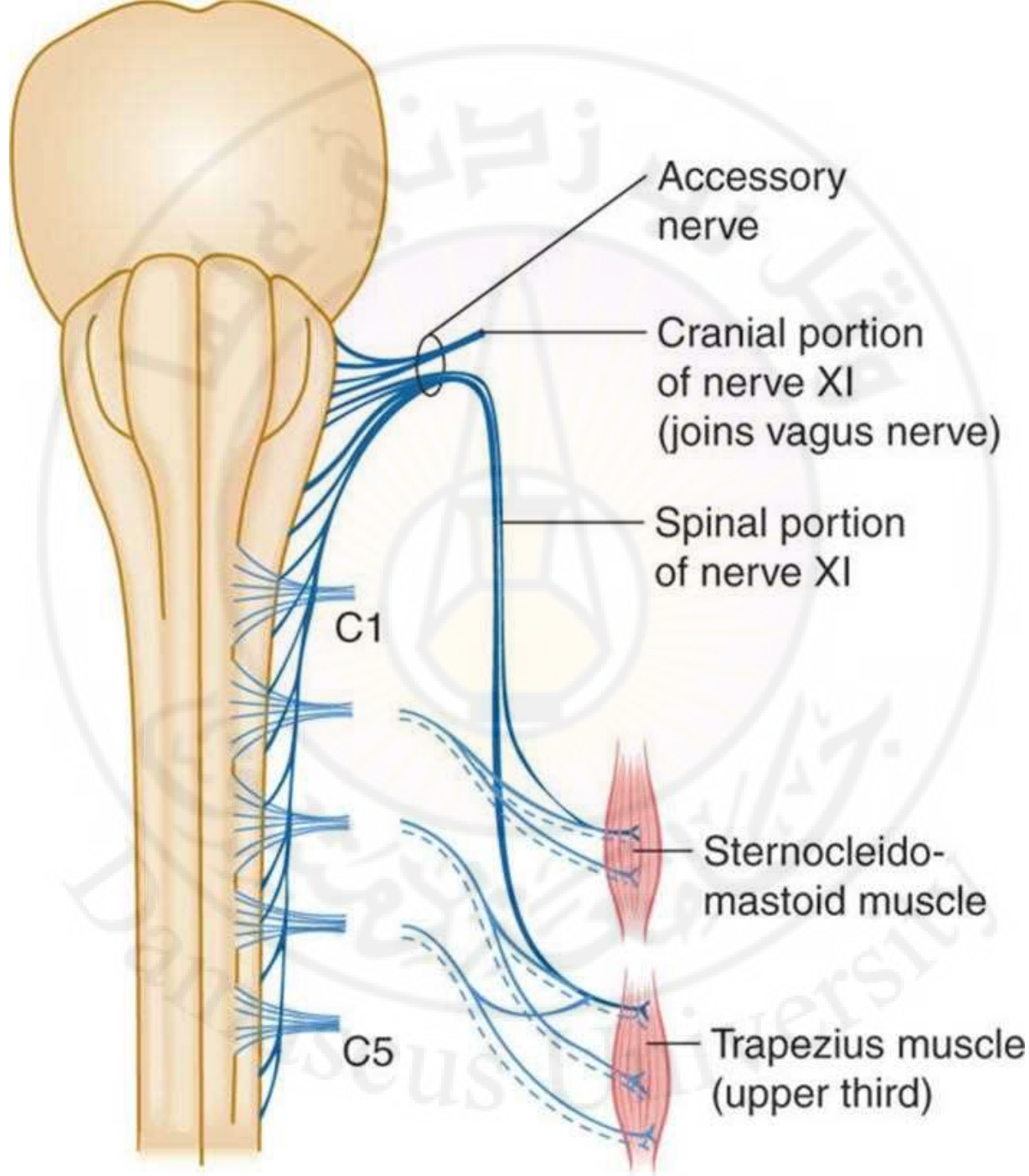
الشلل البصلي الكاذب تلو علاج شعاعي

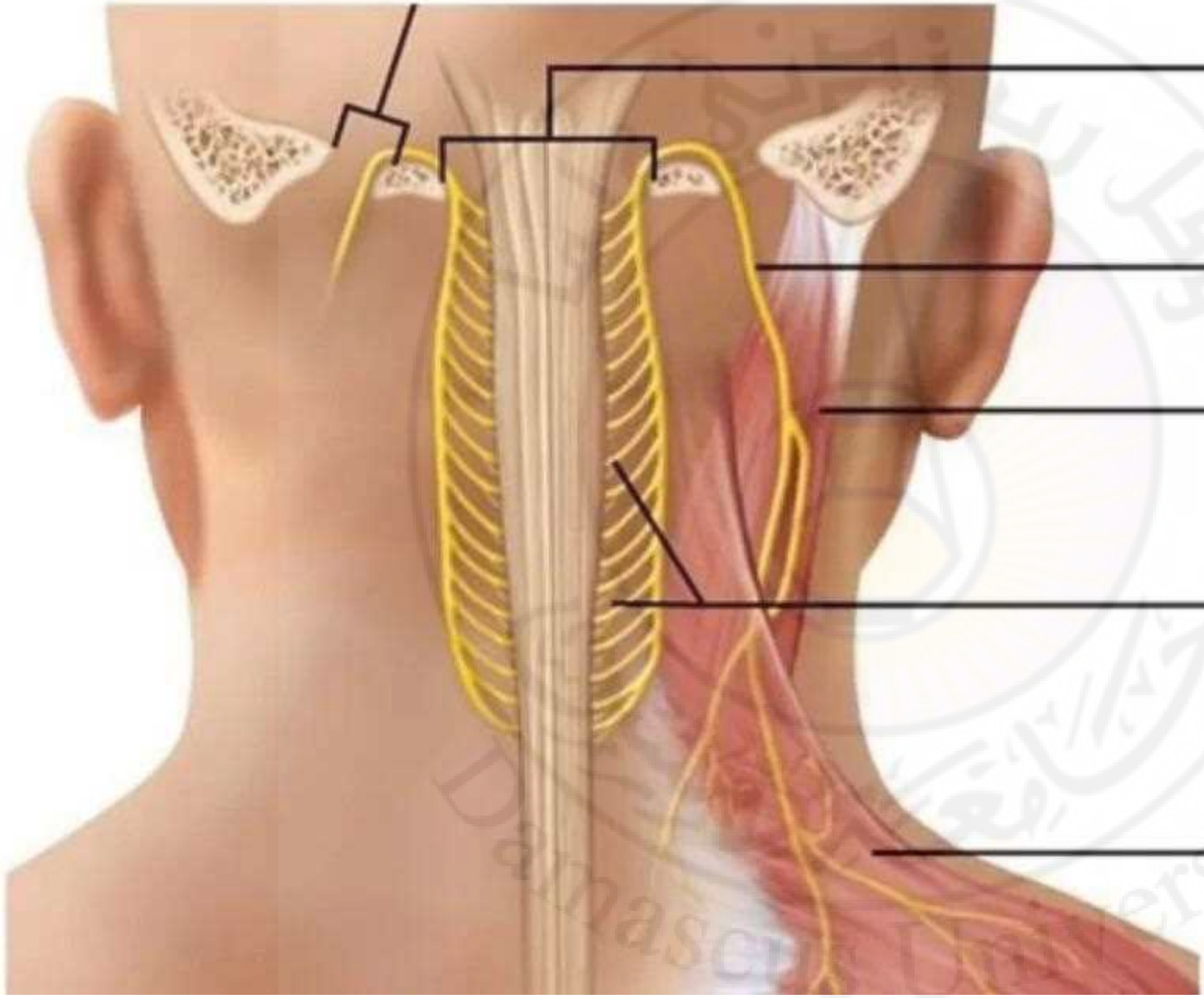


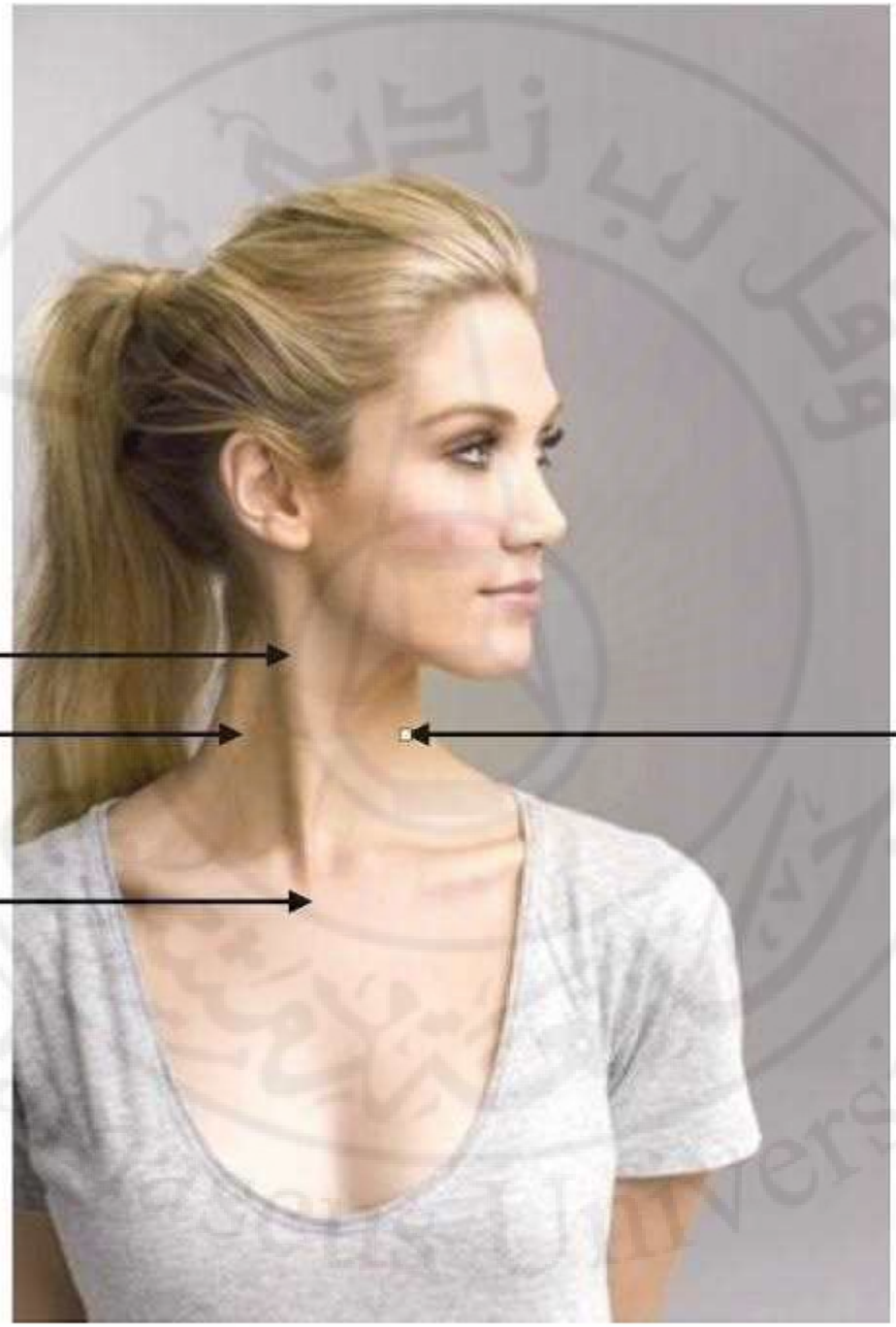

Palate
Larynx
Pharynx
Tongue
Motor neurone disease*
Cerebrovascular disease
Syringobulbia
Erosive tumours of the skull base
Guillain–Barré syndrome*
Recurrent laryngeal nerve palsy
Myasthenia gravis*

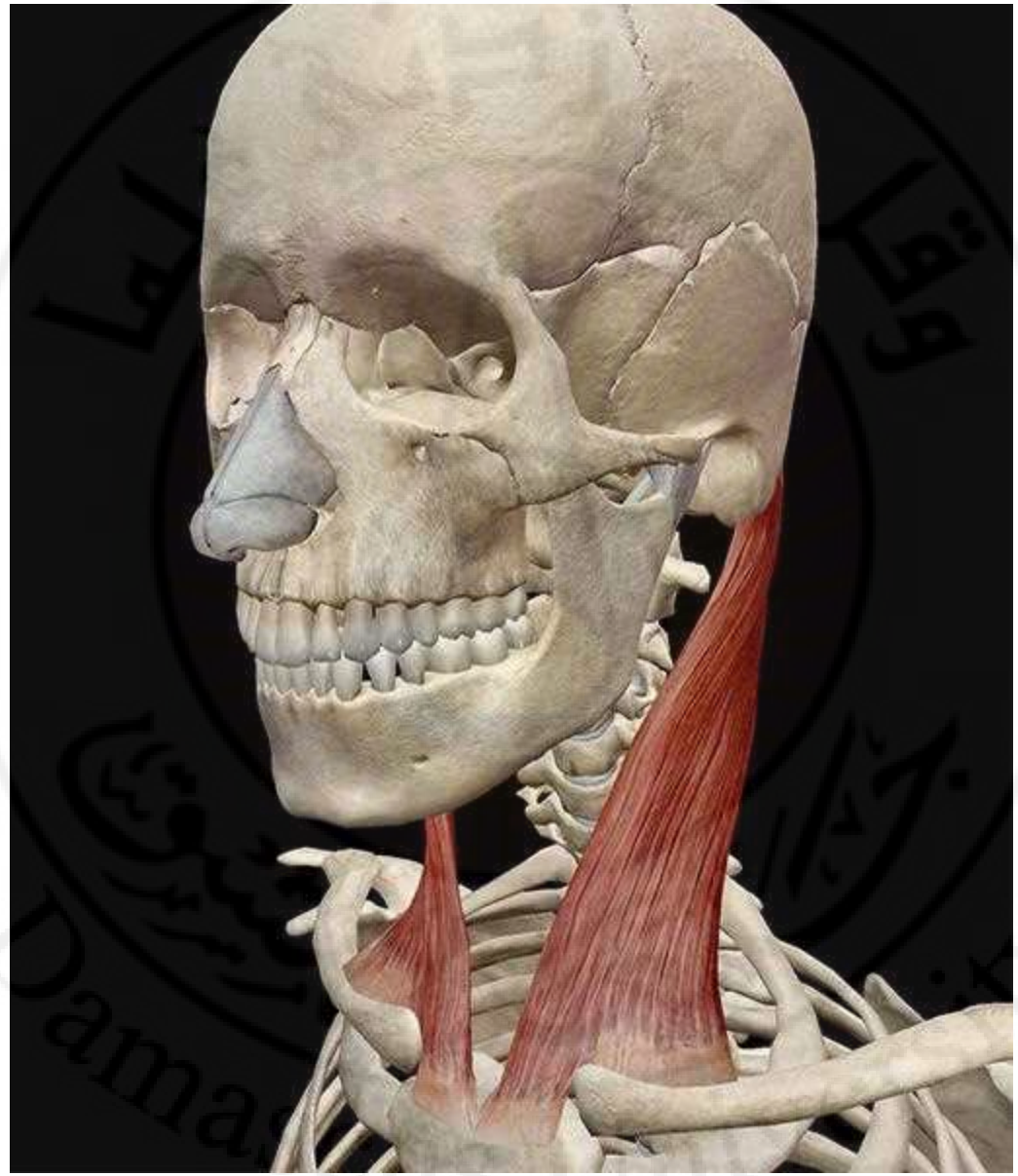
Accessory Nerve




Accessory nerve
Cranial portion of nerve XI (joins vagus nerve)
Spinal portion of nerve XI
C1
C5
Sternocleido-mastoid muscle
Trapezius muscle (upper third)


Foramen magnum
Accessory nerve (XI)
Sternocleidomastoid muscle (innervates)
Rootlets of accessory nerve emerging from spinal cord (C_1–C_5)
Trapezius muscle (innervates)


Sternocleidomastoid
Trapezius
Manubrium
Sternocleidomastoid




Trapezius
Muscles
Upper
Middle
Lower

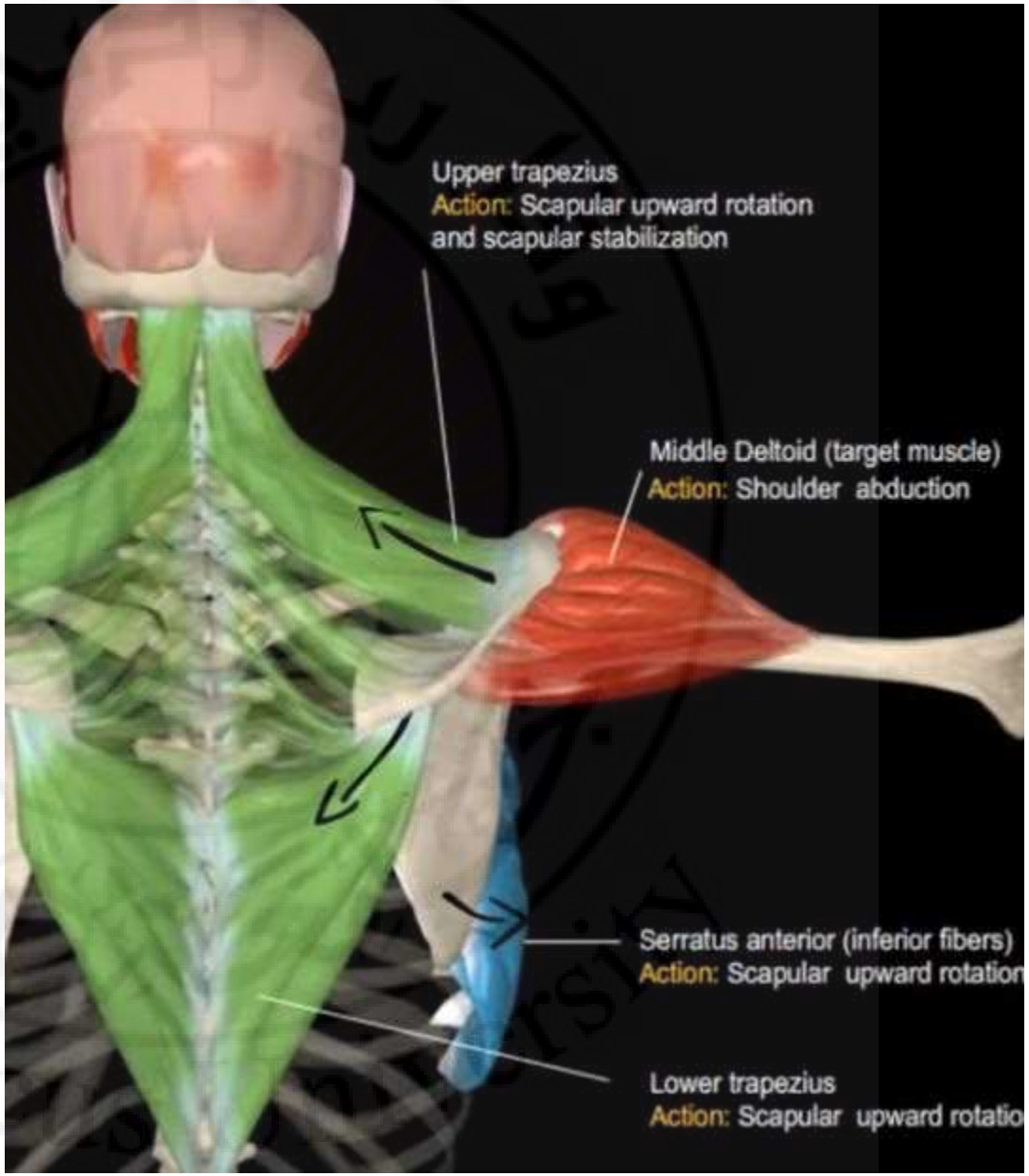




Abduction of the shoulder is initiated by the Supraspinatus; 0 to 15°.

The Deltoid muscle can then abduct to 90°. Its the major abductor. 15° to 90°.

180° (elevation) is brought about by rotation of the scapula upwards by the Trapezius and Serratus anterior.




Upward
Scapular
Rotation



A patient, seen from behind, with a right-sided accessory nerve palsy: (a) at rest, (b) attempting to lift his arms to the horizontal position, and (c) attempting to lift his arms as high as possible (the scapulae are shown in green)

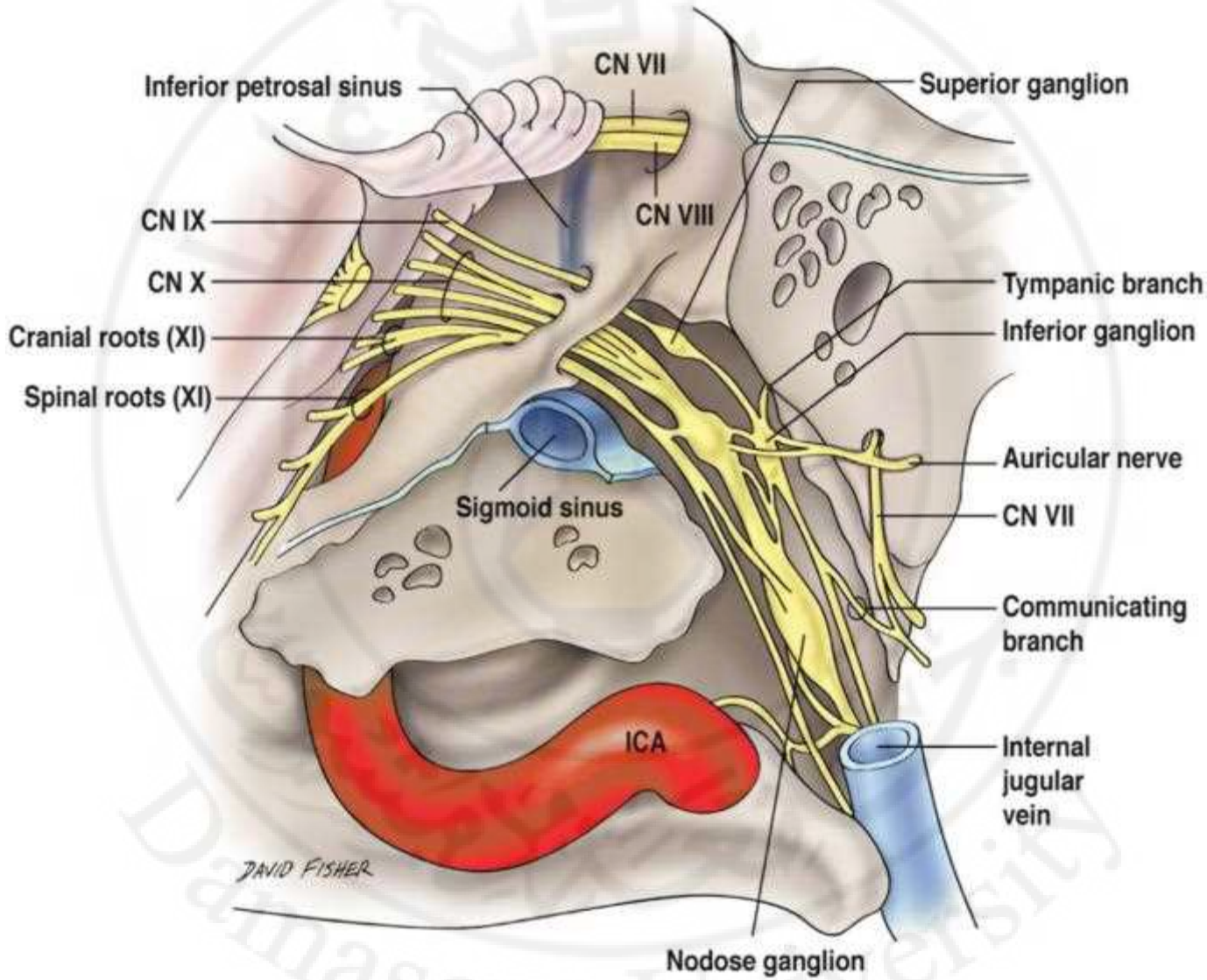
The first half of the shoulder abduction requires good scapula stabilization by the trapezius (and other muscles), so that deltoid muscle contraction can take the arm to the horizontal position

The second half of the shoulder abduction requires elevation of the shoulder and scapula rotation through almost 90° by the trapezius (and other muscles)





Causes of damage may include **trauma, surgery, tumours, and compression at the jugular foramen**


Inferior petrosal sinus
CN VII
Superior ganglion
CN IX
CN VIII
CN X
Tympanic branch
Cranial roots (XI)
Inferior ganglion
Spinal roots (XI)
Auricular nerve
Sigmoid sinus
CN VII
Communicating branch
ICA
Internal jugular vein
DAVID FISHER
Nodose ganglion

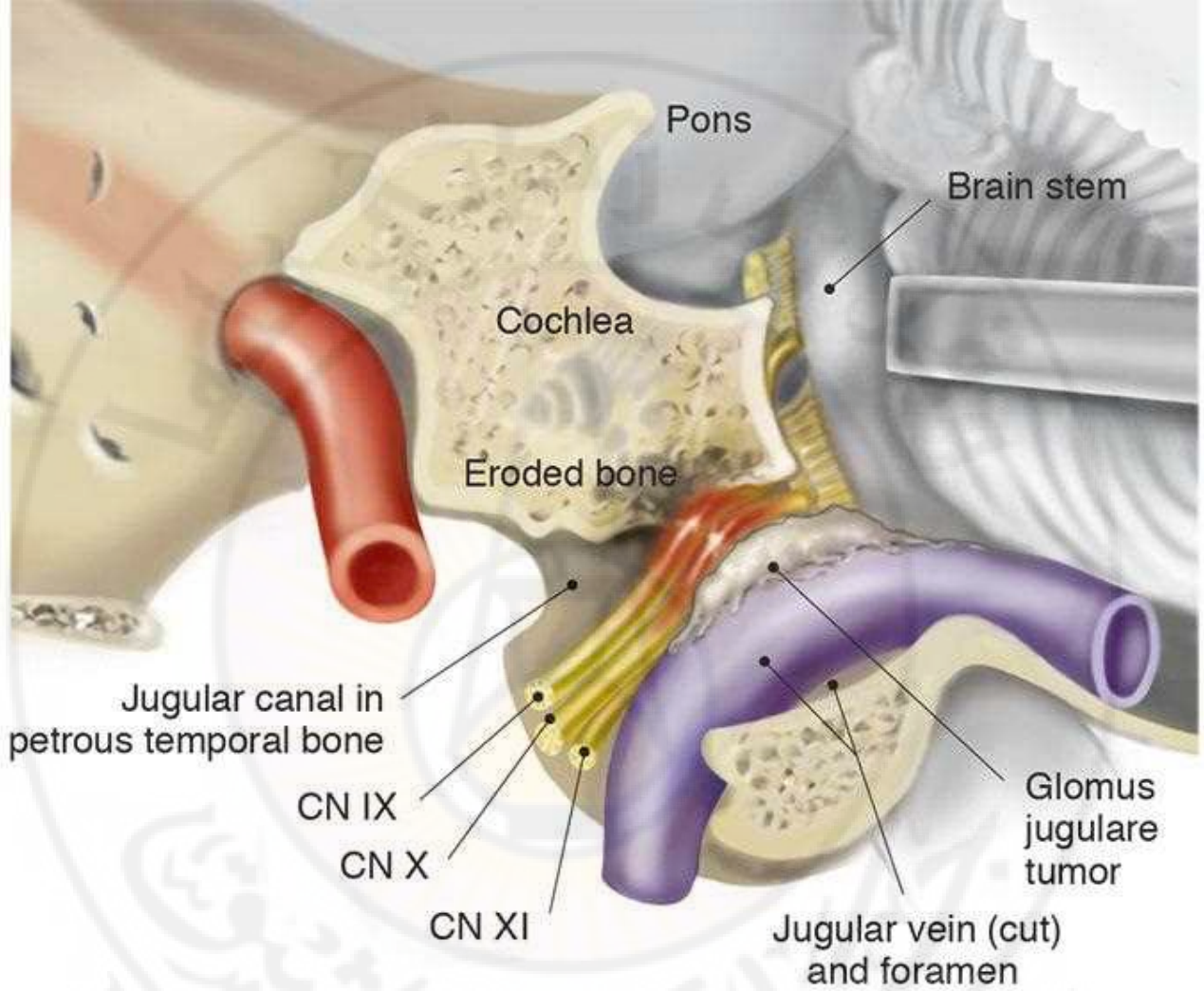
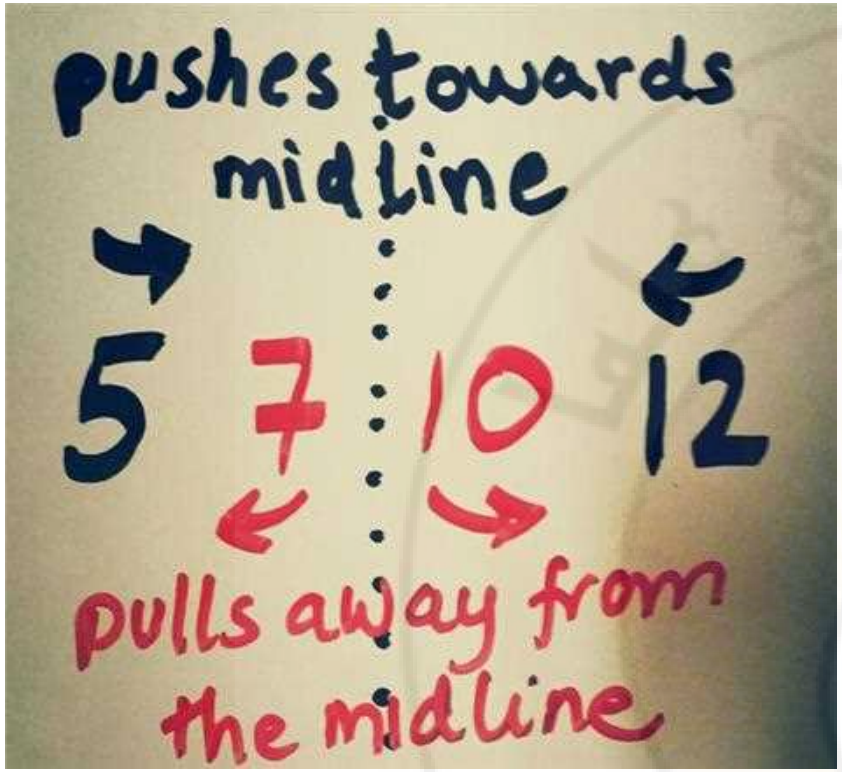
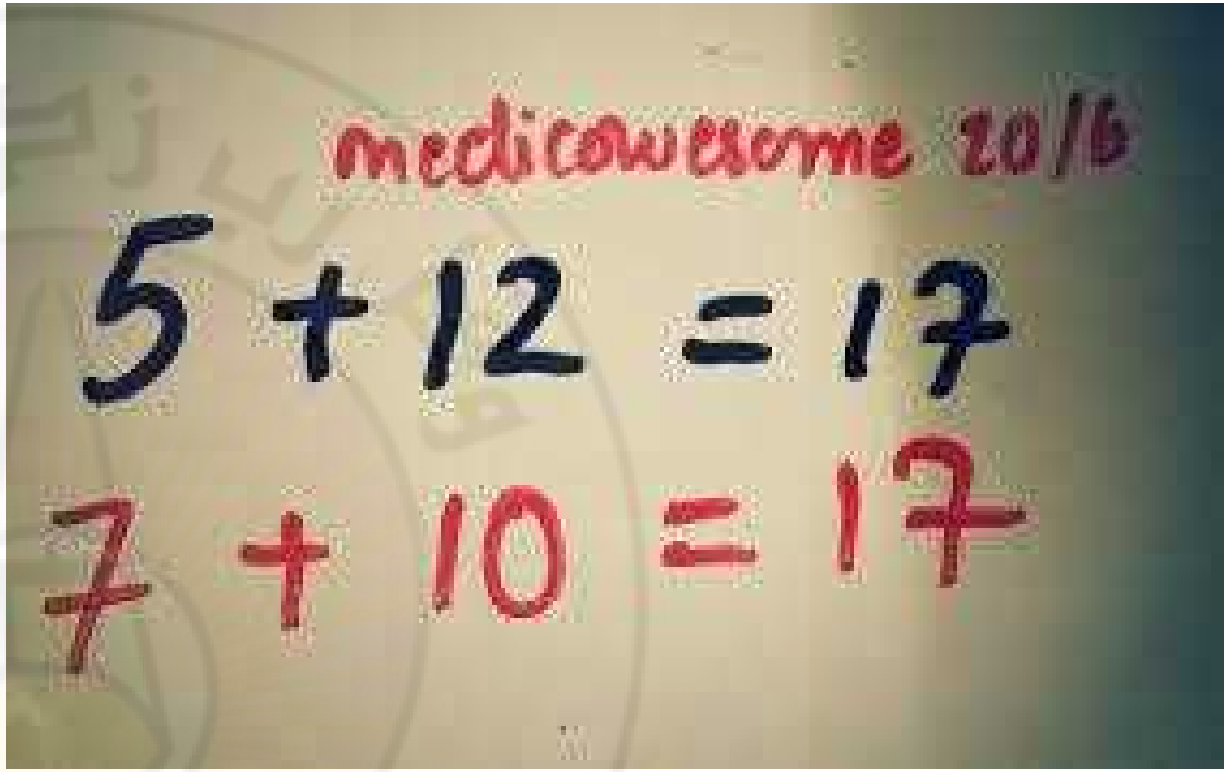


Figure X–12 Tumor of the glomus cells of the jugular bulb compressing cranial nerves IX, X, and XI (lateral view showing cut jugular foramen).

From Cranial Nerves 3rd Ed. ©2010
Wilson-Pauwels, Stewart, Akesson, Spacey, PMPH-USA

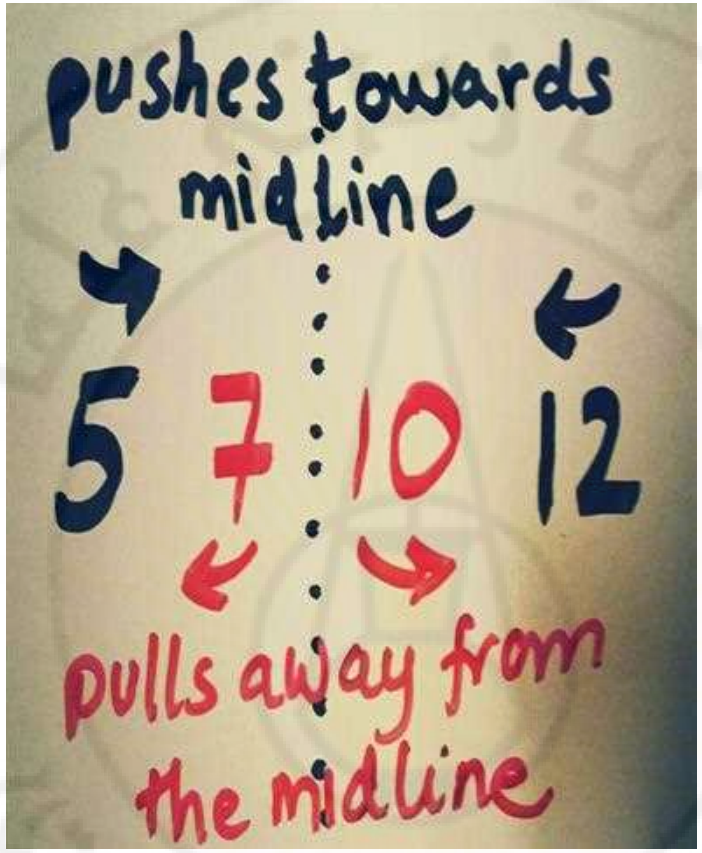




CRANIAL NERVE INJURY

SUM MUST 17
12+5=17 TOWARDS PARALYSED SIDE
10+7=17 TOWARDS NORMAL SIDE
12=HYPOGLOSSAL
5=TRIGEMINAL
10=VAGUS
7= FASIAL

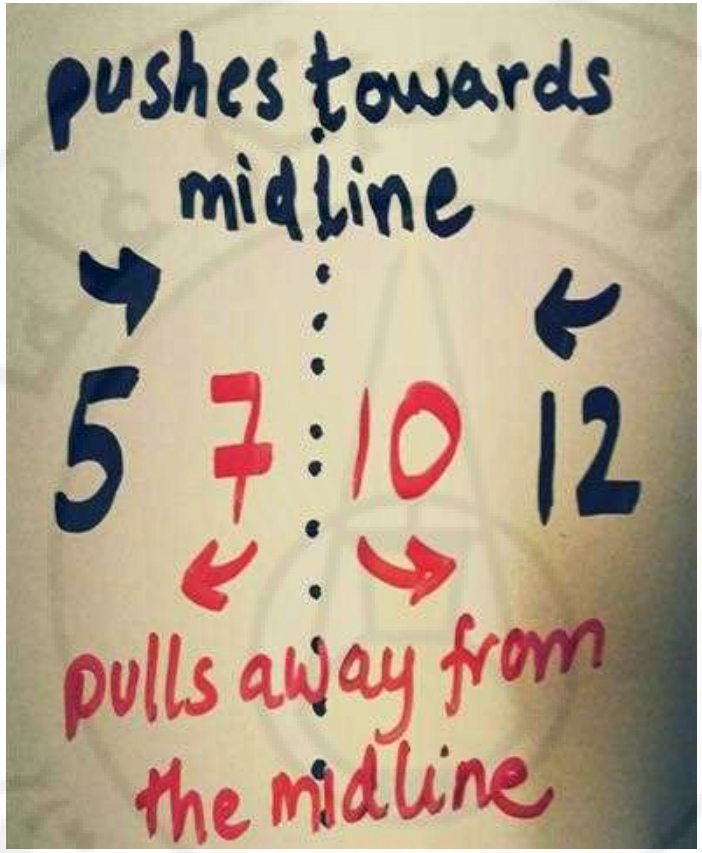






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THANK YOU

بسم الله الرحمن الرحيم

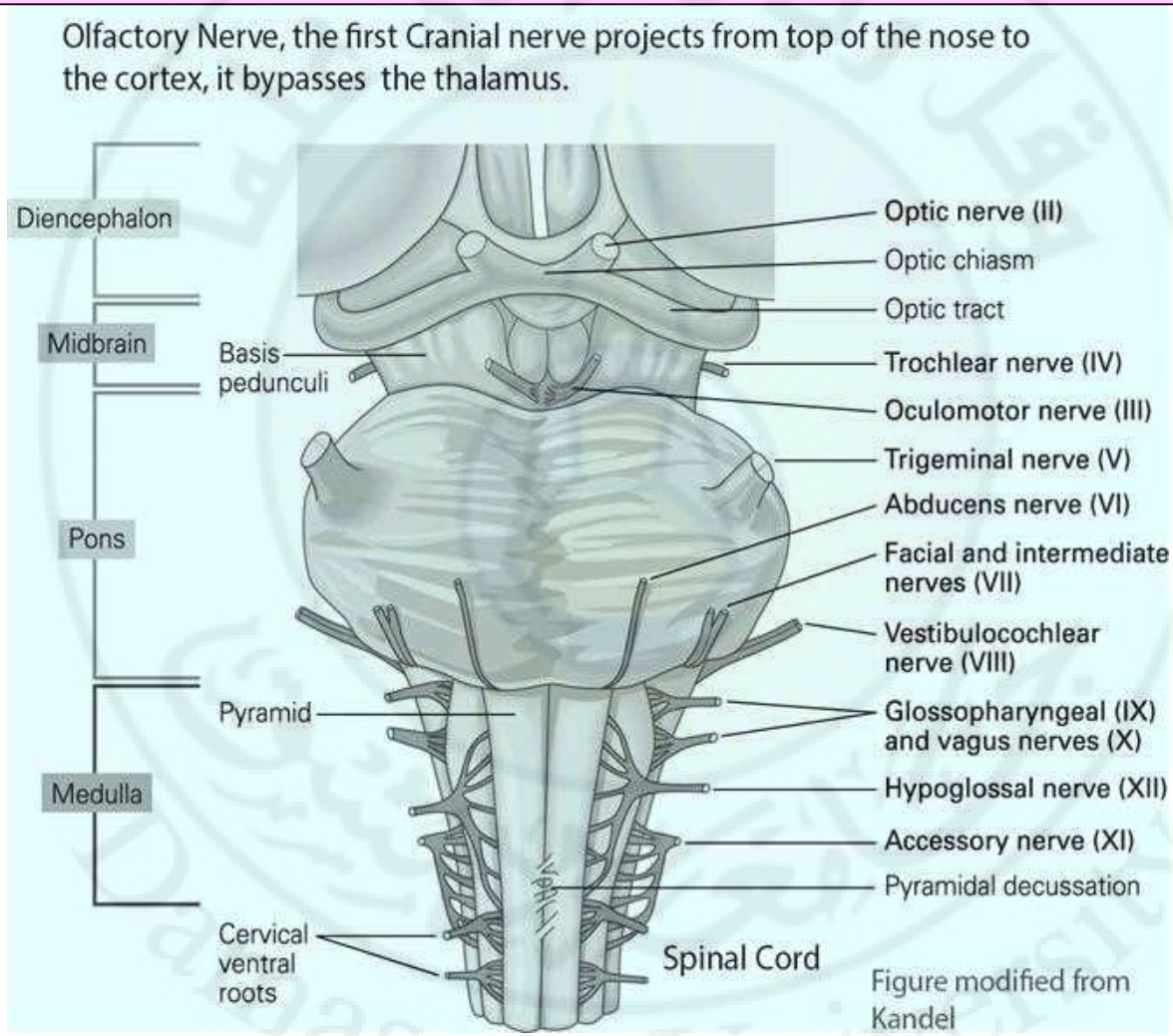
اضطرابات الأعصاب القحفية

ا.د. محمد شحاده آغا

MD MRCP (London) FRCP (Edin)

Know normal = identify abnormal

العصب القحفي ١ و ٢ ينشأن من الحفرة الأمامية ويتعلقان بالشم والبصر



العصب القحفي ١١ ينشأ بمعظمه من النخاع الرقبي

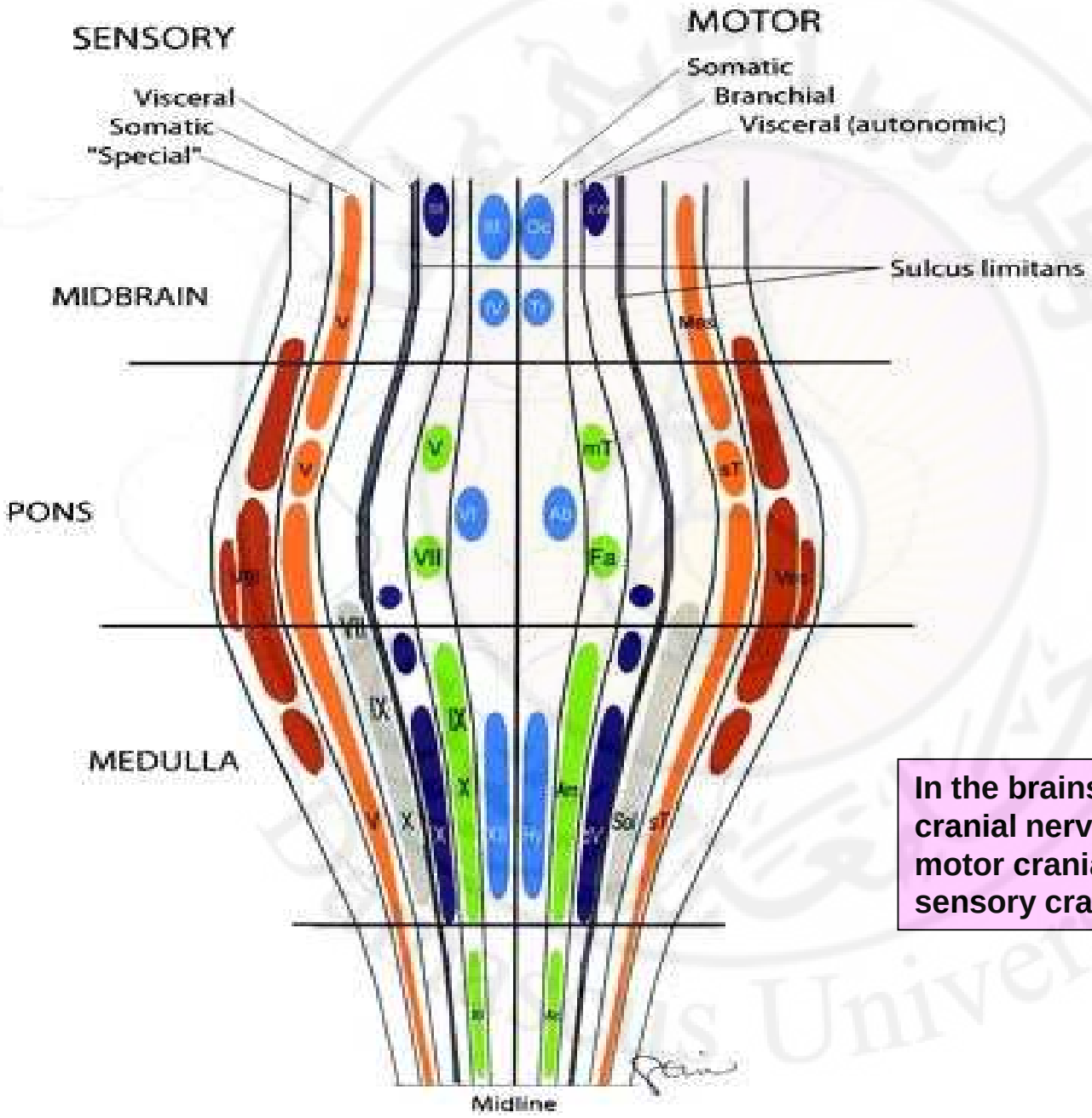
3 There are 4 NERVES in each region of the brainstem

Cranial Nerves 1, 2, 3, 4	Above the Pons
Cranial Nerves 5, 6, 7, 8	Pons
Cranial Nerves 9, 10, 11, 12	Medulla



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Motor Nuclei are divisible into 12 (3,4,6,12 = **M**otor, **M**edial) so (5,7,9,11 = **S**ensory, **S**ide)



1. Four mid-line motor nuclei.
2. Four lateral motor nuclei.
3. Four lateral sensory nuclei.
4. Four parasympathetic nuclei.

In the brainstem, there are about 18 cranial nerve nuclei comprising of 10 motor cranial nerve nuclei and 8 sensory cranial nerve nuclei

Rule of 4

- 4 structures in the 'midline' beginning with M.
- 4 structures to the side beginning with S.
- 4 cranial nerves in the medulla, 4 in the pons and 4 above the pons (2 in the midbrain).
- 4 motor nuclei that are in the midline are those that divide equally into 12 except for 1 and 2, that is 3, 4, 6 and 12 (5, 7, 9 and 11 are in the lateral brainstem).

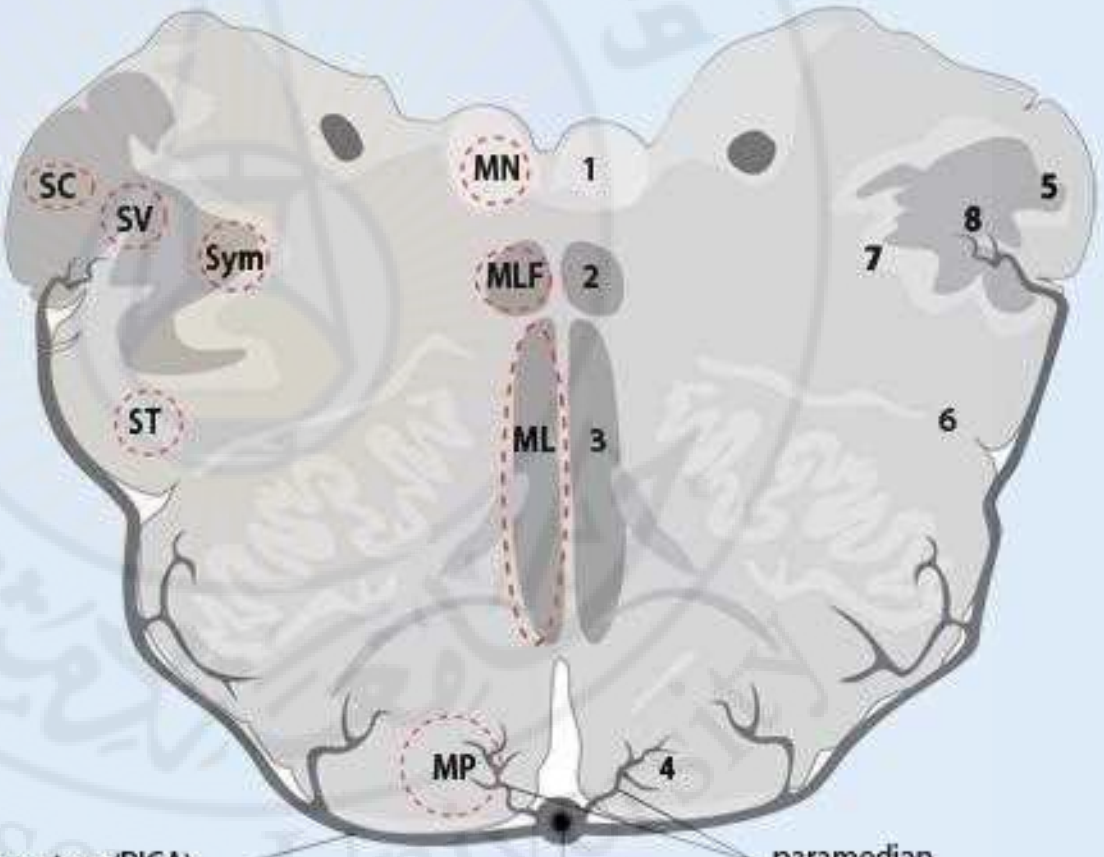
The rule of 4's

The Rule of Four

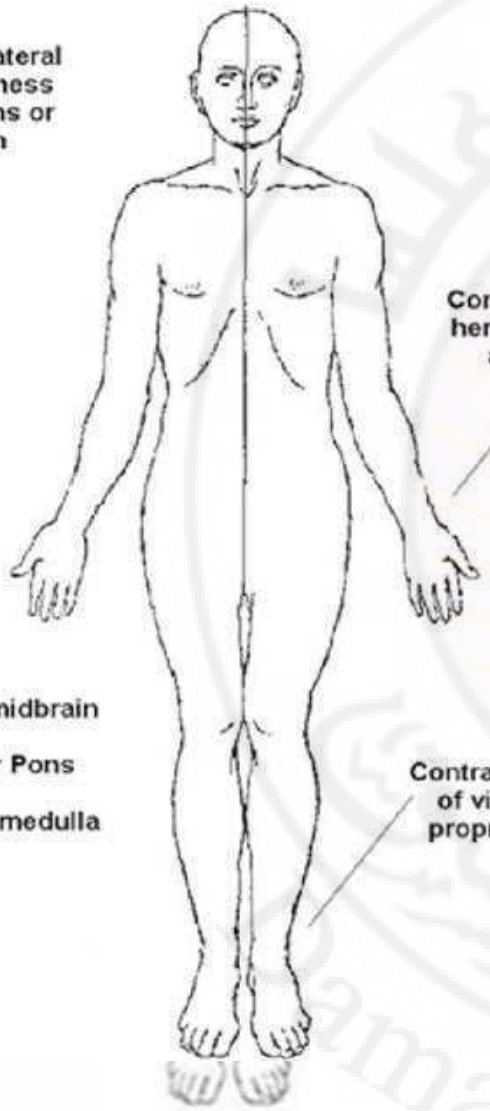
KEY:

A cross section of the brainstem (at the level of the medulla) showing the four structures in the medial and the four structures in the lateral part of the brainstem. The size of the outlined areas is not representative of their anatomical size.

(1) **MN** – Motor nuclei (3, 4, 6 or 12)
(2) **MLF** – Medial longitudinal fasciculus
(3) **ML** – Medial lemnisci
(4) **MP** – Motor pathway (corticospinal/pyramidal tract)
(5) **SC** – Spinocerebellar
(6) **ST** – Spinothalamic
(7) **Sym** – Sympathetic
(8) **SV** – Sensory nucleus of the fifth cranial nerve.



Medial Brainstem Syndrome



Add contralateral facial weakness if upper Pons or Midbrain

Contralateral hemiparesis arm and leg

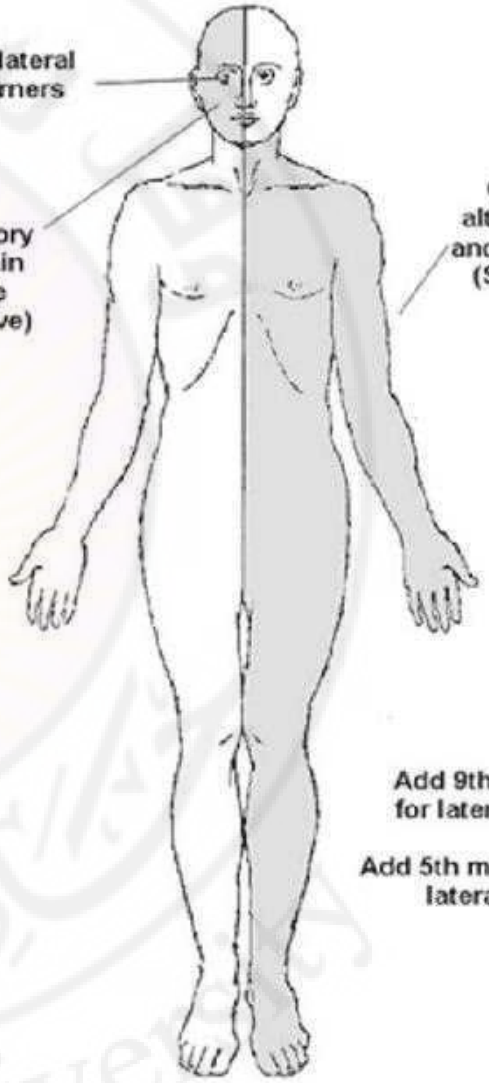
Add 3rd for midbrain

Add 6th for Pons

Add 12th for medulla

Contralateral loss of vibration and proprioception

Sensory Brainstem Syndrome



Ipsilateral Horners

Ipsilateral sensory alteration of pain and temperature (5th cranial nerve)

Contralateral alteration of pain and temperature (Spinothalamic tract)

Ipsilateral cerebellar ataxia

Add 9th, 10th and 11th for lateral Medullary

Add 5th motor, 7th and 8th lateral Pontine

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Let's Learn a System for the Brainstem!

Cranial Nerves

Midbrain	**Pons**	**Medulla**
1 – Olfactory (smell)	**5** – Trigeminal (feel face)	**9** – Glossopharyngeal (feel throat)
2 – Optic (see)	**6** – Abducens (look to ears)	**10** – Vagus (move palate)
3 – Oculomotor (move eyes)	**7** – Facial (move face)	**11** – Accessory (shrug shoulders)
4 – Trochlear (eye down to nose)	**8** – Auditory (hear)	**12** – Hypoglossal (move tongue)

4 Brainstem Rules of Four

4 Midline Structures (**M**'s) – **M**otor tract, **M**LF, **M**edial Lemniscus, **M**otor CN nuclei → **M**edial = **M**OTOR

4 Side Structures (**S**'s) – **S**ympathetic, **S**pinocerebellar, **S**pinothalamic, **S**ensory CN 5 → **S**ide = **S**ENSORY

4 CN in Medulla, 4 CN in Pons, 4 CN in Midbrain

4 Motor Nuclei are divisible into 12 (3,4,6,12 = **M**otor, **M**edial) so (5,7,9,11 = **S**ensory, **S**ide)

4 Medial Structures (*Overall:* **OPPOSITE M**otor weak, Δ vibrate, proprioception + *same INO*)

Motor Tract (Corticospinal) – Opposite weakness arm & leg

Medial Lemniscus (Posterior Column) – Opposite vibration, proprioception arm & leg

MLF (Median Longitudinal Fasciculus) – Same Look left (but right eye stays straight) or vice versa

Motor CN Nuclei (divide into 12) – Midbrain (3,4) eye move, Pons (6) eye lateral, Medulla (12) tongue move

4 Side Structures (*Overall:* **SAME S**haky leg, Horner's SRO, face sense + *opposite pain/temp arm, leg*)

Sympathetic – **S**ame Horner's SRO (ptosis, miosis, anhidrosis)

Spinocerebellar – **S**ame ataxia in arm & leg

Spinothalamic – *Opposite pain/temp in arm & leg*

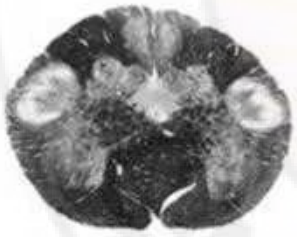
Sensory CN 5 – **S**ame face sensation

CRANIAL NERVE

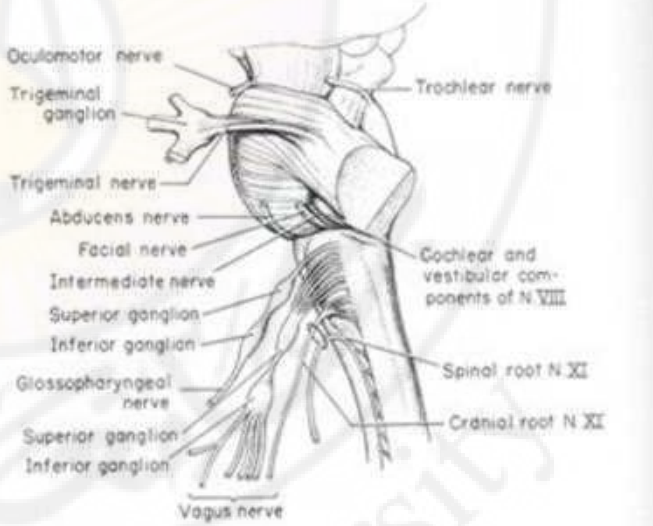
NUCLEUS vs. GANGLION

- WITHIN CNS
- CLUSTER OF NEURONS
- NOT PSEUDOUNIPOLAR*
- SENSORY OR MOTOR

- OUTSIDE OF CNS
- CLUSTER OF NEURONS
- PSEUDOUNIPOLAR
- SENSORY

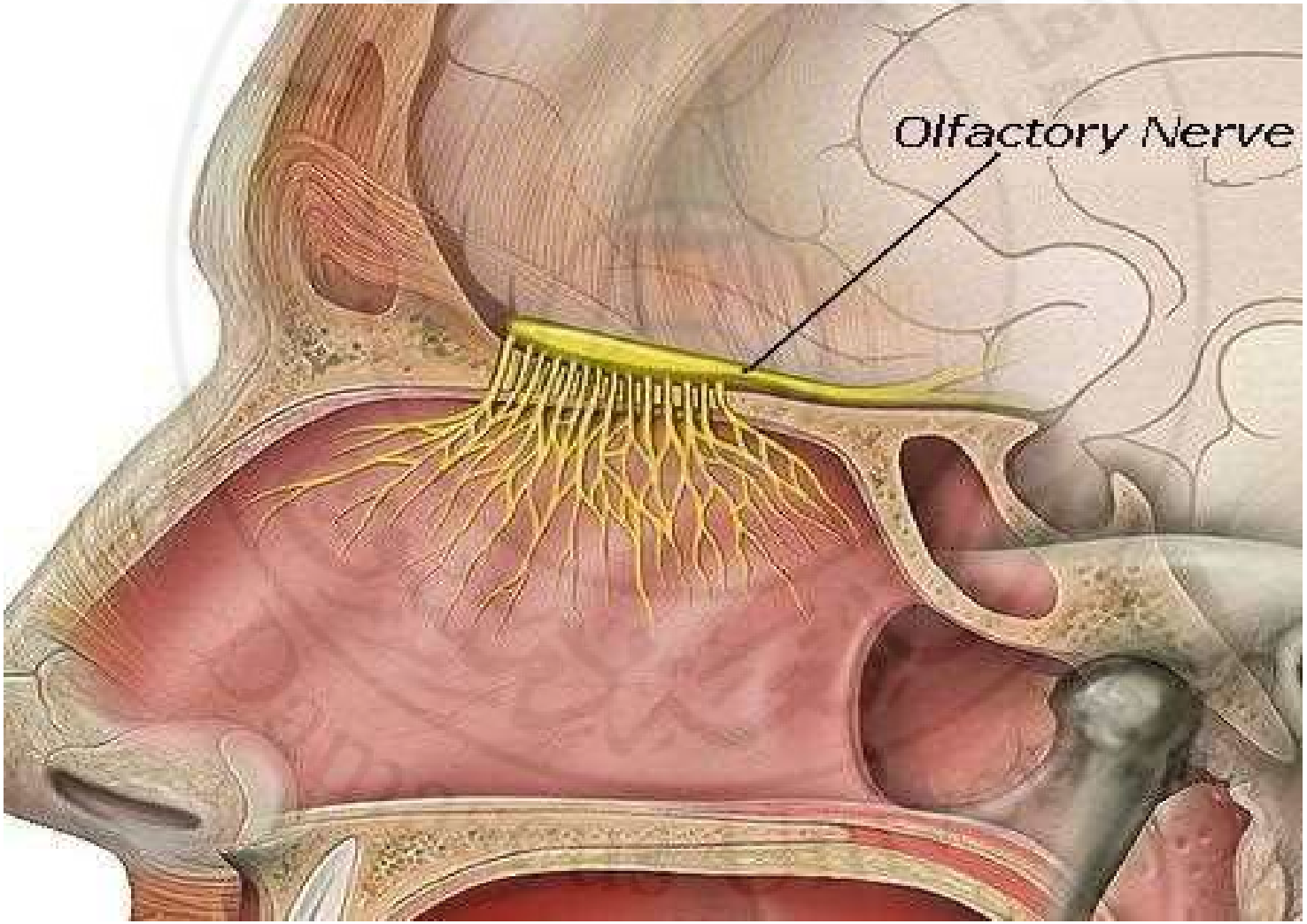


*except mesencephalic nucleus of V

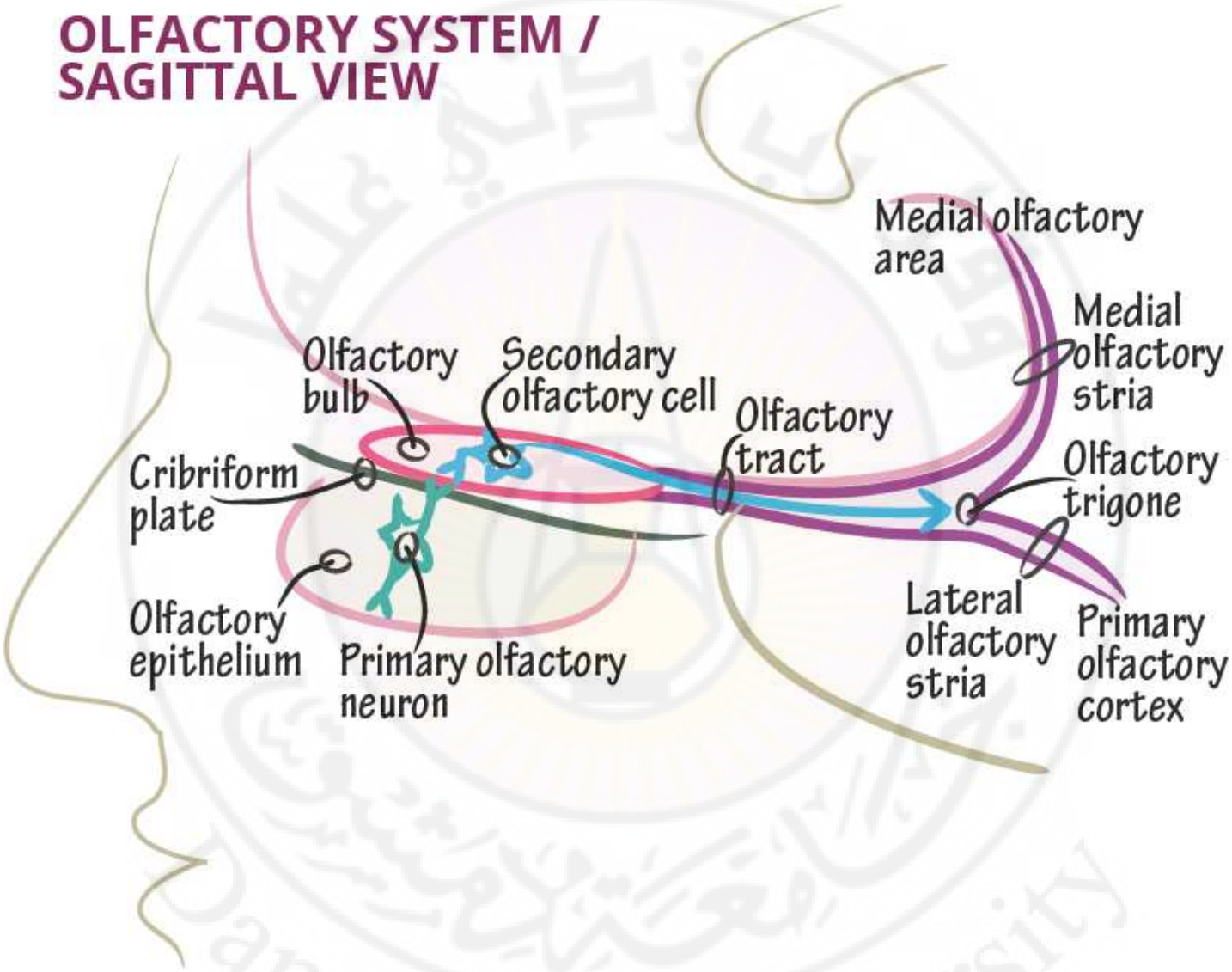


Carpenter, Core Text of Neuroanatomy, 1991

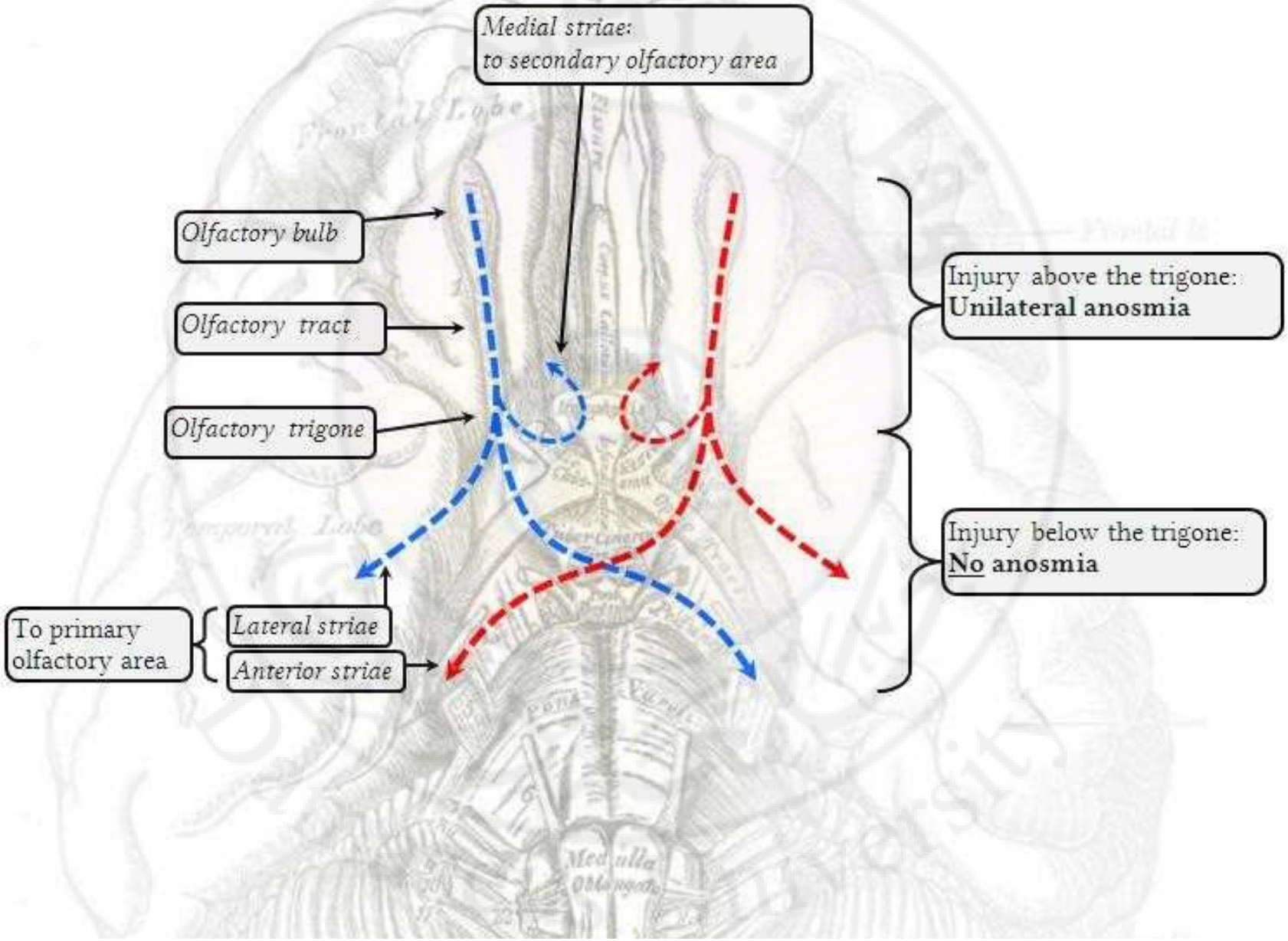
العصب القحفي الأول (الشمي)



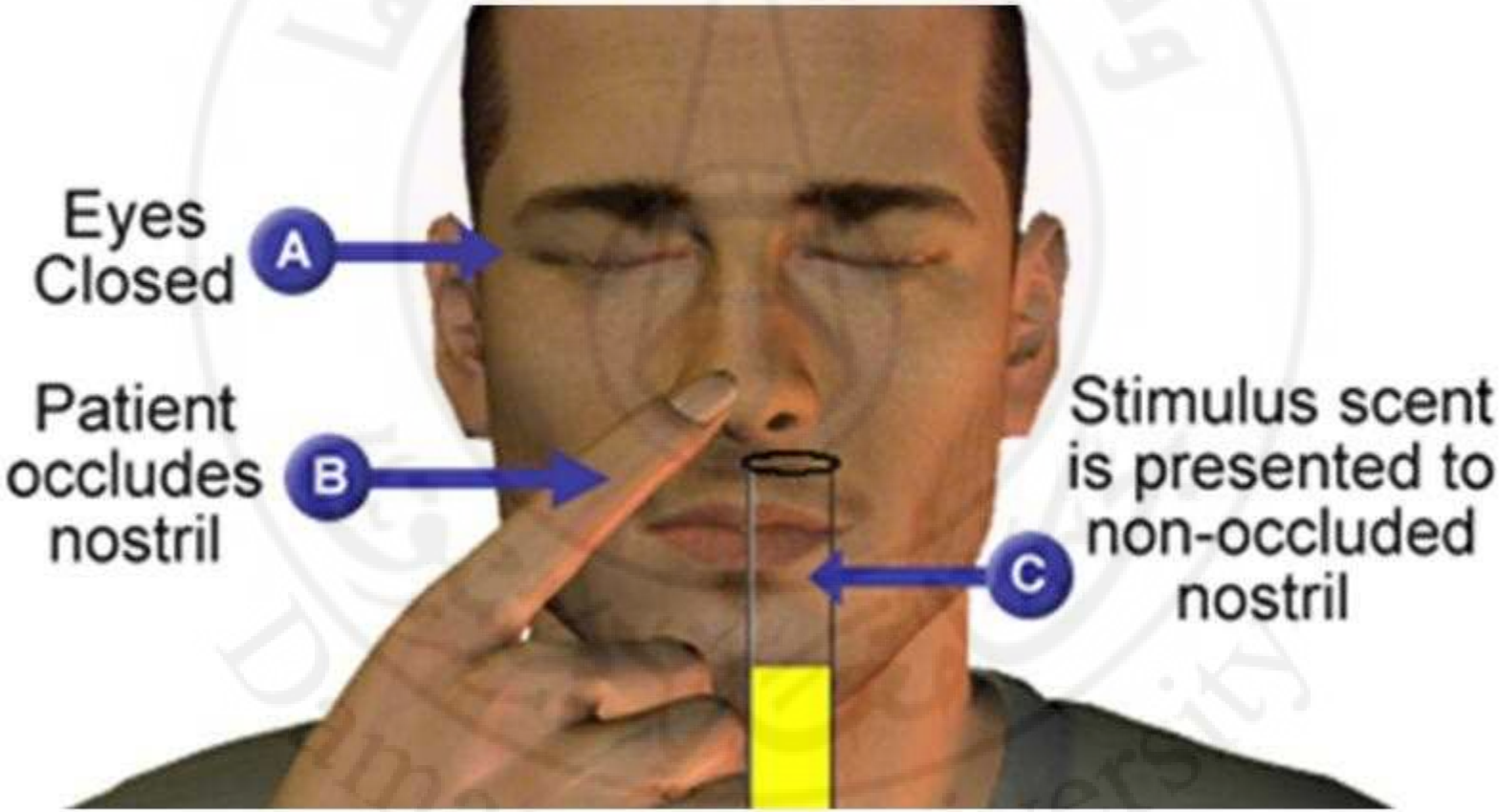
OLFACTORY SYSTEM / SAGITTAL VIEW



Damascus University


Medial striae:
to secondary olfactory area
Olfactory bulb
Olfactory tract
Olfactory trigone
To primary olfactory area
Lateral striae
Anterior striae
Injury above the trigone:
Unilateral anosmia
Injury below the trigone:
No anosmia

Olfactory Nerve (I) Testing



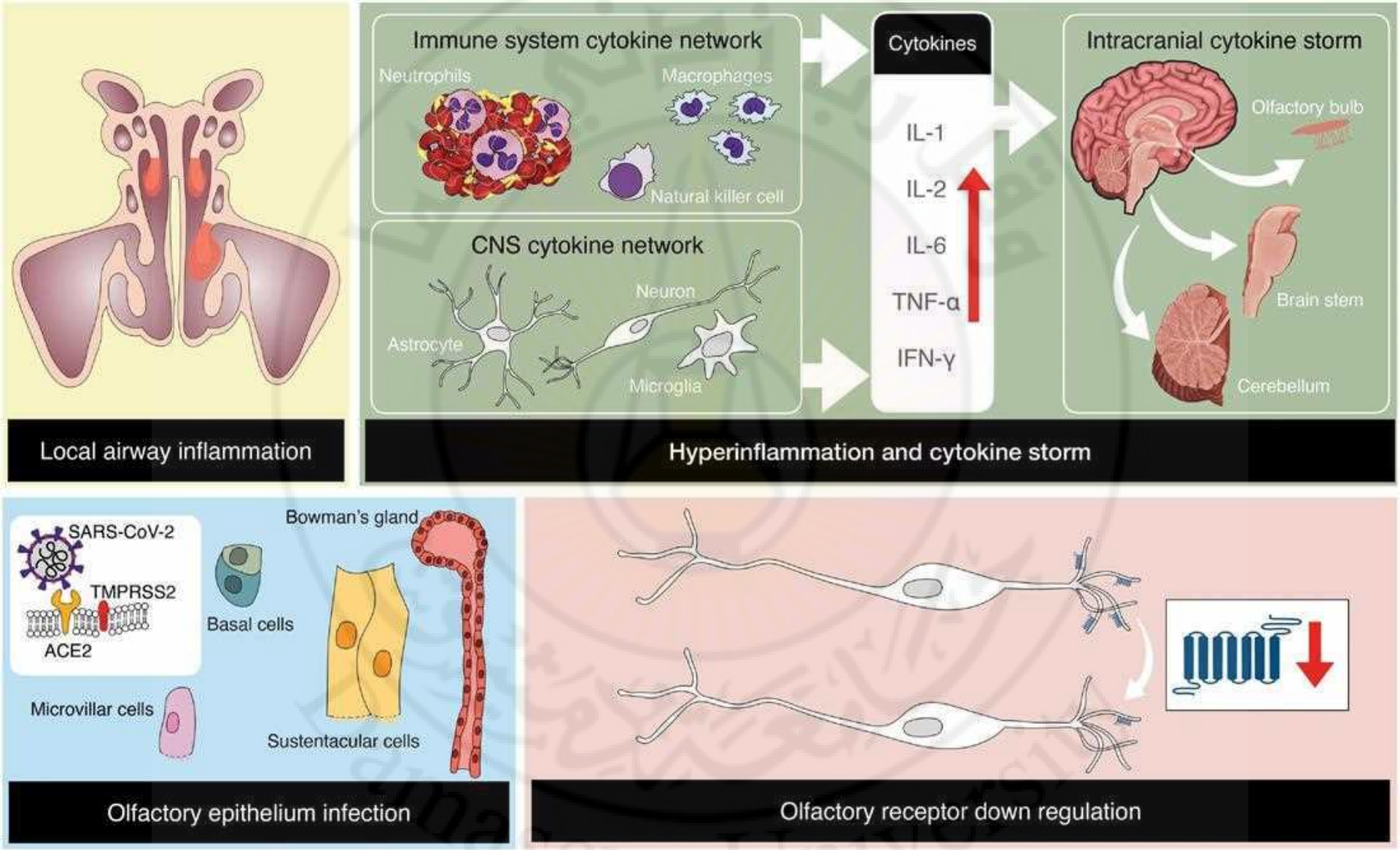
What are symptoms of impaired olfactory nerve function?

- **Anosmia,** complete loss of smell.
- **Dysosmia (also called phantosmia),** unpleasant or strange odors that occur spontaneously.
- **Hyposmia,** partial loss of smell.
- **Parosmia,** distorted sense of smell. For example, familiar foods may smell like chemicals or mold.

Clinical Relevance: Anosmia

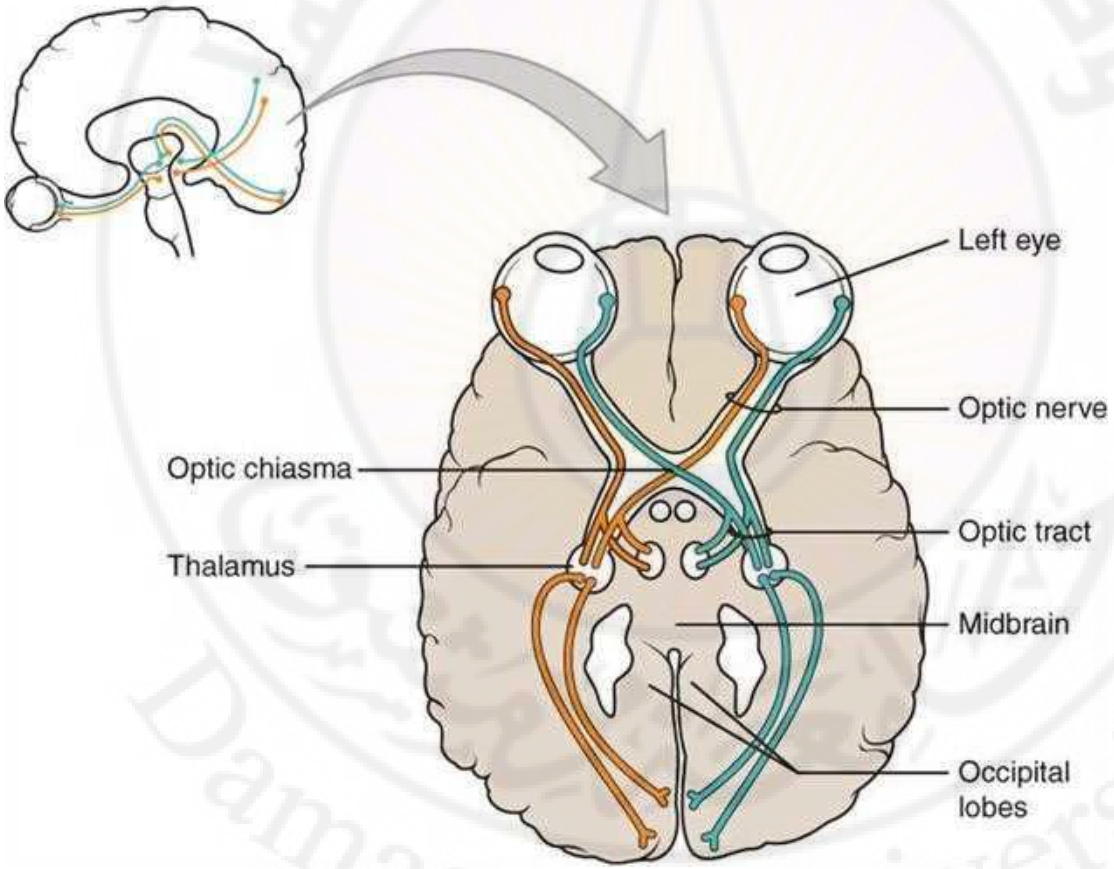
Anosmia is defined as the absence of the sense of smell. It can be temporary, permanent, progressive or congenital.

- Temporary anosmia can be caused by infection (e.g. meningitis) or by local disorders of the nose (e.g. common cold)
- Permanent anosmia can be caused by head injury, or tumours which occur in the olfactory groove (e.g. meningioma).
- Anosmia can also occur as a result of neurodegenerative conditions, such as Parkinson's or Alzheimer's disease. In these conditions, the anosmia is progressive and precedes motor symptoms but it is not often noticed by the patient.
- Anosmia is also a feature of a number of genetic conditions such as Kallmann syndrome (failure to start or finish puberty) and Primary Ciliary Dyskinesia (defect in cilia causing it to be immobile)

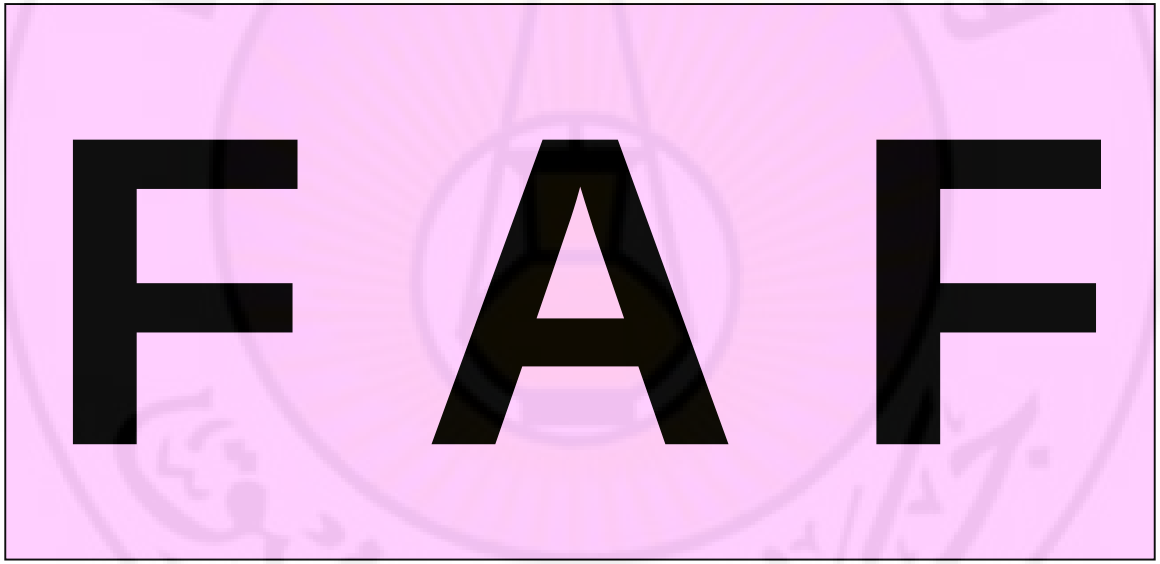


Trends in Molecular Medicine

العصب القحفي الثاني (البصري)



العصب القحفي الثاني (البصري)

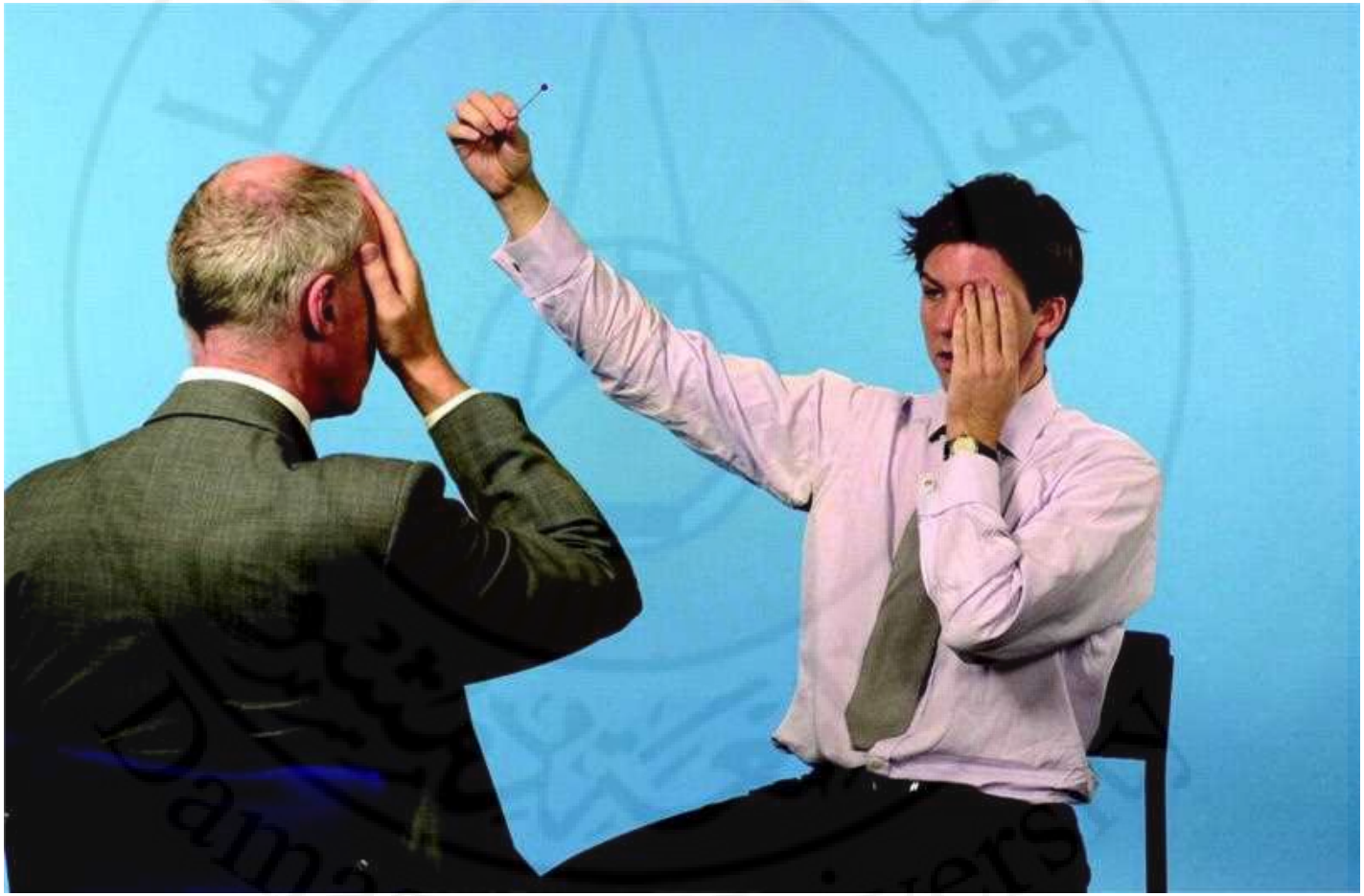


Visual Field

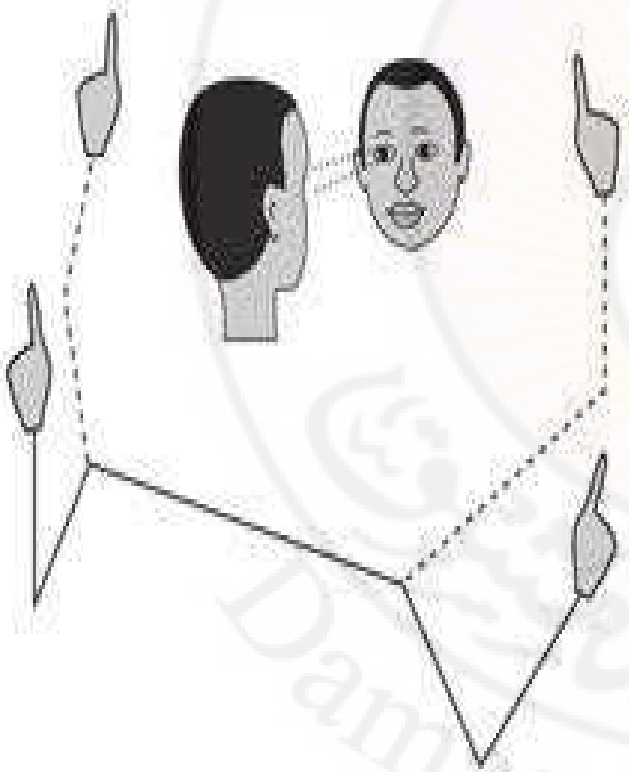
Acuity

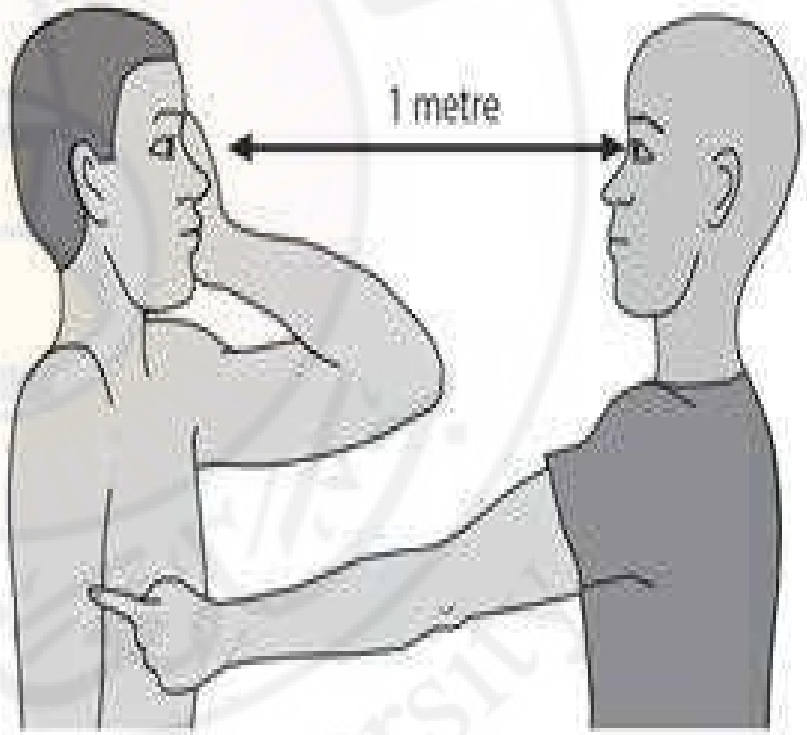
Fundus

العصب القحفي الثاني (البصري)

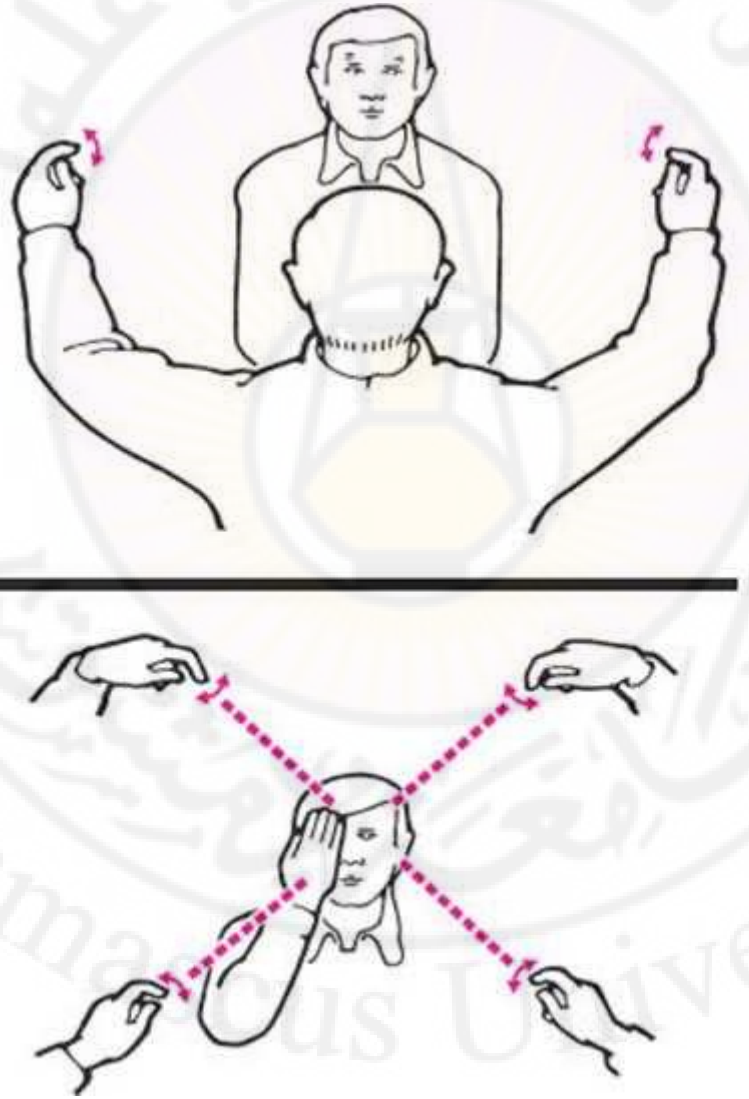


العصب القحفي الثاني (البصري)





العصب القحفي الثاني (البصري)

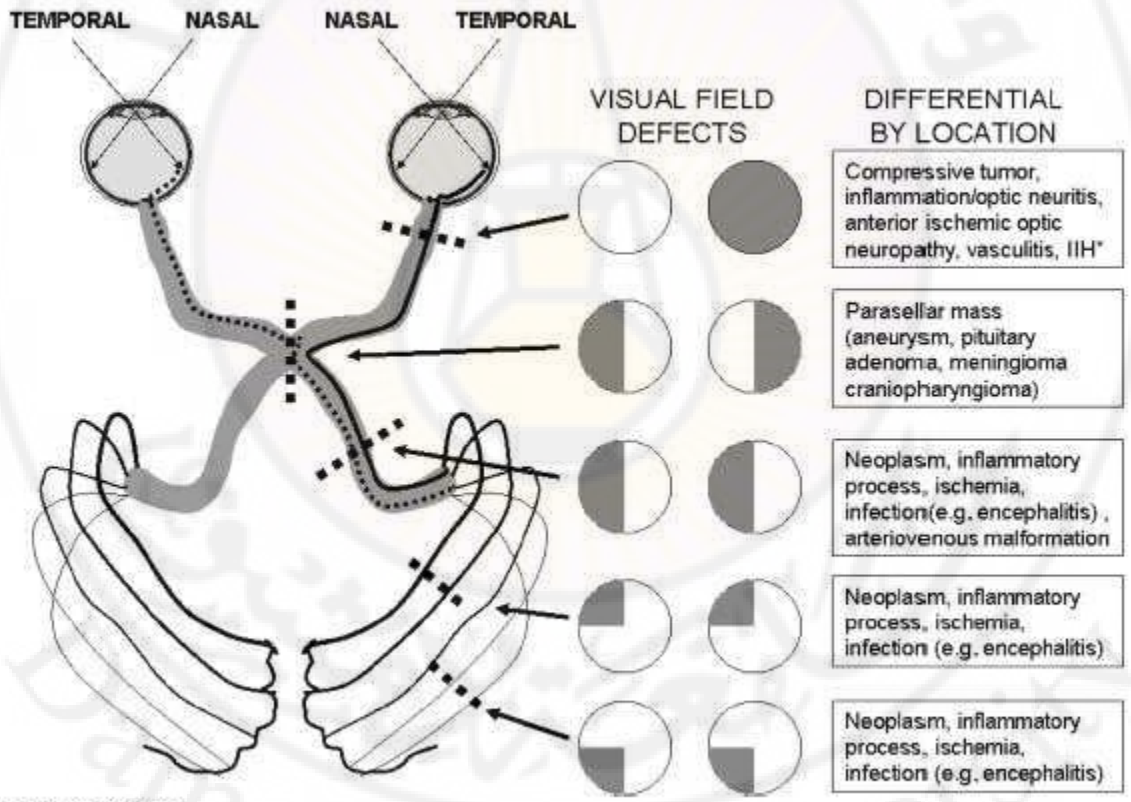


العصب القحفي الثاني (البصري)



CAUSES OF SCOTOMA

Figure 2. The Visual Field Defects Associated With The Various Possible Locations Of A Pathological Lesion

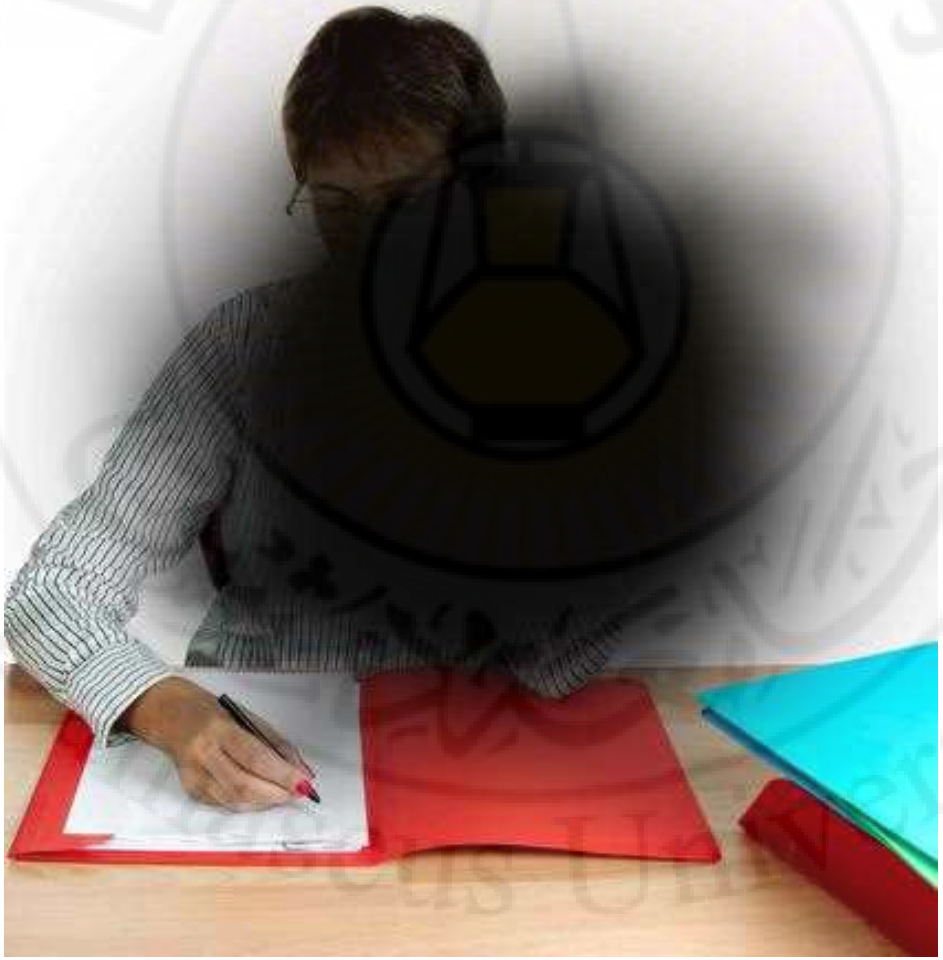


* IIH, idiopathic intracranial hypertension.

Central Scotoma



Central Scotoma



Bitemporal Hemianopia



Binasal Hemianopia



Homonymous Hemianopia



Homonymous Hemianopia with Macular Sparing



Quadrantanopia

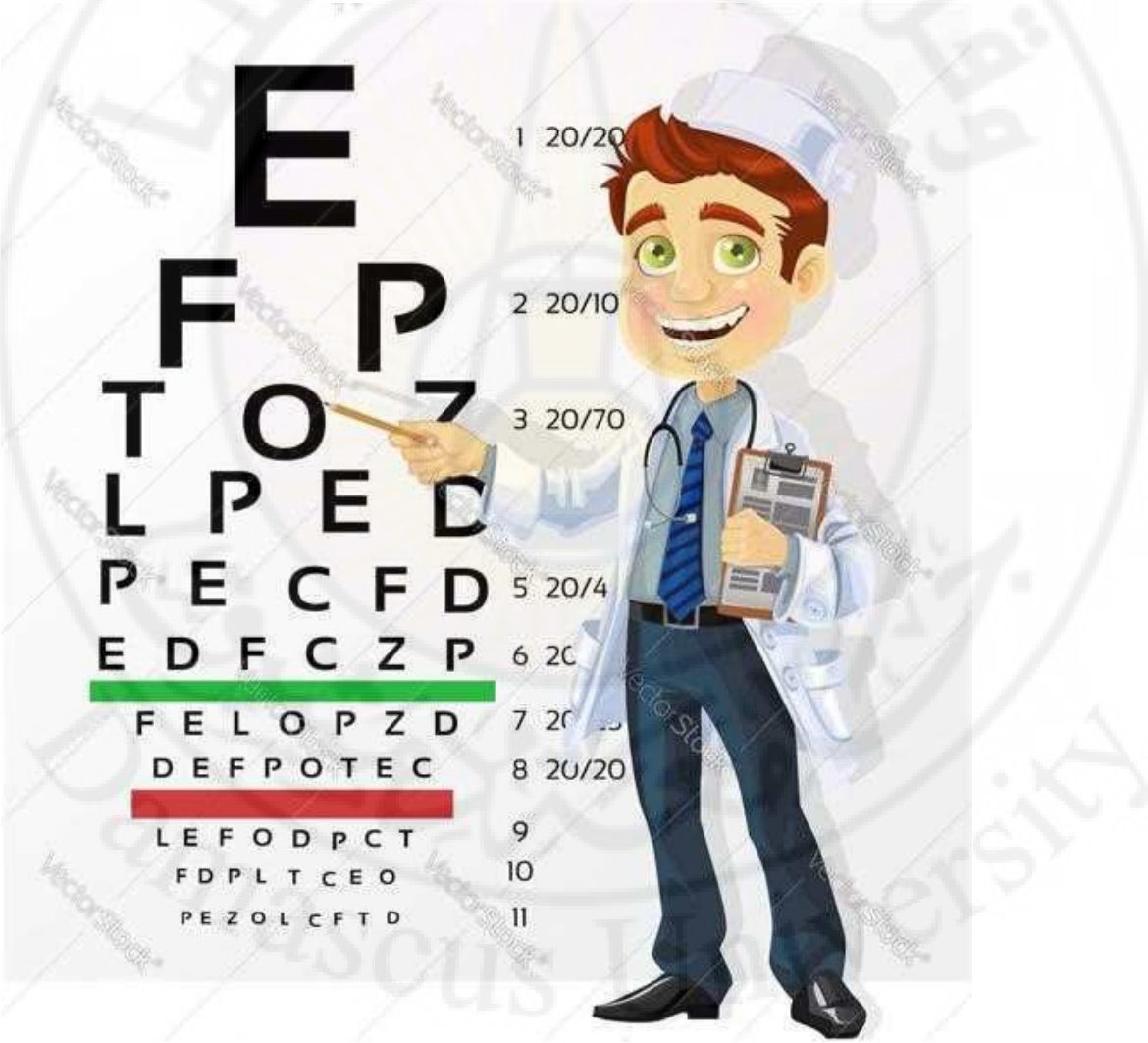


Homonymous Hemianopia with Macular Sparing





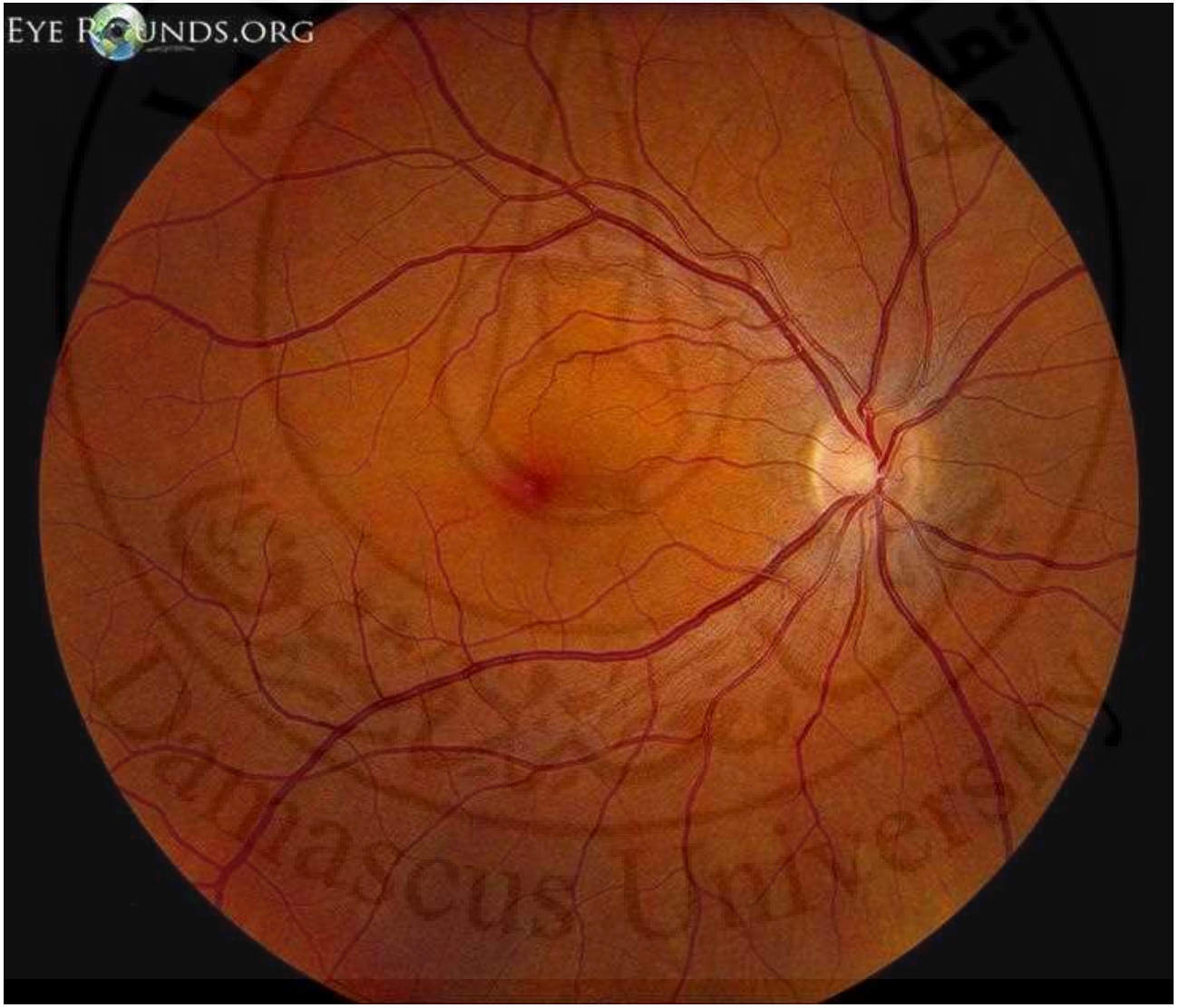
العصب القحفي الثاني (البصري)



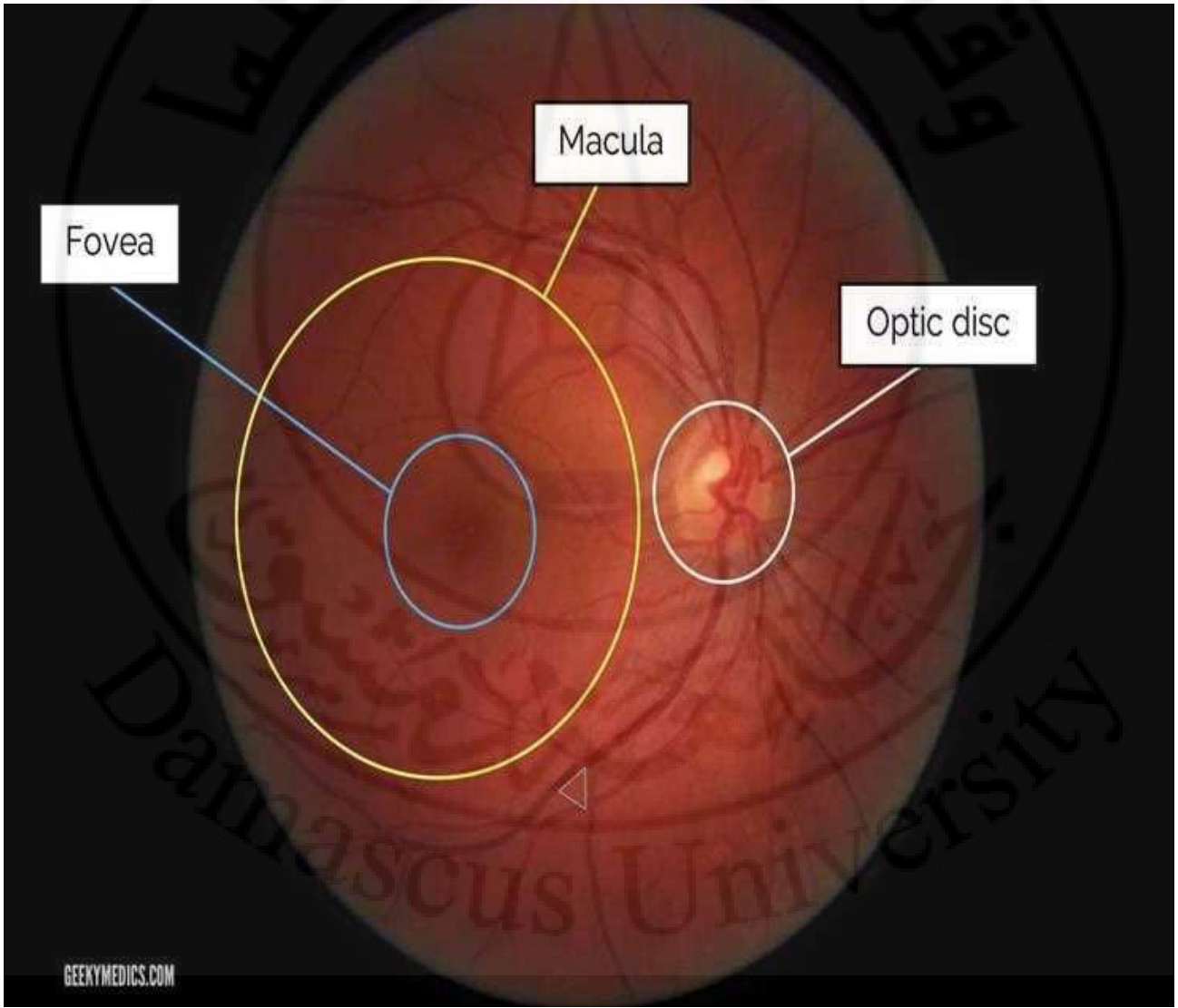
العصب القحفي الثاني (البصري)

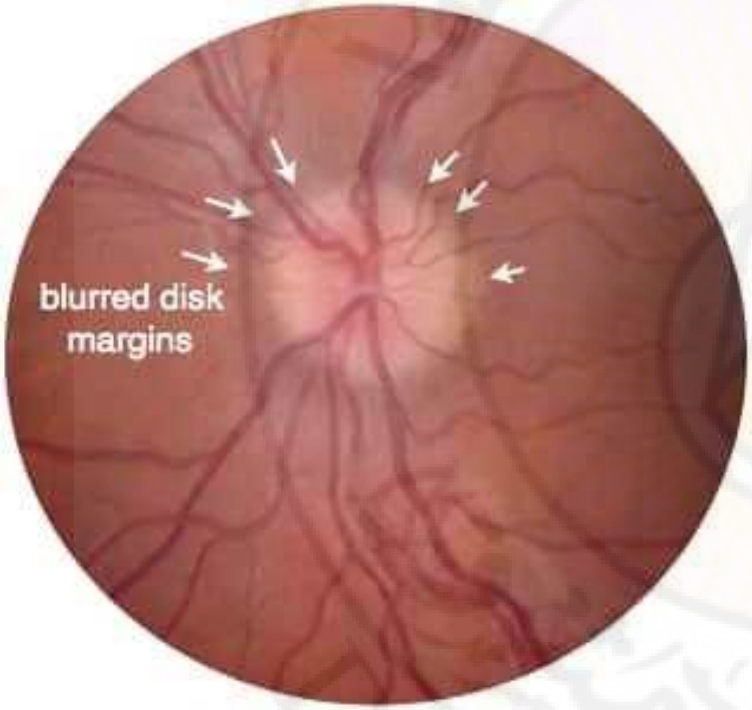


العصب القحفي الثاني (البصري)

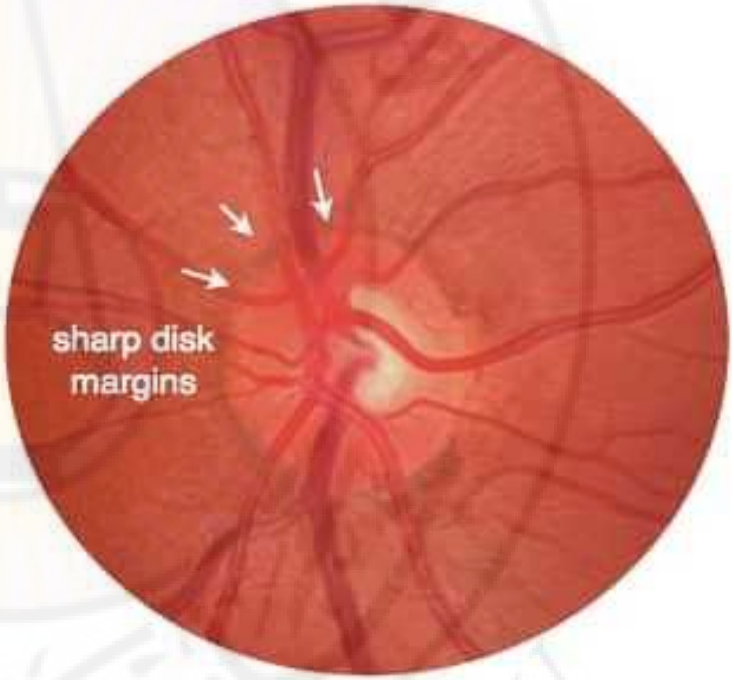


العصب القحفي الثاني (البصري)



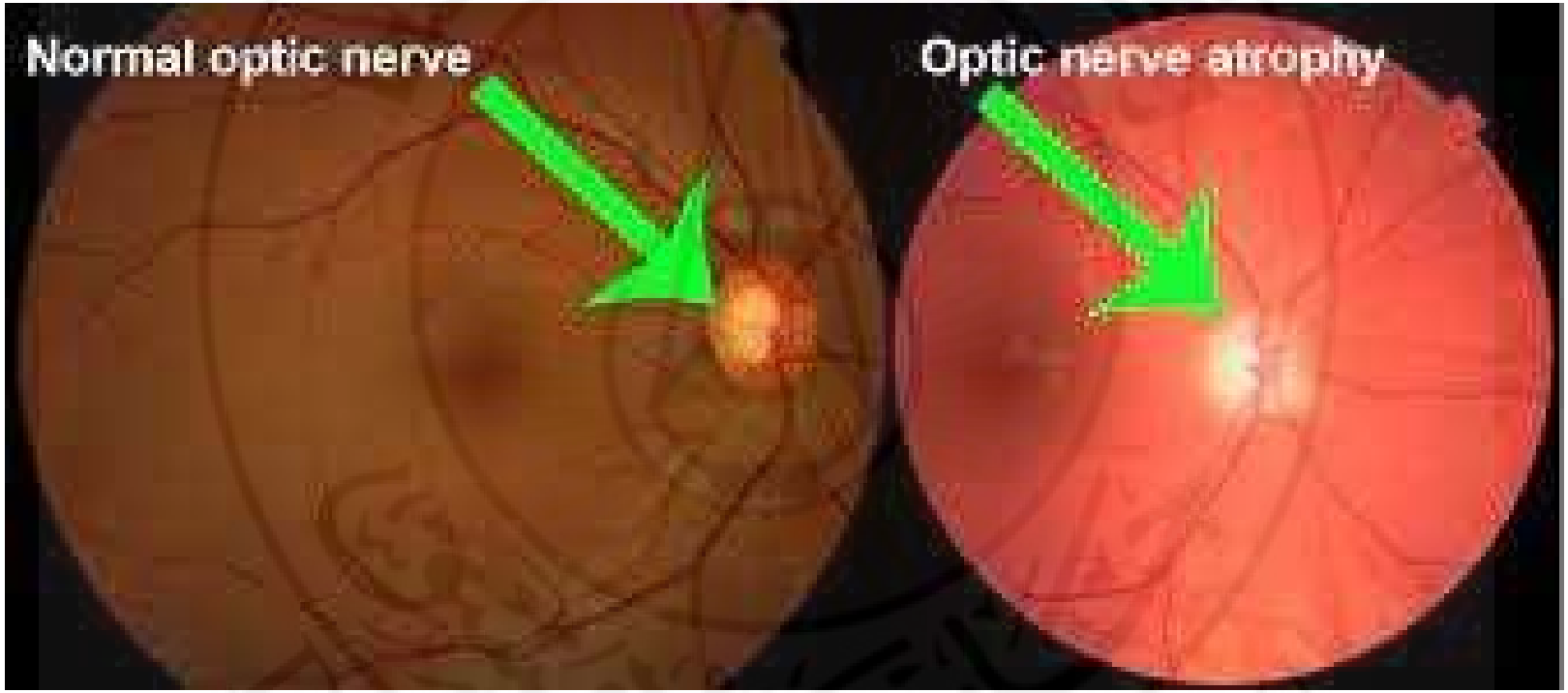


Papilledema



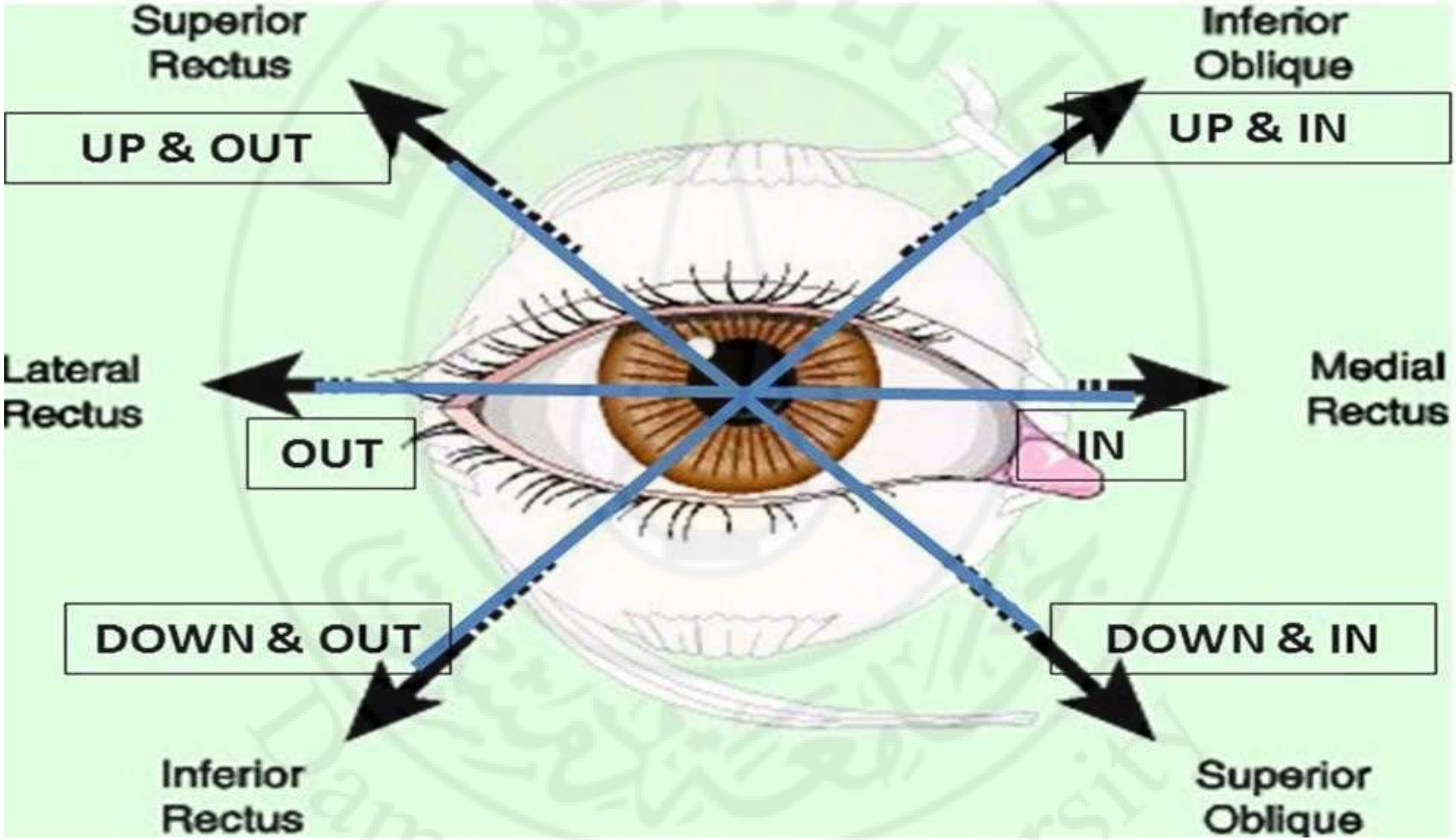
Normal Optic Disk




Normal optic nerve
Optic nerve atrophy

اصابات العصب الثالث والرابع والسادس




Superior Rectus
UP & OUT
Inferior Oblique
UP & IN
Lateral Rectus
OUT
Medial Rectus
IN
DOWN & OUT
DOWN & IN
Inferior Rectus
Superior Oblique



Occulomotor



Occulomotor



Occulomotor



Right Abducens and Left Occulomotor

Occulomotor (3rd cranial nerve) : supplies SR,IR,IO and MR

Trochlear nerve (4th cranial nerve) : supplies SO

Abducens nerve(6th cranial nerve) : supplies LR



Left Abducens and Right Occulomotor



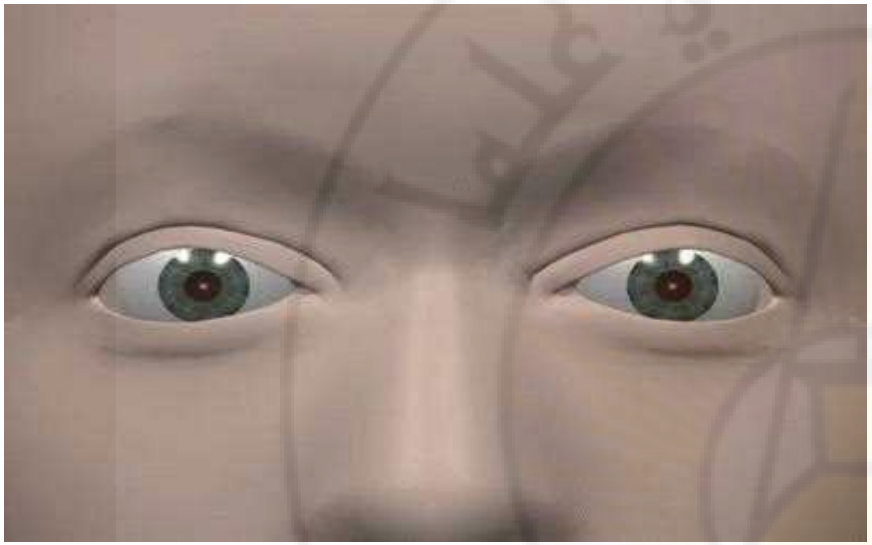
Right Occulomotor and Left Trochlear

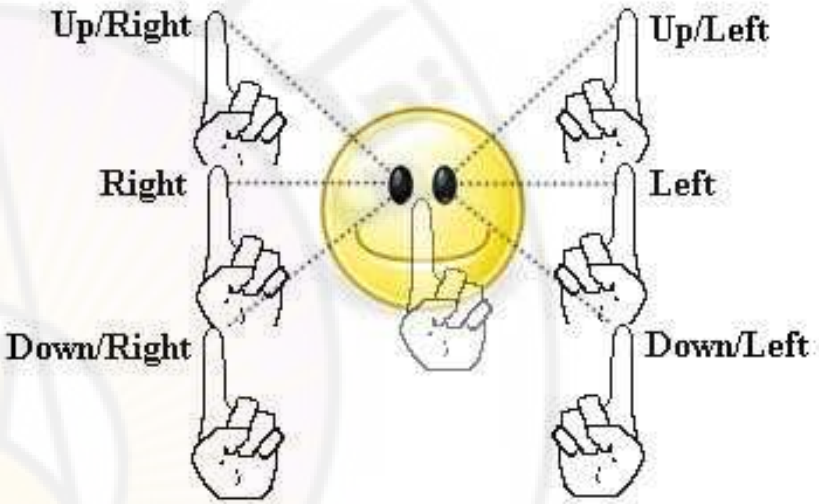


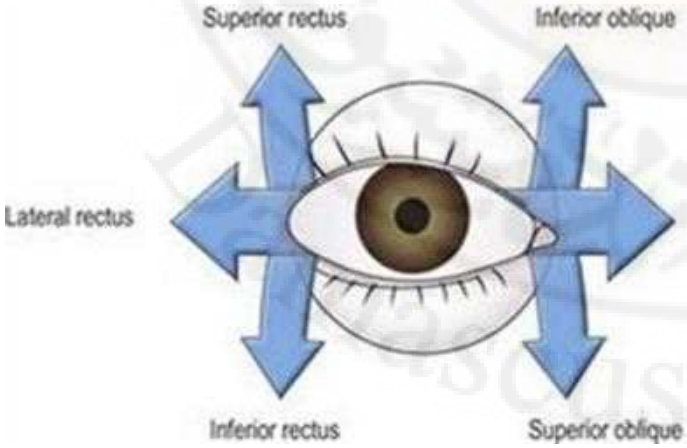
Occulomotor

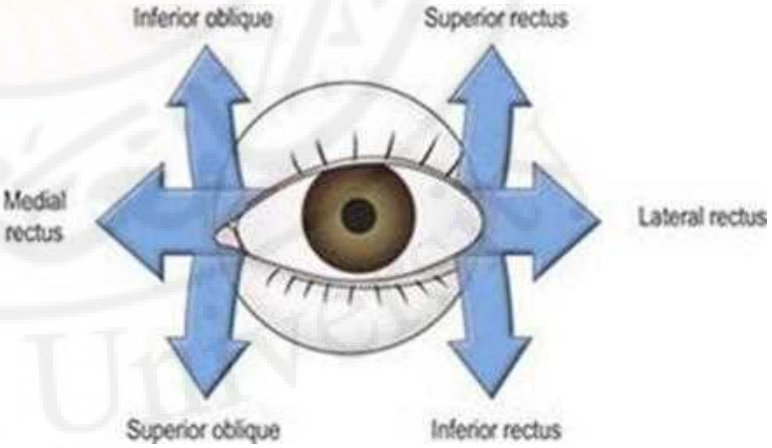


Left Occulomotor and Right Trochlear

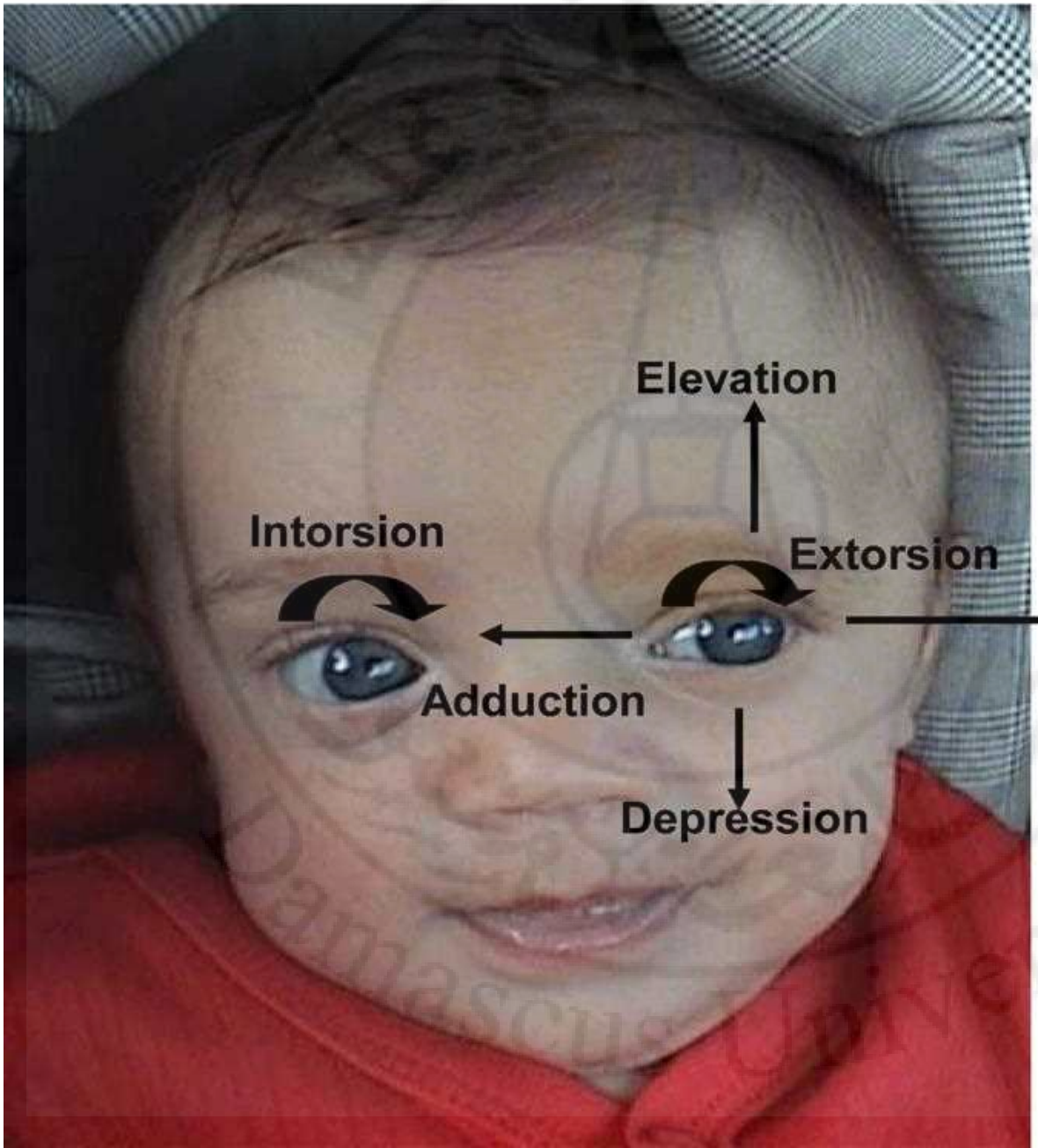



Up/Right
Up/Left
Right
Left
Down/Right
Down/Left

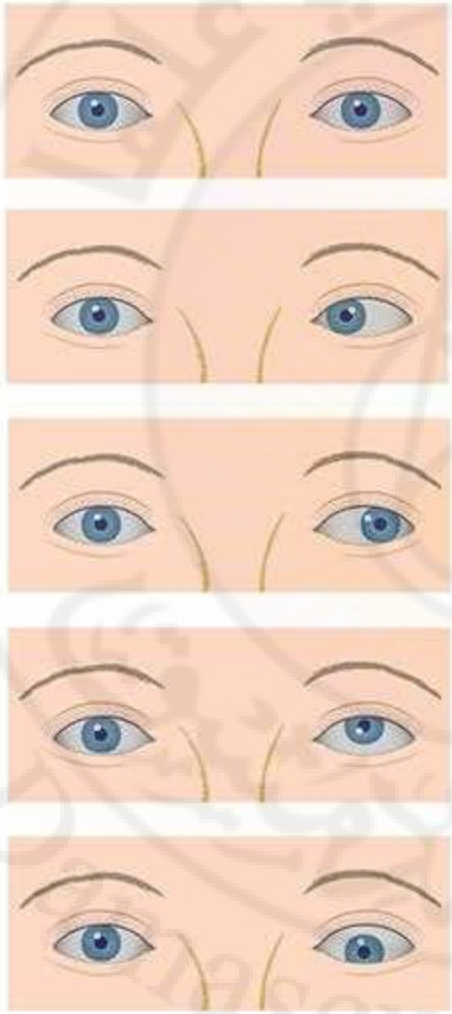

Superior rectus
Inferior oblique
Lateral rectus
Inferior rectus
Superior oblique


Inferior oblique
Superior rectus
Medial rectus
Lateral rectus
Superior oblique
Inferior rectus

Eye Movement Terminology



Strabismus



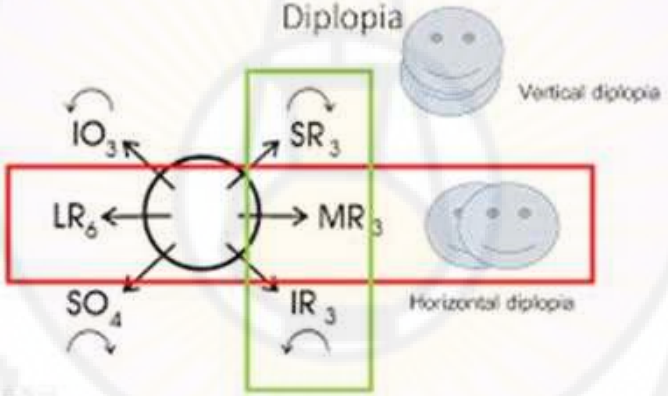
Normal

Esotropia - eye turns inward

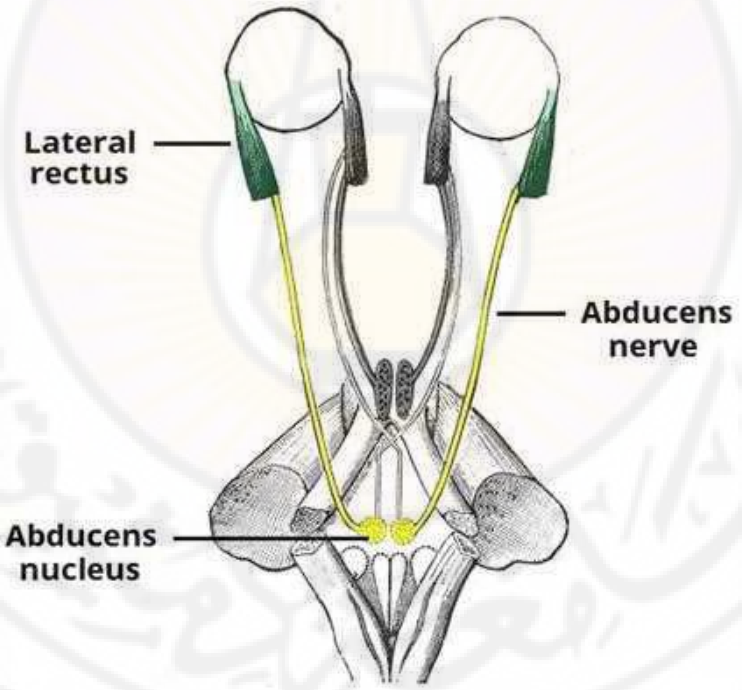
Exotropia - eye turns outward

Hypertropia - eye turns upward

Hypotropia - eye turns downward

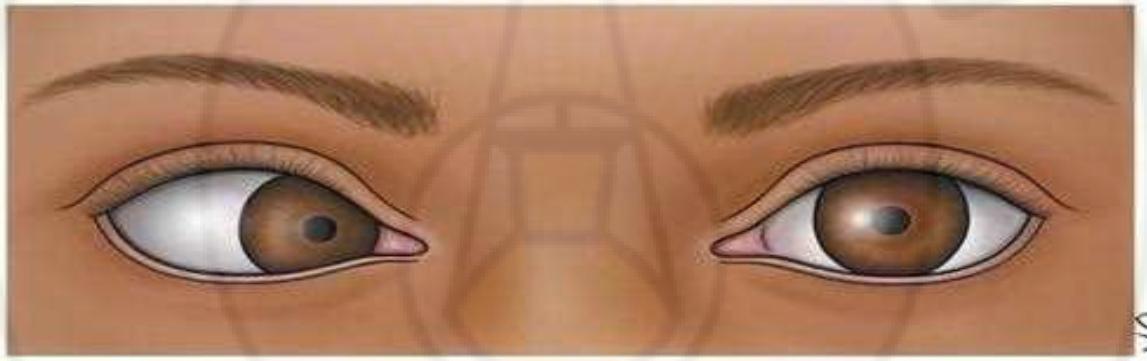

Diplopia
Vertical diplopia
IO3
SR3
LR6
MR3
SO4
IR3
Horizontal diplopia

VI nerve palsy



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VI nerve palsy



Right Left eye: Does not abduct

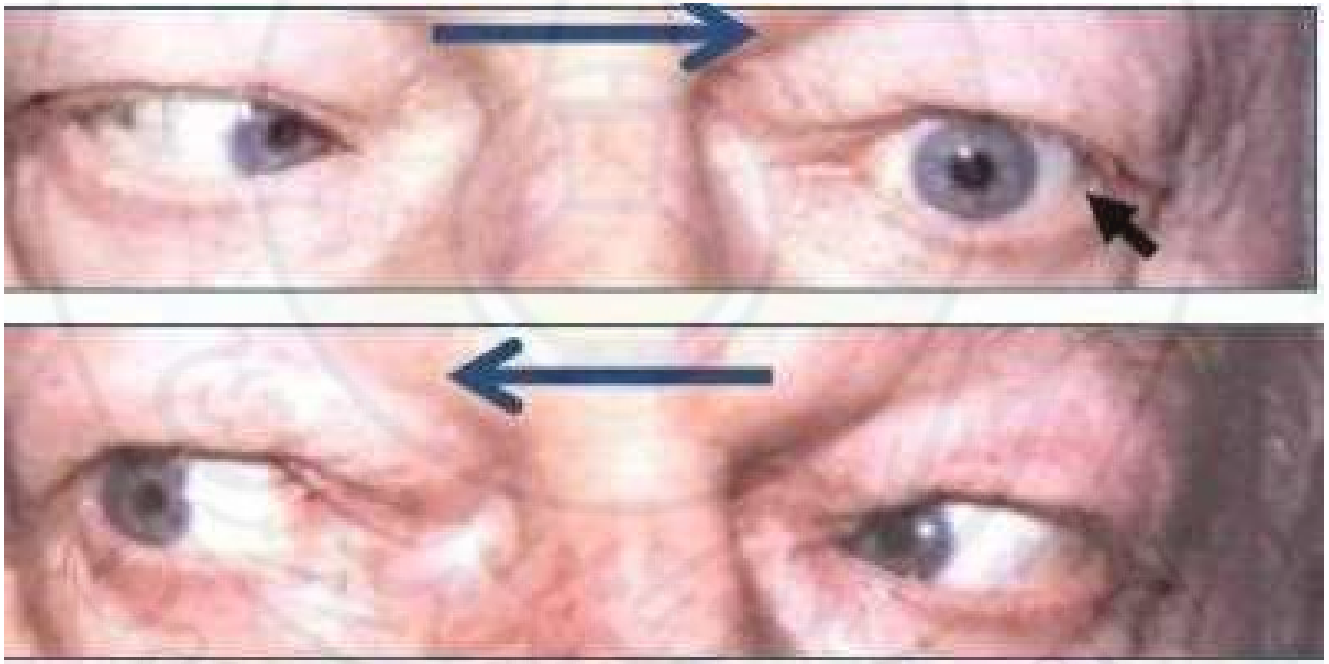
Direction of gaze →

Left abducent (CN VI) nerve palsy

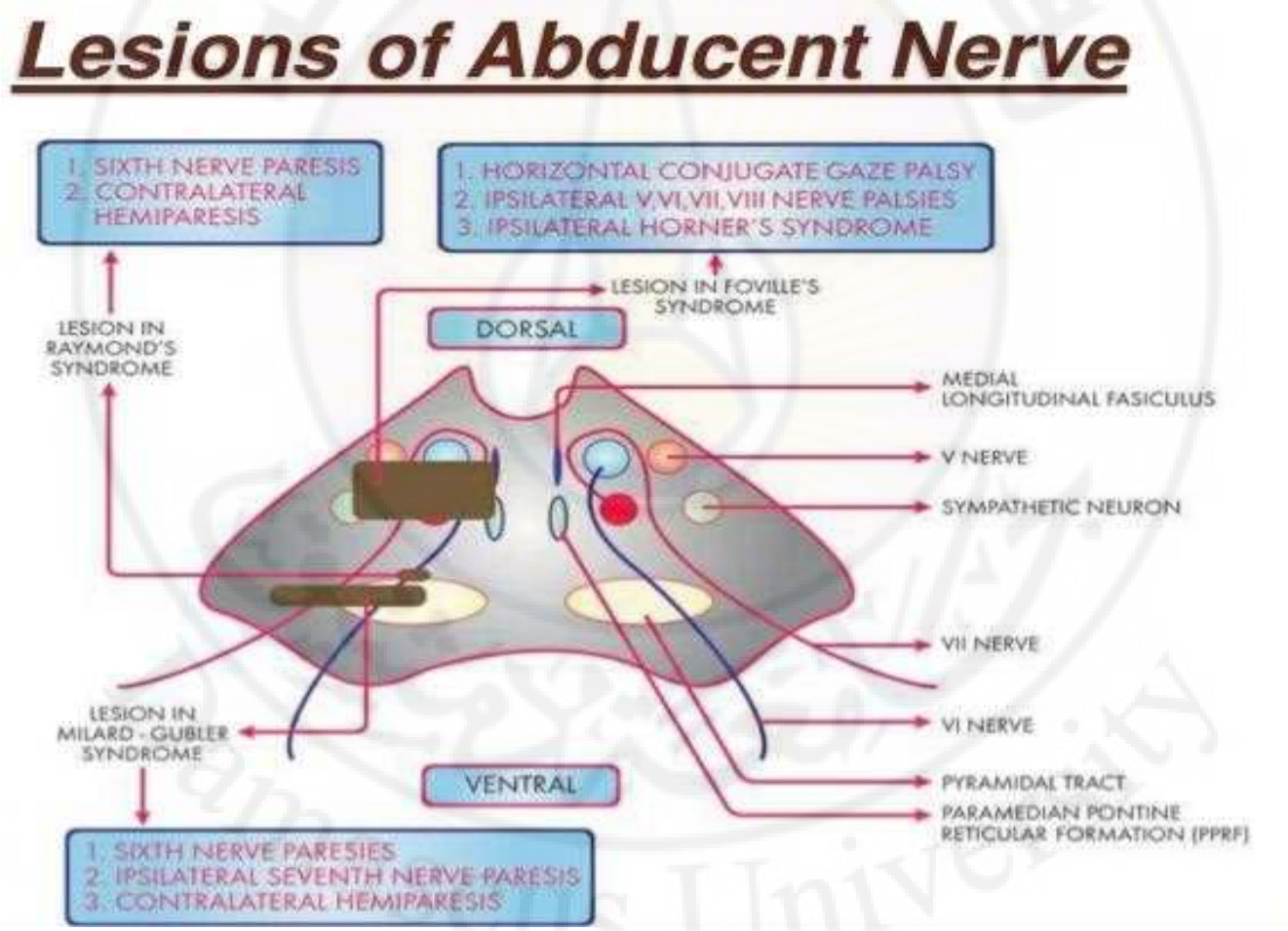
B

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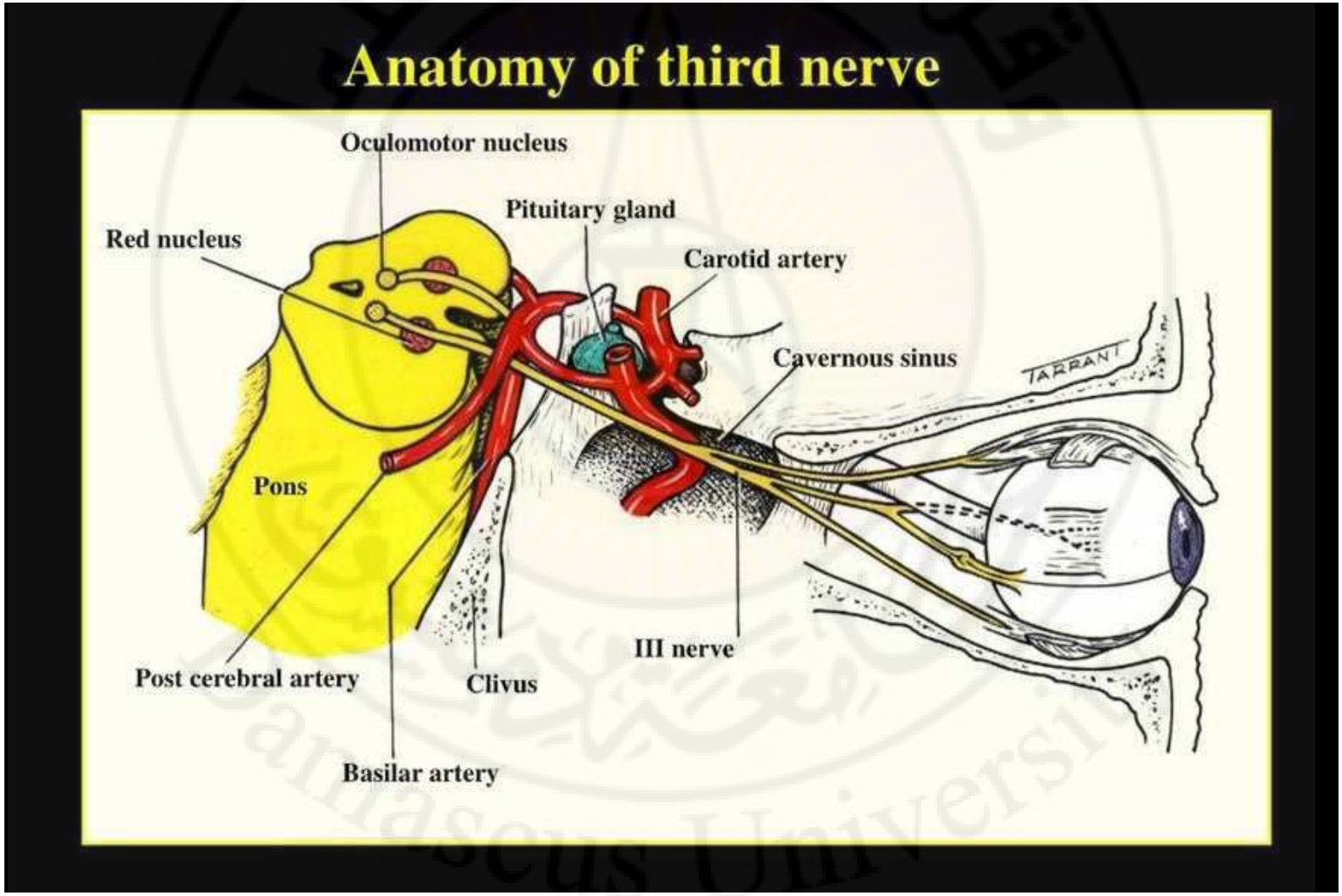
VI nerve palsy



VI and VII CN

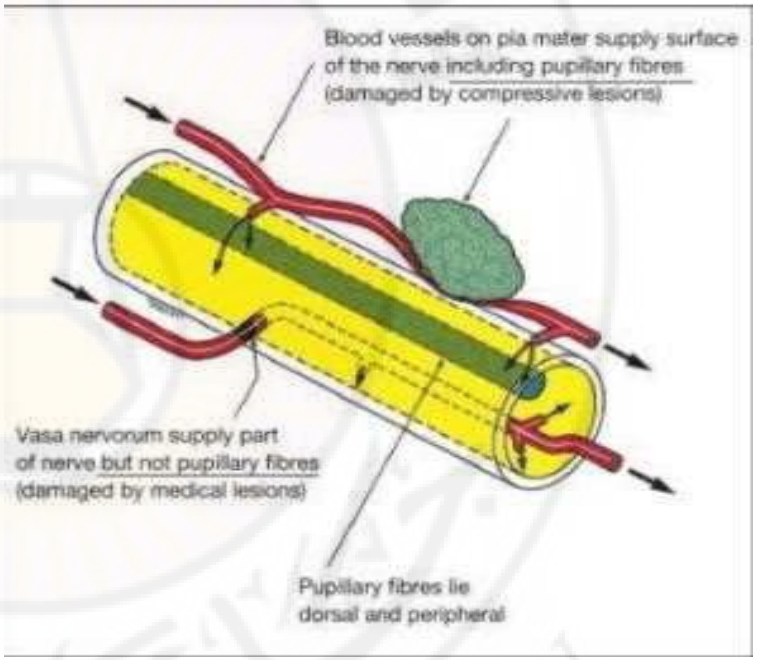

Lesions of Abducent Nerve
1. SIXTH NERVE PARESIS
2. CONTRALATERAL HEMIPARESIS
1. HORIZONTAL CONJUGATE GAZE PALSY
2. IPSILATERAL V,VI,VII,VIII NERVE PALSIES
3. IPSILATERAL HORNER'S SYNDROME
LESION IN RAYMOND'S SYNDROME
LESION IN FOVILLE'S SYNDROME
DORSAL
MEDIAL LONGITUDINAL FASICULUS
V NERVE
SYMPATHETIC NEURON
VII NERVE
VI NERVE
PYRAMIDAL TRACT
PARAMEDIAN PONTINE RETICULAR FORMATION (PPRF)
LESION IN MILARD - GUBLER SYNDROME
VENTRAL
1. SIXTH NERVE PARESIES
2. IPSILATERAL SEVENTH NERVE PARESIS
3. CONTRALATERAL HEMIPARESIS

III nerve palsy

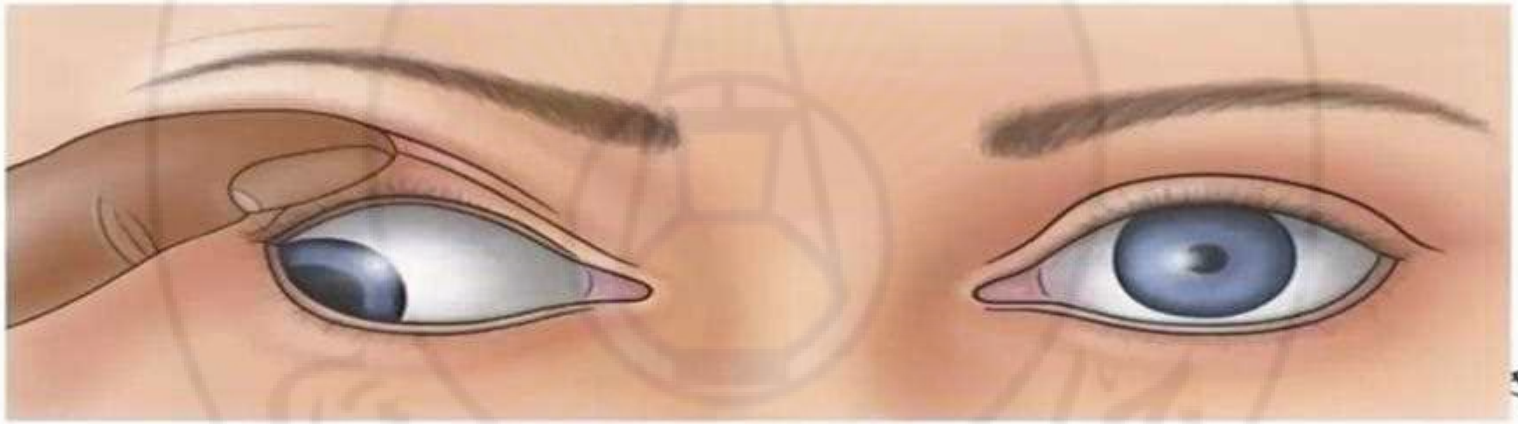


III nerve palsy





III nerve palsy



Right eye: Downward and outward gaze, dilated pupil, eyelid manually elevated due to ptosis

Left: Normal

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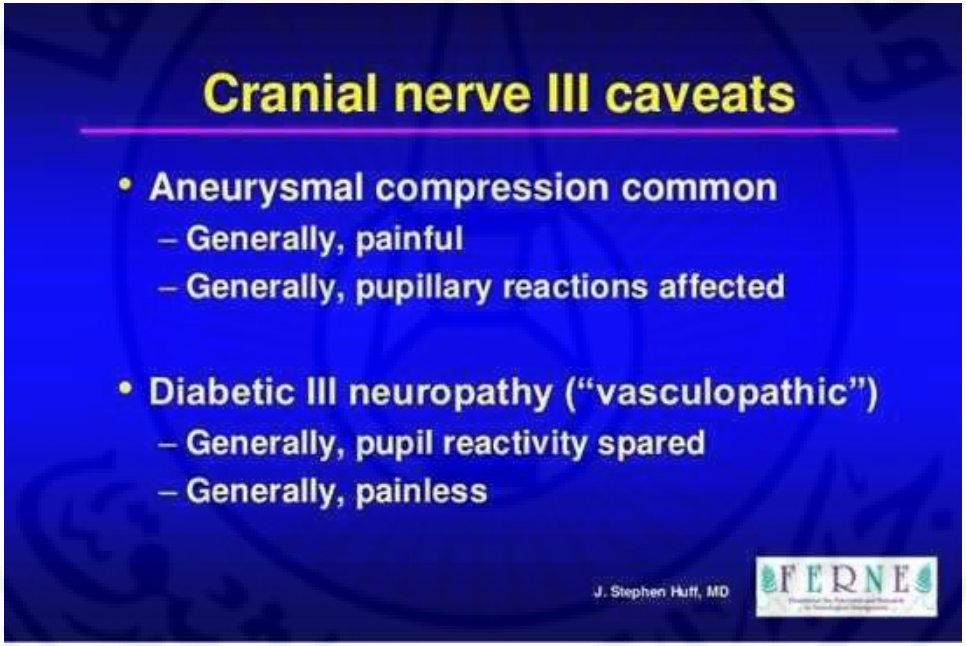
Diabetic III palsy

- Pupillary sparing "almost always" present
- Pupillomotor fibers travel on outside III
  - Selectively vulnerable to compression
  - Resistant to ischemia which often affects central portion of III

J. Stephen Huff, MD



Damascus University


Cranial nerve III caveats
• Aneurysmal compression common
– Generally, painful
– Generally, pupillary reactions affected
• Diabetic III neuropathy ("vasculopathic")
– Generally, pupil reactivity spared
– Generally, painless
J. Stephen Huff, MD
FERNE

III nerve palsy (medical)

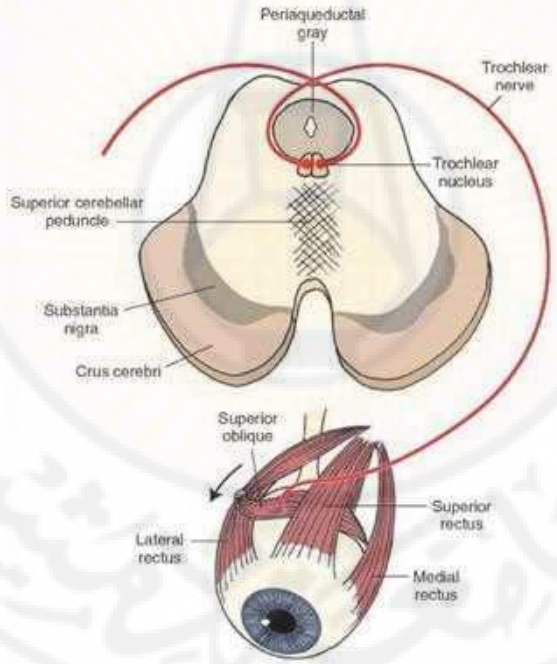


Microvascular cranial nerve palsy (MCNP) symptoms include weakness in one or more eye muscles, blurred vision that improves by closing either eye, double vision, droopy eyelid or pain around the eye.

III nerve palsy (Surgical)



IV nerve palsy



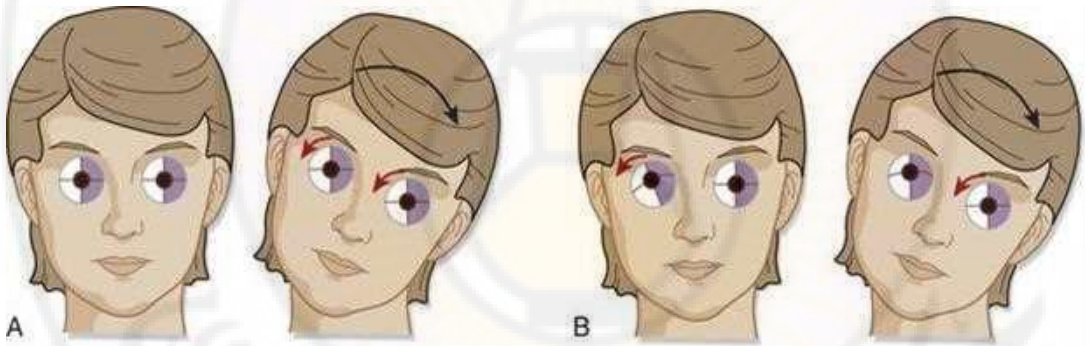
IV nerve palsy



IV nerve palsy

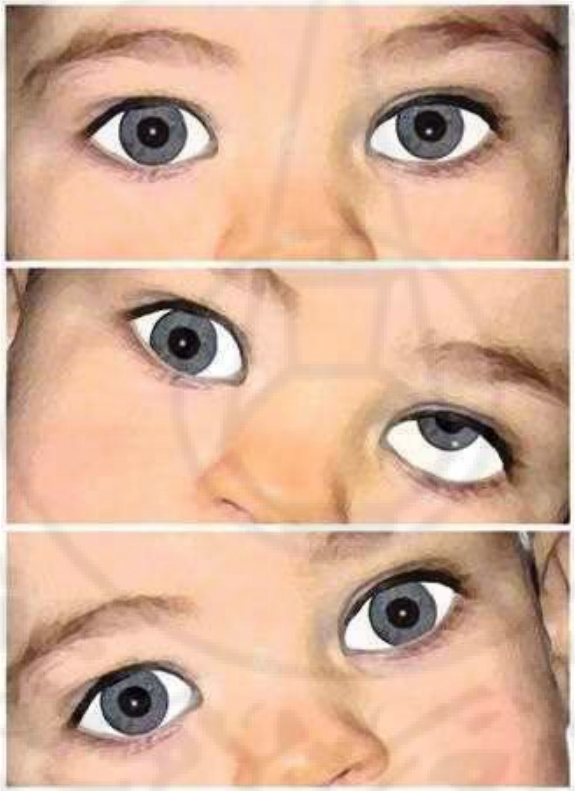


IV nerve palsy



Normal eye rotation
When the head tilts to the left, both eyes rotate in the opposite direction (right eye extorts, left eye intorts)

Cranial nerve IV palsy (right eye)
Right eye extorted and slightly elevated causing double vision. To compensate, the patient tilts her head to the left



Supranuclear Gaze Palsy

It is best to assess for an SNGP in a hierarchical fashion; initially assessing saccades to command, then saccades to visual targets, then smooth pursuit of a target, and finally with the VOR.

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Supranuclear Gaze Palsy



primary position in the illuminated room



convergence

upward gaze



rightward gaze





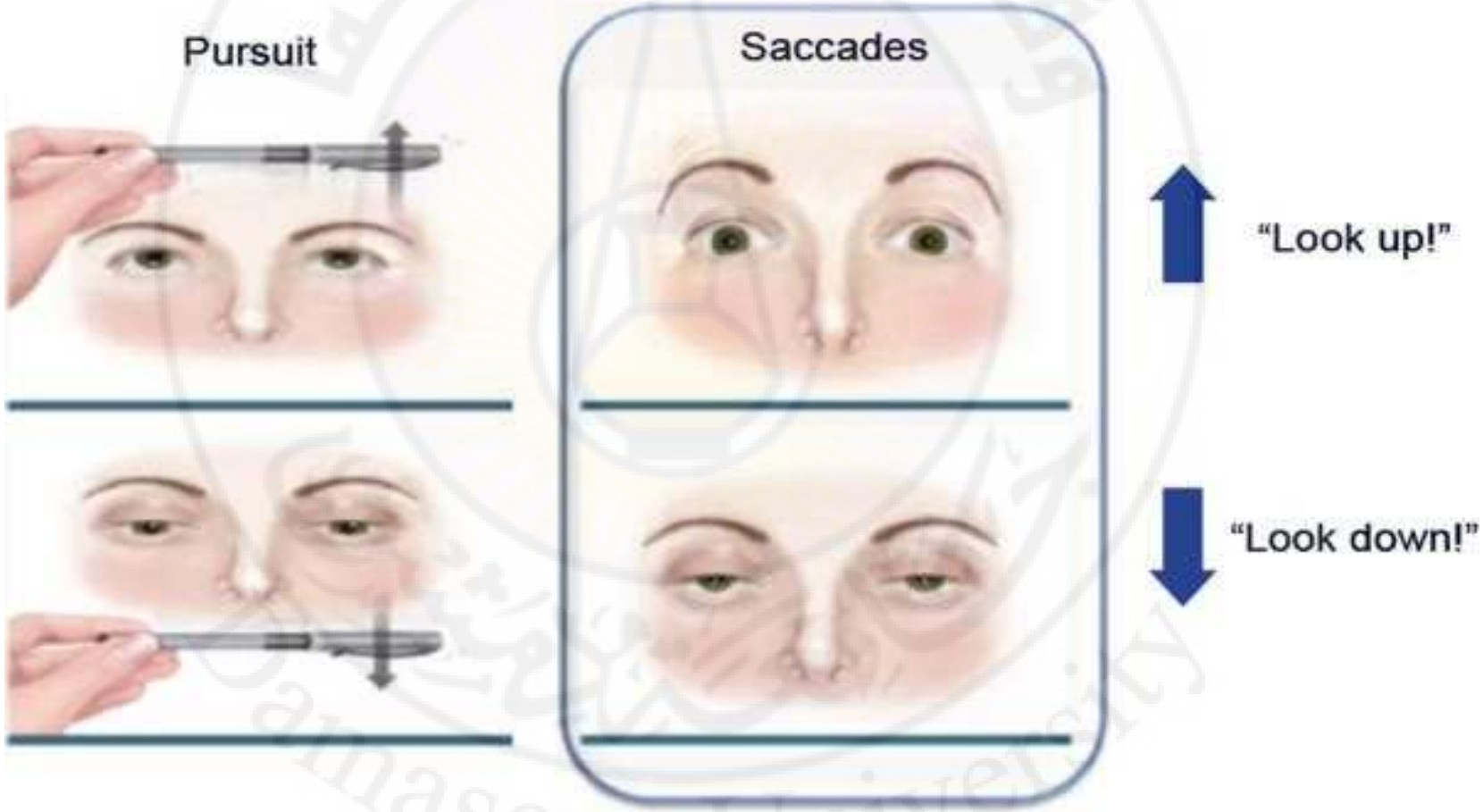
leftward gaze





downward gaze

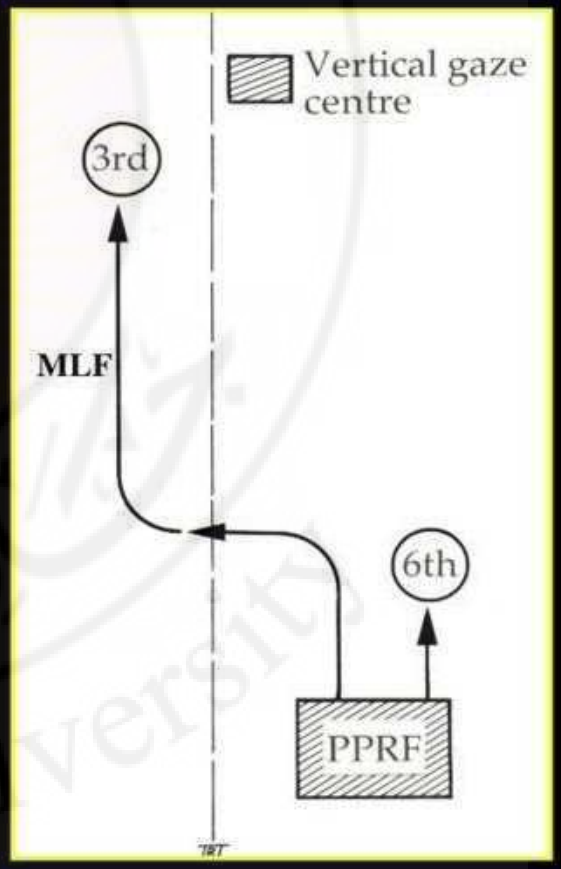
Supranuclear Gaze Palsy



Supranuclear Gaze Palsy

SUPRANUCLEAR DISORDERS OF EYE MOVEMENT

1. **Horizontal gaze palsies**
   - Internuclear ophthalmoplegia
   - Combined internuclear and PPRF ('one-and-a-half syndrome')
2. **Vertical gaze palsies**
   - Parinaud dorsal midbrain syndrome
   - Progressive supranuclear palsy



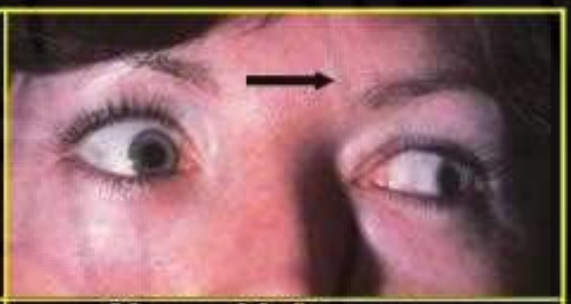
Supranuclear Gaze Palsy

Internuclear ophthalmoplegia

Lesion involving left MLF



Defective left adduction and ataxic nystagmus of right eye



Normal left gaze



Convergence intact if lesion discrete

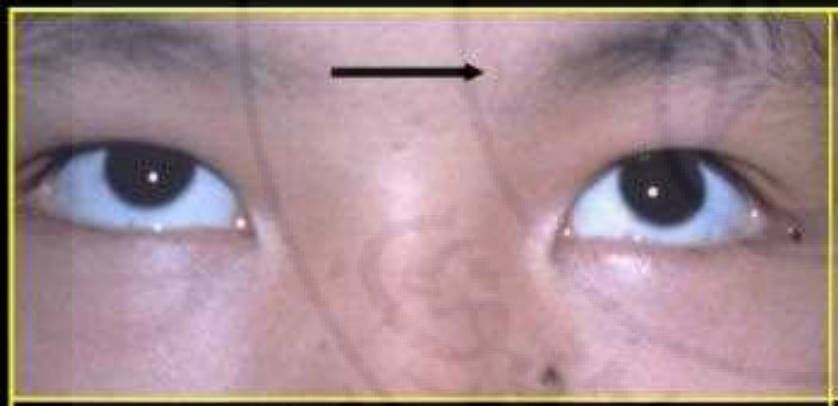
Important causes

- Demylination - usually bilateral
- Vascular disease
- Tumours of brainstem

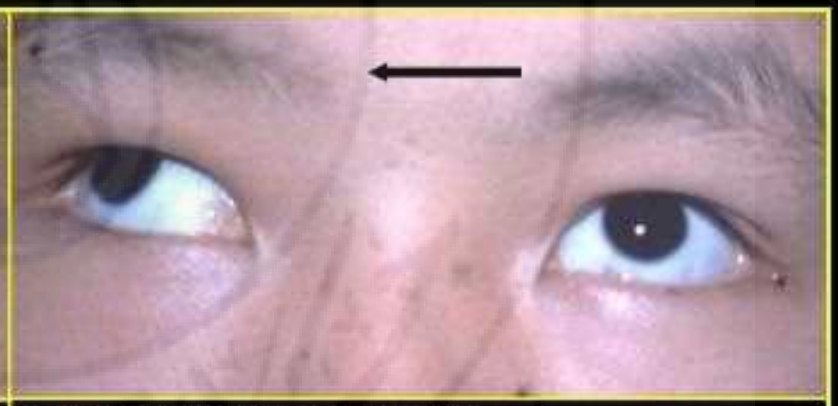
Supranuclear Gaze Palsy

‘One-and-a-half syndrome ’

Combined lesion of left MLF and PPRF



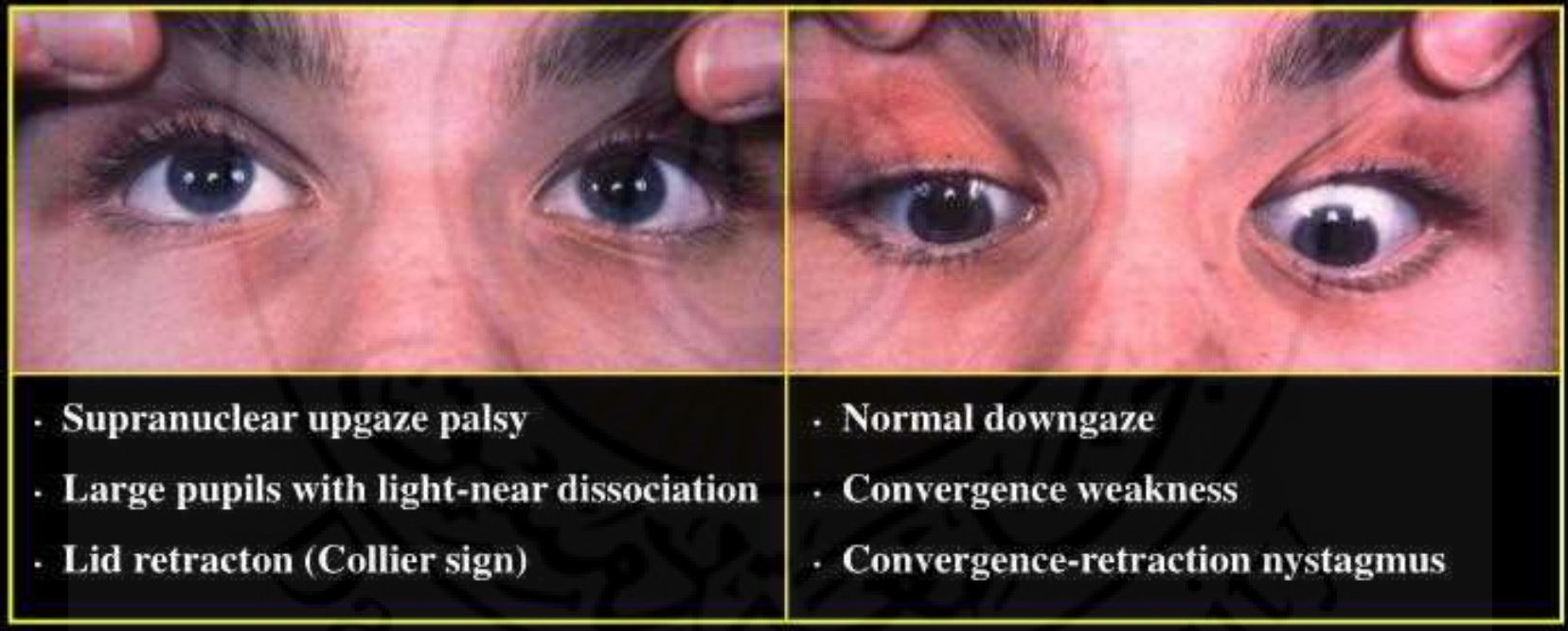
- Ipsilateral (left) gaze palsy



- Defective left adduction
- Normal right abduction with ataxic nystagmus

Supranuclear Gaze Palsy

Parinaud dorsal midbrain syndrome



· Supranuclear upgaze palsy	· Normal downgaze
· Large pupils with light-near dissociation	· Convergence weakness
· Lid retracton (Collier sign)	· Convergence-retraction nystagmus

Important causes

- In children: aqueduct stenosis, meningitis and pinealoma
- In young adults: demylination, trauma and a-v malformations
- In elderly: vascular accidents and posterior fossa aneurysms

Supranuclear Gaze Palsy

Progressive supranuclear palsy
(Steele-Richardson-Olszewski syndrome)



Initially involves downgaze

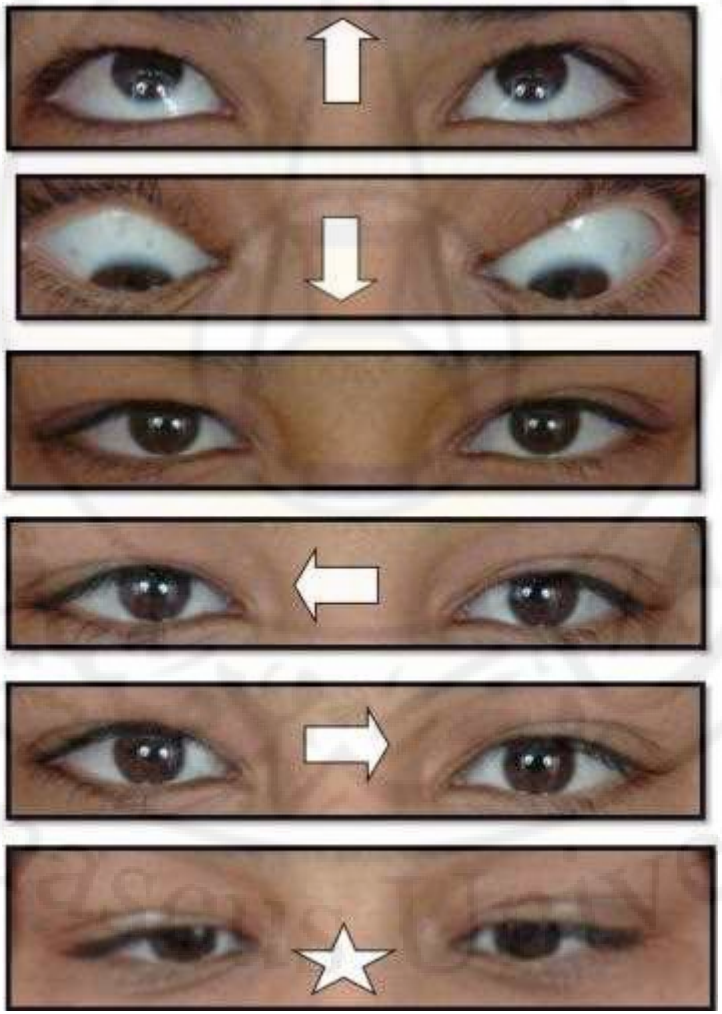


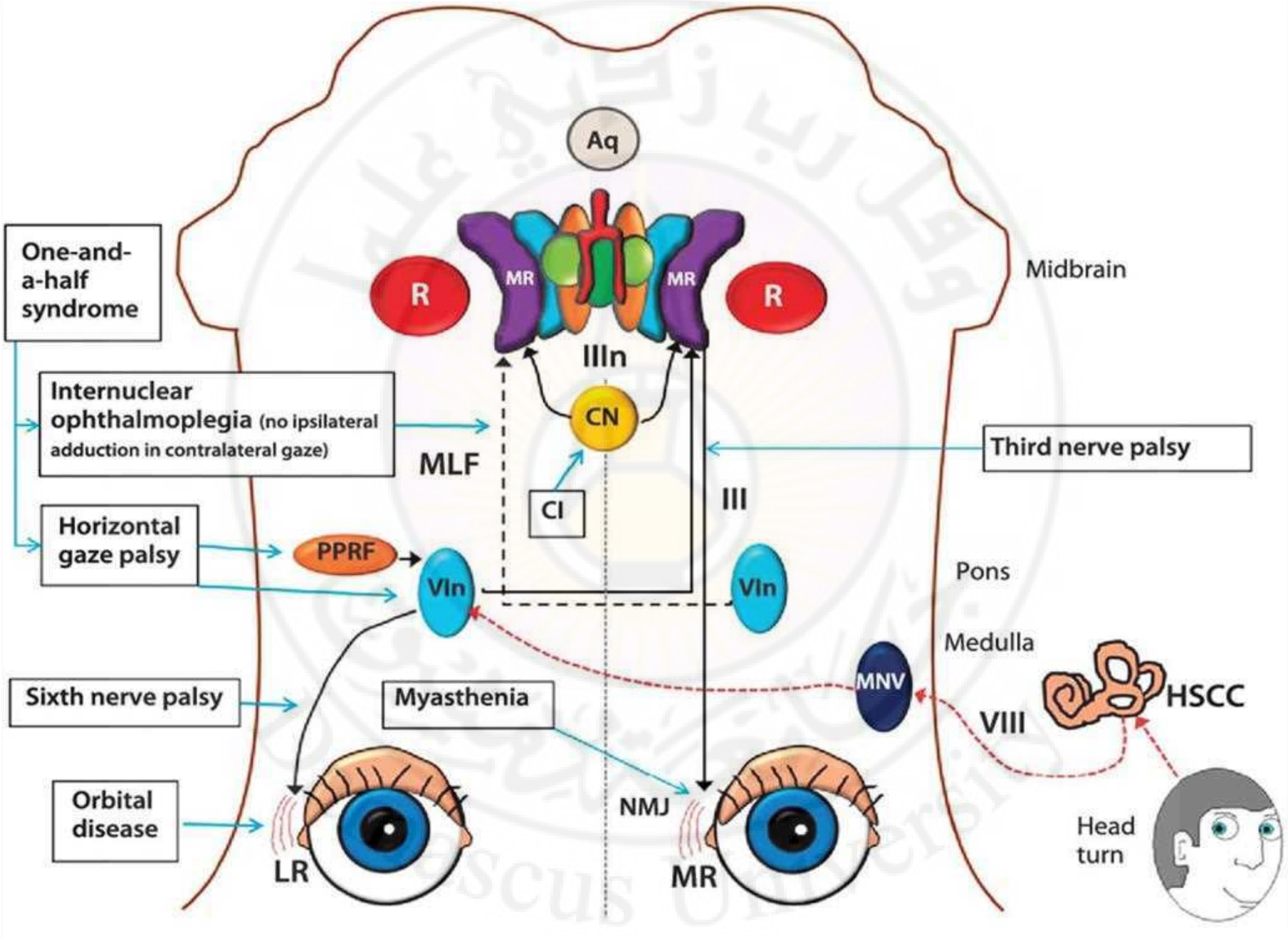
Subsequent defective up and horizontal gaze

- Affects elderly
- Pseudobulbar palsy
- Extrapyramidal rigidity
- Gait ataxia
- Dementia



Horizontal gaze palsy




Aq
One-and-a-half syndrome
R
MR
MR
R
Midbrain
IIIn
Internuclear ophthalmoplegia (no ipsilateral adduction in contralateral gaze)
CN
Third nerve palsy
MLF
CI
III
Horizontal gaze palsy
PPRF
VIn
VIn
Pons
Medulla
MNV
HSCC
VIII
Sixth nerve palsy
Myasthenia
Orbital disease
NMJ
LR
MR
Head turn

IS THERE ANY VARIABILITY OR REMISSION ?

- MULTIPLE SCLEROSIS
- MYASTHENIA
- BOTULINUM TOXIN

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Myasthenia Gravis

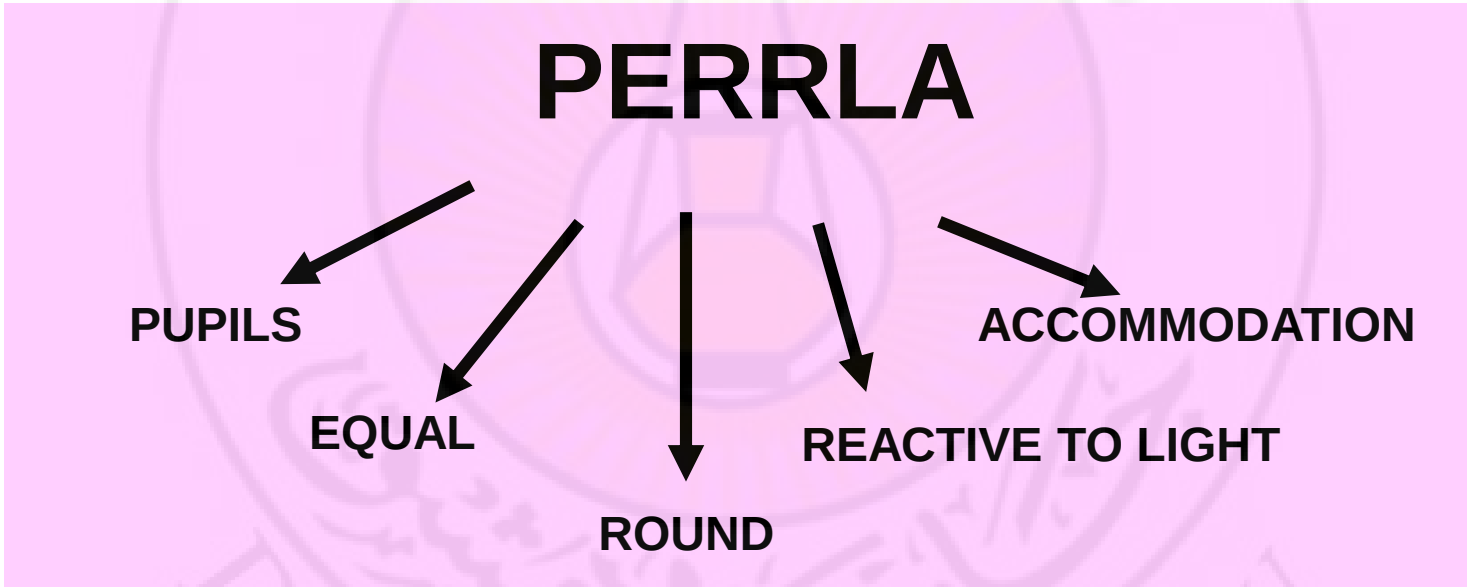


Botulinum Toxin



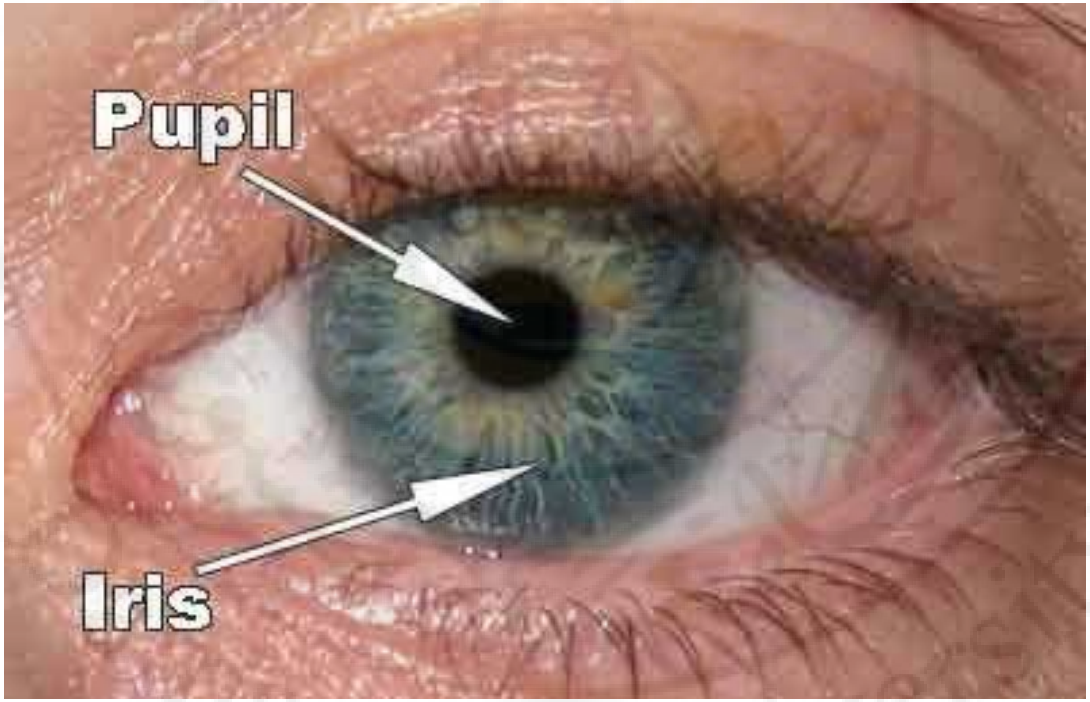
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ALWAYS REMEMBER

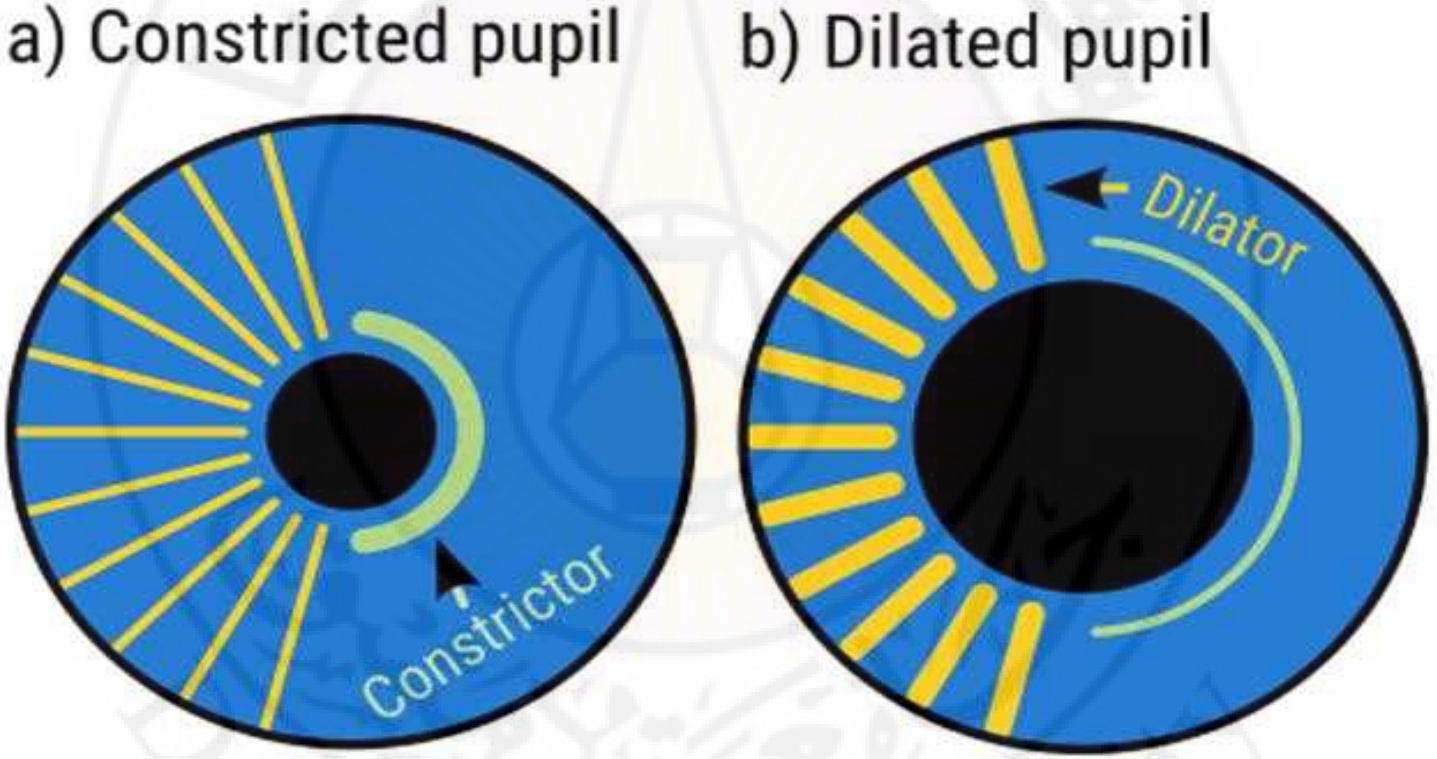


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The Pupil

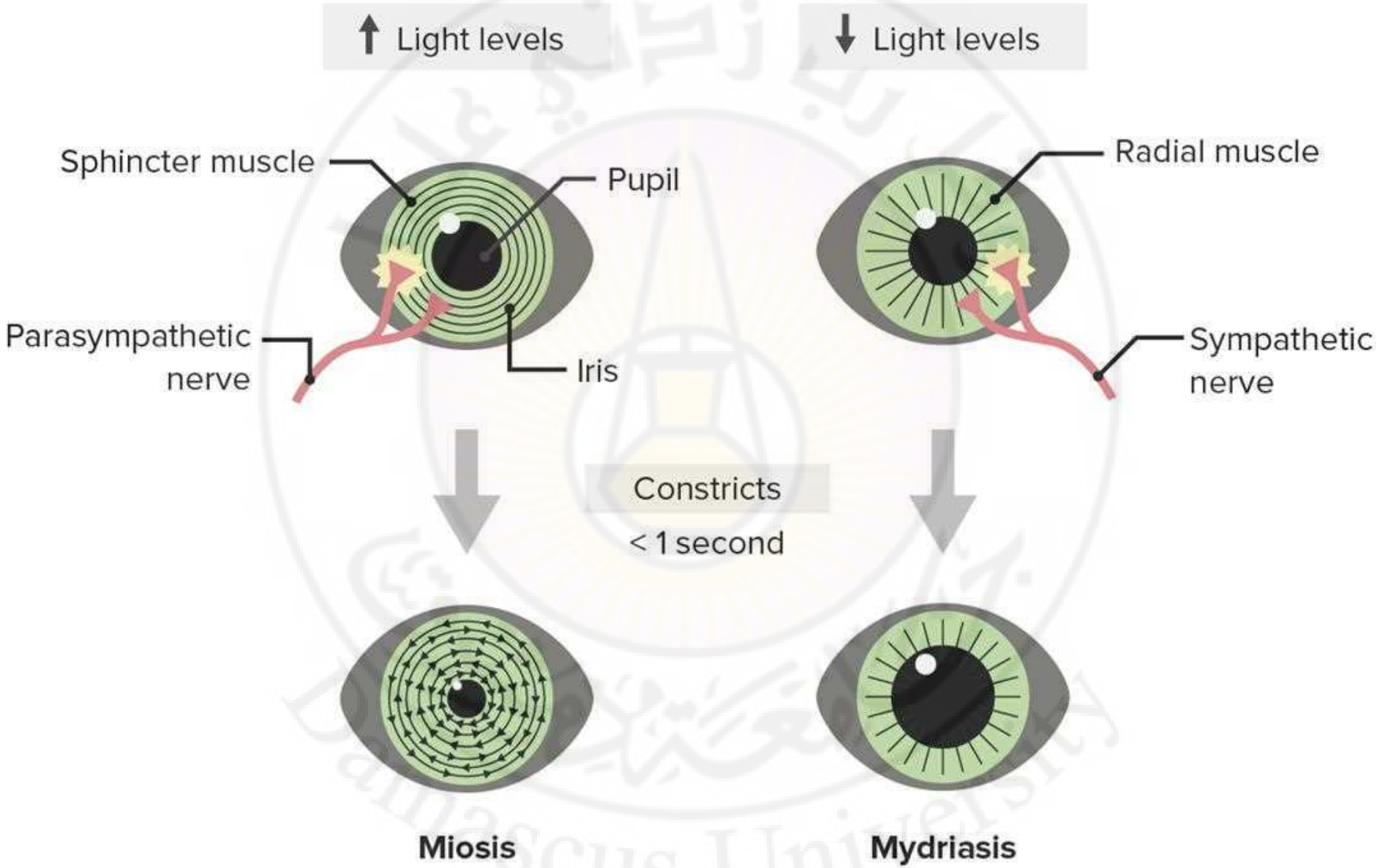


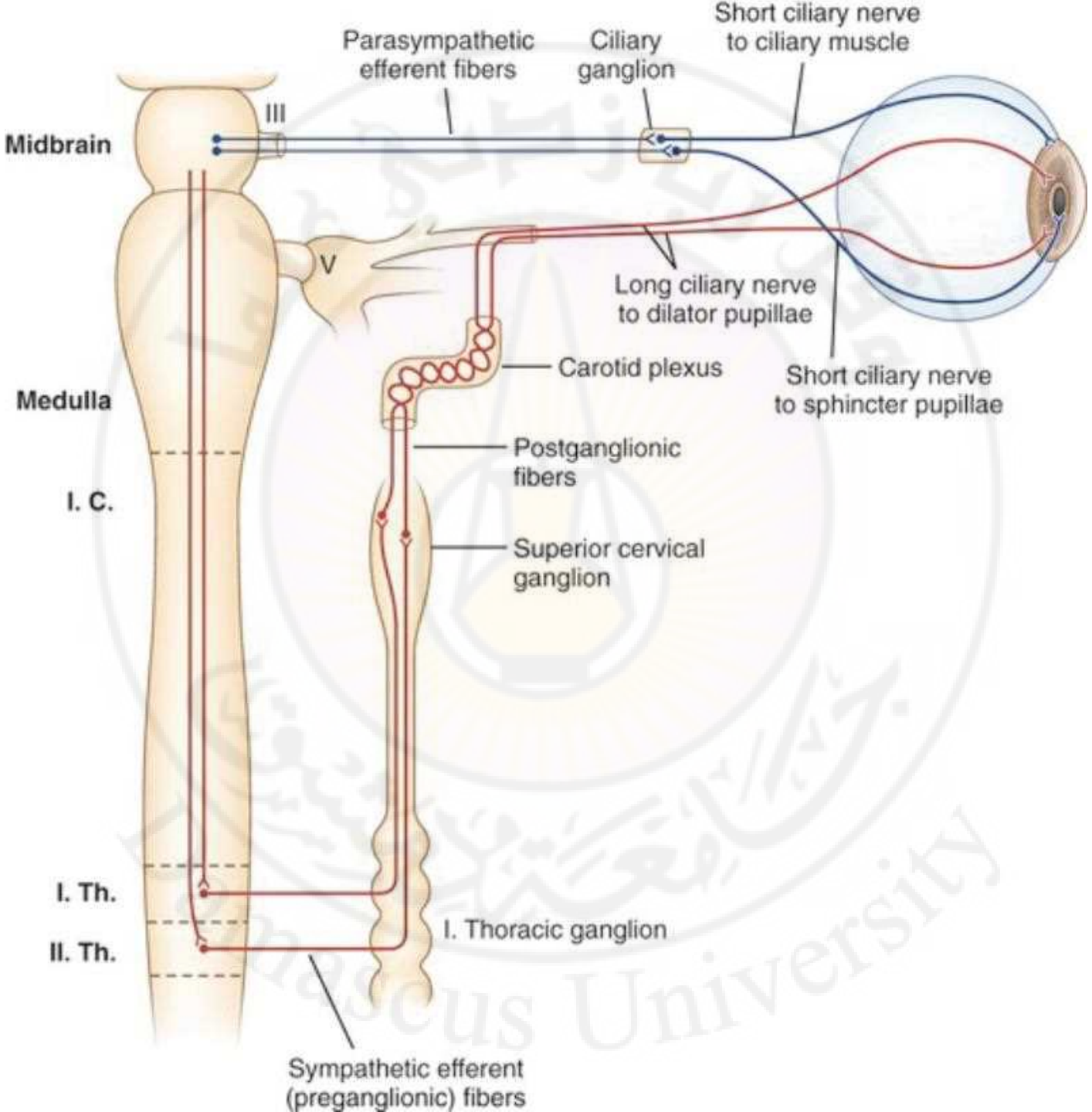
The Pupil

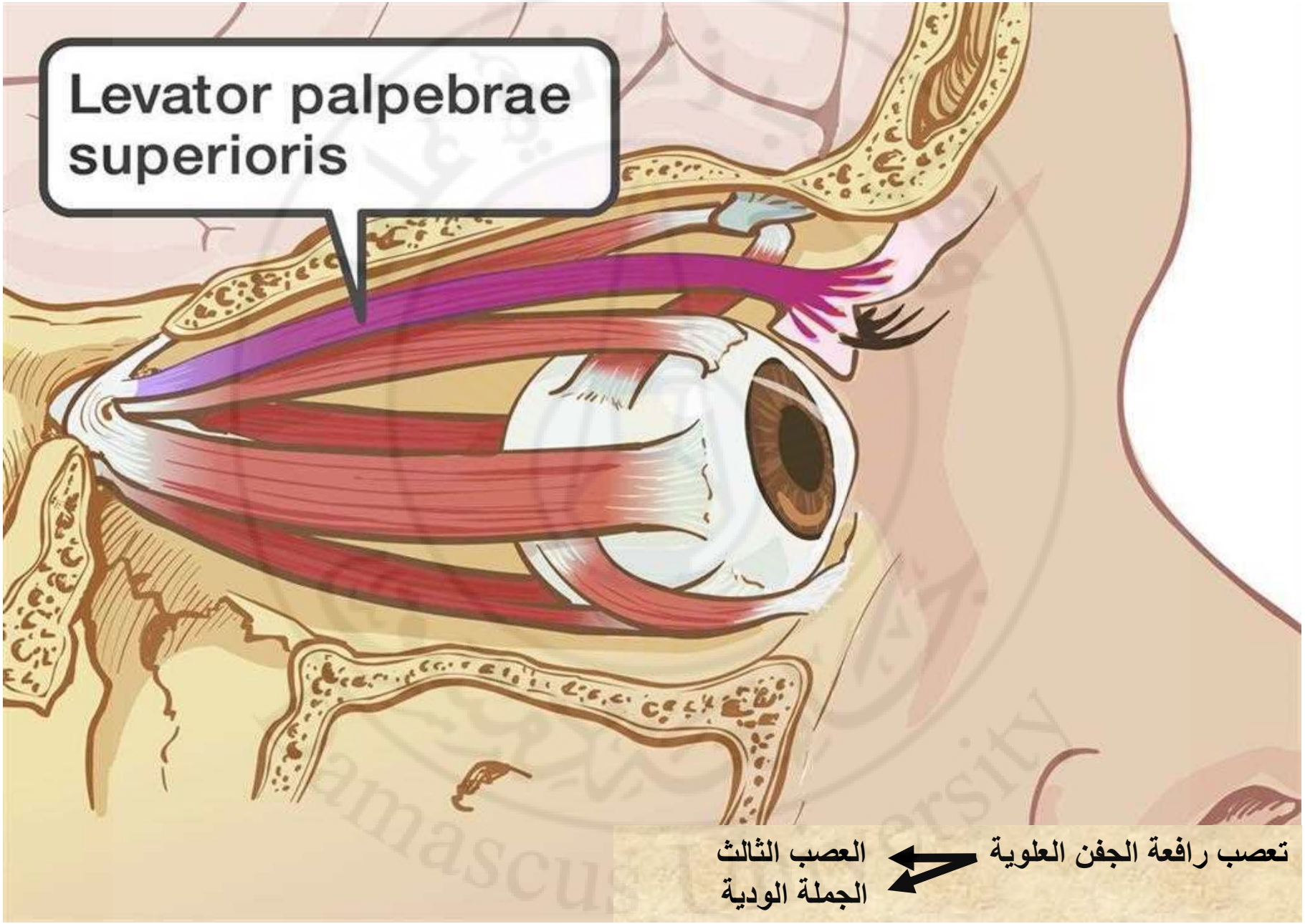


تقبض : الجملة نظيرة الودية (كوليني الفعل) III CN

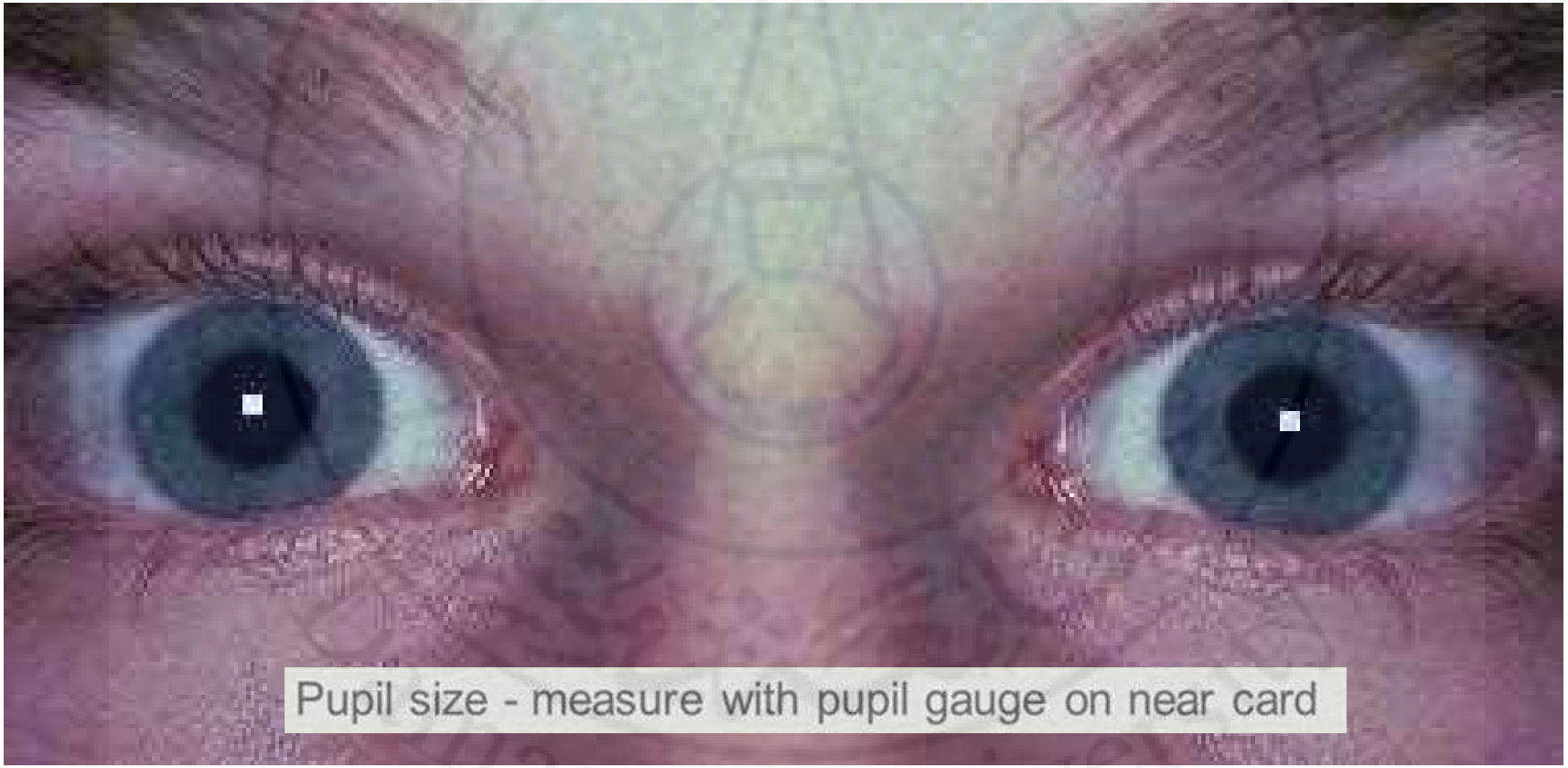
توسع: الجملة الودية (ادرينالييني الفعل)


Light levels
Light levels
Sphincter muscle
Pupil
Parasympathetic nerve
Iris
Radial muscle
Sympathetic nerve
Constricts
< 1 second
Miosis
Mydriasis

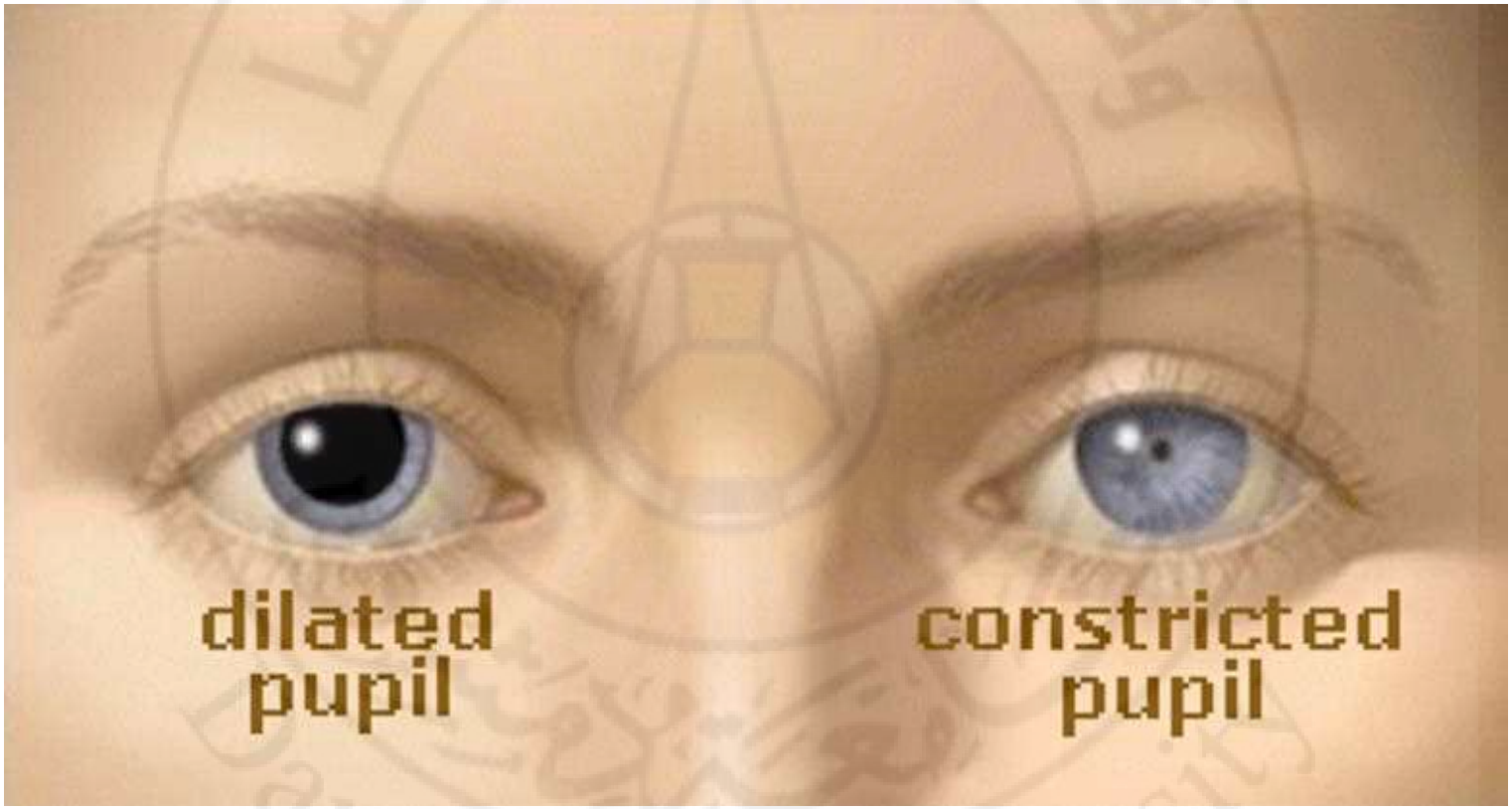

Parasympathetic efferent fibers
Ciliary ganglion
Short ciliary nerve to ciliary muscle
III
Midbrain
V
Long ciliary nerve to dilator pupillae
Carotid plexus
Short ciliary nerve to sphincter pupillae
Medulla
Postganglionic fibers
I. C.
Superior cervical ganglion
I. Th.
II. Th.
I. Thoracic ganglion
Sympathetic efferent (preganglionic) fibers


Levator palpebrae superioris
تعصب رافعة الجفن العلوية
العصب الثالث
الجملة الودية

EQUAL



The Pupil



Round



Vertical



Cat Eyes

Horizontal pupil



Eyes of a goat

Round pupil



Eyes of a tiger

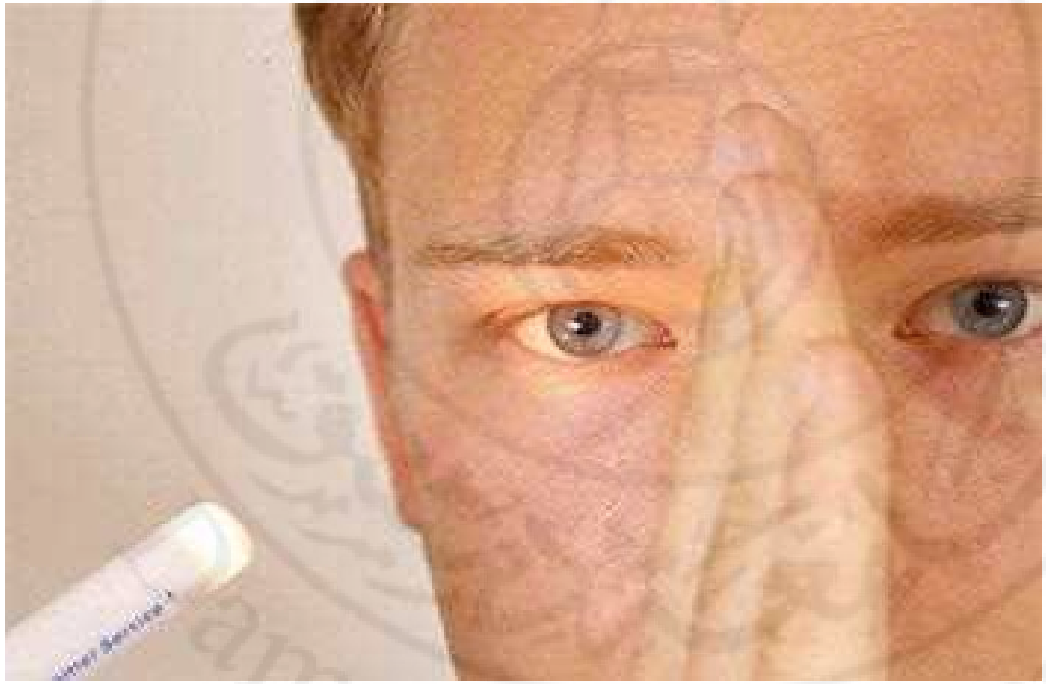
Why do the eyes of some animals, have horizontal-shaped pupils, while others have vertical slits?



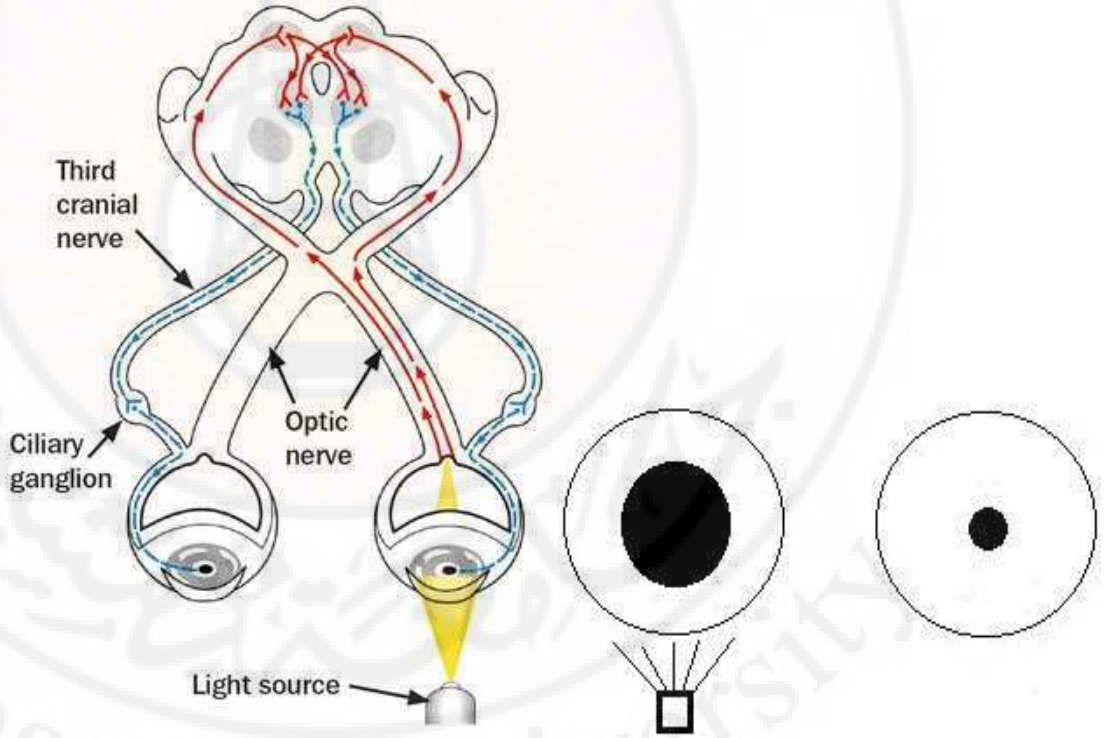
Respond to light (direct and consensual)



Respond to light (direct and consensual)



RAPD


Third cranial nerve
Ciliary ganglion
Optic nerve
Light source

RAPD



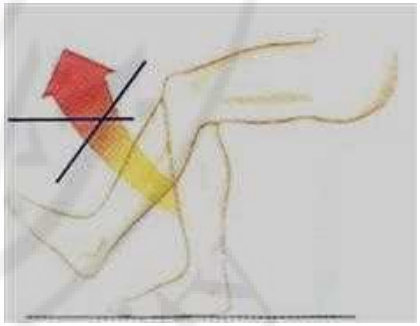
Constriction in the near



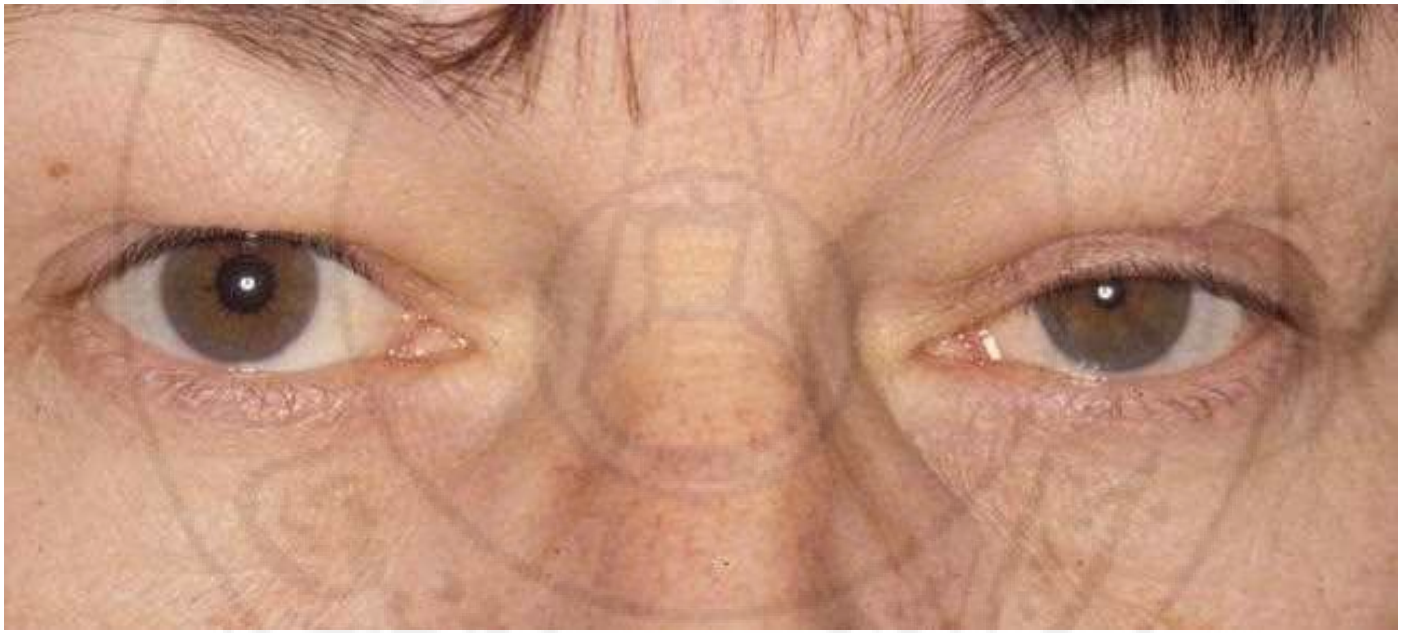
Adie's tonic pupil



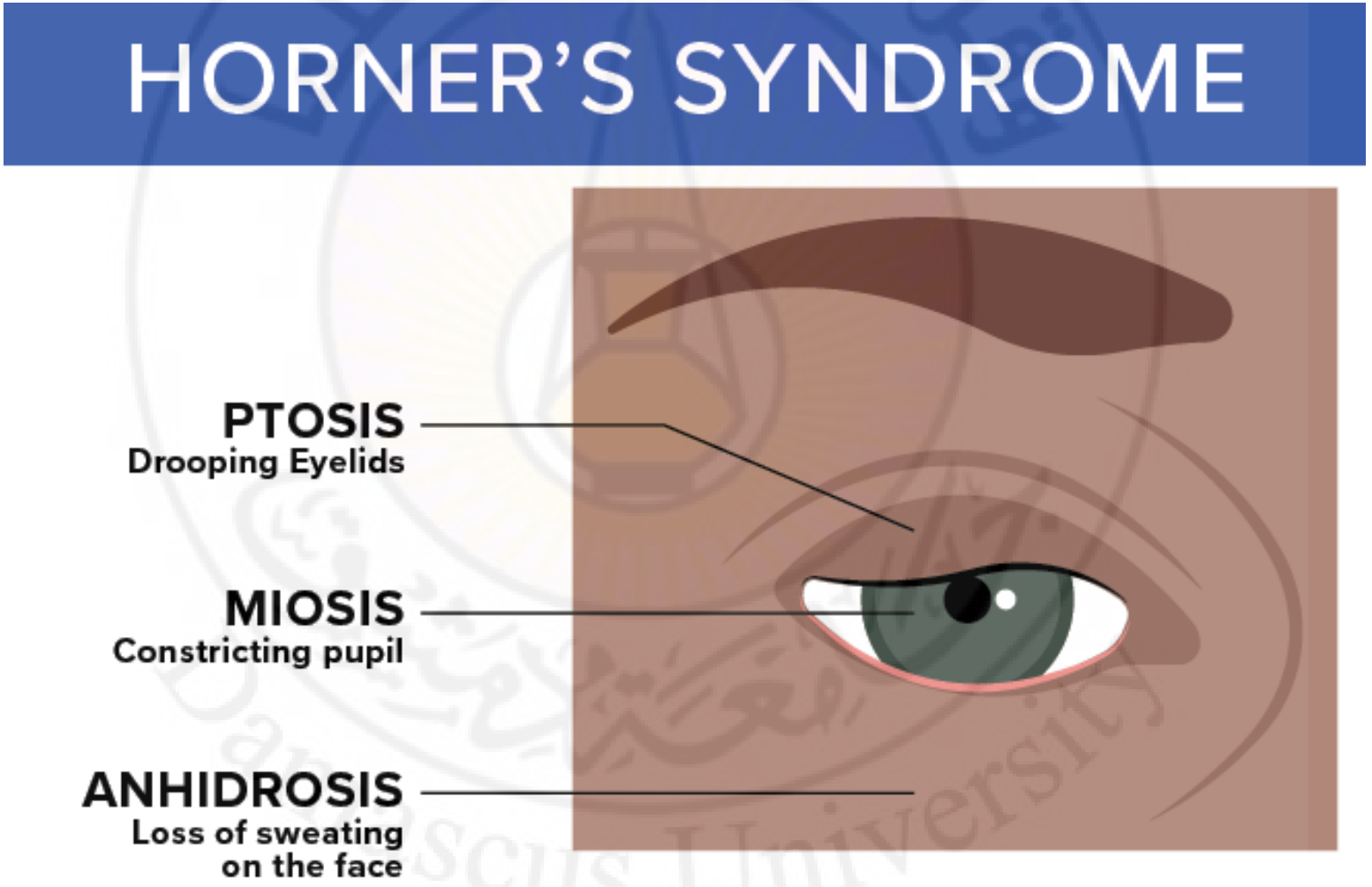
Deep tendon reflexes are absent



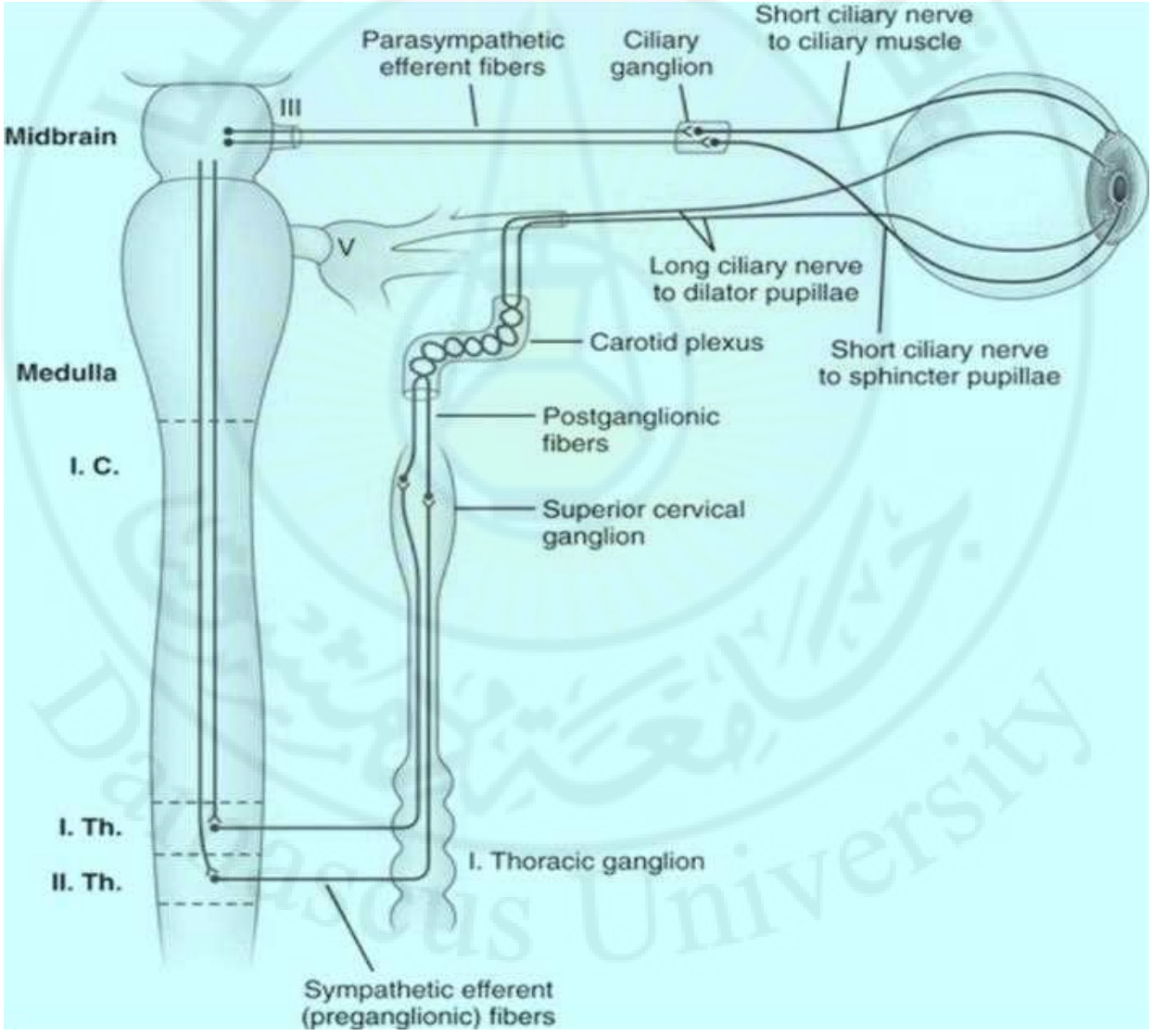
Horner’s symptoms



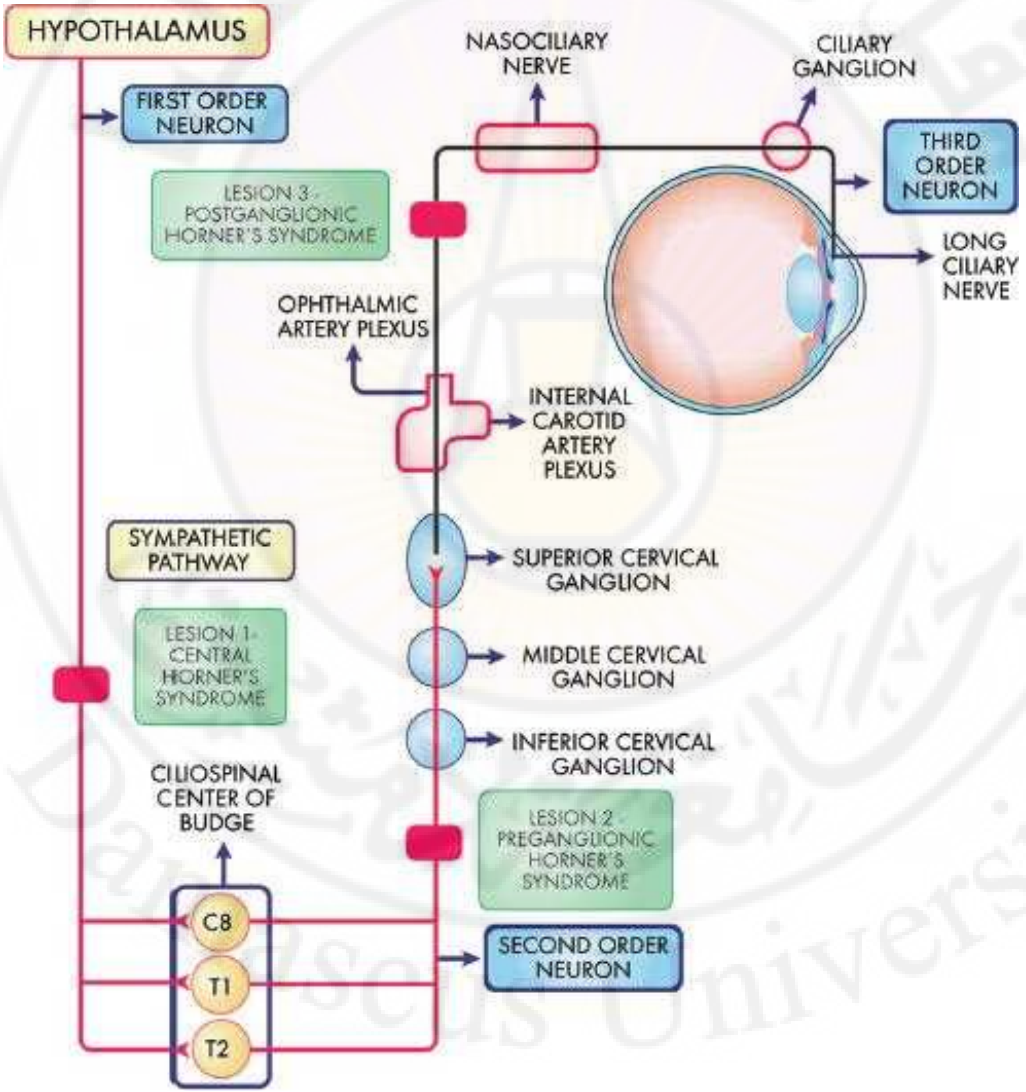
Horner's symptoms



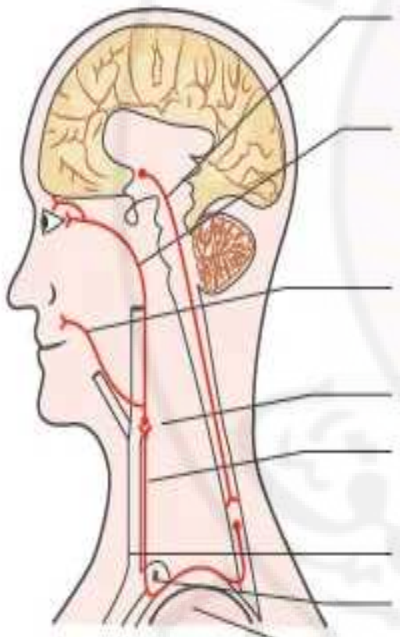
Horner's symptoms



Horner's symptoms



Horner's symptoms

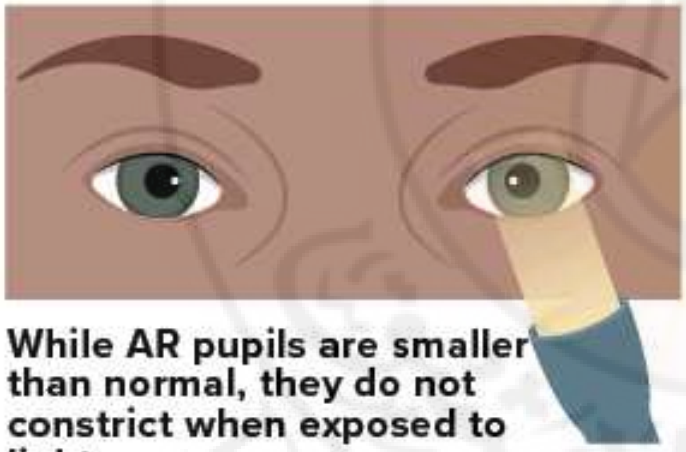


Horner's syndrome
(oculosympathetic paresis)

	Causes
1st order neuron (central) may be affected in:	Brain stem diseases (demyelination), syringomyelia
3rd order neuron (Post ganglionic to dilator pupillae) may be affected in:	Internal carotid artery dissection, nasopharyngeal tumour, otitis media, cavernous sinus mass
3rd order neuron to facial sweat glands	
Superior cervical ganglion	
2nd order neuron (pre ganglionic) may be affected in:	Pan coast tumour, carotid aneurysm and dissection, thyroid tumour
Common carotid artery	
Subclavian artery	
Apex of lung	Other cause: Clusture headache

Bilateral small pupils

Argyll Robertson Pupil

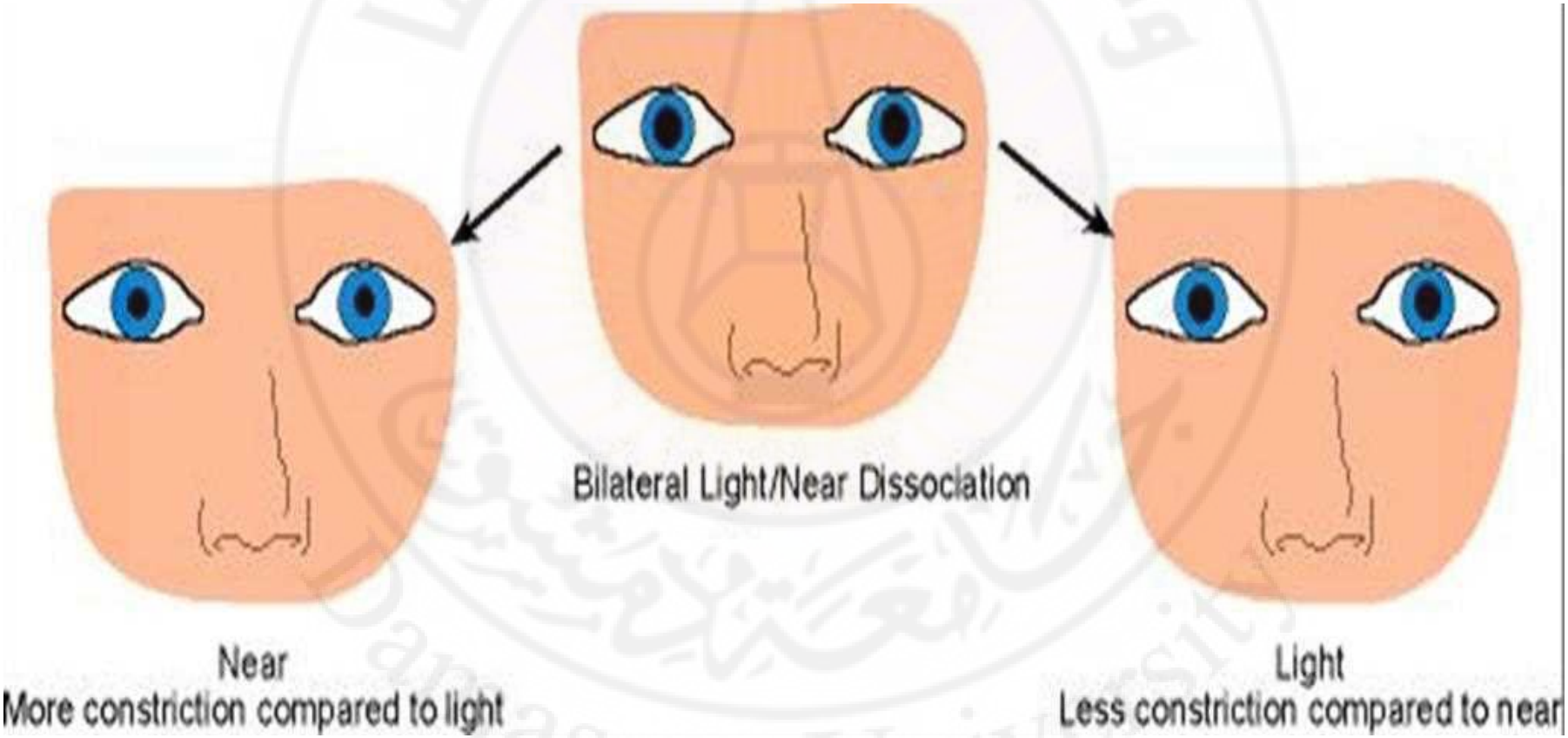


While AR pupils are smaller than normal, they do not constrict when exposed to light

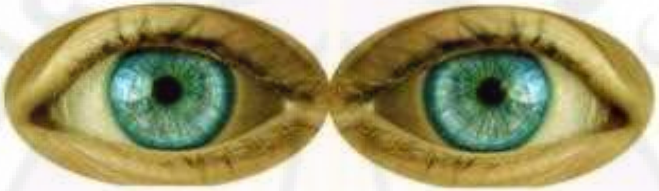


AR pupils constrict when focused on a near object

Bilateral small pupils



Bilateral small pupils

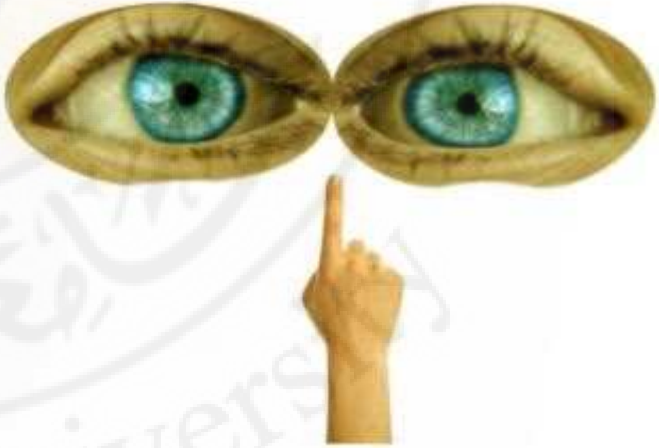


Bilateral miotic and irregular pupils

Pupils do not react to light



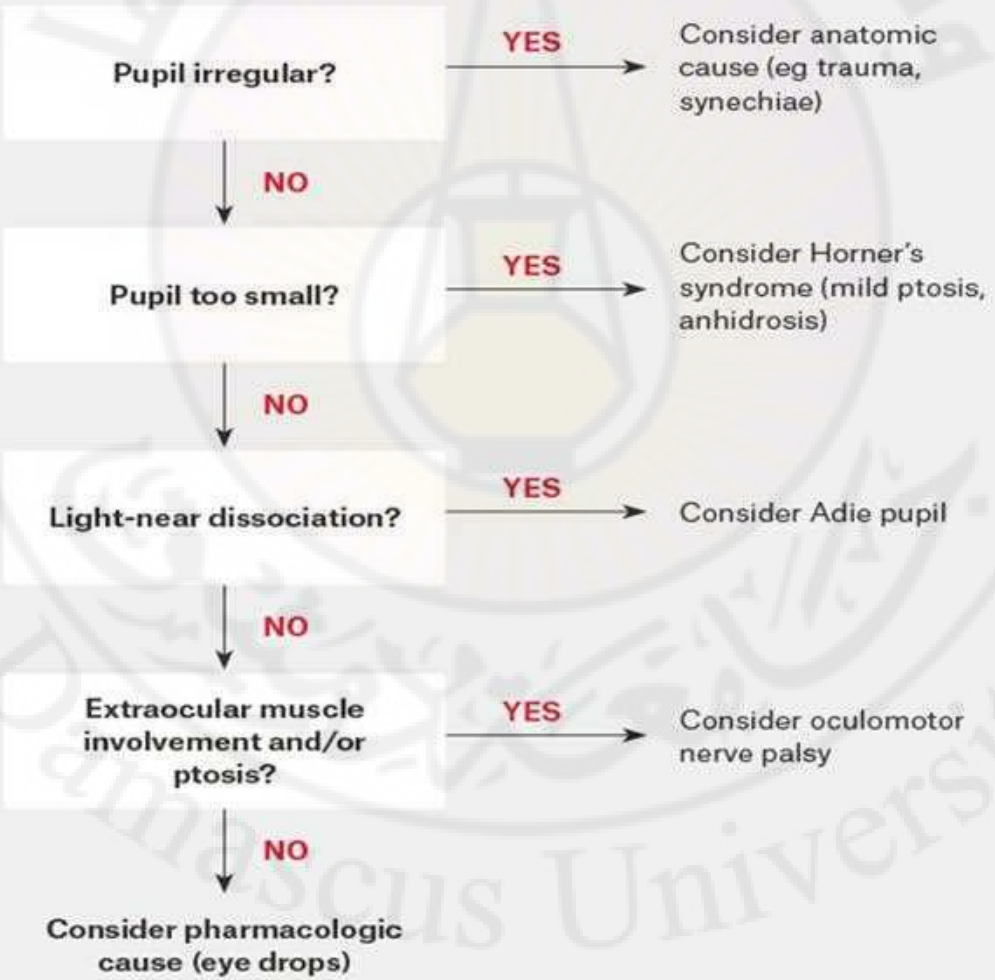
Pupils react briskly to accomodation

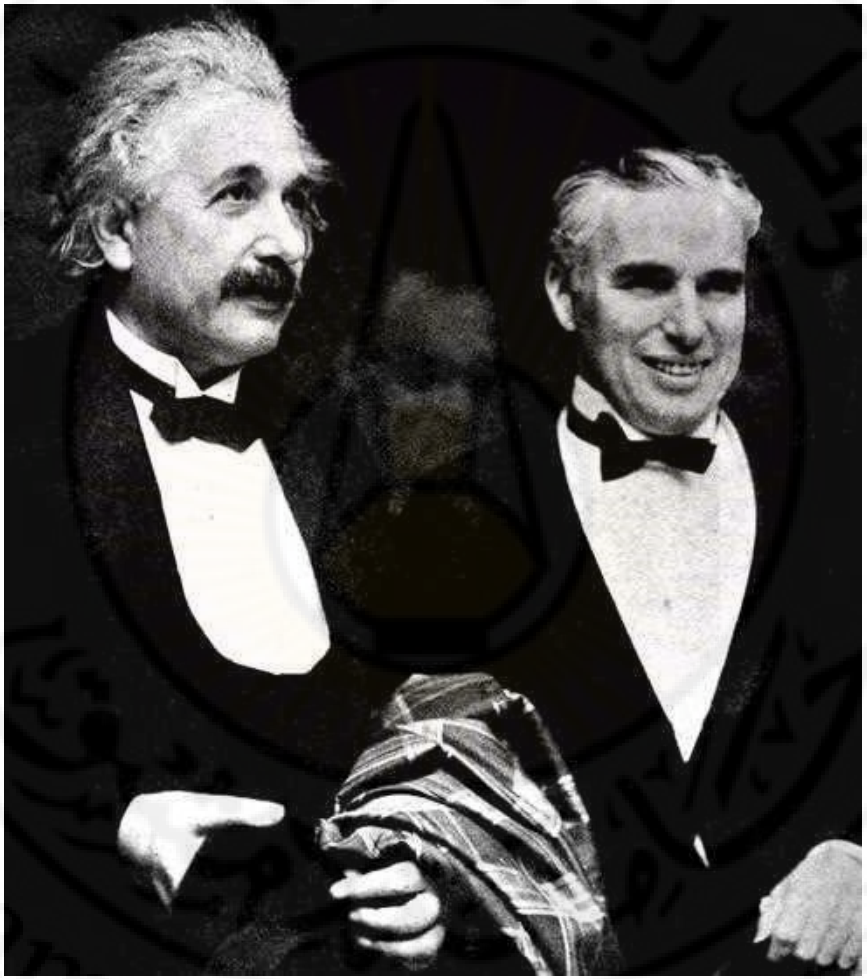


Bilateral small pupils
Argyll Robertson



Pupils


Pupil irregular?
YES
Consider anatomic cause (eg trauma, synechiae)
NO
Pupil too small?
YES
Consider Horner's syndrome (mild ptosis, anhidrosis)
NO
Light-near dissociation?
YES
Consider Adie pupil
NO
Extraocular muscle involvement and/or ptosis?
YES
Consider oculomotor nerve palsy
NO
Consider pharmacologic cause (eye drops)



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بسم الله الرحمن الرحيم

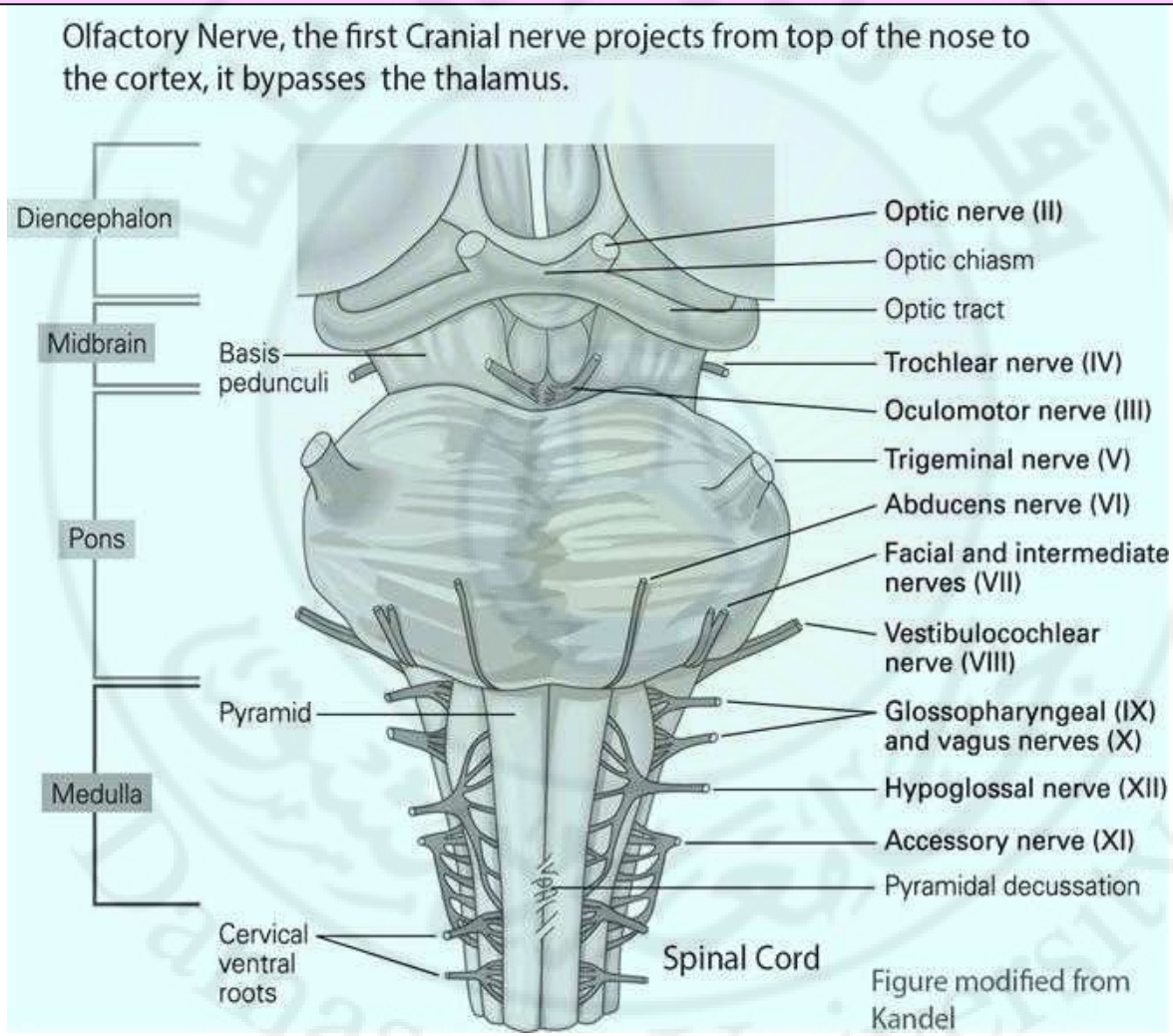
اضطرابات الأعصاب القحفية

ا.د. محمد شحاده آغا

MD MRCP (London) FRCP (Edin)

Know normal = identify abnormal

العصب القحفي ١ و ٢ ينشأن من الحفرة الأمامية ويتعلقان بالشم والبصر



العصب القحفي ١١ ينشأ بمعظمه من النخاع الرقبي

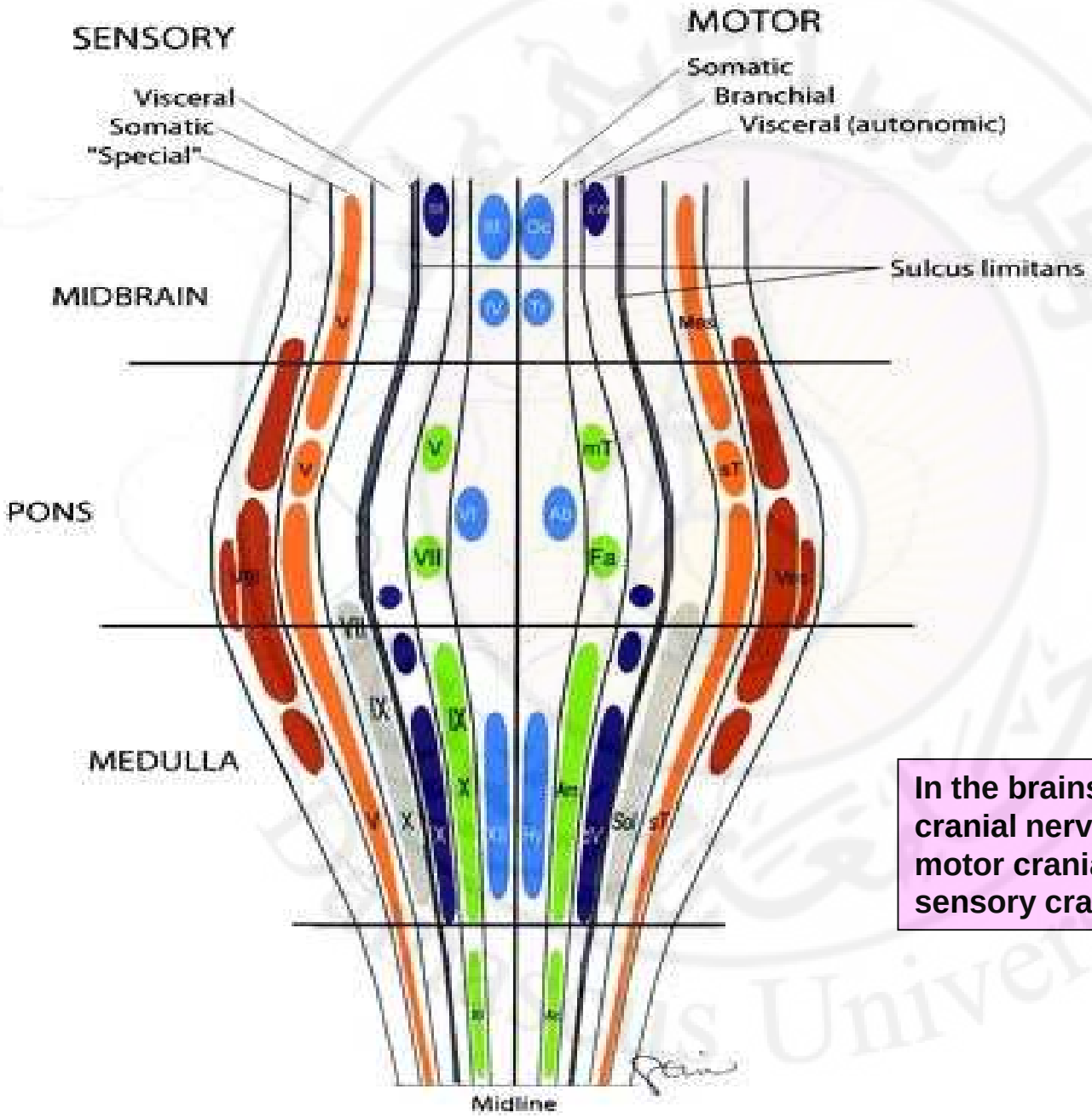
3 There are 4 NERVES in each region of the brainstem

Cranial Nerves 1, 2, 3, 4	Above the Pons
Cranial Nerves 5, 6, 7, 8	Pons
Cranial Nerves 9, 10, 11, 12	Medulla



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Motor Nuclei are divisible into 12 (3,4,6,12 = **M**otor, **M**edial) so (5,7,9,11 = **S**ensory, **S**ide)



1. Four mid-line motor nuclei.
2. Four lateral motor nuclei.
3. Four lateral sensory nuclei.
4. Four parasympathetic nuclei.

In the brainstem, there are about 18 cranial nerve nuclei comprising of 10 motor cranial nerve nuclei and 8 sensory cranial nerve nuclei

Rule of 4

- 4 structures in the 'midline' beginning with M.
- 4 structures to the side beginning with S.
- 4 cranial nerves in the medulla, 4 in the pons and 4 above the pons (2 in the midbrain).
- 4 motor nuclei that are in the midline are those that divide equally into 12 except for 1 and 2, that is 3, 4, 6 and 12 (5, 7, 9 and 11 are in the lateral brainstem).

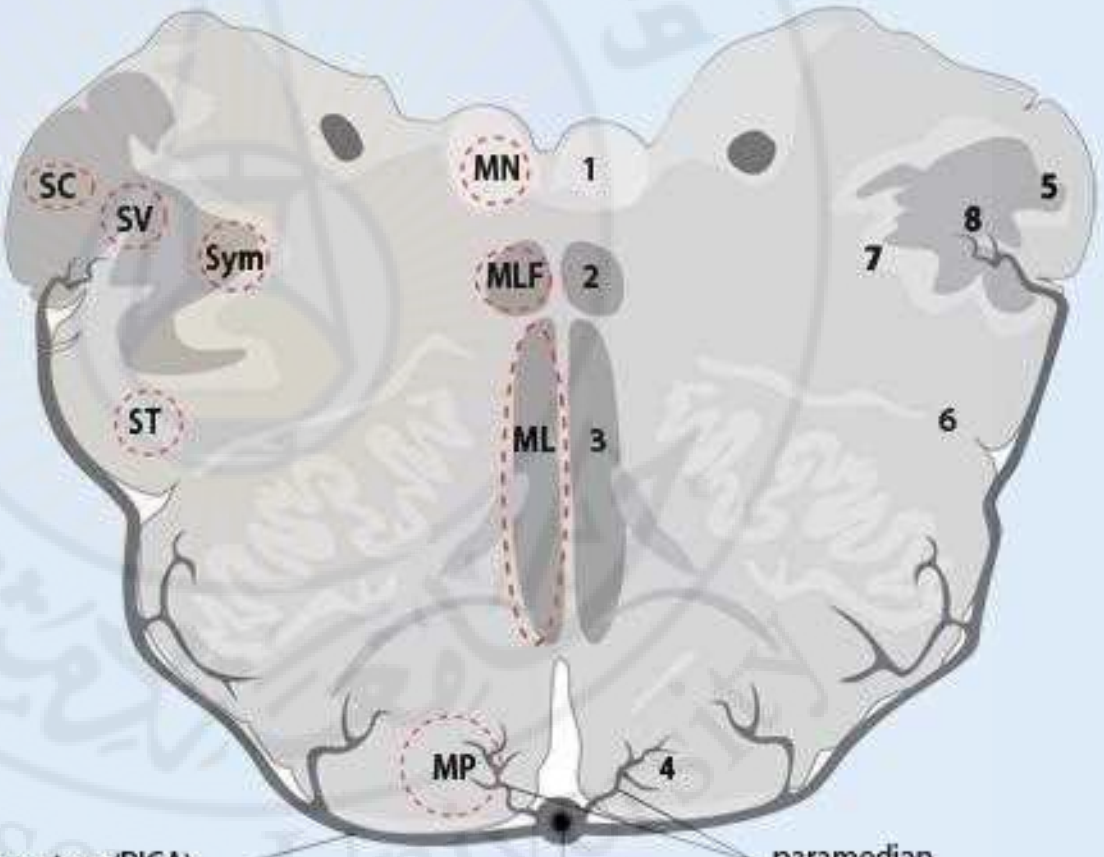
The rule of 4's

The Rule of Four

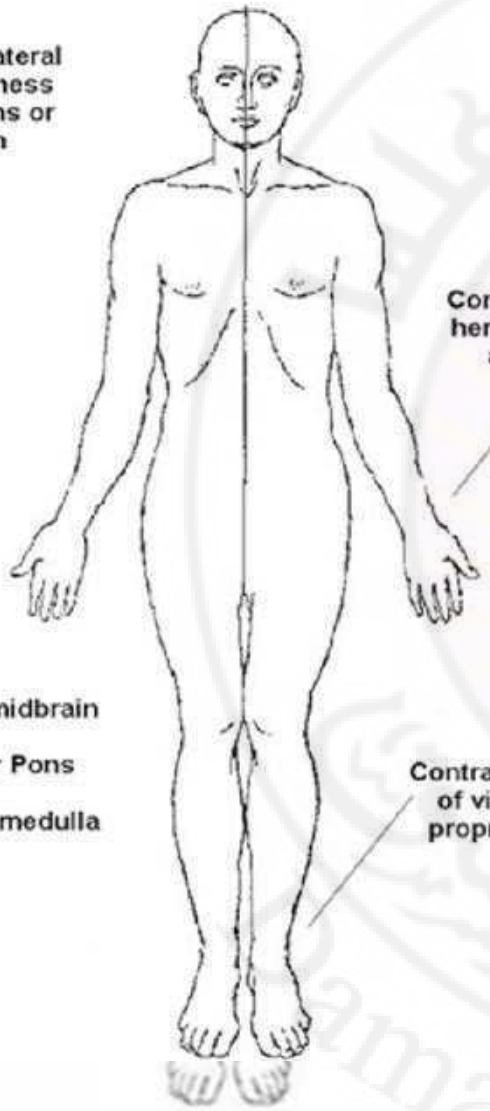
KEY:

A cross section of the brainstem (at the level of the medulla) showing the four structures in the medial and the four structures in the lateral part of the brainstem. The size of the outlined areas is not representative of their anatomical size.

(1) **MN** – Motor nuclei (3, 4, 6 or 12)
(2) **MLF** – Medial longitudinal fasciculus
(3) **ML** – Medial lemnisci
(4) **MP** – Motor pathway (corticospinal/pyramidal tract)
(5) **SC** – Spinocerebellar
(6) **ST** – Spinothalamic
(7) **Sym** – Sympathetic
(8) **SV** – Sensory nucleus of the fifth cranial nerve.



Medial Brainstem Syndrome



Add contralateral facial weakness if upper Pons or Midbrain

Contralateral hemiparesis arm and leg

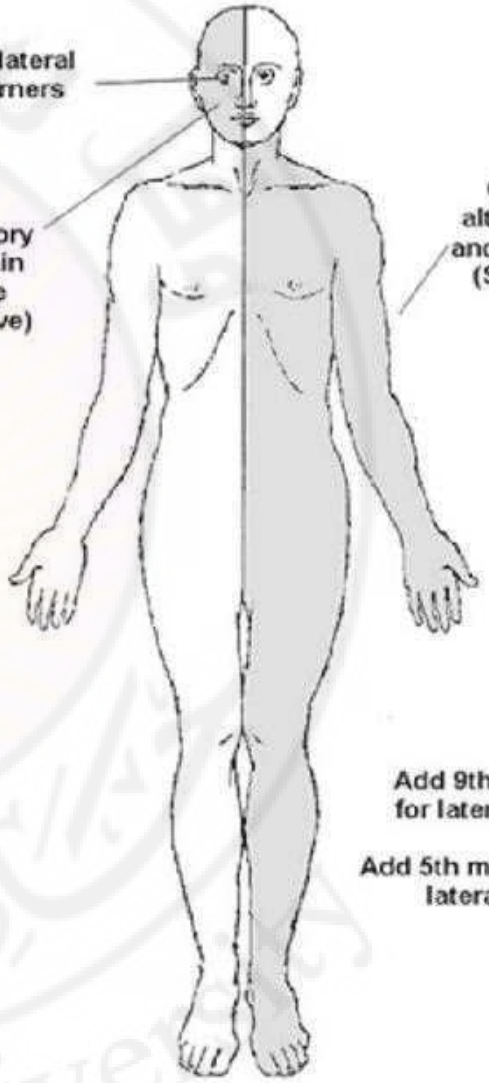
Add 3rd for midbrain

Add 6th for Pons

Add 12th for medulla

Contralateral loss of vibration and proprioception

Sensory Brainstem Syndrome



Ipsilateral Horners

Ipsilateral sensory alteration of pain and temperature (5th cranial nerve)

Contralateral alteration of pain and temperature (Spinothalamic tract)

Ipsilateral cerebellar ataxia

Add 9th, 10th and 11th for lateral Medullary

Add 5th motor, 7th and 8th lateral Pontine

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Let's Learn a System for the Brainstem!

Cranial Nerves

Midbrain	**Pons**	**Medulla**
1 – Olfactory (smell)	**5** – Trigeminal (feel face)	**9** – Glossopharyngeal (feel throat)
2 – Optic (see)	**6** – Abducens (look to ears)	**10** – Vagus (move palate)
3 – Oculomotor (move eyes)	**7** – Facial (move face)	**11** – Accessory (shrug shoulders)
4 – Trochlear (eye down to nose)	**8** – Auditory (hear)	**12** – Hypoglossal (move tongue)

4 Brainstem Rules of Four

4 Midline Structures (**M**'s) – **M**otor tract, **M**LF, **M**edial Lemniscus, **M**otor CN nuclei → **M**edial = **M**OTOR

4 Side Structures (**S**'s) – **S**ympathetic, **S**pinocerebellar, **S**pinothalamic, **S**ensory CN 5 → **S**ide = **S**ENSORY

4 CN in Medulla, 4 CN in Pons, 4 CN in Midbrain

4 Motor Nuclei are divisible into 12 (3,4,6,12 = **M**otor, **M**edial) so (5,7,9,11 = **S**ensory, **S**ide)

4 Medial Structures (*Overall:* **OPPOSITE M**otor weak, Δ vibrate, proprioception + *same INO*)

Motor Tract (Corticospinal) – Opposite weakness arm & leg

Medial Lemniscus (Posterior Column) – Opposite vibration, proprioception arm & leg

MLF (Median Longitudinal Fasciculus) – Same Look left (but right eye stays straight) or vice versa

Motor CN Nuclei (divide into 12) – Midbrain (3,4) eye move, Pons (6) eye lateral, Medulla (12) tongue move

4 Side Structures (*Overall:* **SAME S**haky leg, Horner's SRO, face sense + *opposite pain/temp arm, leg*)

Sympathetic – **S**ame Horner's SRO (ptosis, miosis, anhidrosis)

Spinocerebellar – **S**ame ataxia in arm & leg

Spinothalamic – *Opposite pain/temp in arm & leg*

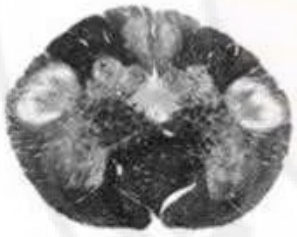
Sensory CN 5 – **S**ame face sensation

CRANIAL NERVE

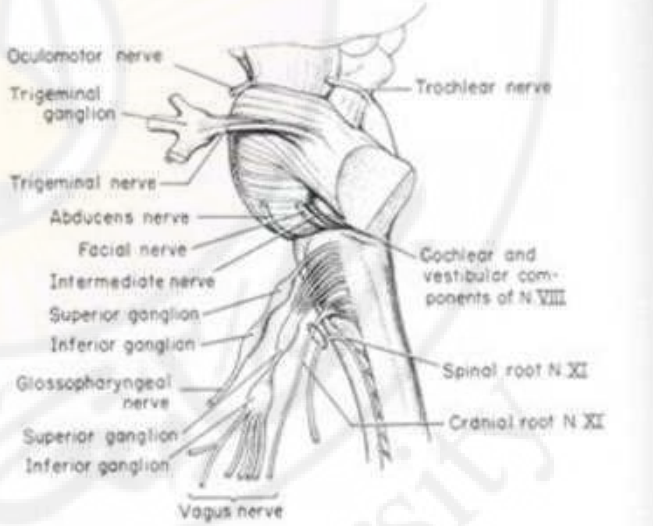
NUCLEUS vs. GANGLION

- WITHIN CNS
- CLUSTER OF NEURONS
- NOT PSEUDOUNIPOLAR*
- SENSORY OR MOTOR

- OUTSIDE OF CNS
- CLUSTER OF NEURONS
- PSEUDOUNIPOLAR
- SENSORY

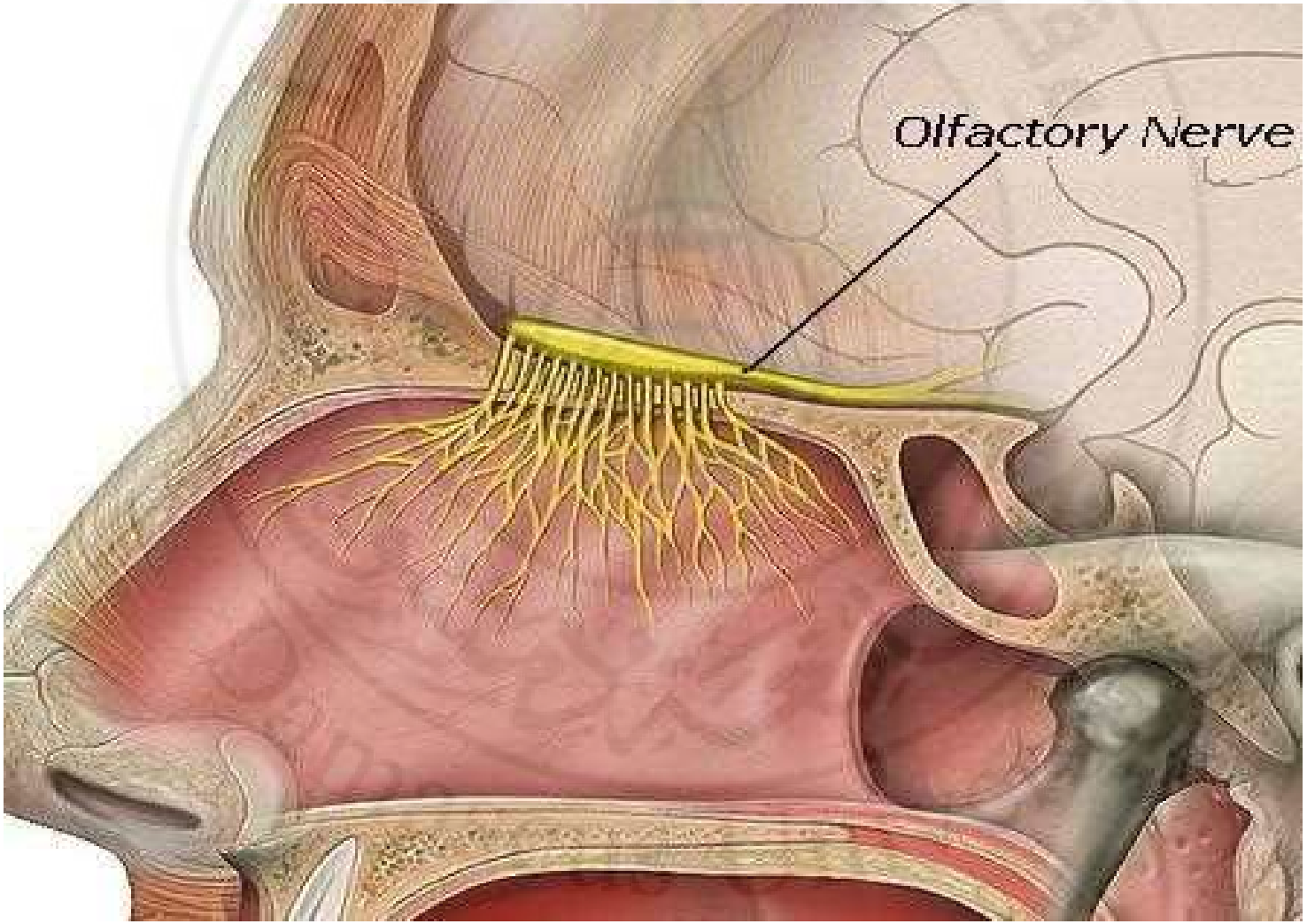


*except mesencephalic nucleus of V

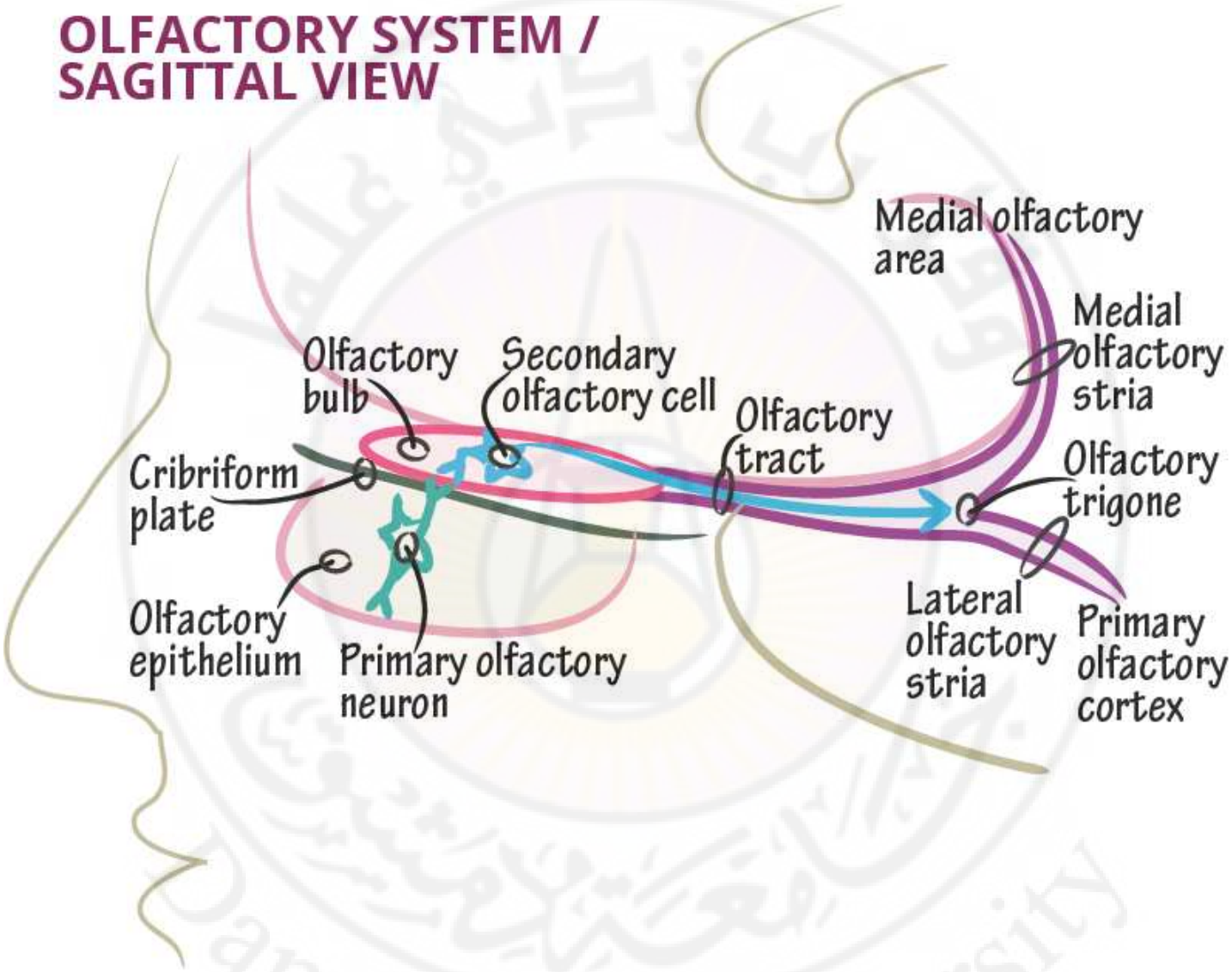


Carpenter, Core Text of Neuroanatomy, 1991

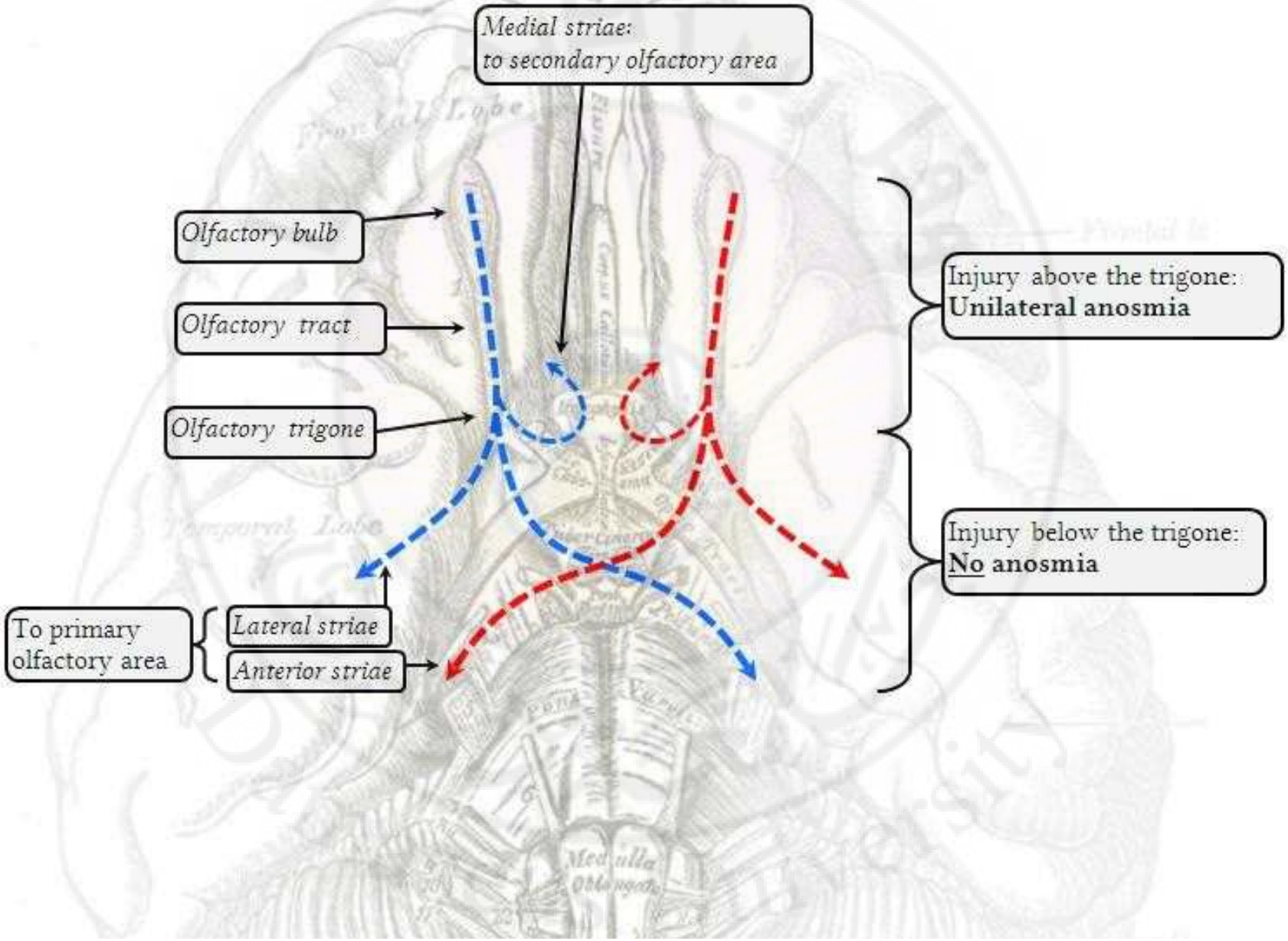
العصب القحفي الأول (الشمي)



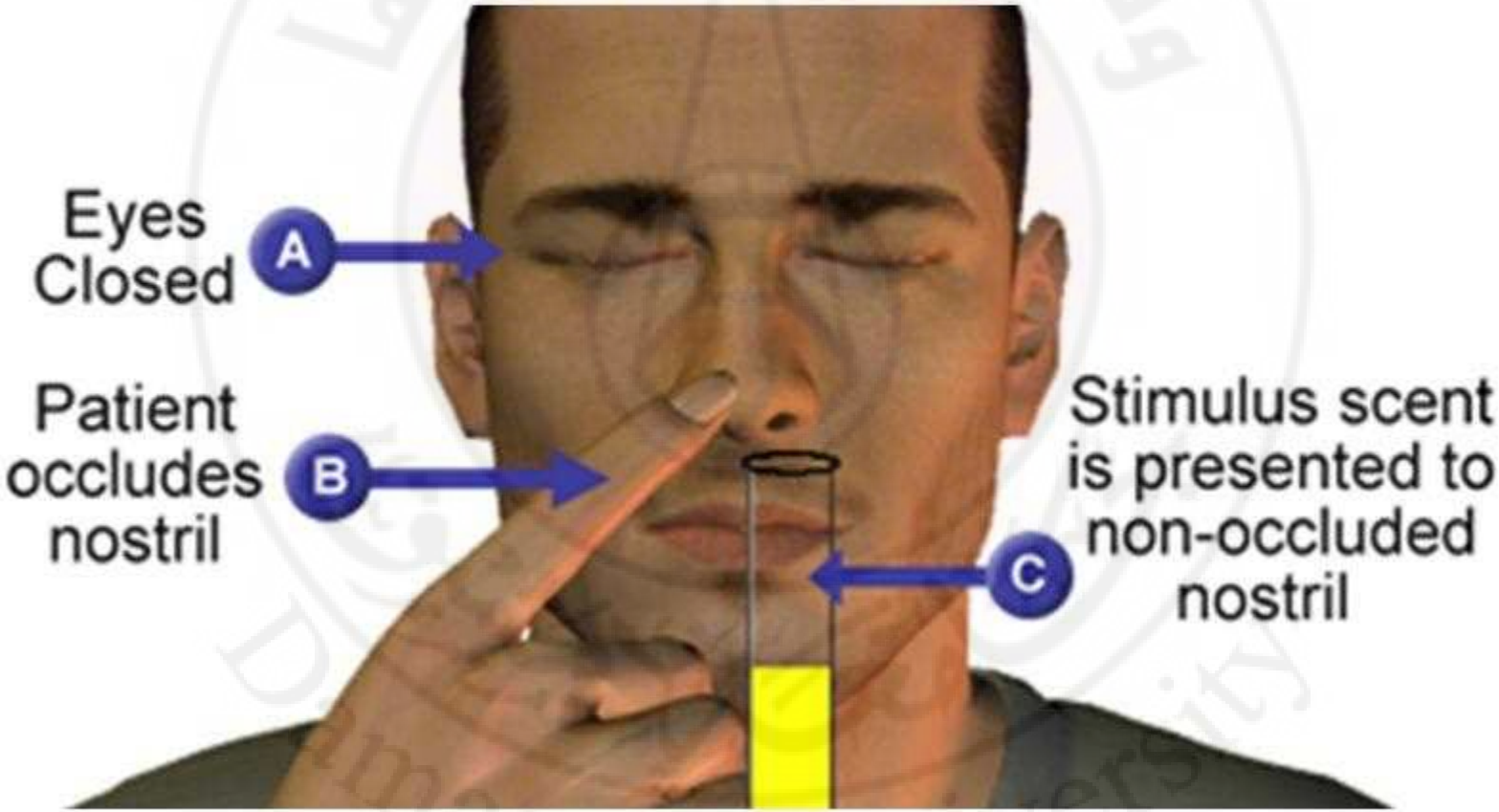
OLFACTORY SYSTEM / SAGITTAL VIEW



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Medial striae:
to secondary olfactory area
Olfactory bulb
Olfactory tract
Olfactory trigone
To primary olfactory area
Lateral striae
Anterior striae
Injury above the trigone:
Unilateral anosmia
Injury below the trigone:
No anosmia

Olfactory Nerve (I) Testing



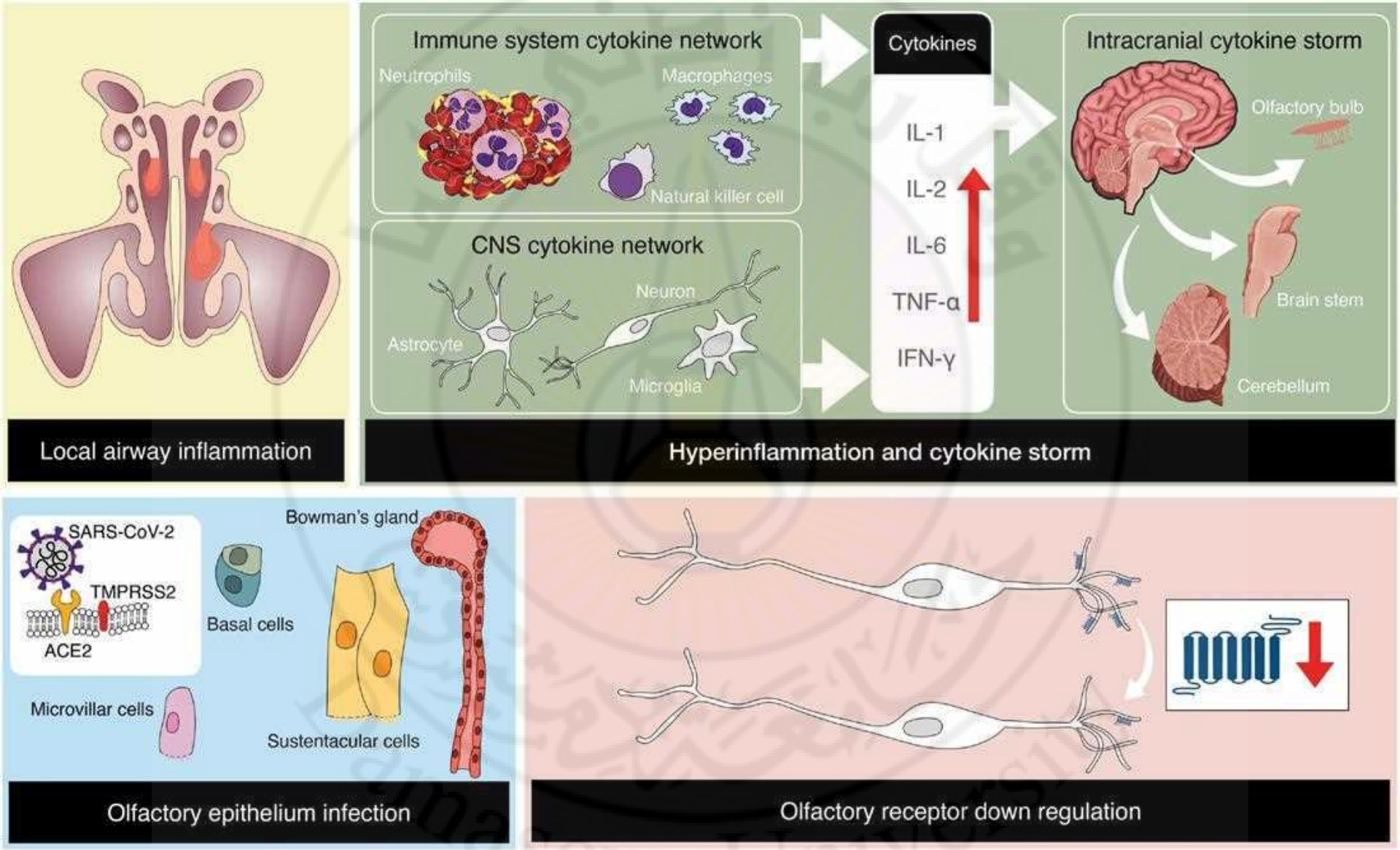
What are symptoms of impaired olfactory nerve function?

- **Anosmia,** complete loss of smell.
- **Dysosmia (also called phantosmia),** unpleasant or strange odors that occur spontaneously.
- **Hyposmia,** partial loss of smell.
- **Parosmia,** distorted sense of smell. For example, familiar foods may smell like chemicals or mold.

Clinical Relevance: Anosmia

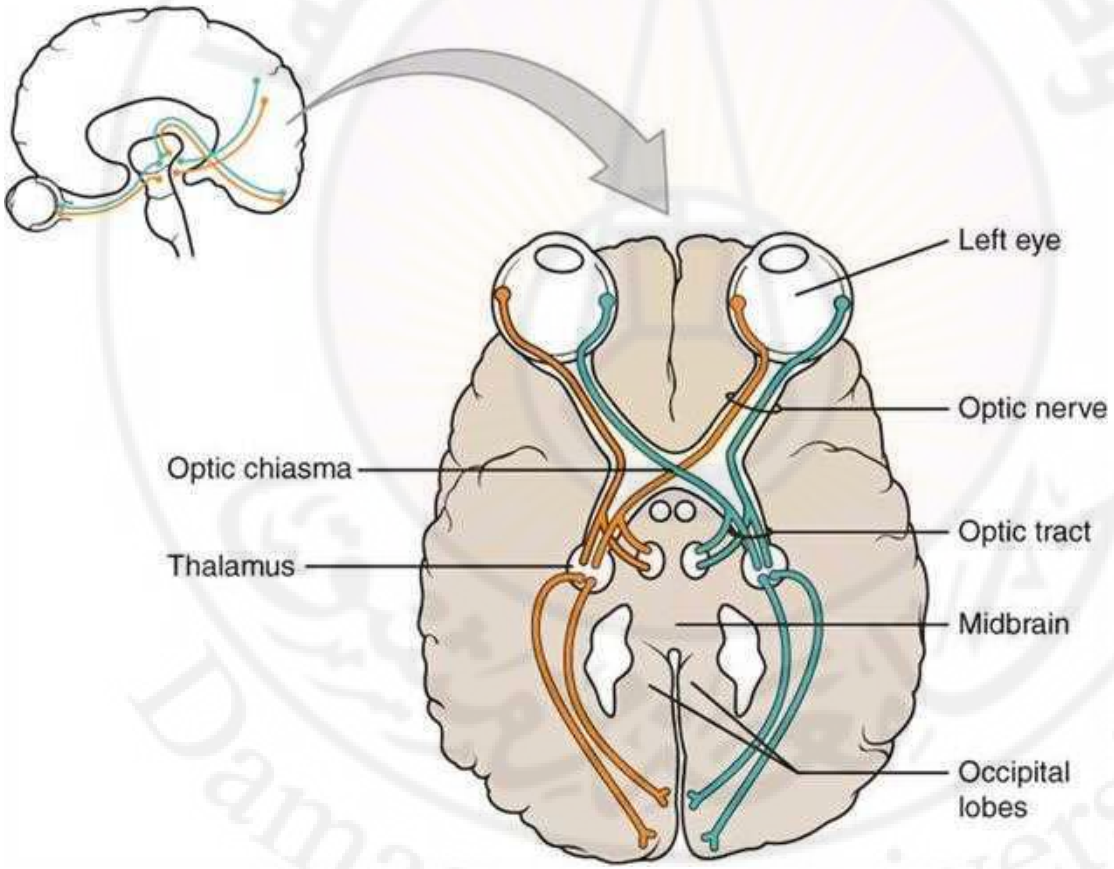
Anosmia is defined as the absence of the sense of smell. It can be temporary, permanent, progressive or congenital.

- Temporary anosmia can be caused by infection (e.g. meningitis) or by local disorders of the nose (e.g. common cold)
- Permanent anosmia can be caused by head injury, or tumours which occur in the olfactory groove (e.g. meningioma).
- Anosmia can also occur as a result of neurodegenerative conditions, such as Parkinson's or Alzheimer's disease. In these conditions, the anosmia is progressive and precedes motor symptoms but it is not often noticed by the patient.
- Anosmia is also a feature of a number of genetic conditions such as Kallmann syndrome (failure to start or finish puberty) and Primary Ciliary Dyskinesia (defect in cilia causing it to be immobile)



Trends in Molecular Medicine

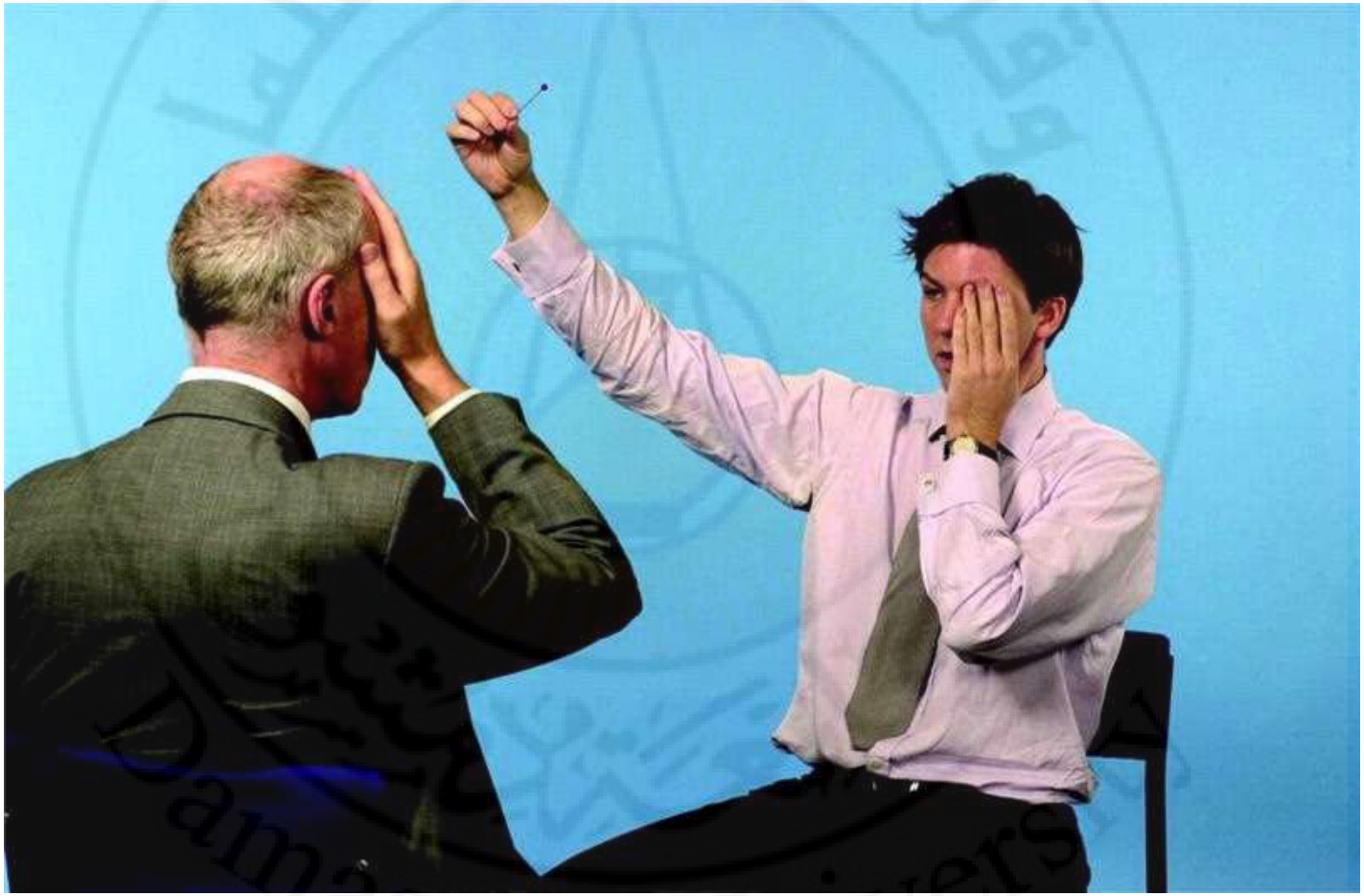
العصب القحفي الثاني (البصري)



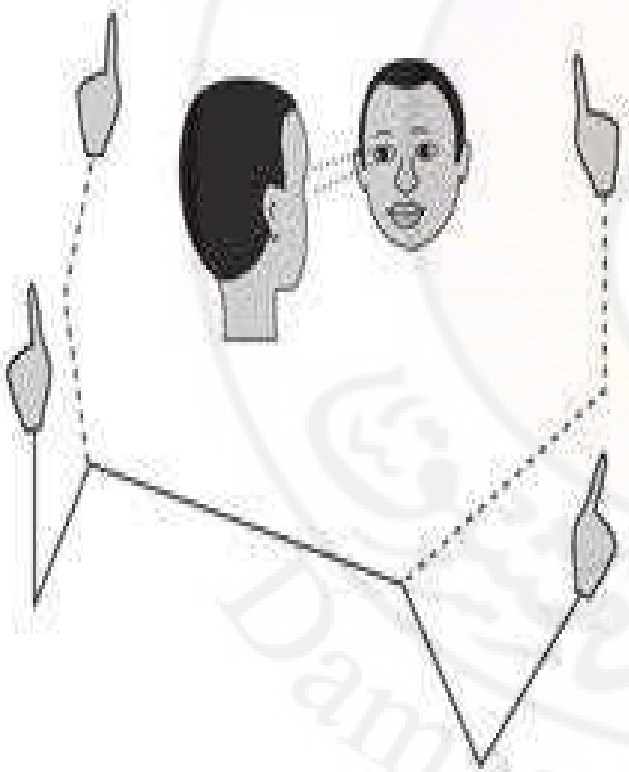
العصب القحفي الثاني (البصري)

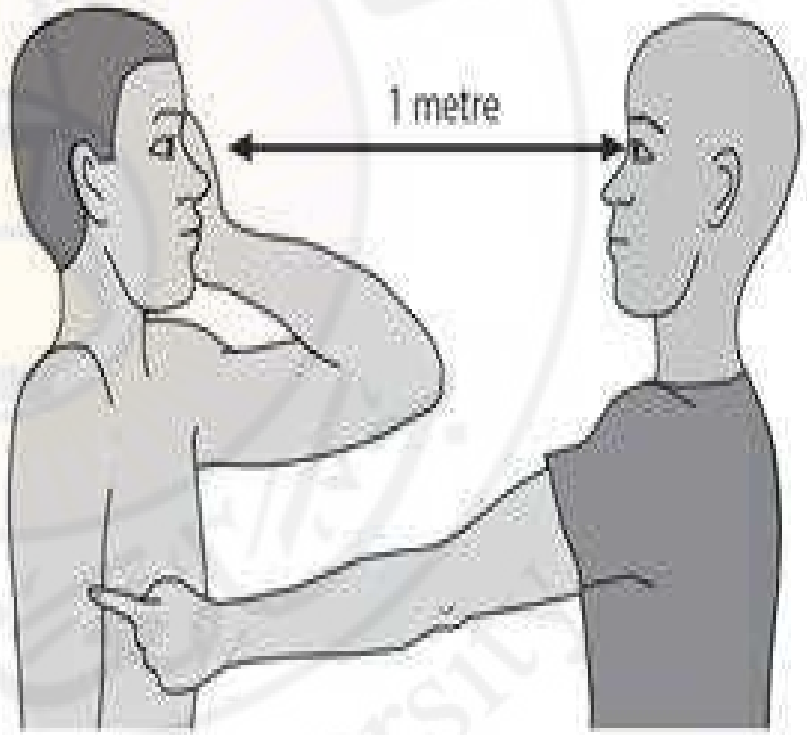
F A F

العصب القحفي الثاني (البصري)

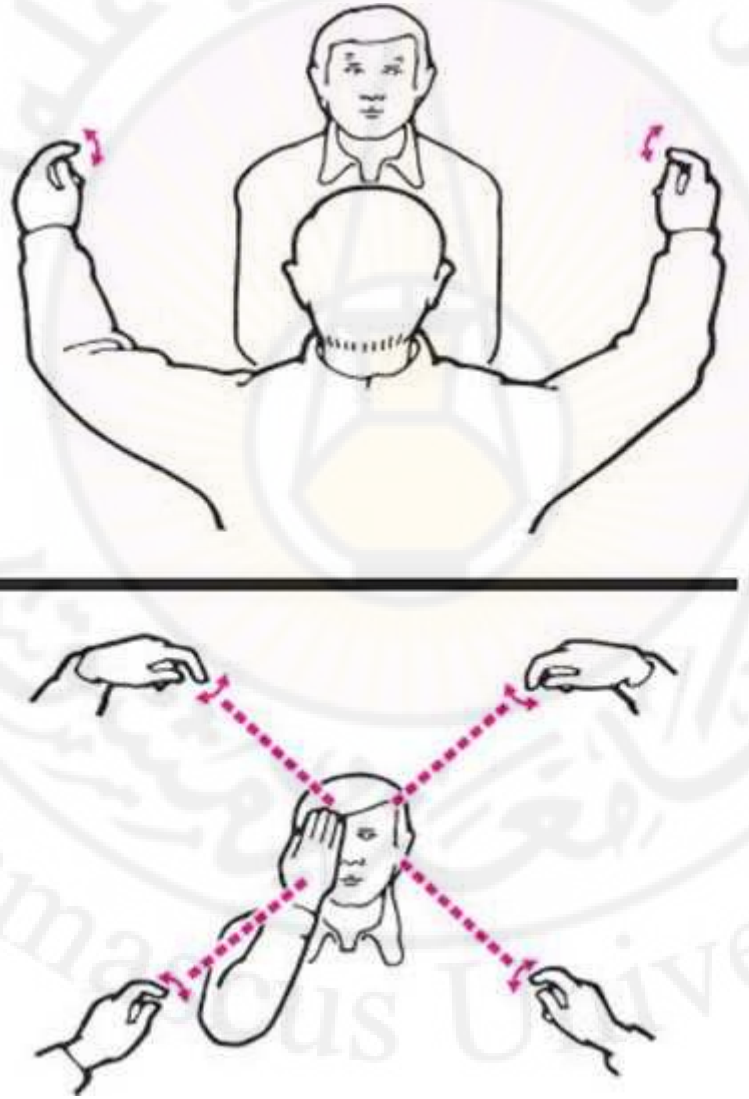


العصب القحفي الثاني (البصري)





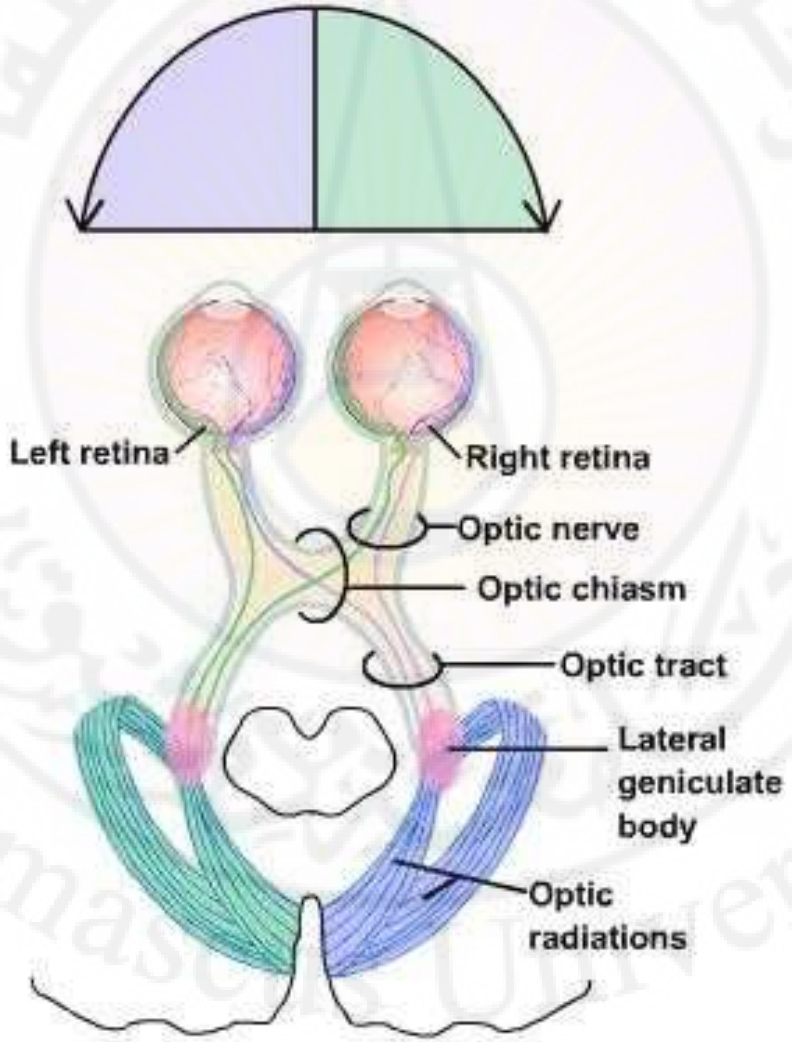
العصب القحفي الثاني (البصري)



العصب القحفي الثاني (البصري)

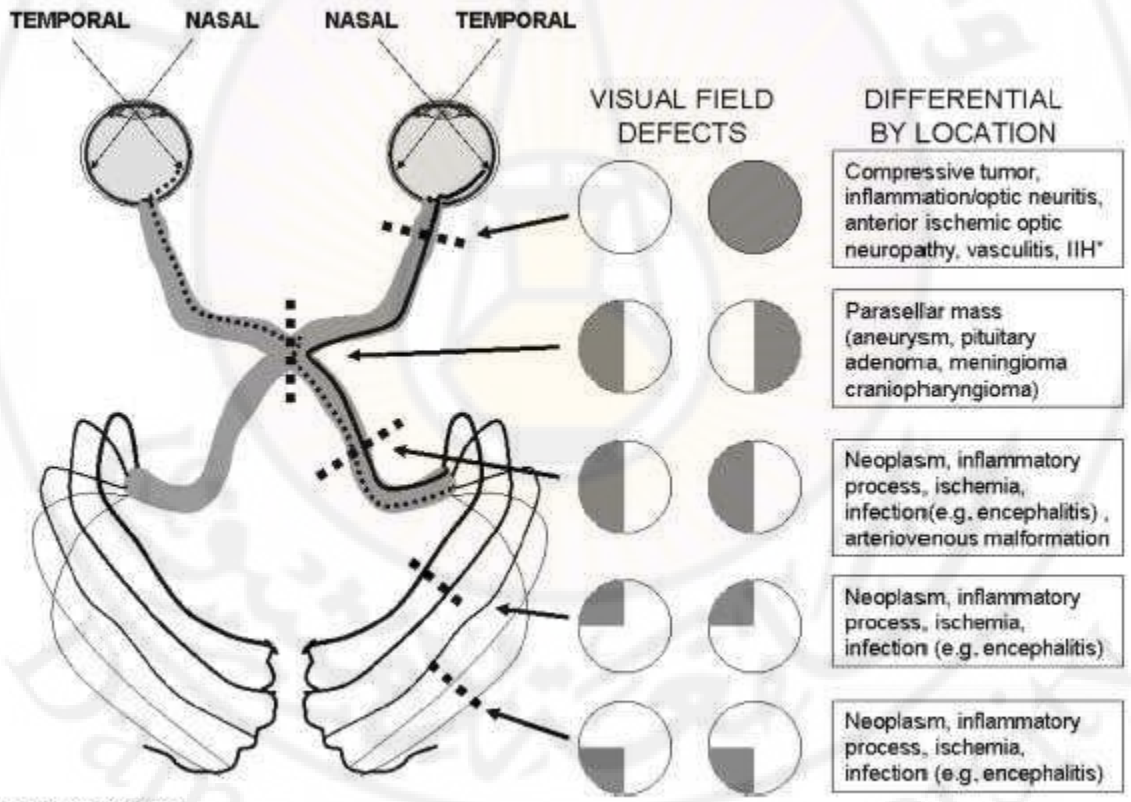


CAUSES OF SCOTOMA



CAUSES OF SCOTOMA

Figure 2. The Visual Field Defects Associated With The Various Possible Locations Of A Pathological Lesion

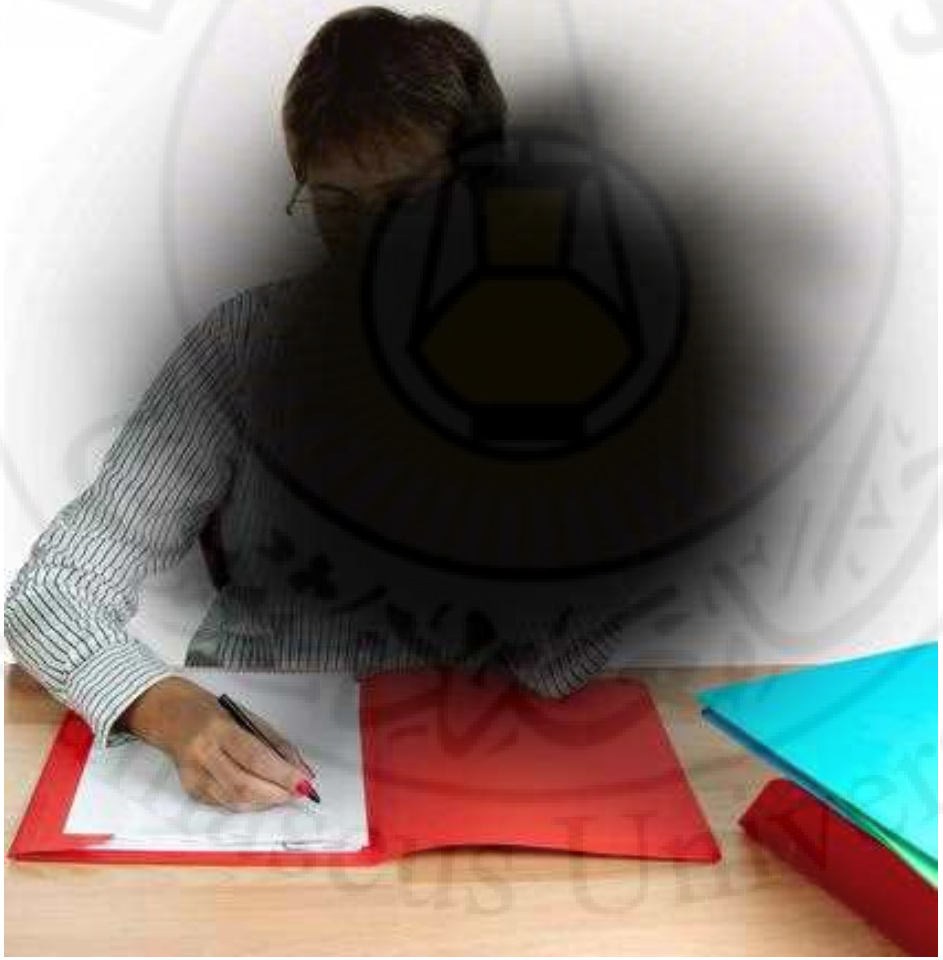


* IIH, idiopathic intracranial hypertension.

Central Scotoma



Central Scotoma



Bitemporal Hemianopia



Binasal Hemianopia



Homonymous Hemianopia



Homonymous Hemianopia with Macular Sparing



Quadrantanopia

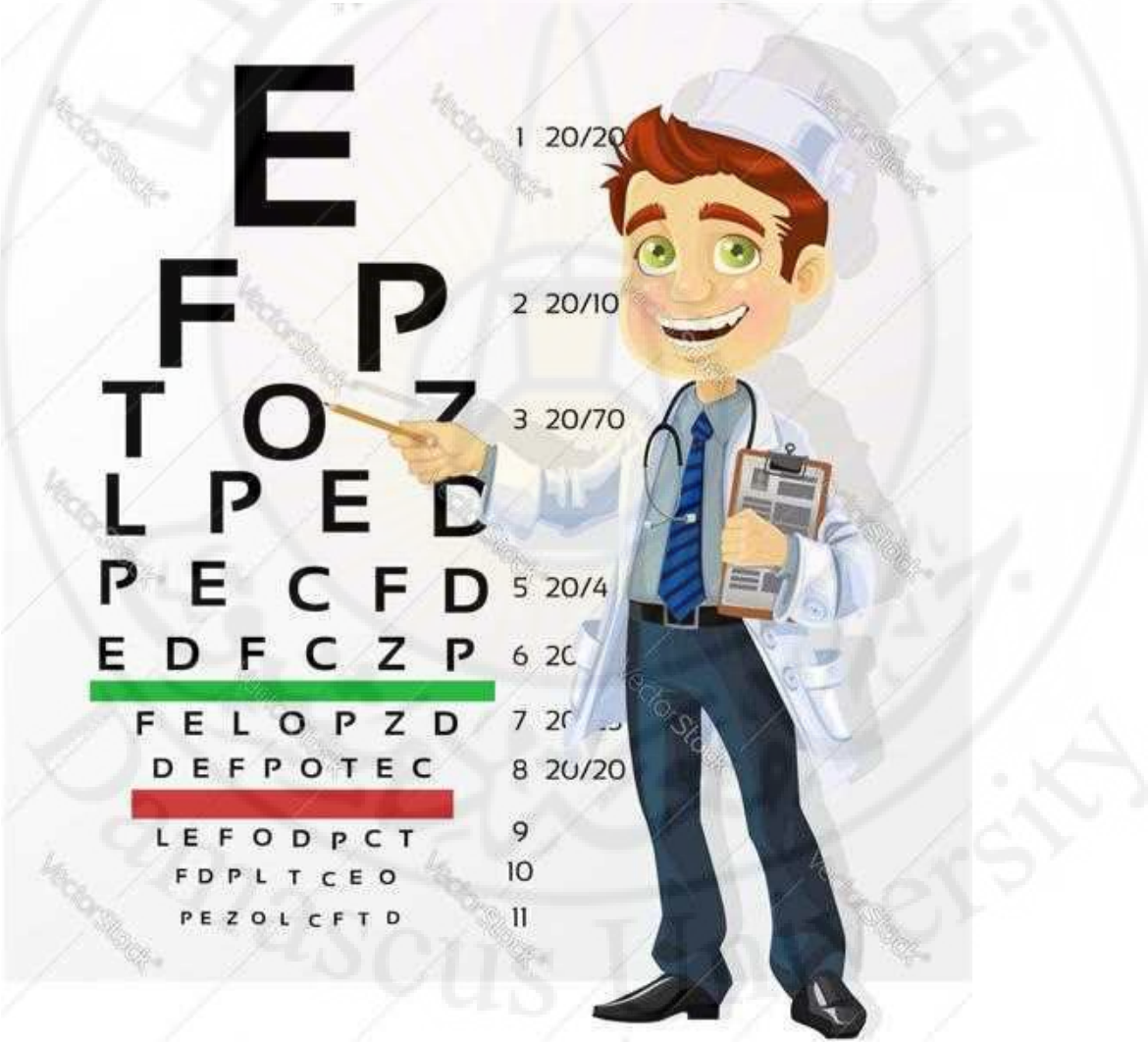


Homonymous Hemianopia with Macular Sparing





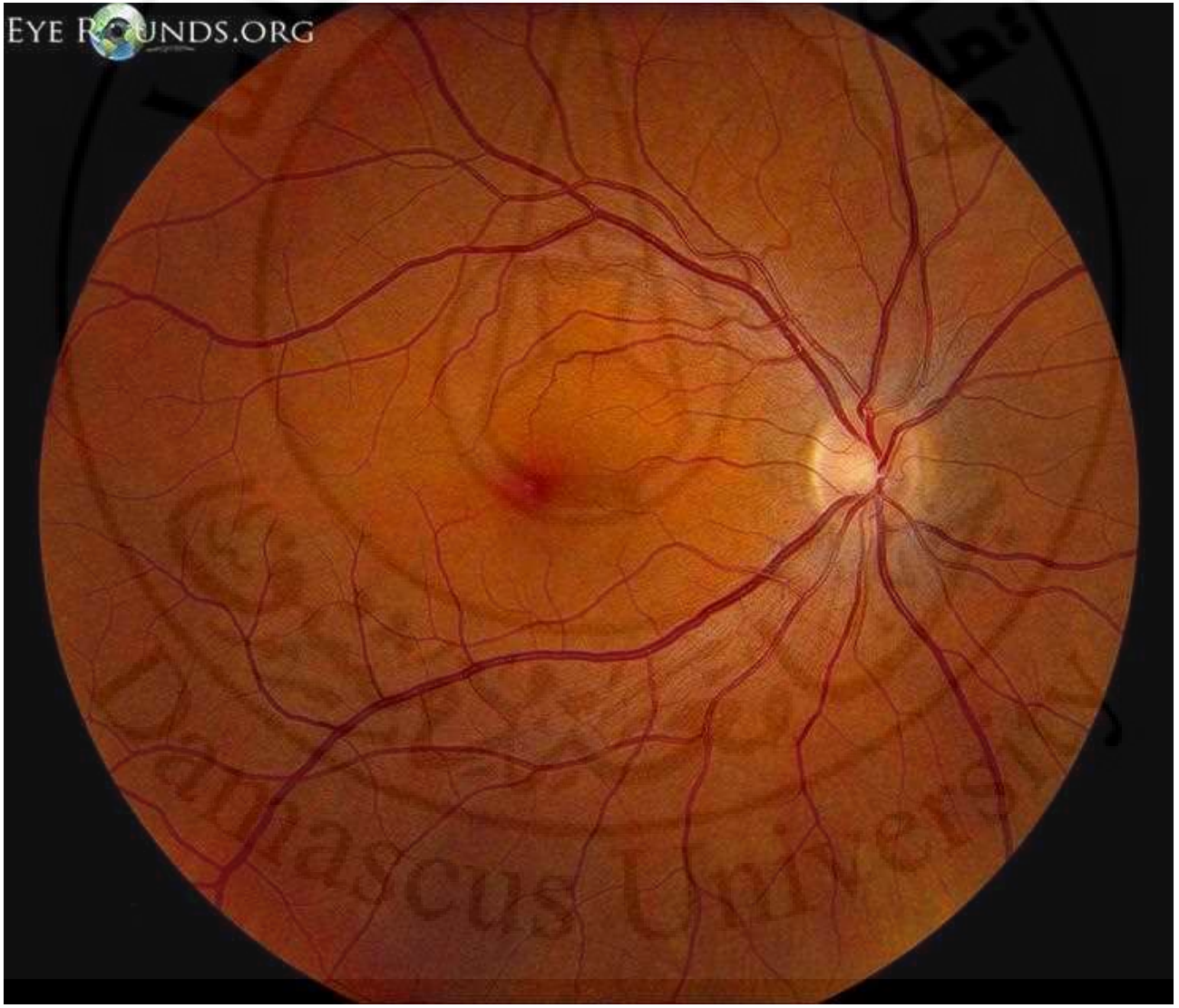
العصب القحفي الثاني (البصري)



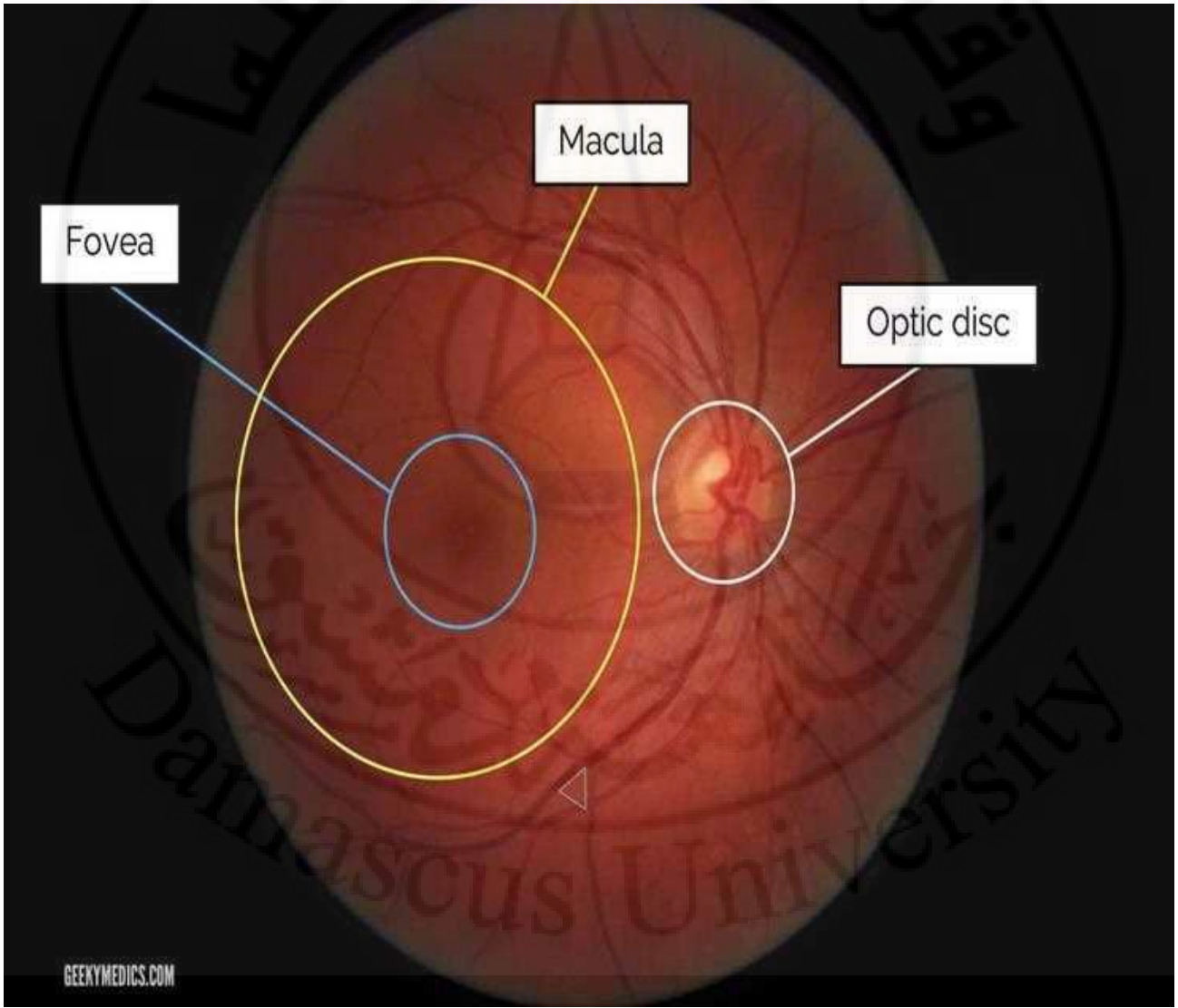
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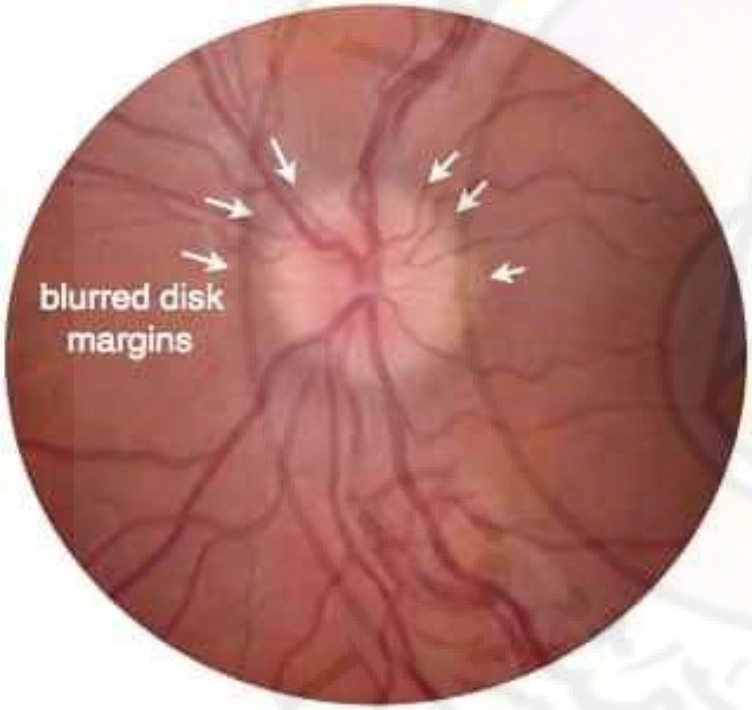


العصب القحفي الثاني (البصري)

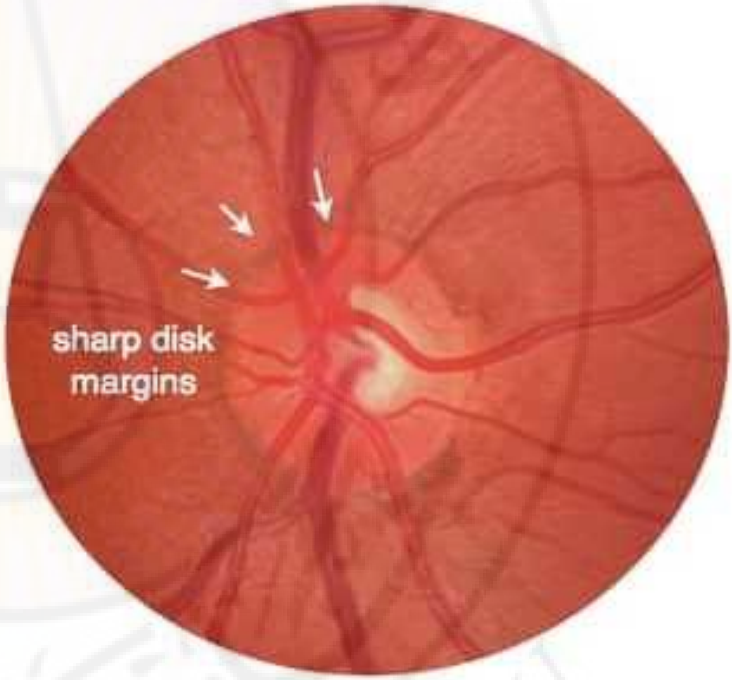


العصب القحفي الثاني (البصري)



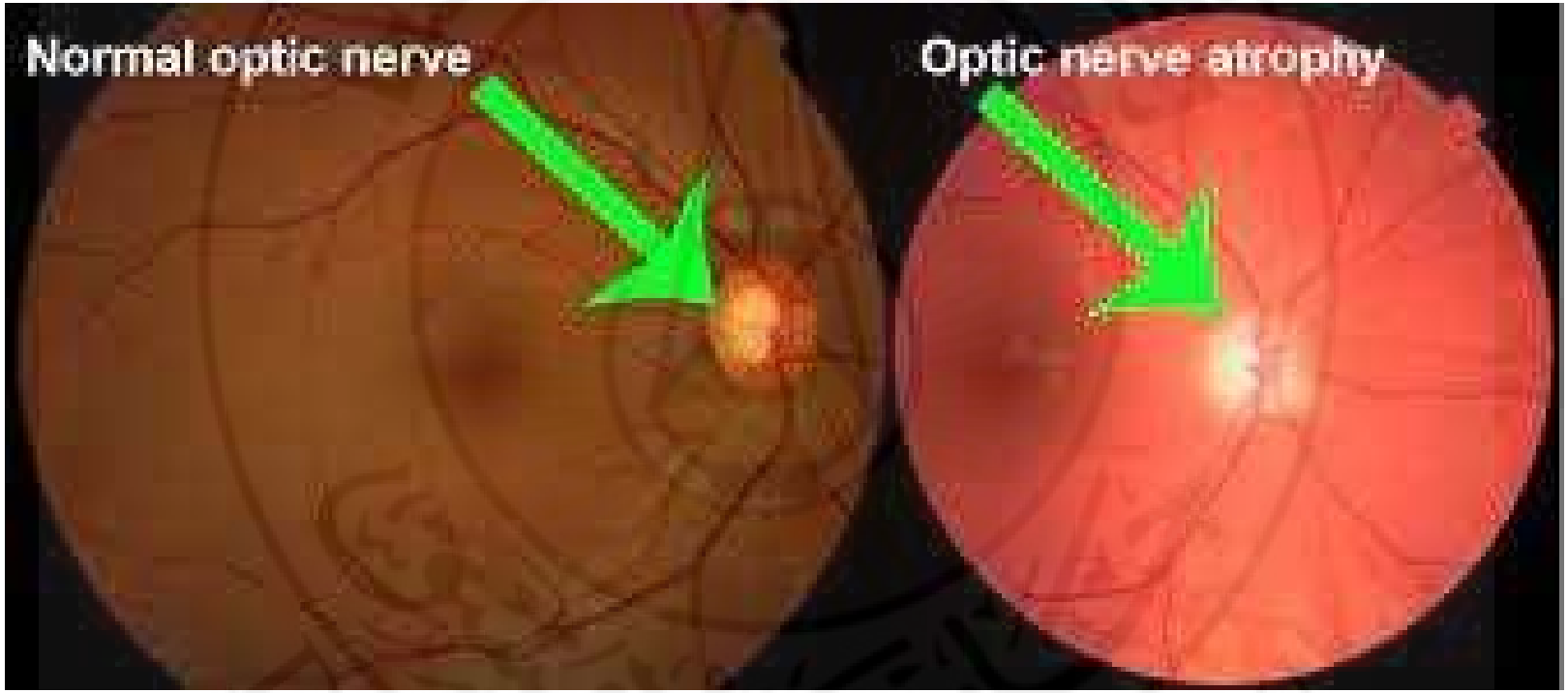


Papilledema



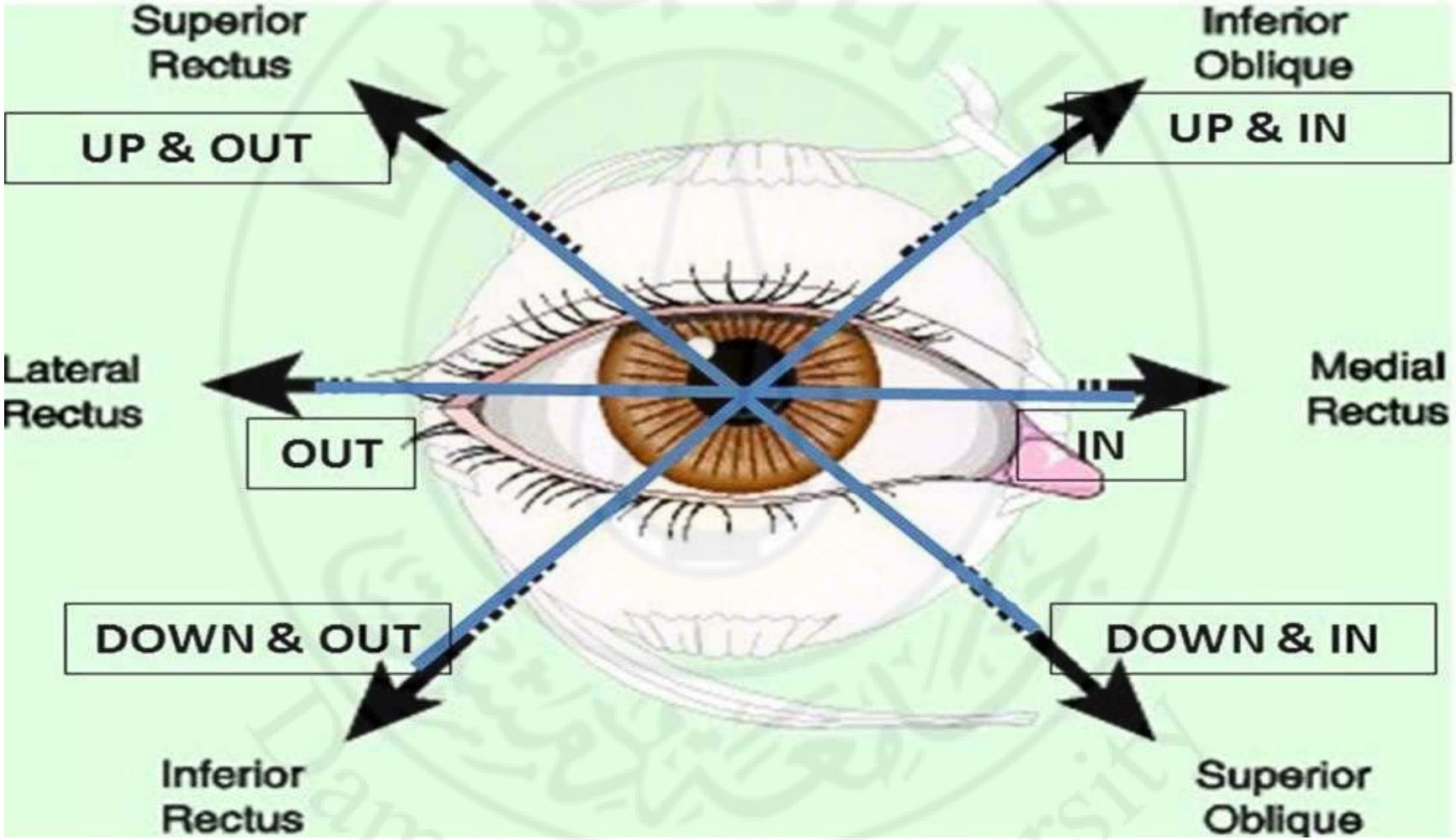
Normal Optic Disk




Normal optic nerve
Optic nerve atrophy

اصابات العصب الثالث والرابع والسادس




Superior Rectus
UP & OUT
Inferior Oblique
UP & IN
Lateral Rectus
OUT
Medial Rectus
IN
DOWN & OUT
DOWN & IN
Inferior Rectus
Superior Oblique



Occulomotor



Occulomotor



Occulomotor



Right Abducens and Left Occulomotor

Occulomotor (3rd cranial nerve) : supplies SR,IR,IO and MR

Trochlear nerve (4th cranial nerve) : supplies SO

Abducens nerve(6th cranial nerve) : supplies LR



Left Abducens and Right Occulomotor



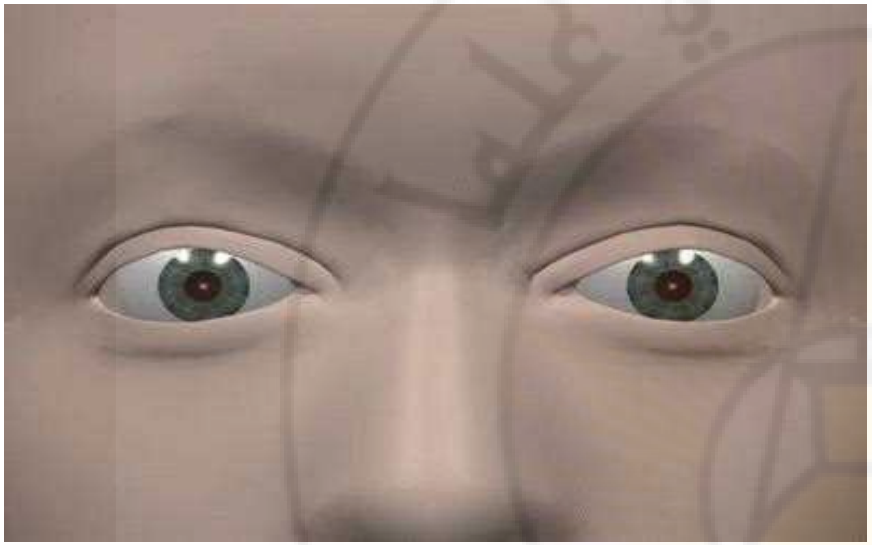
Right Occulomotor and Left Trochlear

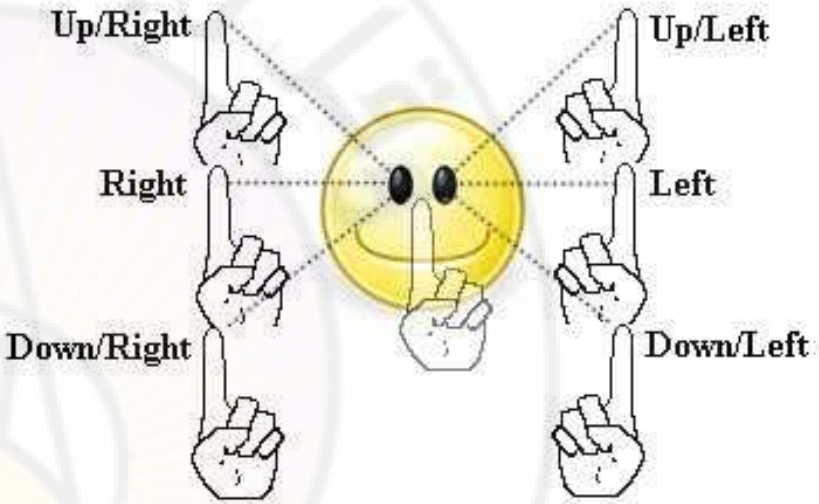


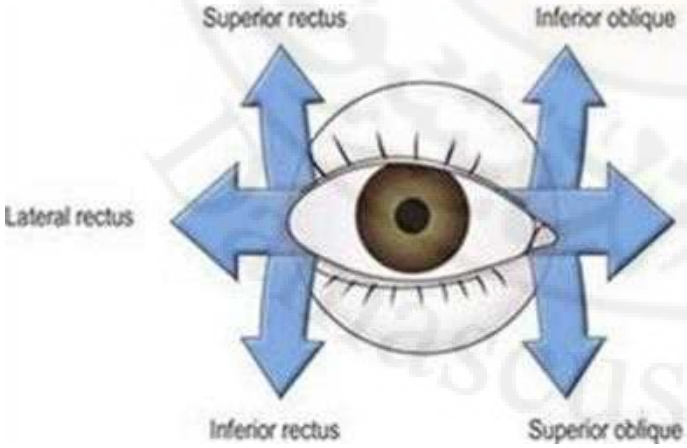
Occulomotor

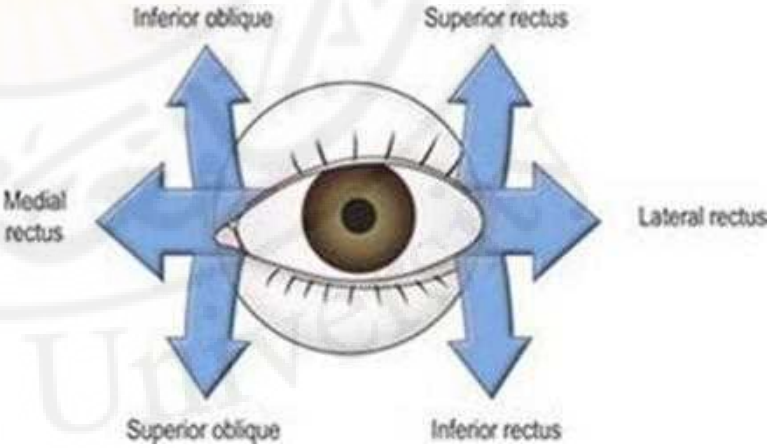


Left Occulomotor and Right Trochlear

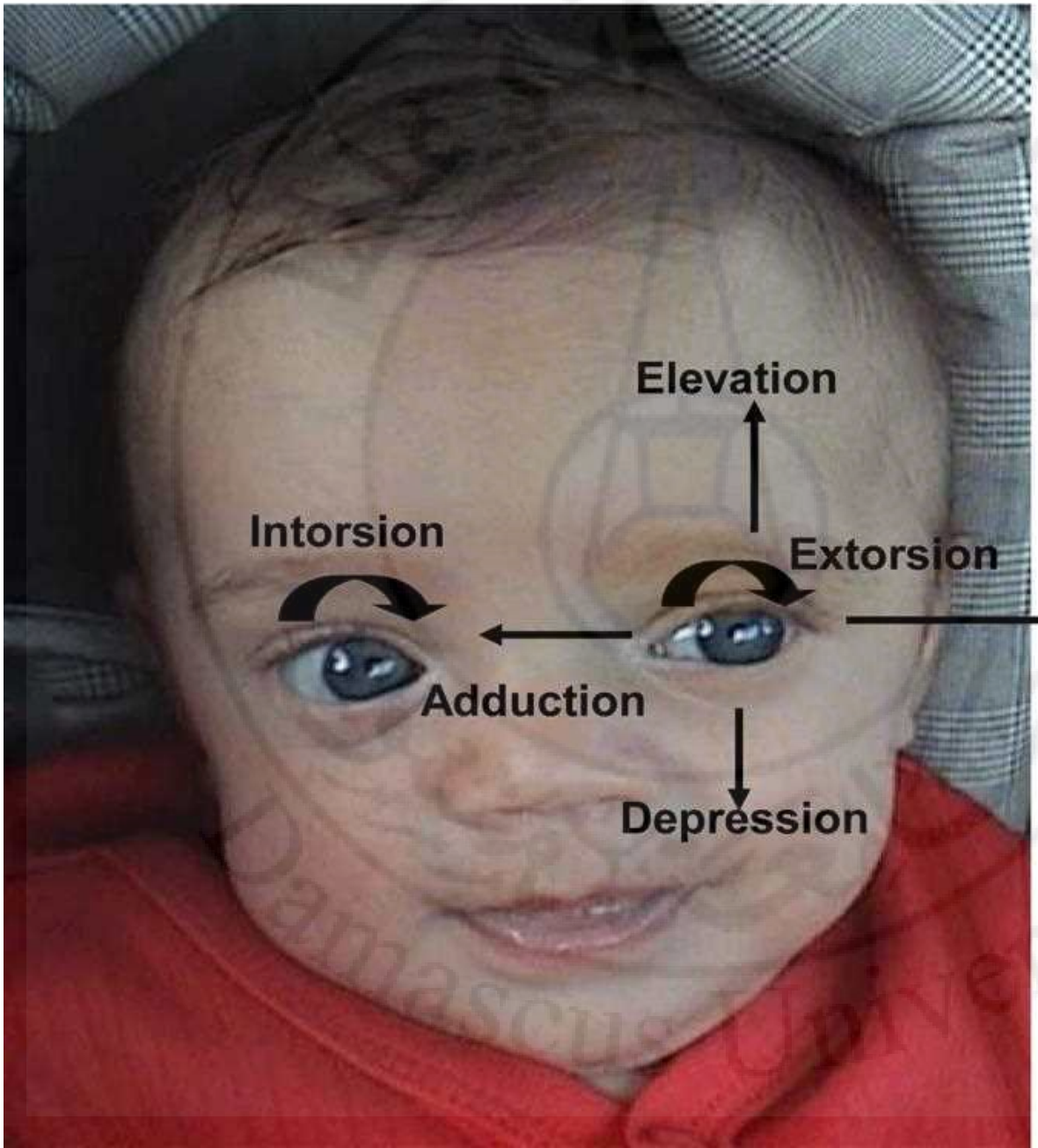



Up/Right
Up/Left
Right
Left
Down/Right
Down/Left

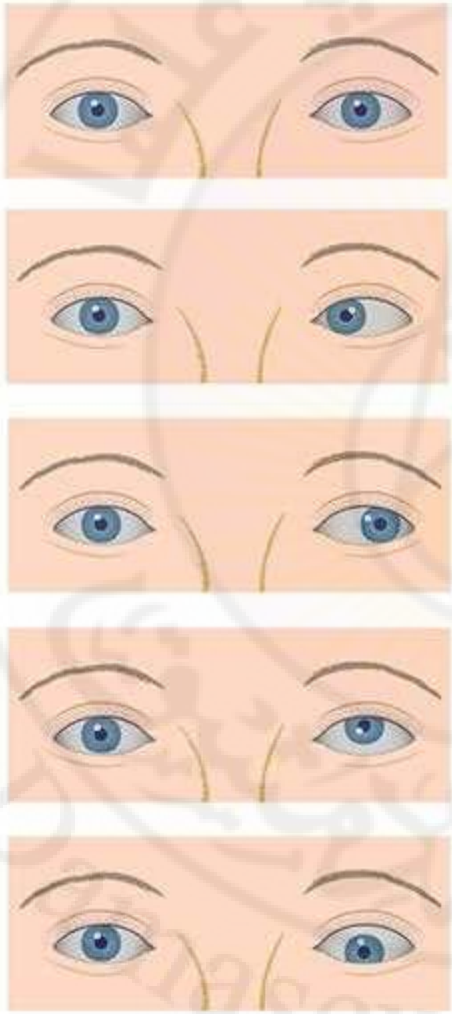

Superior rectus
Inferior oblique
Lateral rectus
Inferior rectus
Superior oblique


Inferior oblique
Superior rectus
Medial rectus
Lateral rectus
Superior oblique
Inferior rectus

Eye Movement Terminology



Strabismus



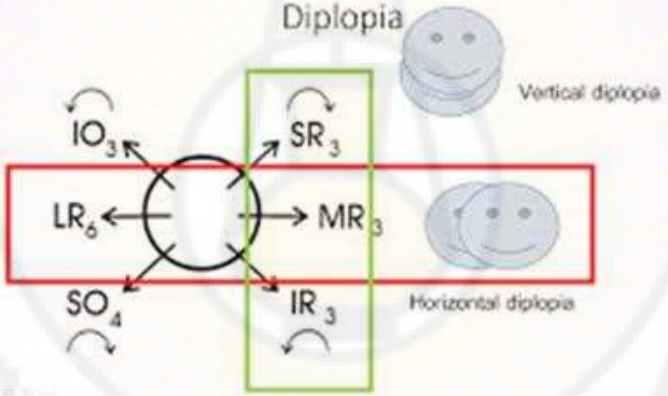
Normal

Esotropia - eye turns inward

Exotropia - eye turns outward

Hypertropia - eye turns upward

Hypotropia - eye turns downward

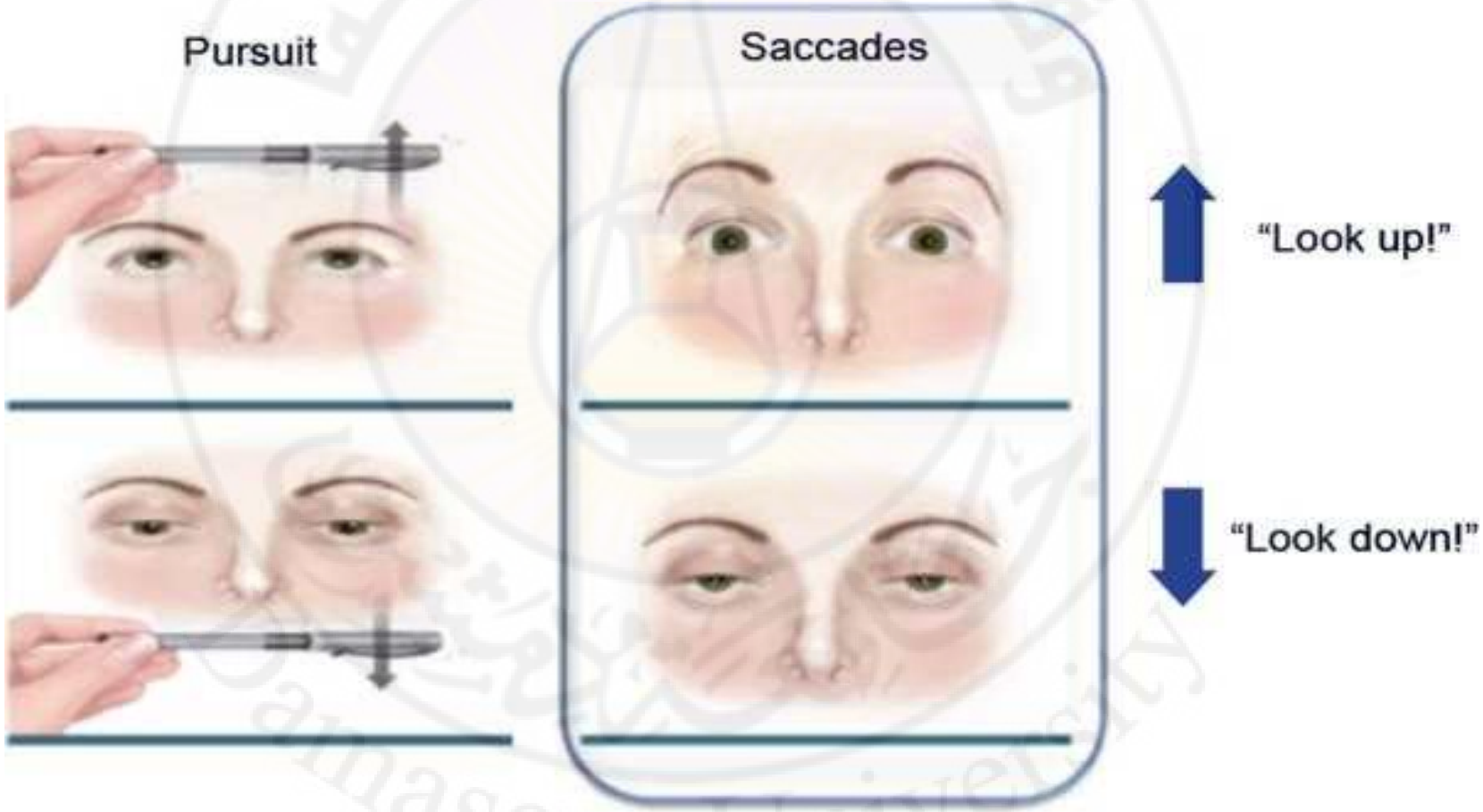

Diplopia
Vertical diplopia
IO3
SR3
LR6
MR3
SO4
IR3
Horizontal diplopia

Supranuclear Gaze Palsy

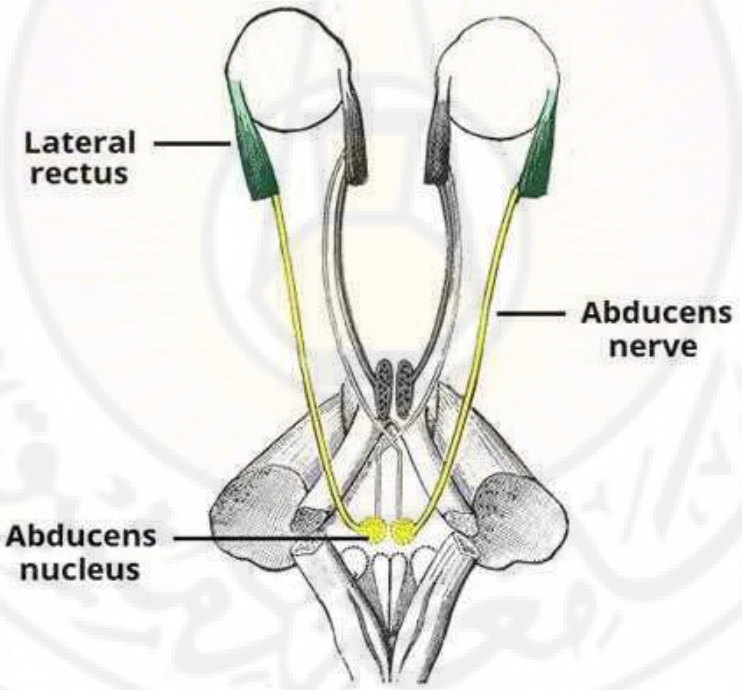
It is best to assess for an SNGP in a hierarchical fashion; initially assessing saccades to command, then saccades to visual targets, then smooth pursuit of a target, and finally with the VOR.

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Supranuclear Gaze Palsy

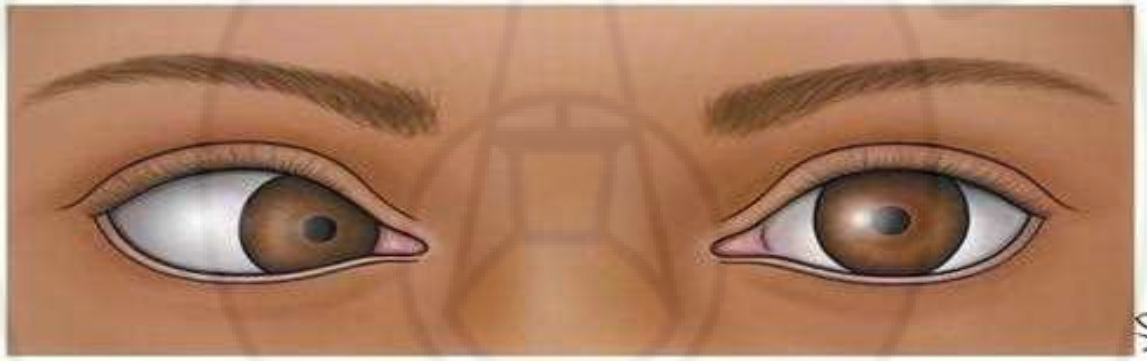


VI nerve palsy



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VI nerve palsy



Right Left eye: Does not abduct

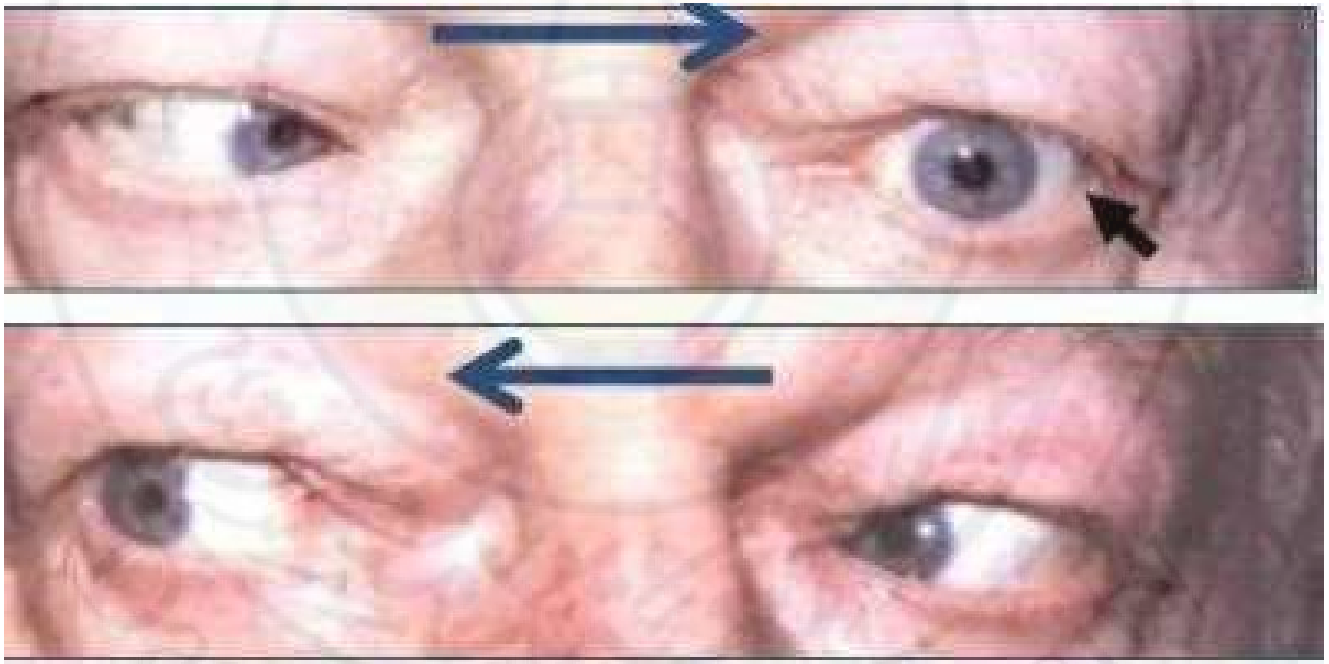
Direction of gaze →

Left abducent (CN VI) nerve palsy

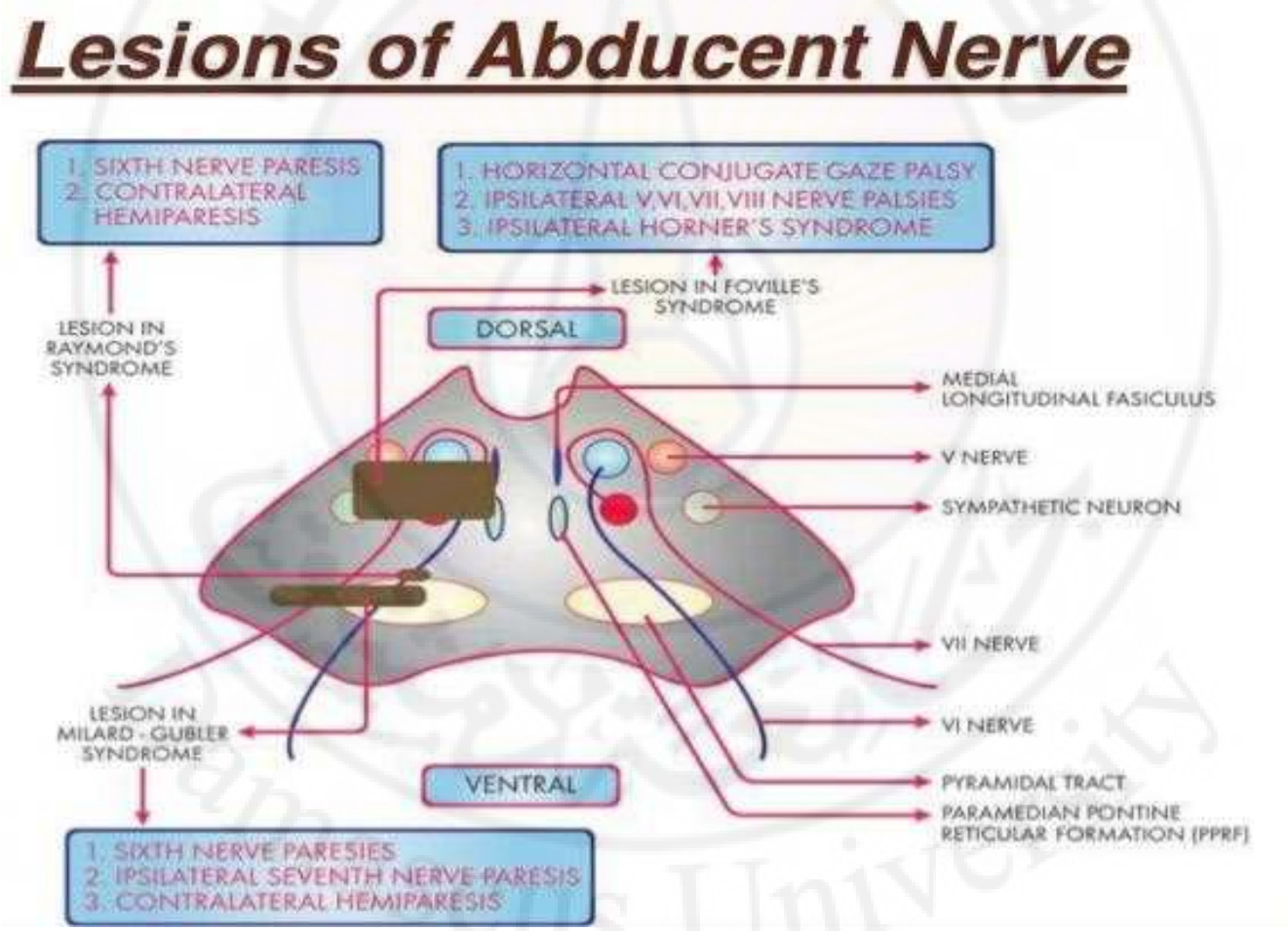
B

Copyright © 2007 Lippincott Williams & Wilkins.

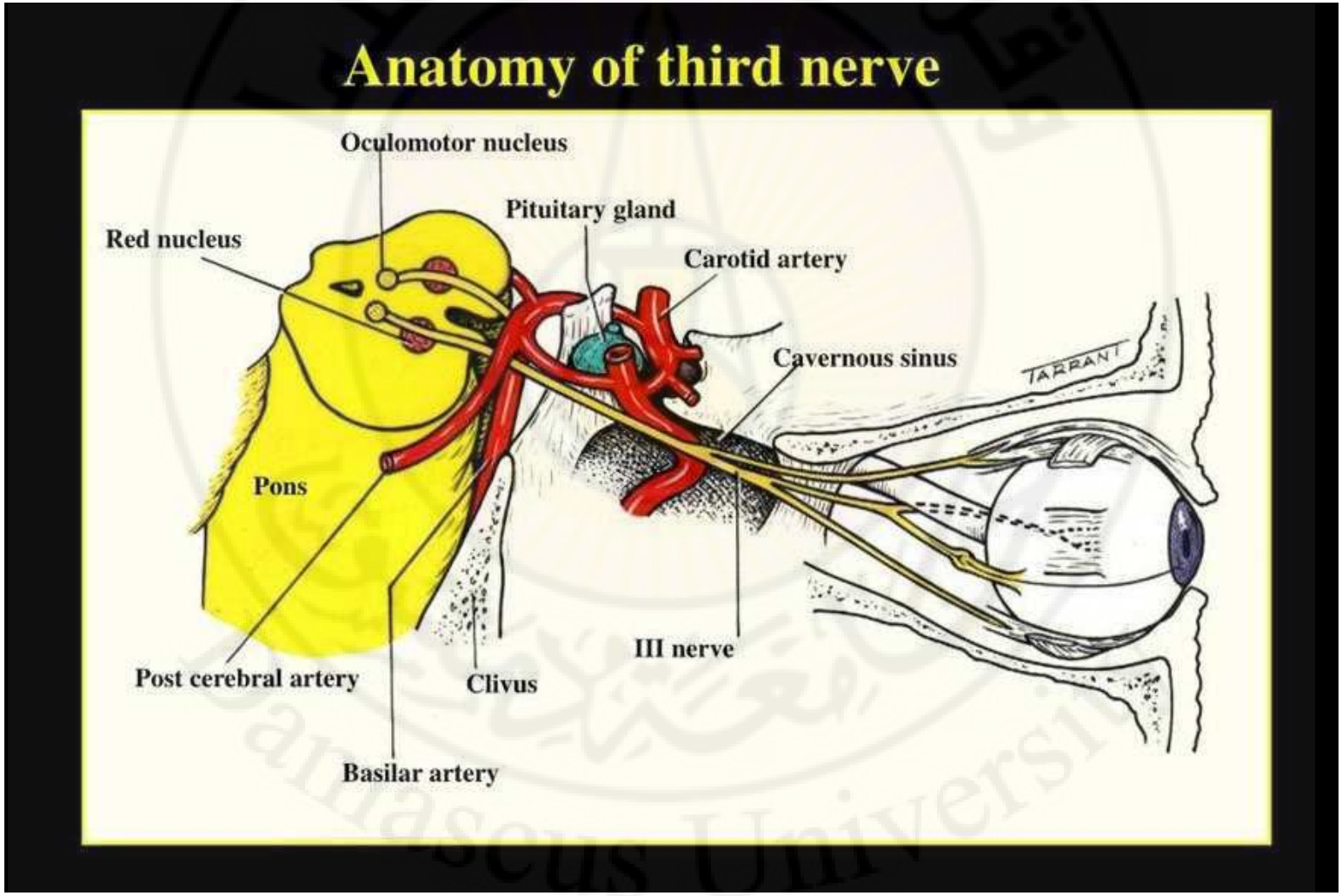
VI nerve palsy



VI and VII CN

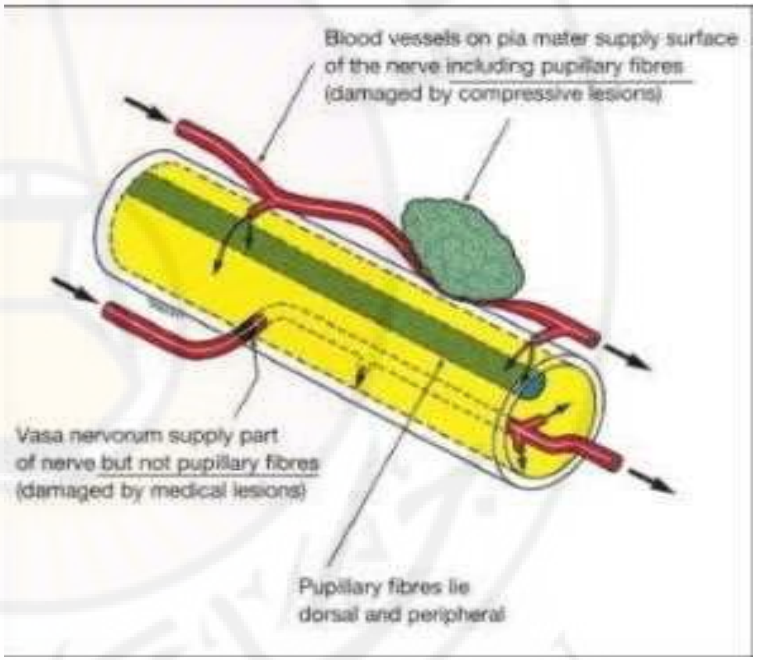

Lesions of Abducent Nerve
1. SIXTH NERVE PARESIS
2. CONTRALATERAL HEMIPARESIS
1. HORIZONTAL CONJUGATE GAZE PALSY
2. IPSILATERAL V,VI,VII,VIII NERVE PALSIES
3. IPSILATERAL HORNER'S SYNDROME
LESION IN RAYMOND'S SYNDROME
LESION IN FOVILLE'S SYNDROME
DORSAL
MEDIAL LONGITUDINAL FASICULUS
V NERVE
SYMPATHETIC NEURON
VII NERVE
VI NERVE
PYRAMIDAL TRACT
PARAMEDIAN PONTINE RETICULAR FORMATION (PPRF)
LESION IN MILARD - GUBLER SYNDROME
VENTRAL
1. SIXTH NERVE PARESIES
2. IPSILATERAL SEVENTH NERVE PARESIS
3. CONTRALATERAL HEMIPARESIS

III nerve palsy

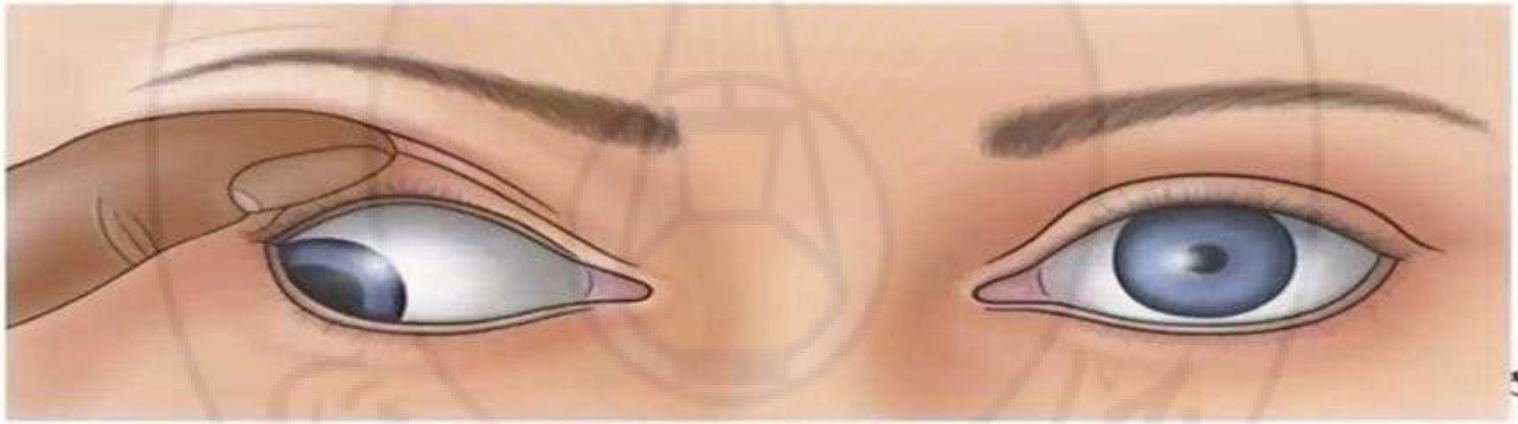


III nerve palsy





III nerve palsy



Right eye: Downward and outward gaze, dilated pupil, eyelid manually elevated due to ptosis

Left: Normal

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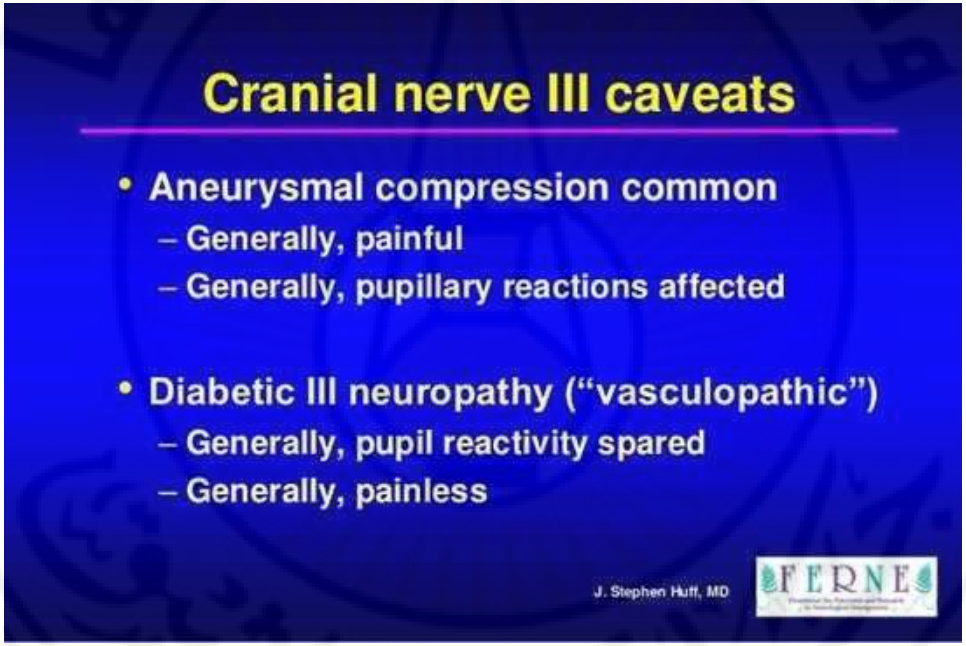
Diabetic III palsy

- Pupillary sparing "almost always" present
- Pupillomotor fibers travel on outside III
  - Selectively vulnerable to compression
  - Resistant to ischemia which often affects central portion of III

J. Stephen Huff, MD



Damascus University


Cranial nerve III caveats
• Aneurysmal compression common
– Generally, painful
– Generally, pupillary reactions affected
• Diabetic III neuropathy ("vasculopathic")
– Generally, pupil reactivity spared
– Generally, painless
J. Stephen Huff, MD
FERNE

III nerve palsy (medical)

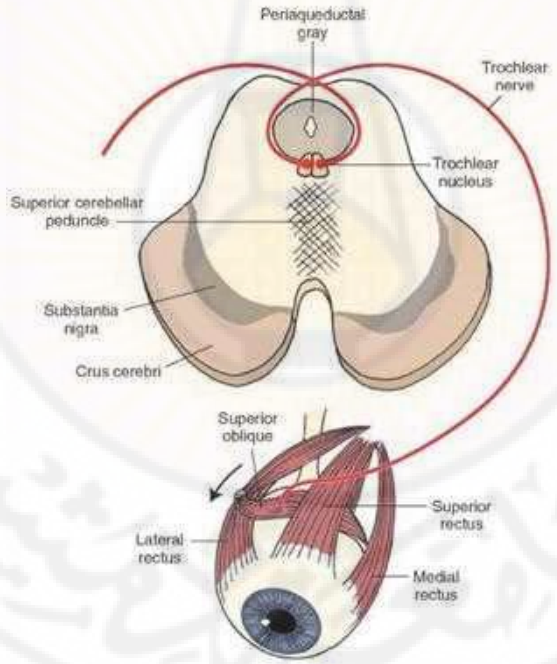


Microvascular cranial nerve palsy (MCNP) symptoms include weakness in one or more eye muscles, blurred vision that improves by closing either eye, double vision, droopy eyelid or pain around the eye.

III nerve palsy (Surgical)



IV nerve palsy



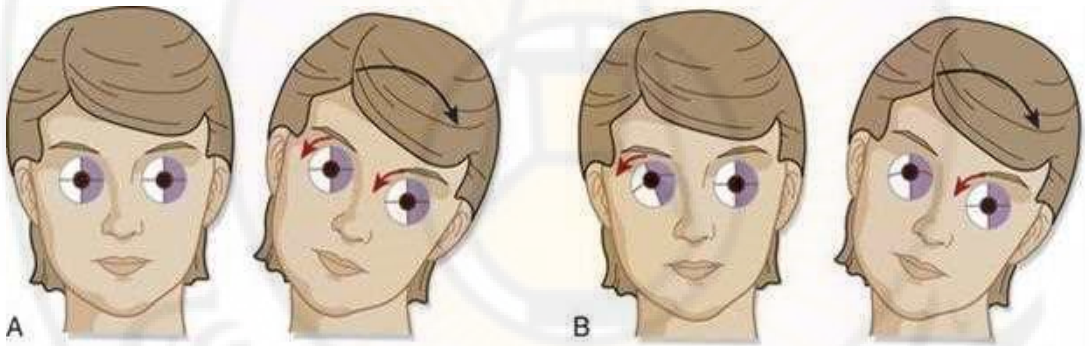
IV nerve palsy



IV nerve palsy

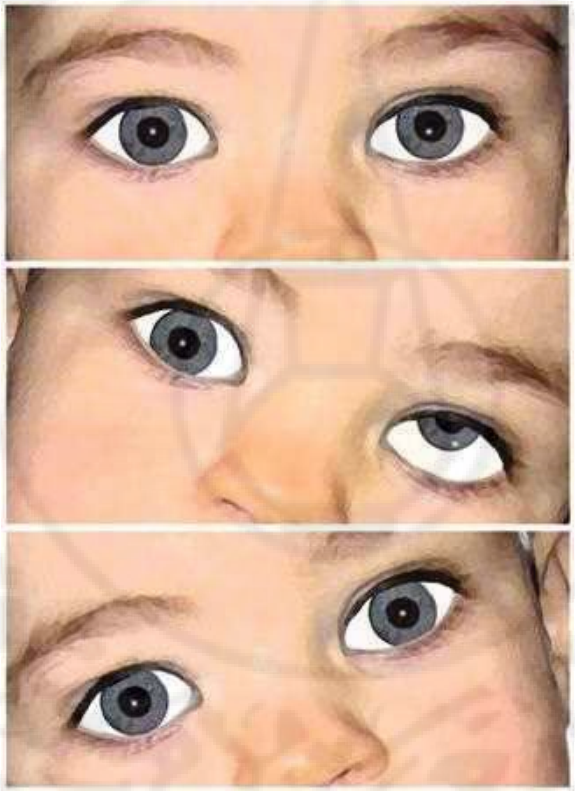


IV nerve palsy



Normal eye rotation
When the head tilts to the left, both eyes rotate in the opposite direction (right eye extorts, left eye intorts)

Cranial nerve IV palsy (right eye)
Right eye extorted and slightly elevated causing double vision. To compensate, the patient tilts her head to the left



IS THERE ANY VARIABILITY OR REMISSION ?

- MULTIPLE SCLEROSIS
- MYASTHENIA
- BOTULINUM TOXIN

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Myasthenia Gravis



Botulinum Toxin



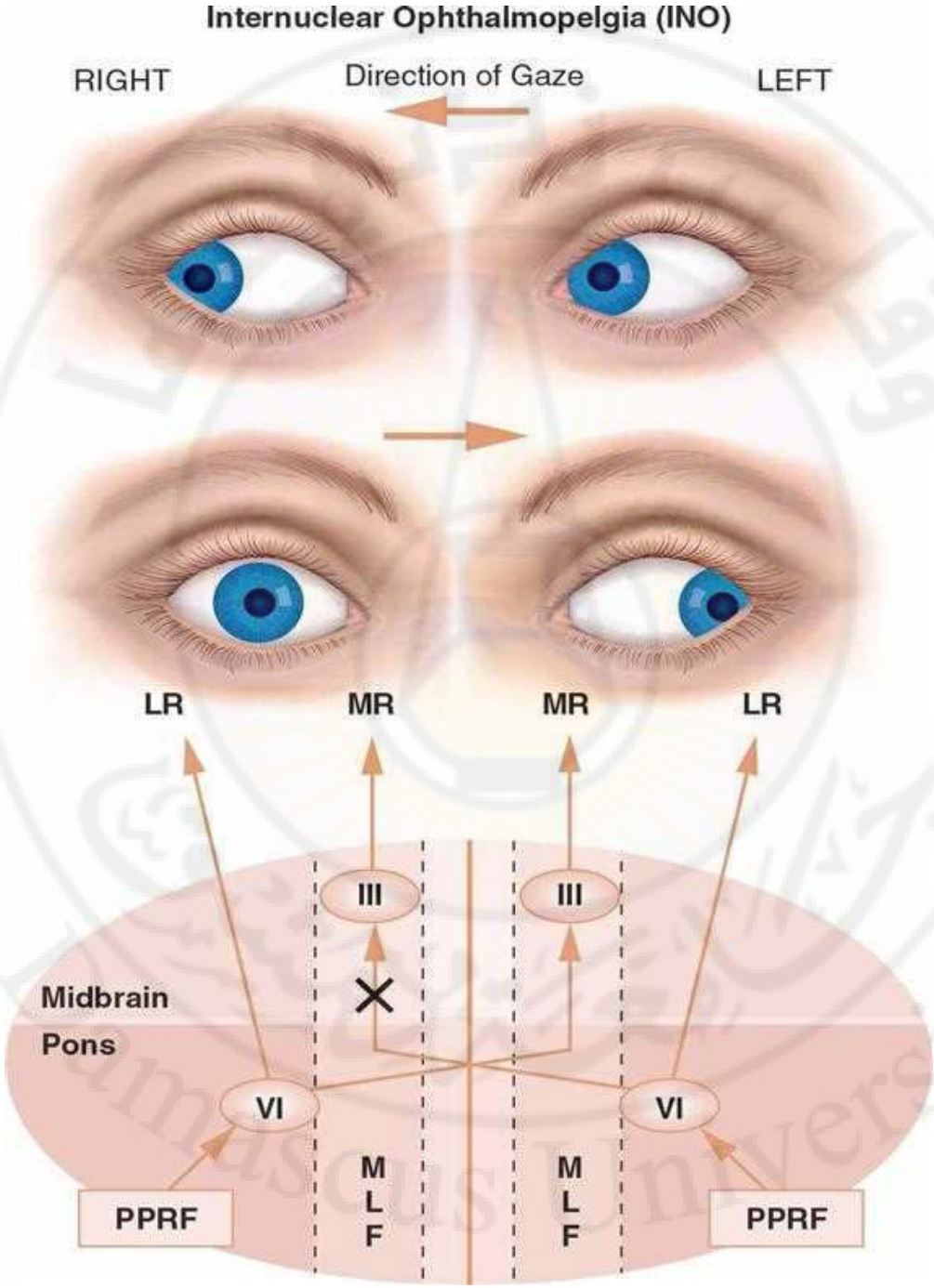
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Common supra nuclear disorders

INO

- INO is a lesion of the Medial longitudinal fascicules (MLF) resulting in a palsy of the MR muscle and a dissociated gaze evoked nystagmus in the abducting eye .

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Internuclear Ophthalmopelgia (INO)
RIGHT
Direction of Gaze
LEFT
LR
MR
MR
LR
III
III
Midbrain
Pons
VI
VI
M
L
F
M
L
F
PPRF
PPRF



INO

- Symptoms and Signs:
- Painless onset of visual disturbance
- Diplopia
  - usually not in the primary position
  - horizontal diplopia in the lateral gaze
- Convergence usually normal

INO

- INO may be unilateral or bilateral.
- Aetiology:
- Multiple Sclerosis in younger patients.
- Brainstem tumor
- Trauma etc.

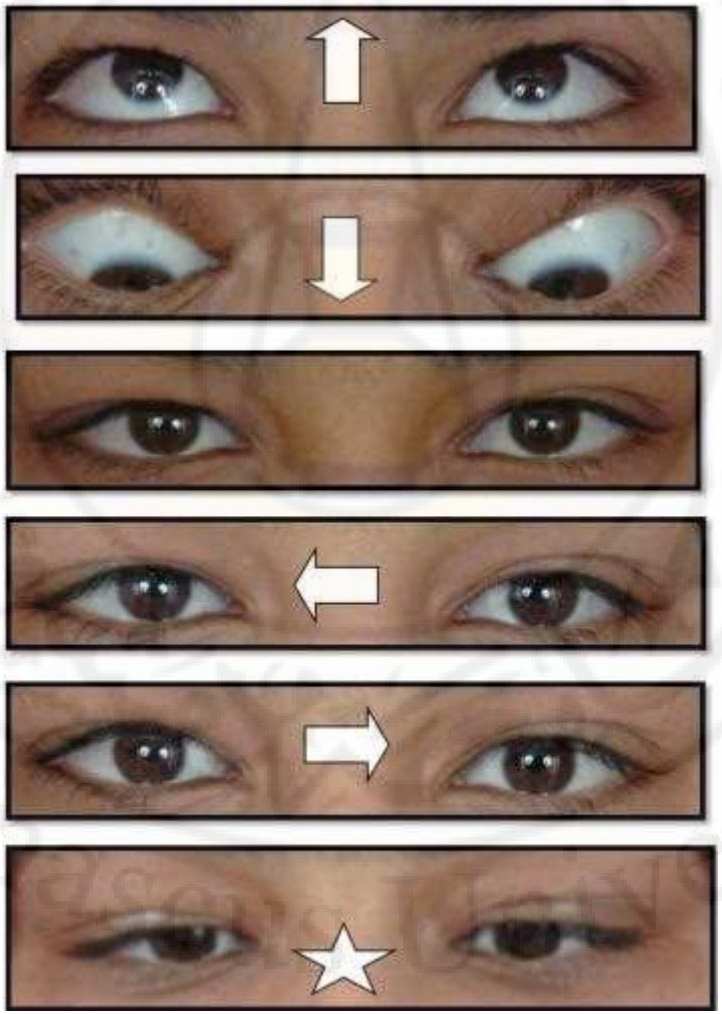


Horizontal gaze palsy

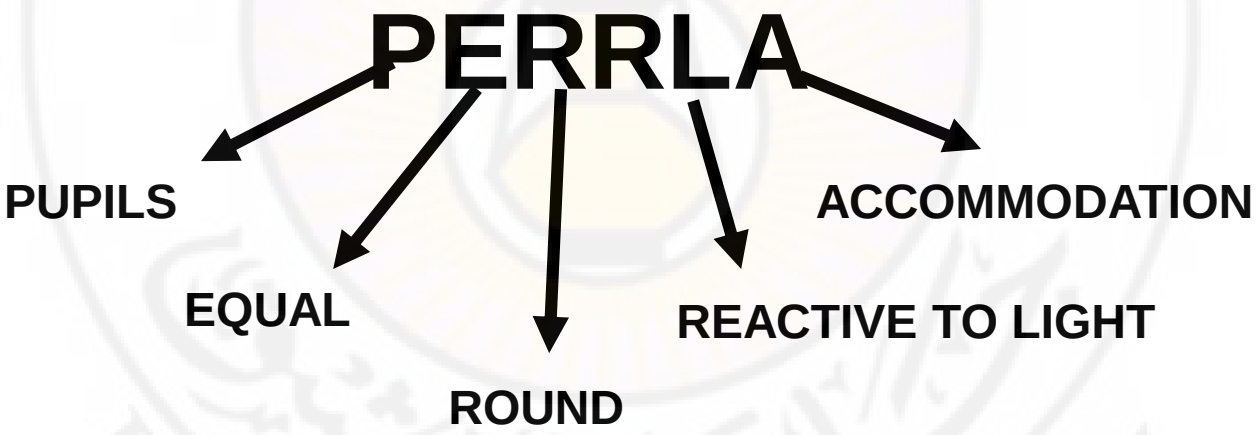
A gaze palsy is the paresis of conjugate eye movements.

Horizontal gaze palsy may be caused by lesions in the cerebral hemispheres, which cause paresis of gaze away from the side of the lesion, or from brain stem lesions, which, if they occur below the crossing of the fibers from the frontal eye fields in the caudal midbrain, will cause weakness of gaze toward the side of the lesion. These will result in horizontal gaze deviations from unopposed action of the unaffected extraocular muscles. Another way to remember this is that patients with hemisphere lesions look towards their lesion, while patients with pontine gaze palsies look away from their lesions.

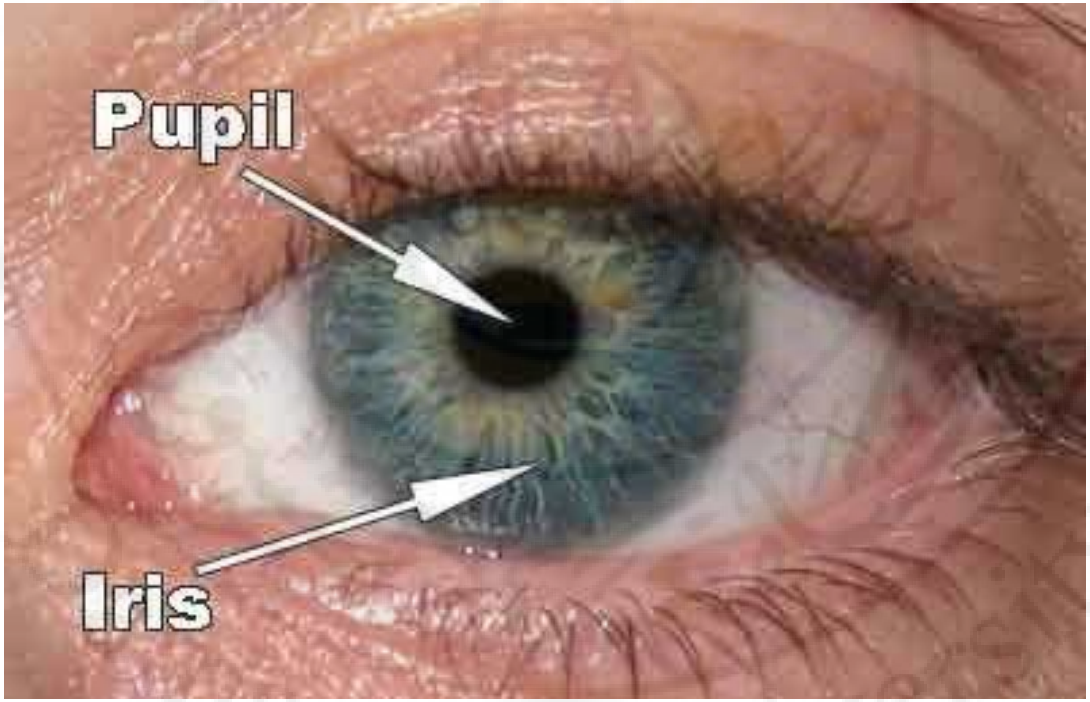
Horizontal gaze palsy



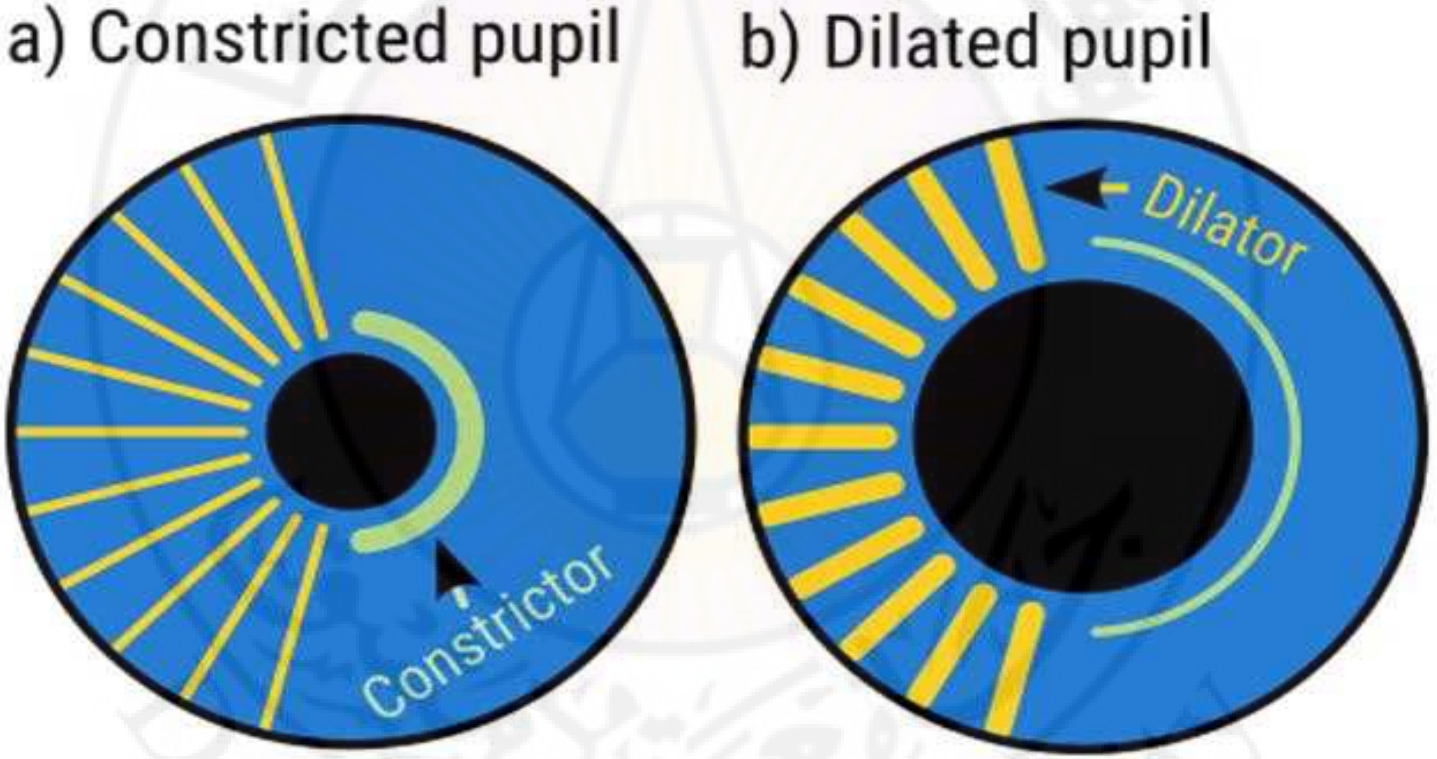
ALWAYS REMEMBER



The Pupil

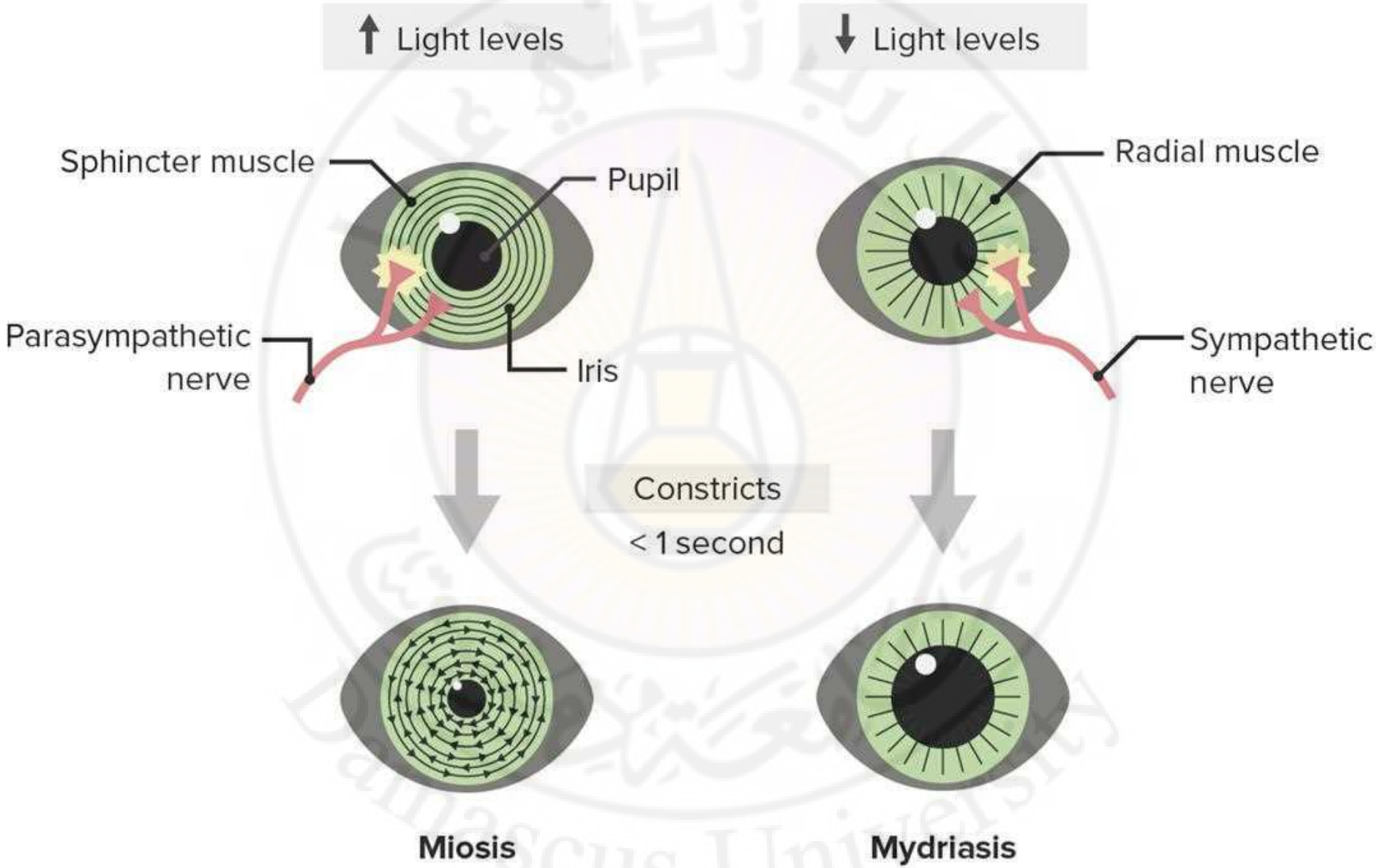


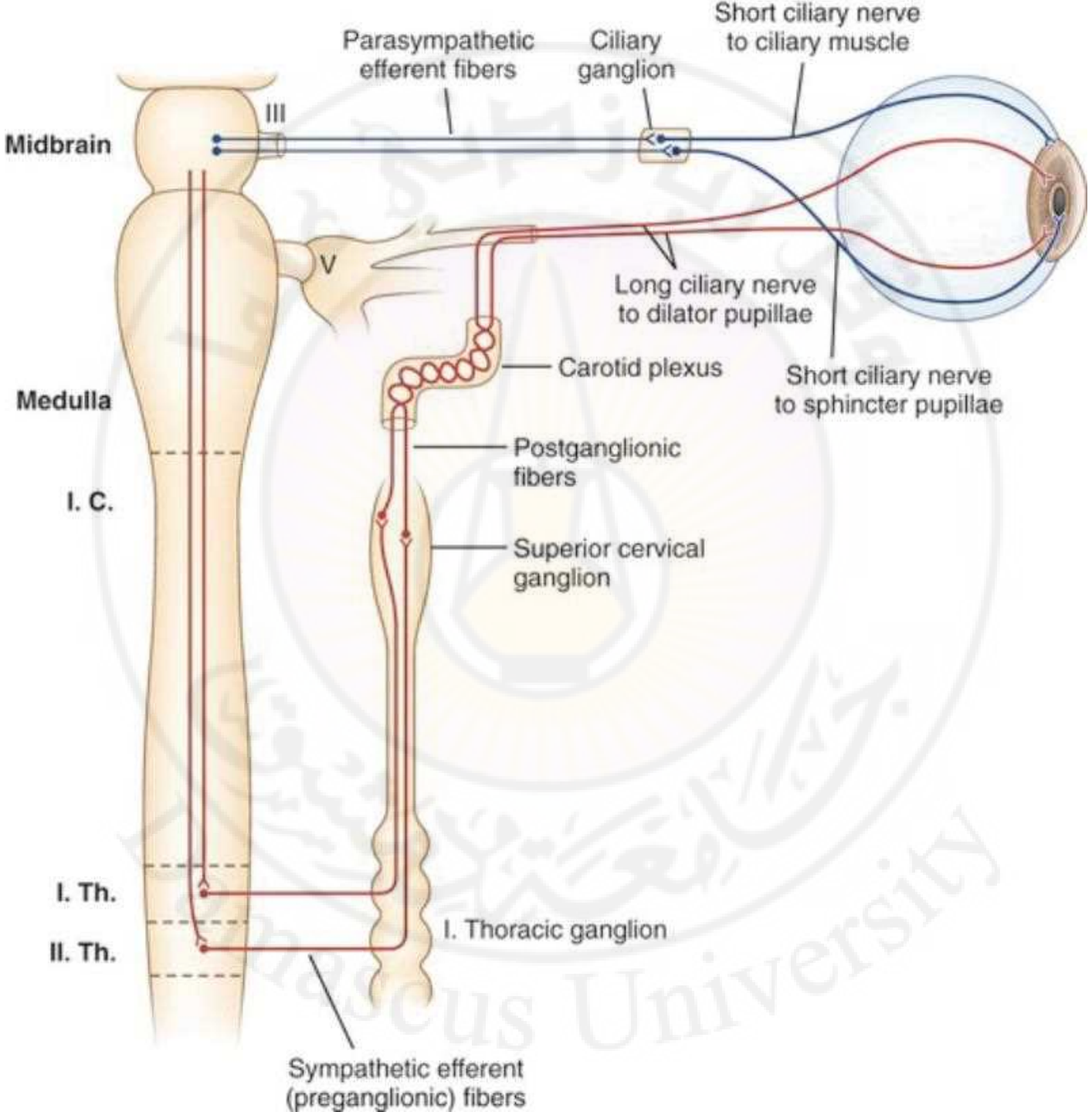
The Pupil

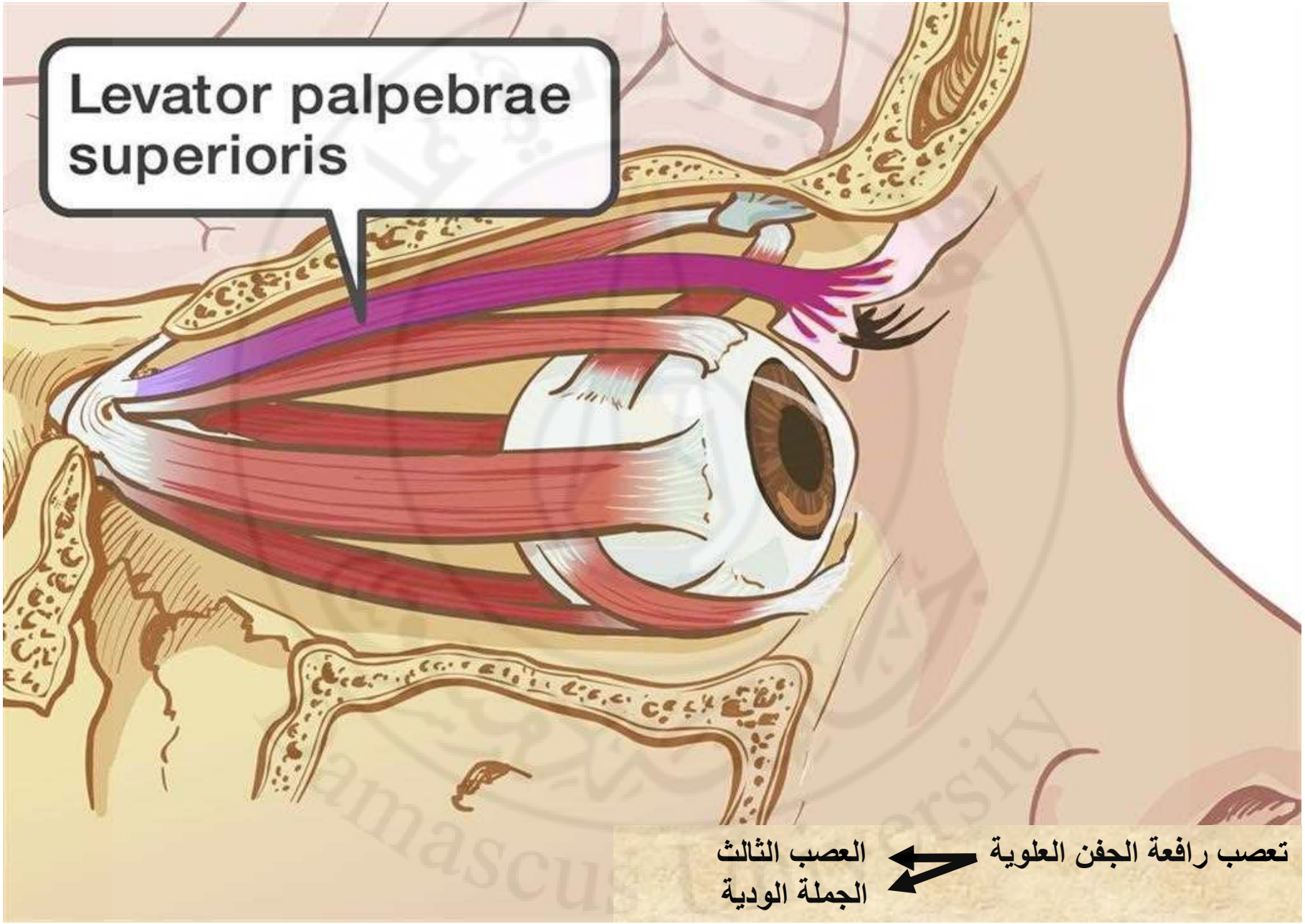


توسع: الجملة الودية (ادرينالليني الفعل)

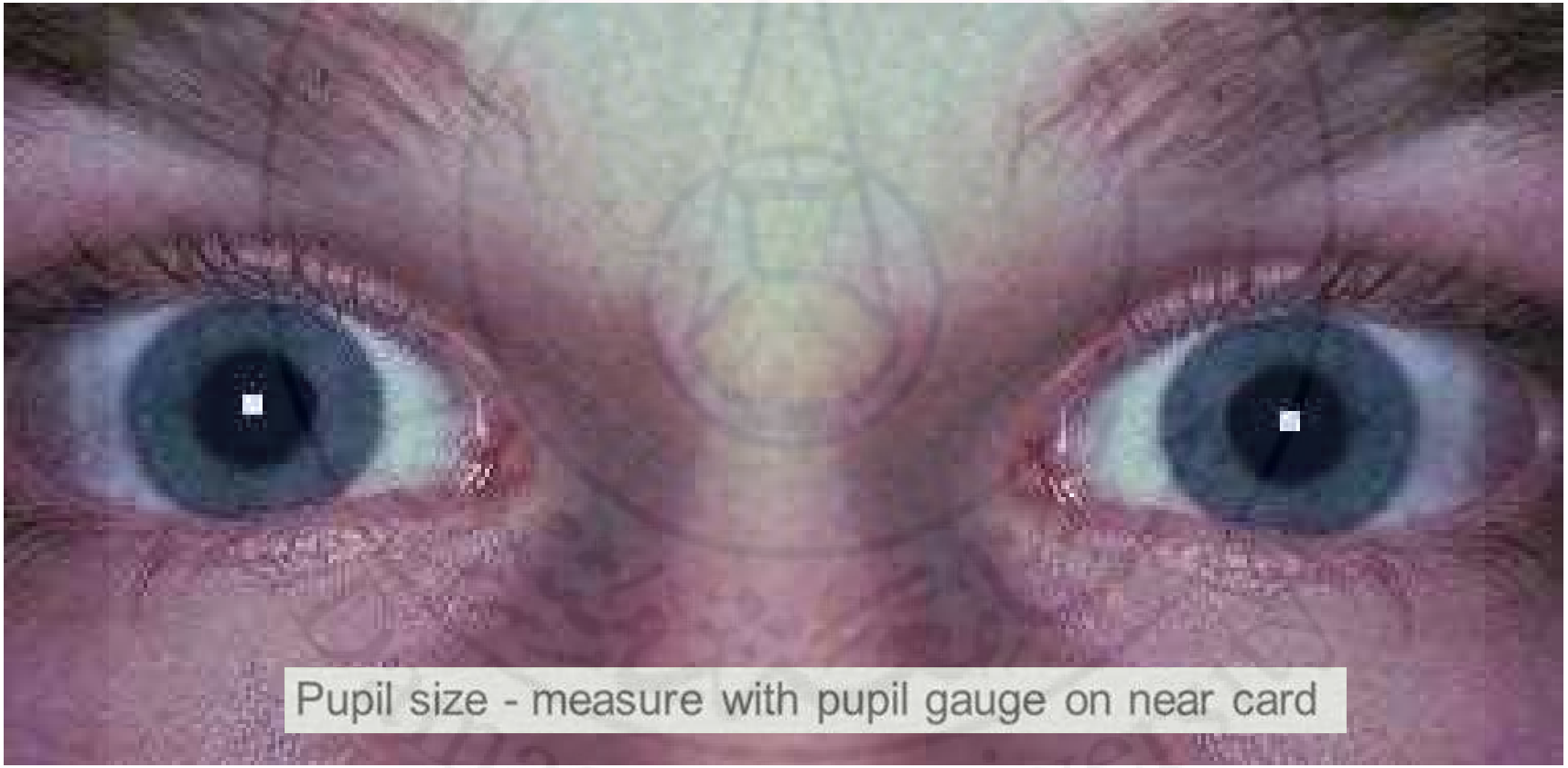
تقبض : الجملة نظيرة الودية (كوليني الفعل) III CN


Light levels
Light levels
Sphincter muscle
Pupil
Parasympathetic nerve
Iris
Radial muscle
Sympathetic nerve
Constricts
< 1 second
Miosis
Mydriasis

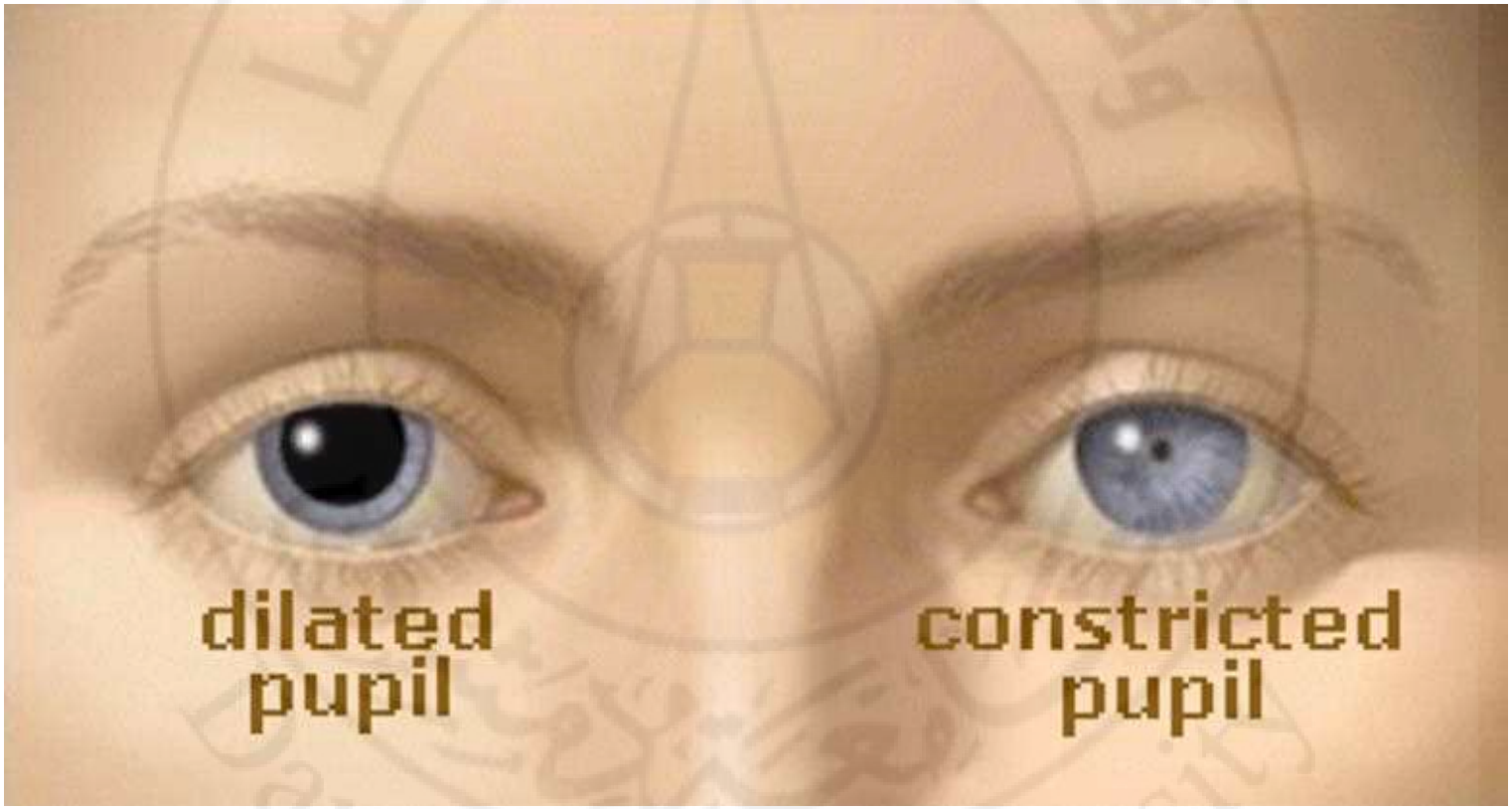

Parasympathetic efferent fibers
Ciliary ganglion
Short ciliary nerve to ciliary muscle
III
Midbrain
V
Long ciliary nerve to dilator pupillae
Carotid plexus
Short ciliary nerve to sphincter pupillae
Medulla
Postganglionic fibers
I. C.
Superior cervical ganglion
I. Th.
II. Th.
I. Thoracic ganglion
Sympathetic efferent (preganglionic) fibers


Levator palpebrae superioris
تعصب رافعة الجفن العلوية
العصب الثالث
الجملة الودية

EQUAL



The Pupil



Round



Vertical



Cat Eyes

Horizontal pupil



Eyes of a goat

Round pupil



Eyes of a tiger

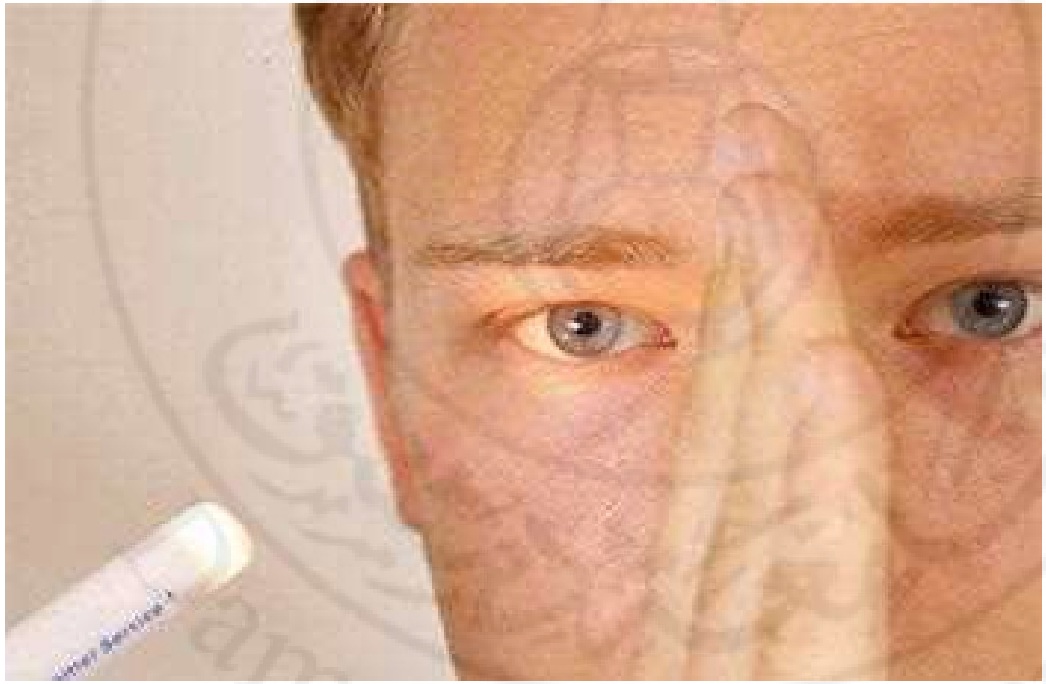
Why do the eyes of some animals, have horizontal-shaped pupils, while others have vertical slits?



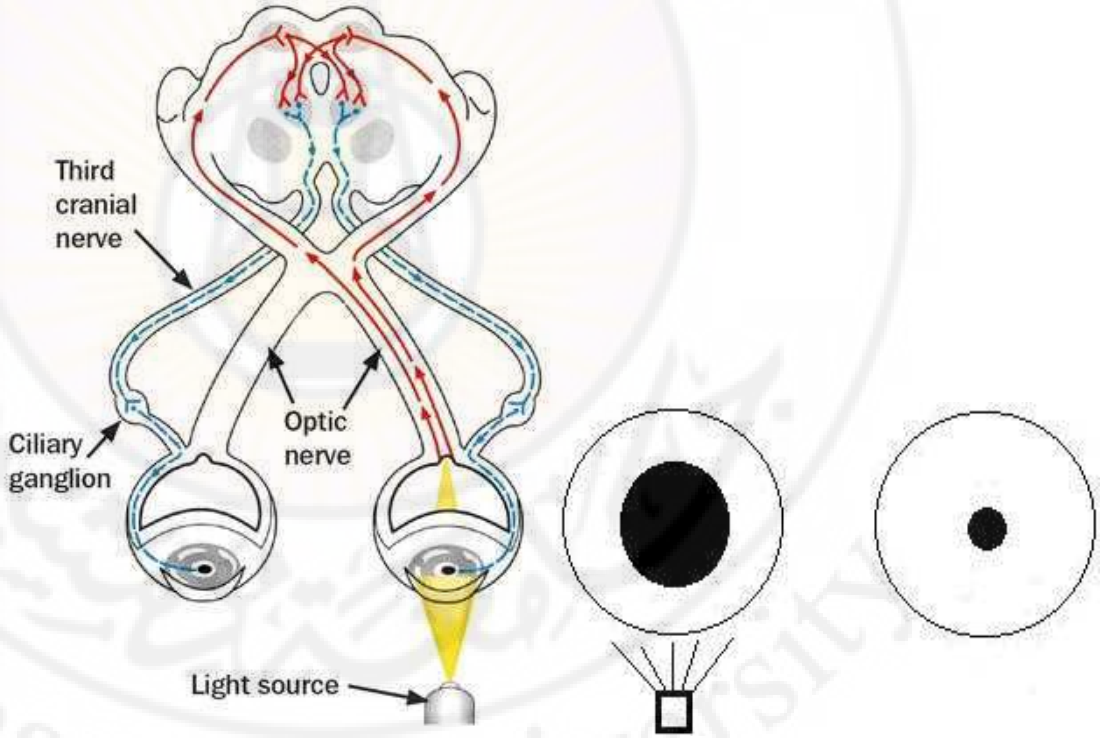
Respond to light (direct and consensual)



Respond to light (direct and consensual)



RAPD


Third cranial nerve
Ciliary ganglion
Optic nerve
Light source

RAPD



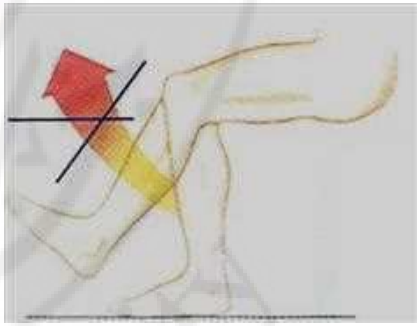
Constriction in the near



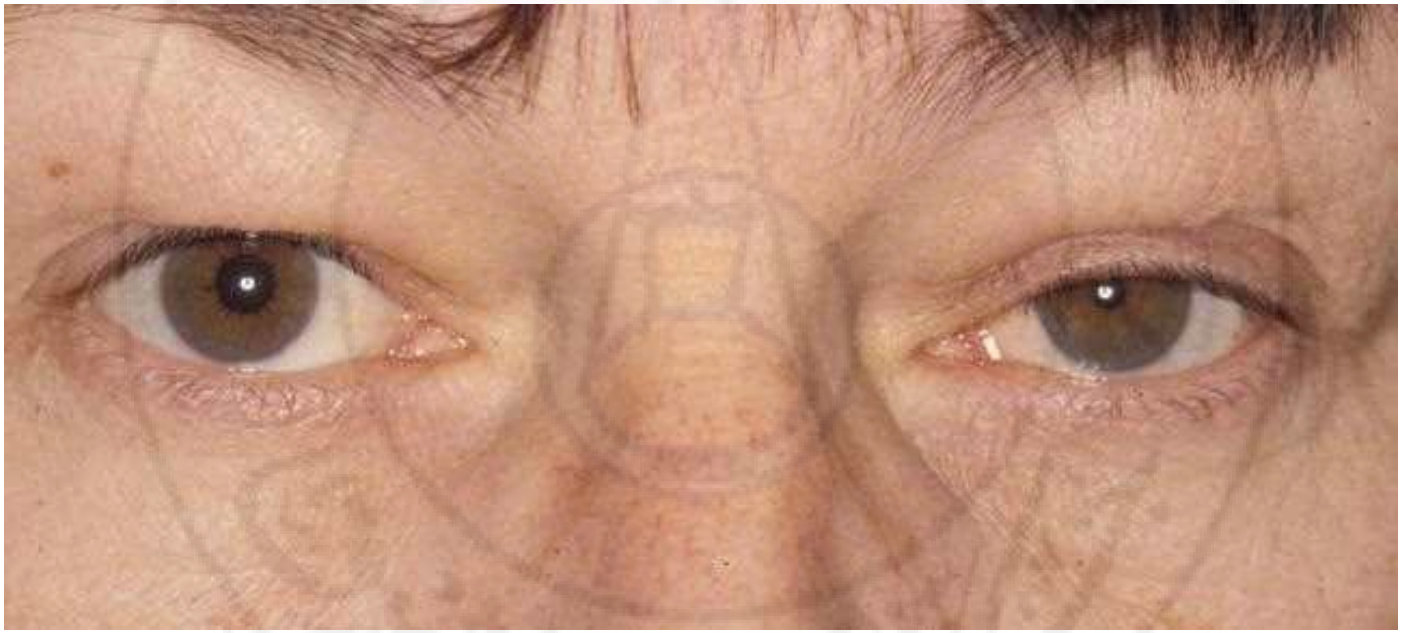
Adie's tonic pupil



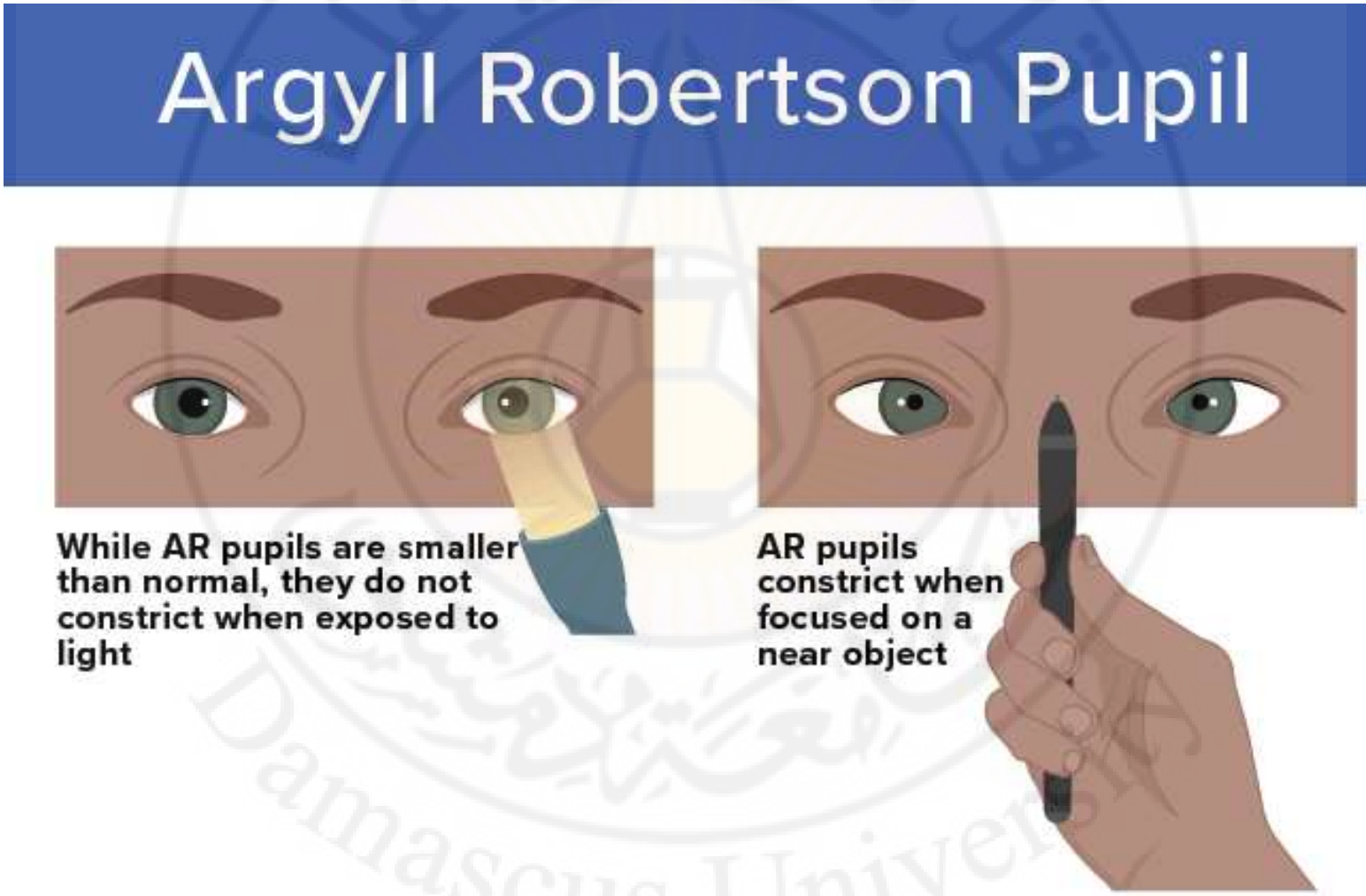
Deep tendon reflexes are absent



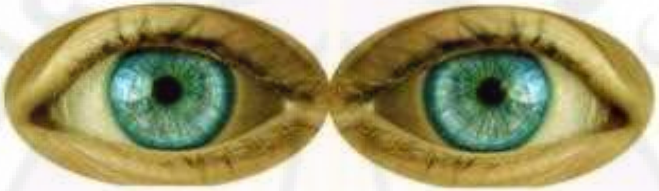
Horner’s symptoms



Bilateral small pupils



Bilateral small pupils

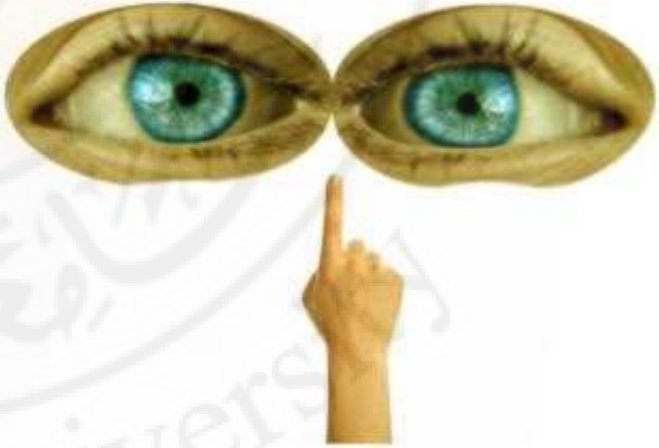


Bilateral miotic and irregular pupils

Pupils do not react to light

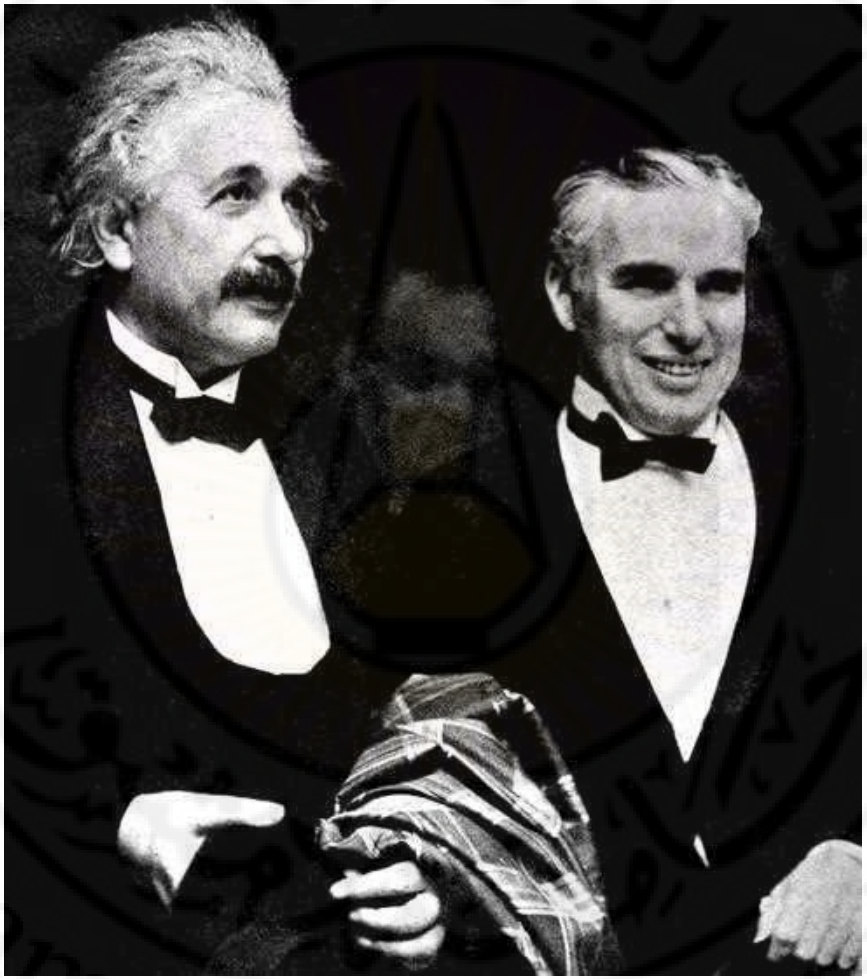


Pupils react briskly to accomodation

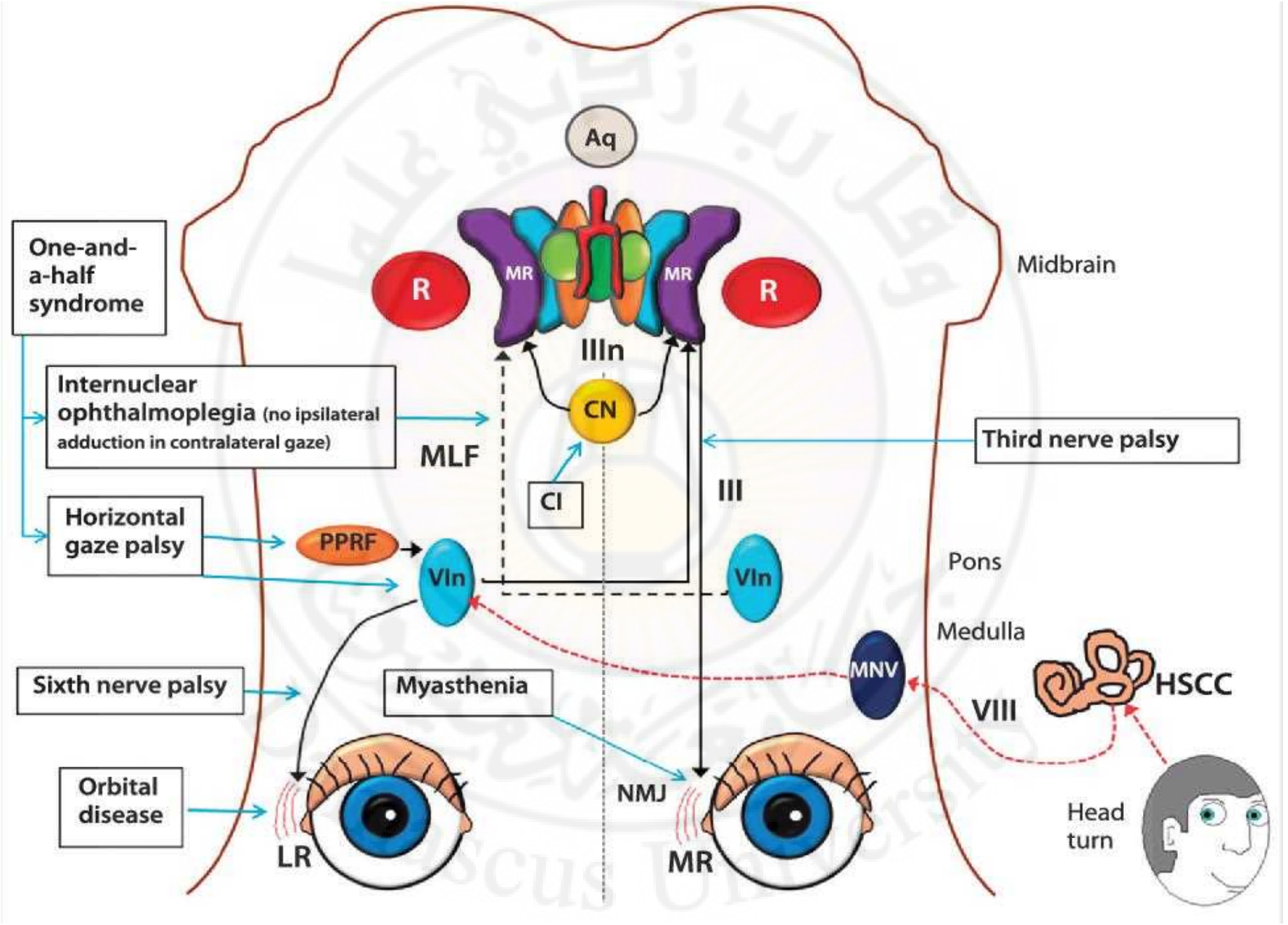


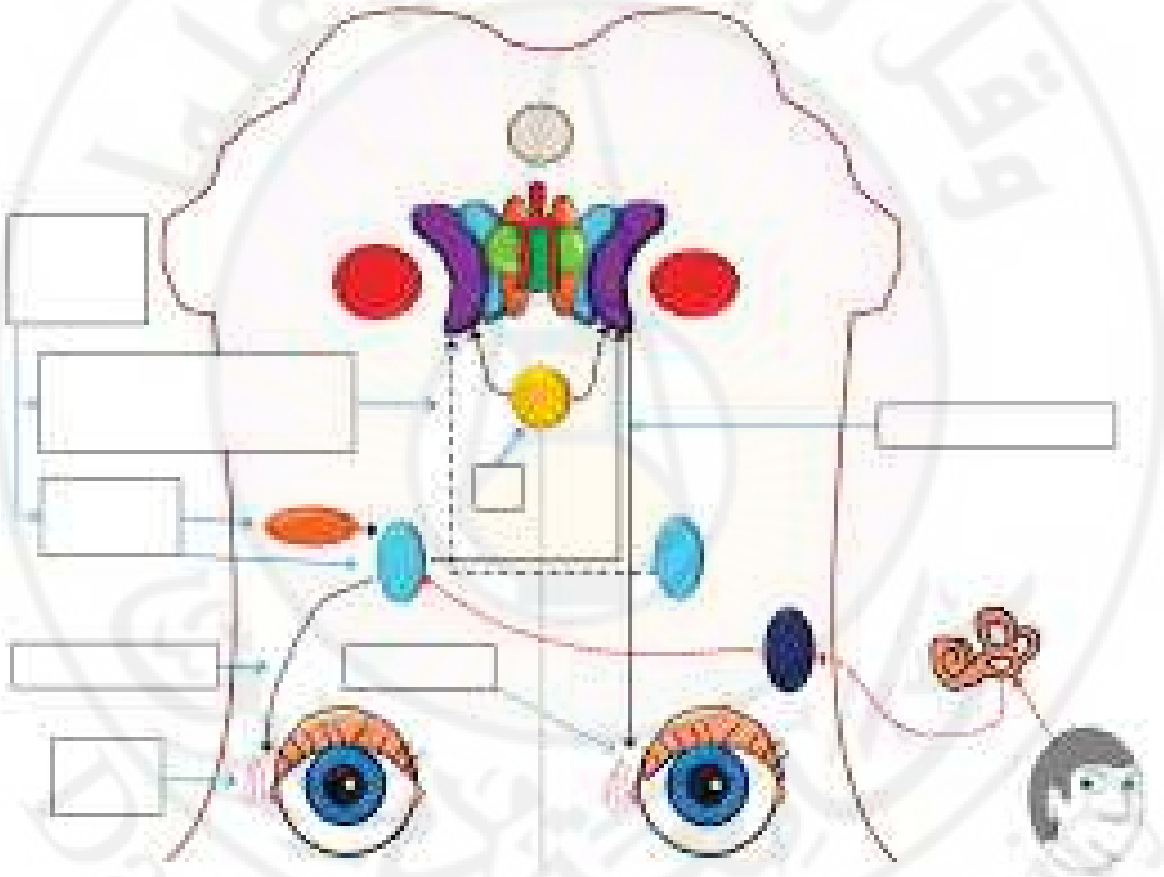
Bilateral small pupils
Argyll Robertson

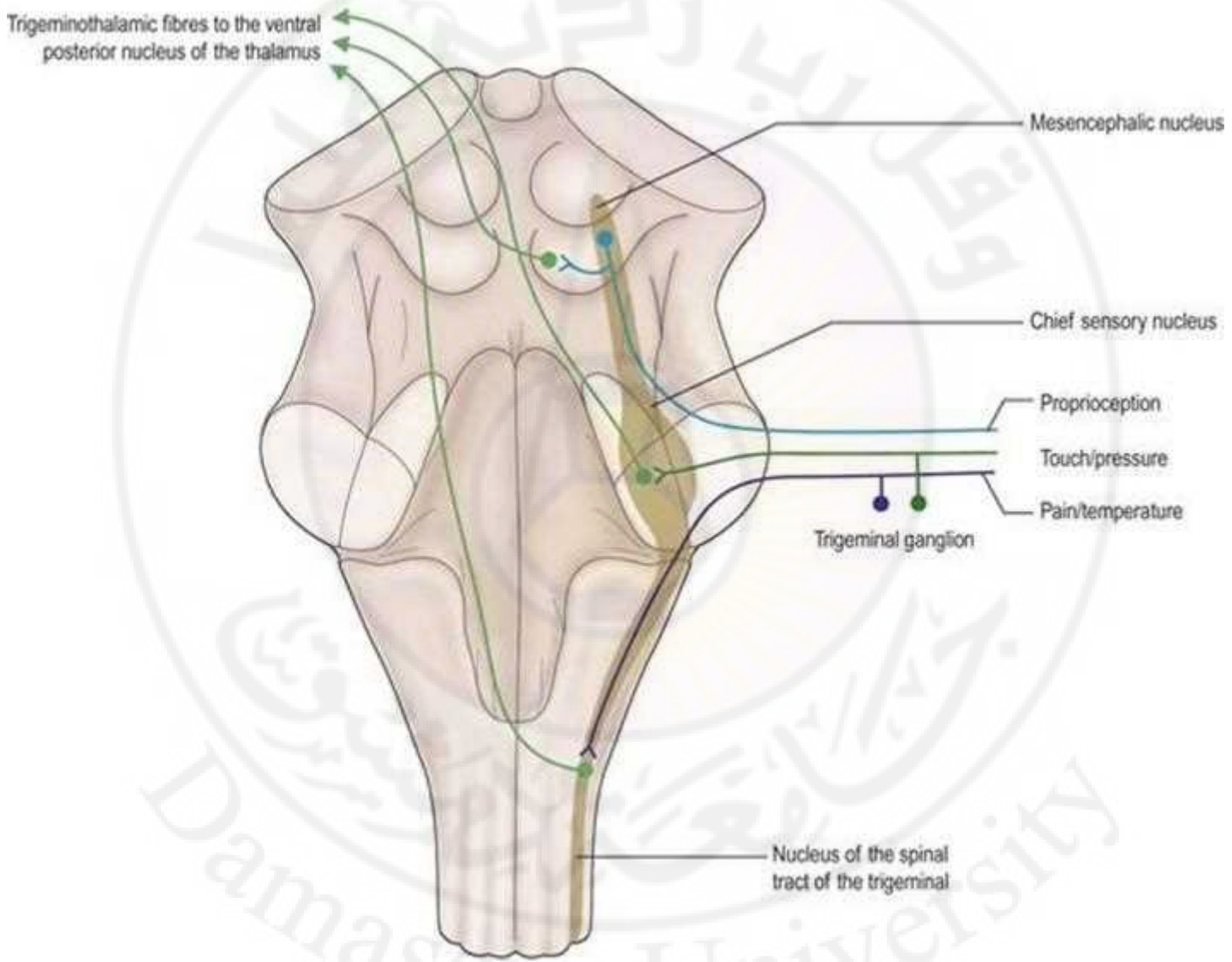


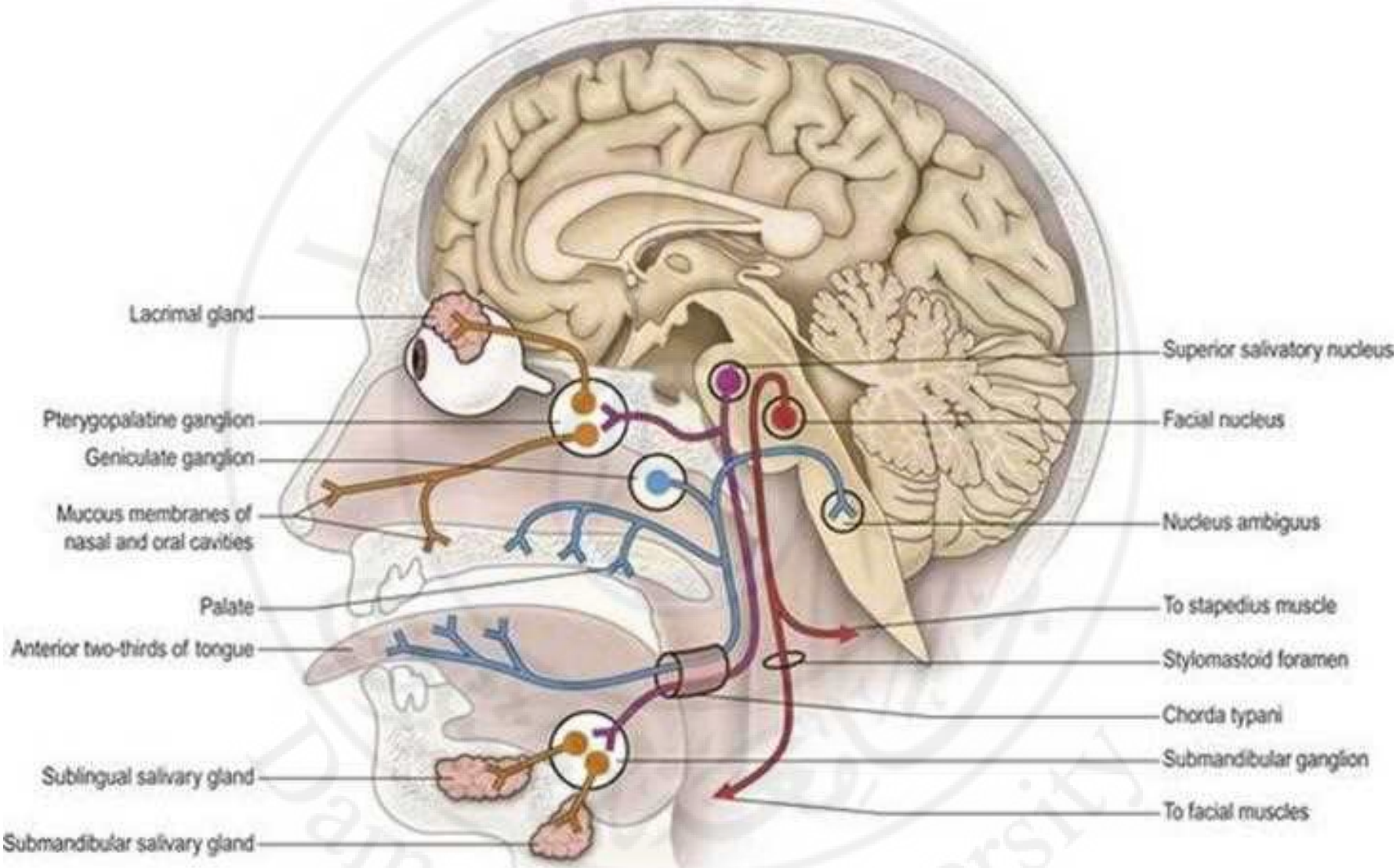


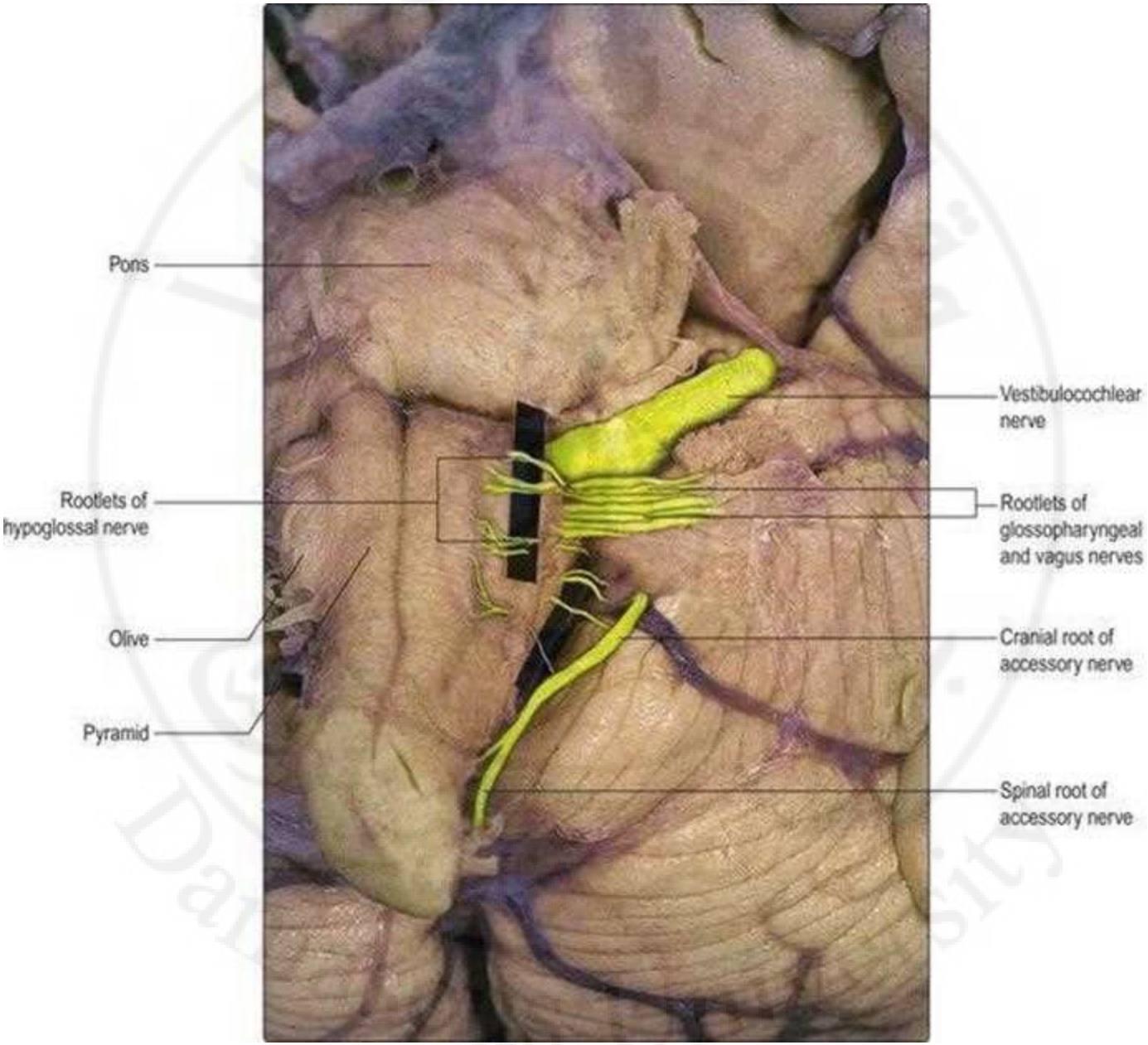
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Aq
One-and-a-half syndrome
R
MR
MR
R
Midbrain
IIIn
Internuclear ophthalmoplegia (no ipsilateral adduction in contralateral gaze)
CN
MLF
Third nerve palsy
CI
III
Horizontal gaze palsy
PPRF
VIn
VIn
Pons
Medulla
MNV
HSCC
VIII
Sixth nerve palsy
Myasthenia
Orbital disease
NMJ
LR
MR
Head turn

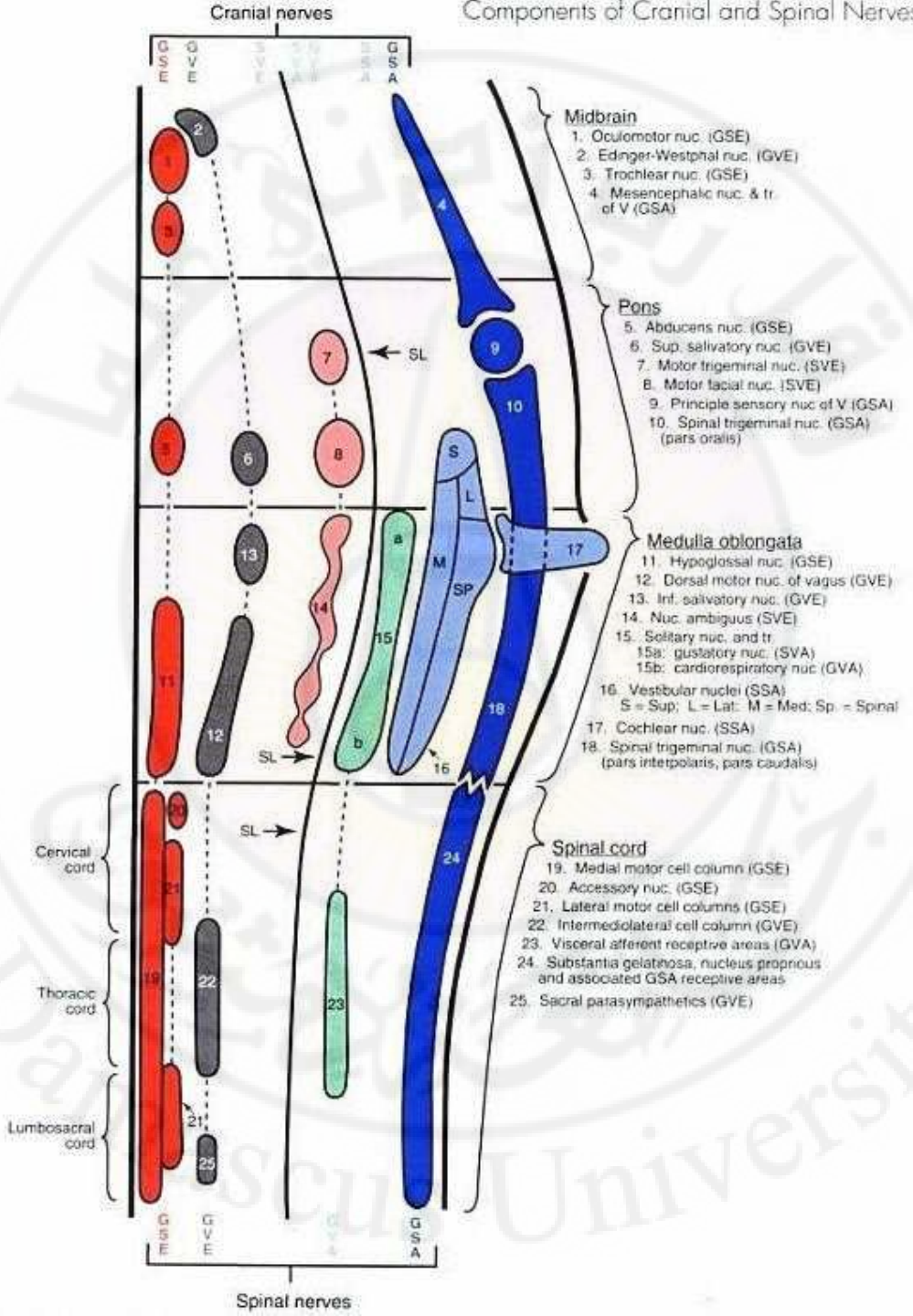


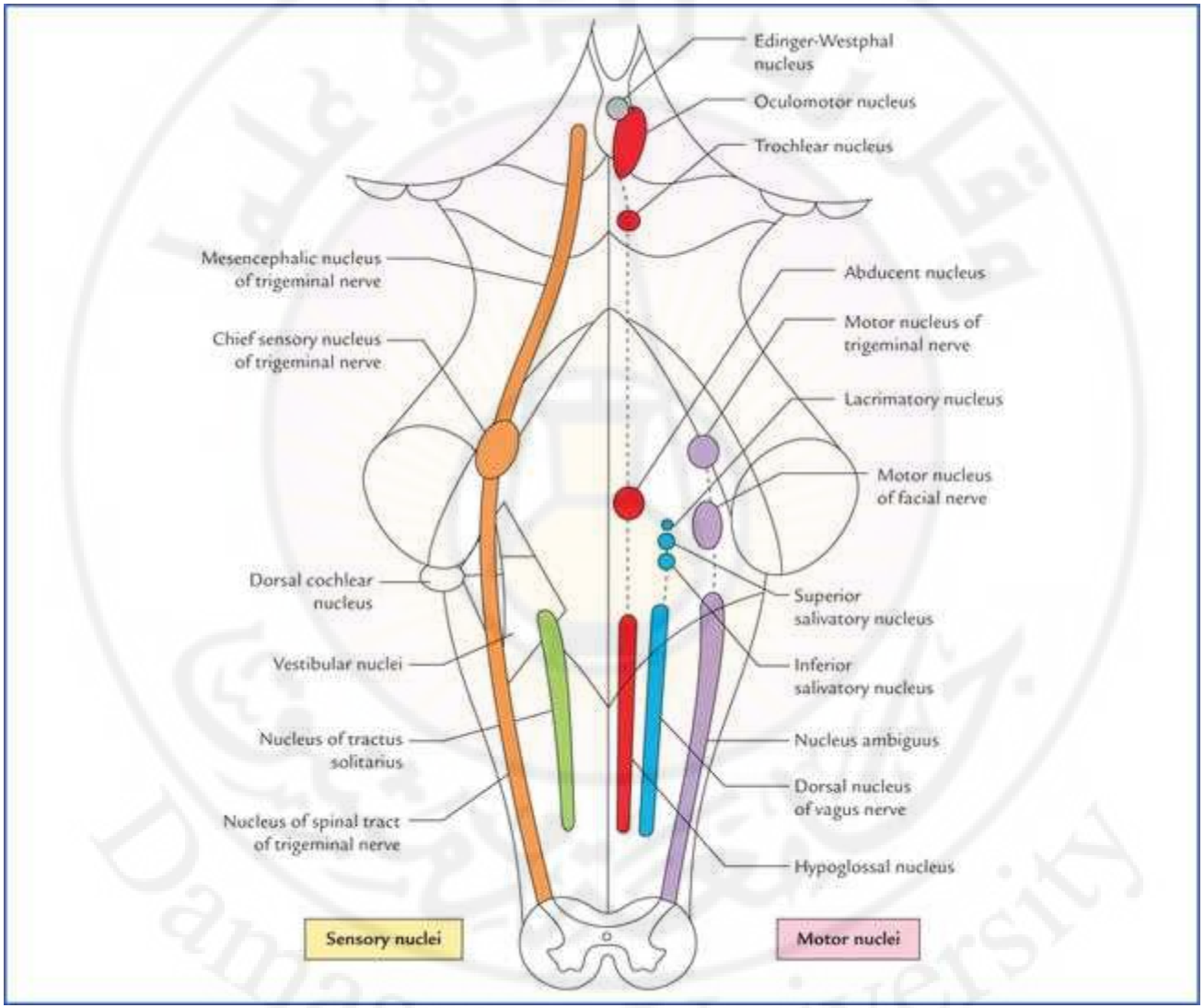

Trigeminothalamic fibres to the ventral posterior nucleus of the thalamus
Mesencephalic nucleus
Chief sensory nucleus
Proprioception
Touch/pressure
Pain/temperature
Trigeminal ganglion
Nucleus of the spinal tract of the trigeminal

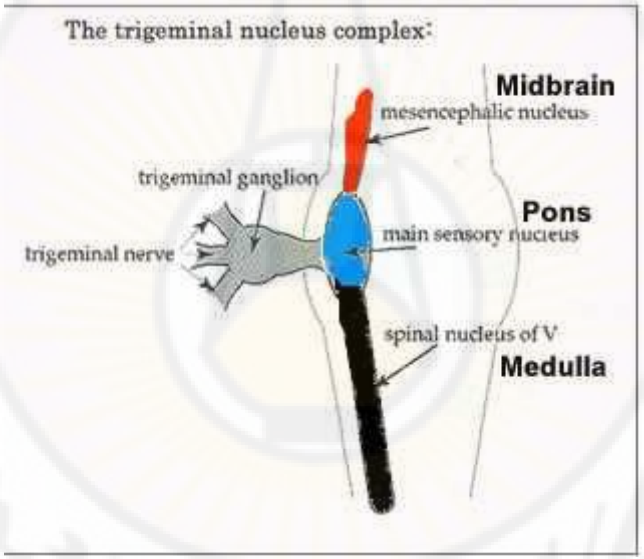

Lacrimal gland
Pterygopalatine ganglion
Geniculate ganglion
Mucous membranes of nasal and oral cavities
Palate
Anterior two-thirds of tongue
Sublingual salivary gland
Submandibular salivary gland
Superior salivatory nucleus
Facial nucleus
Nucleus ambiguus
To stapedius muscle
Stylomastoid foramen
Chorda tympani
Submandibular ganglion
To facial muscles

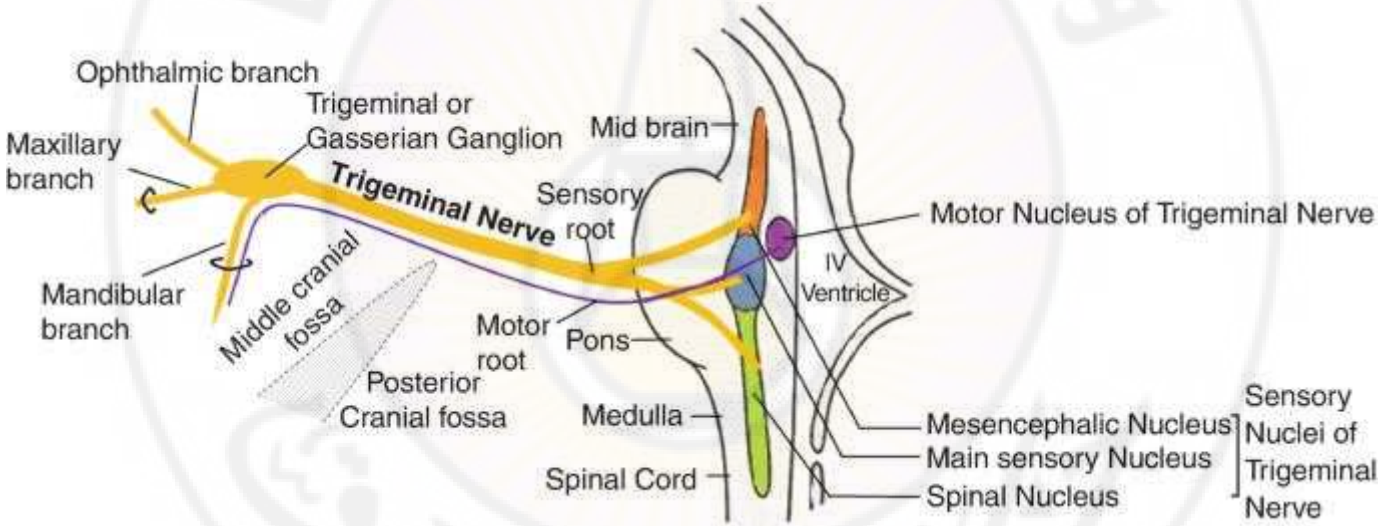

Pons
Rootlets of hypoglossal nerve
Olive
Pyramid
Vestibulocochlear nerve
Rootlets of glossopharyngeal and vagus nerves
Cranial root of accessory nerve
Spinal root of accessory nerve

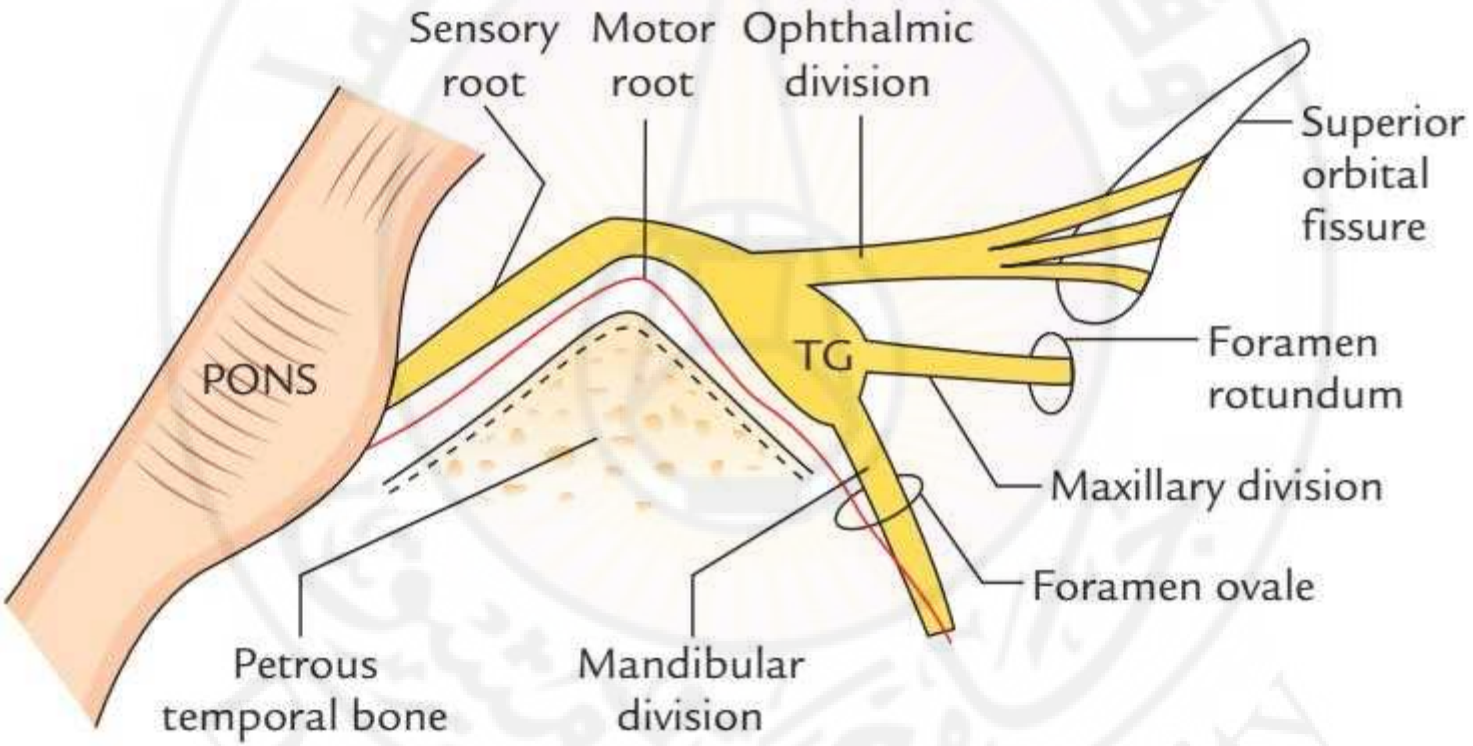
Components of Cranial and Spinal Nerves

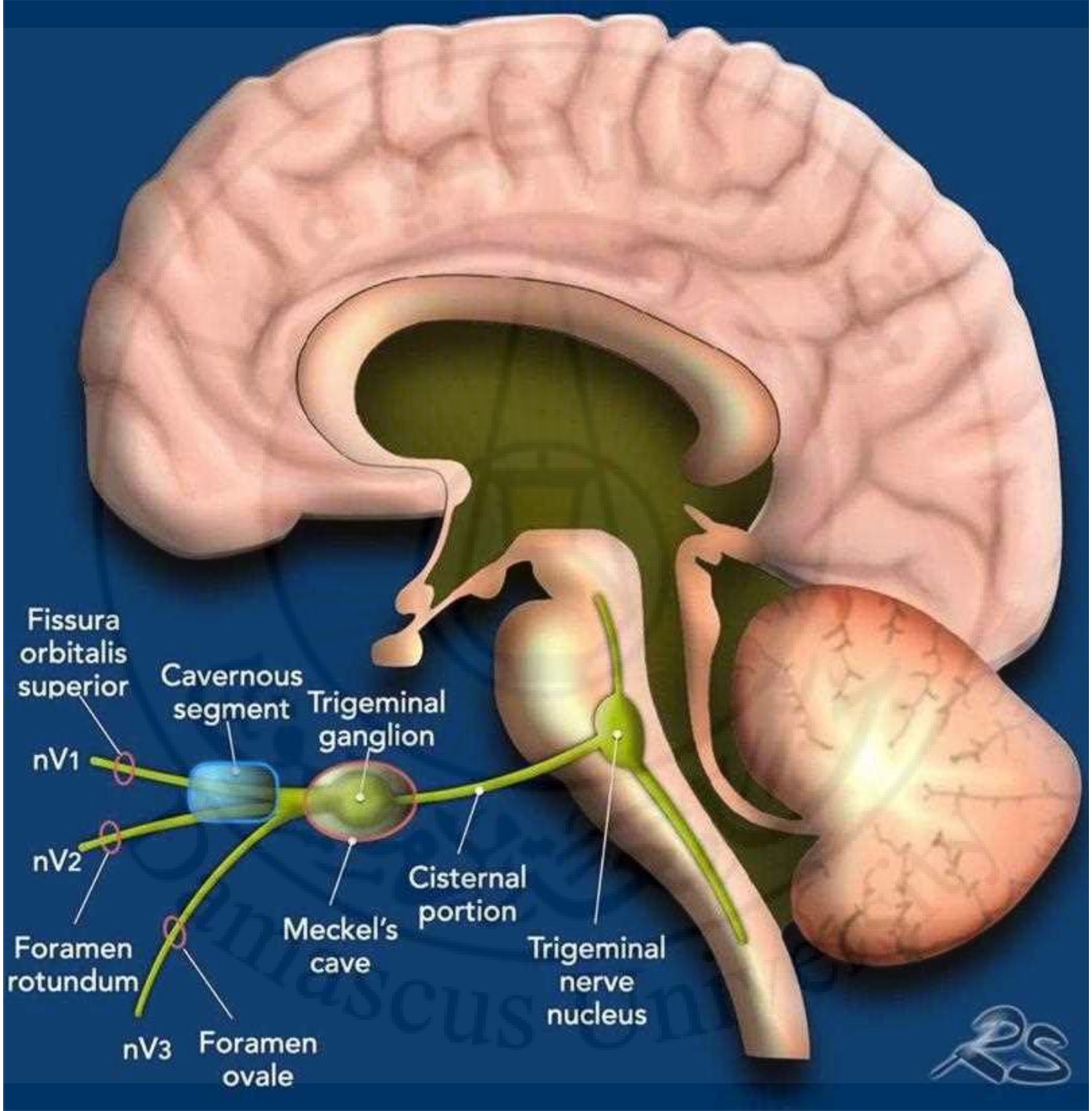



Edinger-Westphal nucleus
Oculomotor nucleus
Trochlear nucleus
Mesencephalic nucleus of trigeminal nerve
Abducent nucleus
Motor nucleus of trigeminal nerve
Chief sensory nucleus of trigeminal nerve
Lacrimatory nucleus
Motor nucleus of facial nerve
Dorsal cochlear nucleus
Superior salivatory nucleus
Vestibular nuclei
Inferior salivatory nucleus
Nucleus of tractus solitarius
Nucleus ambiguus
Dorsal nucleus of vagus nerve
Nucleus of spinal tract of trigeminal nerve
Hypoglossal nucleus
Sensory nuclei
Motor nuclei


The trigeminal nucleus complex:
Midbrain
mesencephalic nucleus
trigeminal ganglion
Pons
main sensory nucleus
trigeminal nerve
spinal nucleus of V
Medulla


Ophthalmic branch
Trigeminal or
Gasserian Ganglion
Maxillary
branch
Trigeminal Nerve
Sensory
root
Mandibular
branch
Middle cranial
fossa
Posterior
Cranial fossa
Motor
root
Pons
Medulla
Spinal Cord
Mid brain
Motor Nucleus of Trigeminal Nerve
IV
Ventricle
Mesencephalic Nucleus
Main sensory Nucleus
Spinal Nucleus
Sensory
Nuclei of
Trigeminal
Nerve


Sensory root
Motor root
Ophthalmic division
Superior orbital fissure
PONS
TG
Foramen rotundum
Maxillary division
Foramen ovale
Petrous temporal bone
Mandibular division


Fissura orbitalis superior
Cavernous segment
Trigeminal ganglion
nV1
nV2
Foramen rotundum
nV3
Foramen ovale
Meckel's cave
Cisternal portion
Trigeminal nerve nucleus

The pathology of the trigeminal nerve is related to the location.

- In the illustration the five different segments of the trigeminal nerve are presented, which will be discussed in more detail in the following chapters.
- **Brainstem: trigeminal nucleus**

- Demyelinisation: MS
- Neoplasm: metastases, glioma
- Vascular: cavernoma, infarction, AVM
- Infection: rhombencephalitis

- **Cisternal segment**
- Neurovascular compression
- Neoplasm: schwannoma, meningioma, epidermoïd, perineural spread
- Infection / inflammation: neuritis, meningitis, apicitis (from the petrous bone)

- **Meckel's cave**
- Neoplasm: schwannoma, meningioma, epidermoïd, perineural spread, skull base lesion.

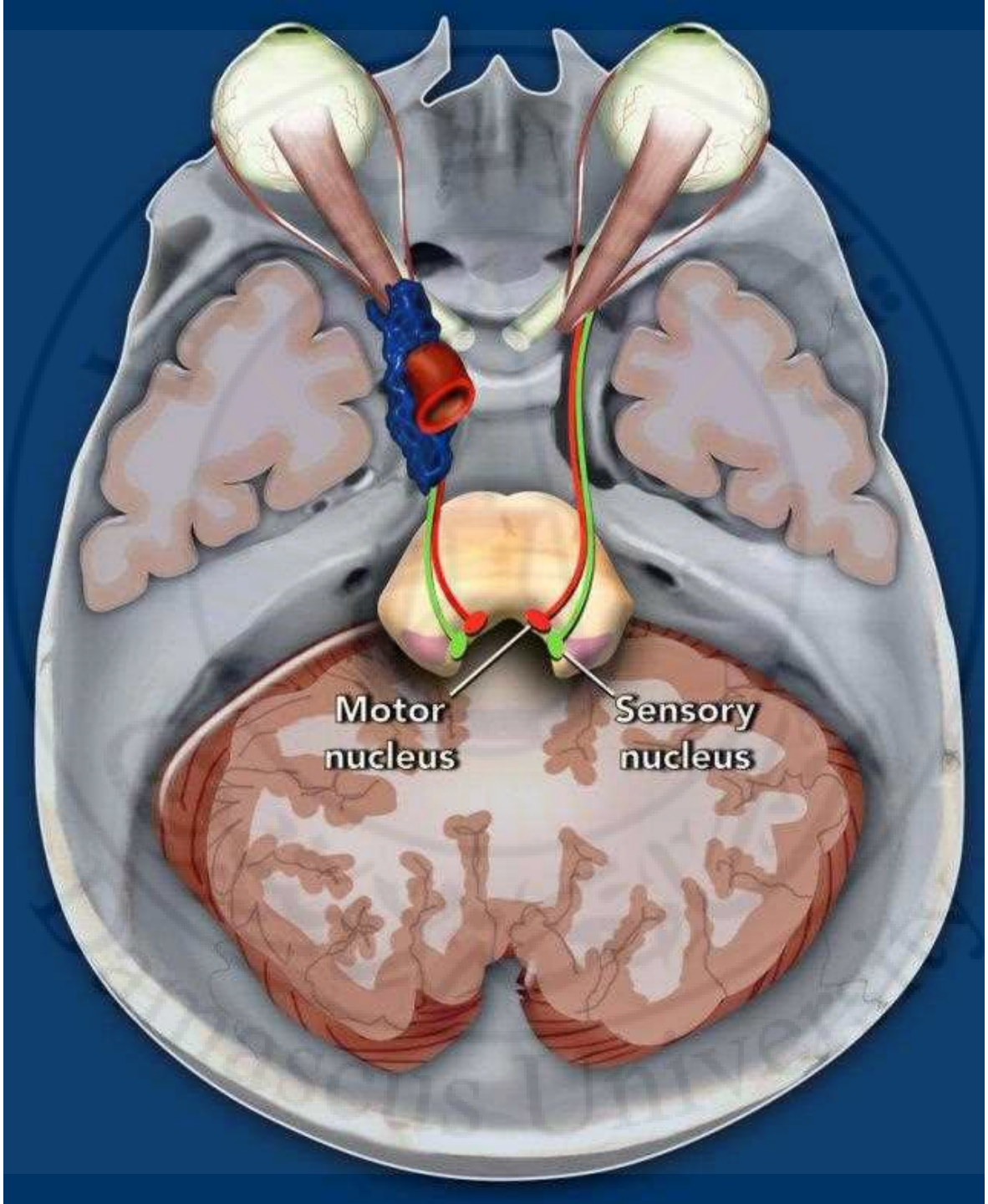
- **Cavernous segment**
- Neoplasm: schwannoma, meningioma, metastasis, perineural spread, skull base lesions
- Vascular: aneurysm
- Infection / inflammation: Tolosa-Hunt

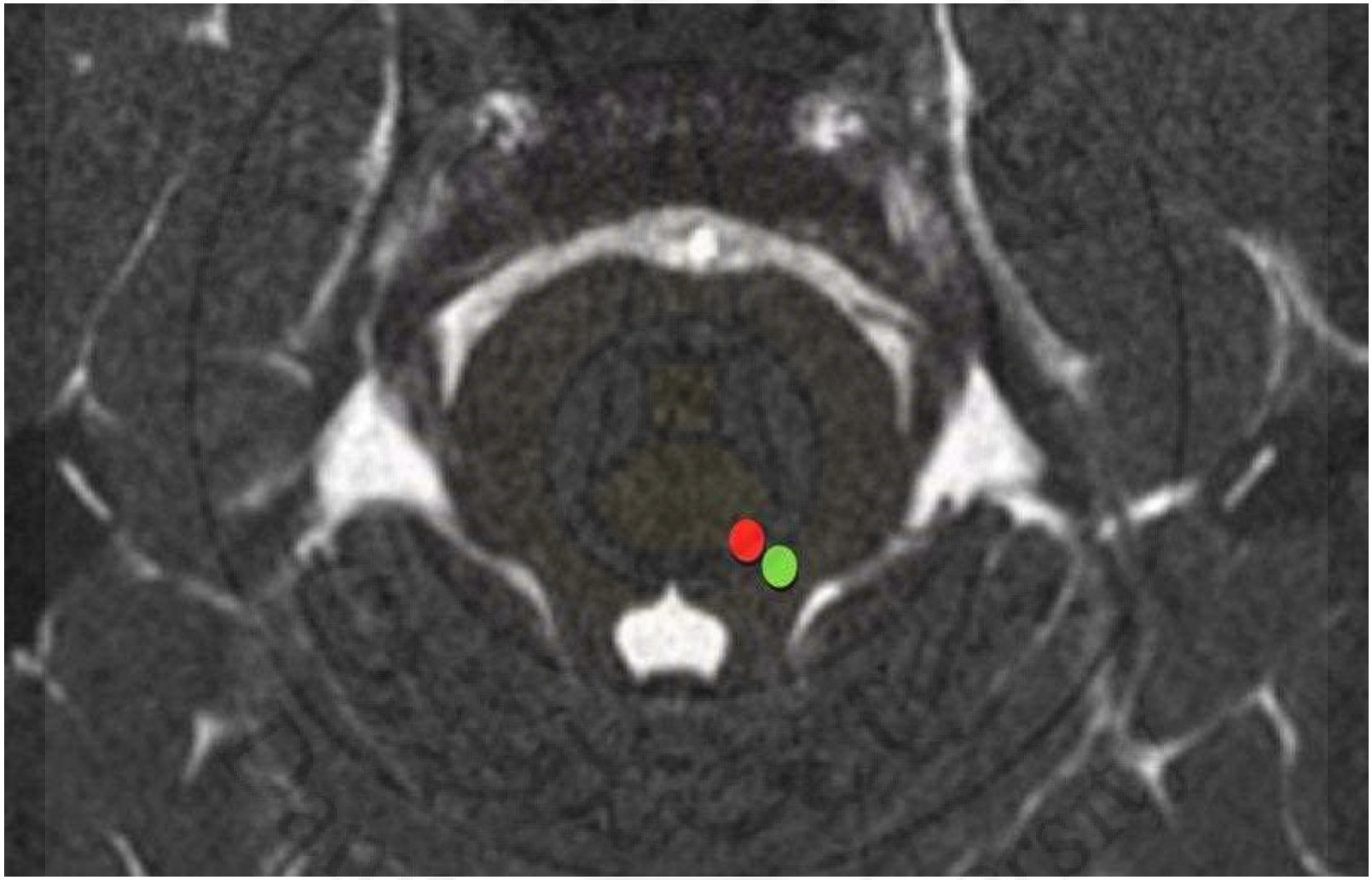
- **Peripheral segment**
- Neoplasm: perineural spread, schwannoma, neurofibroma
- Infection / inflammation: sinonasal

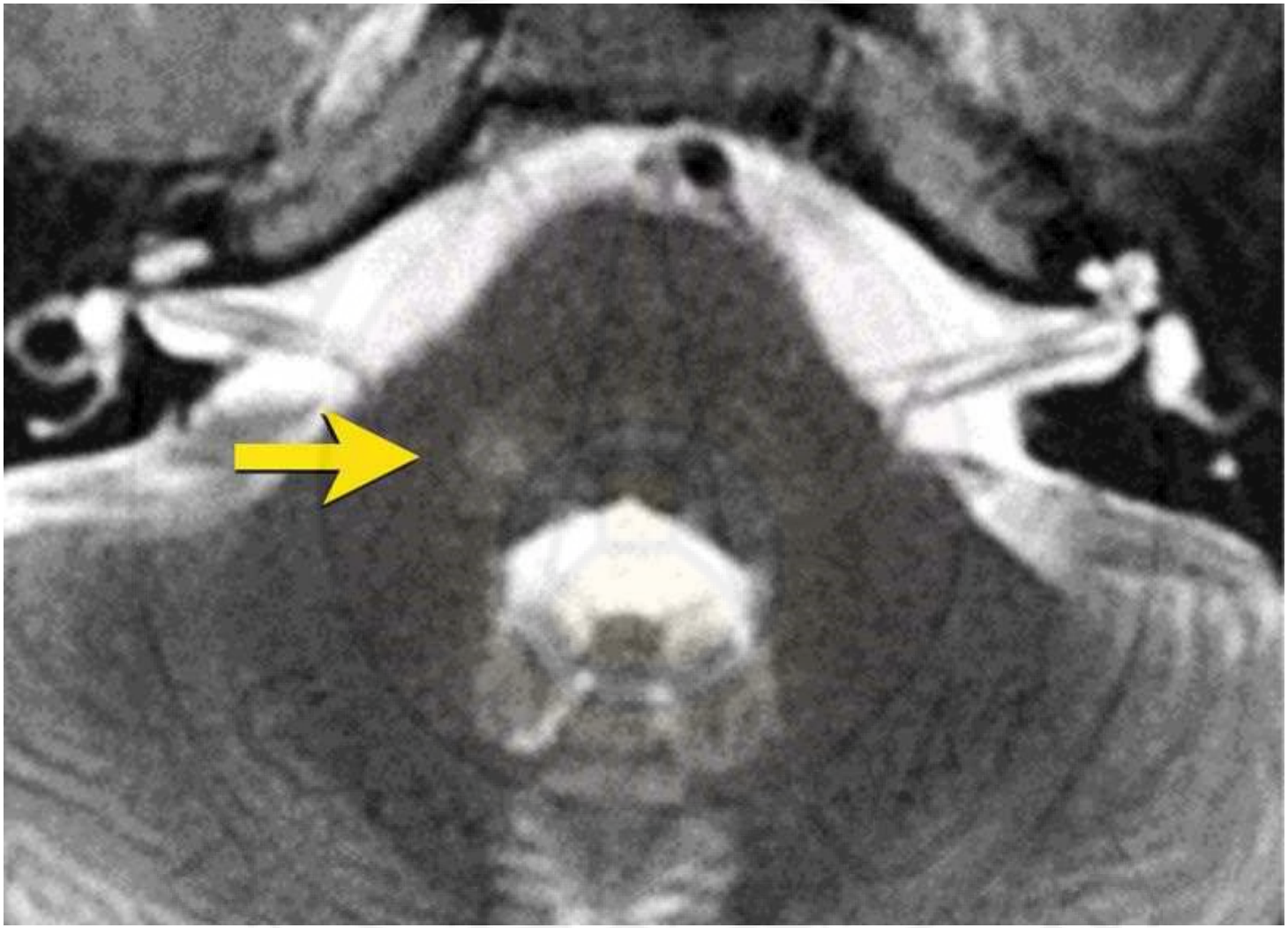
Dd Brainstem segment

- Demyelinisation: MS
- Neoplasm: metastases, glioma
- Vascular: cavernoma, infarction, AVM
- Infection: rhombencephalitis

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Motor
nucleus
Sensory
nucleus





The axial T2W image shows a hyperintense lesion at the trigeminal nucleus (arrow).
This may be a sign of demyelination, for instance in multiple sclerosis

Dd Cisternal segment

- Vascular: neurovascular compression
- Neoplasm:
  - schwannoma
  - meningioma
  - epidermoïd
  - perineural spread
- Infection / inflammation: neuritis, meningitis, apicitis (from the petrous bone)

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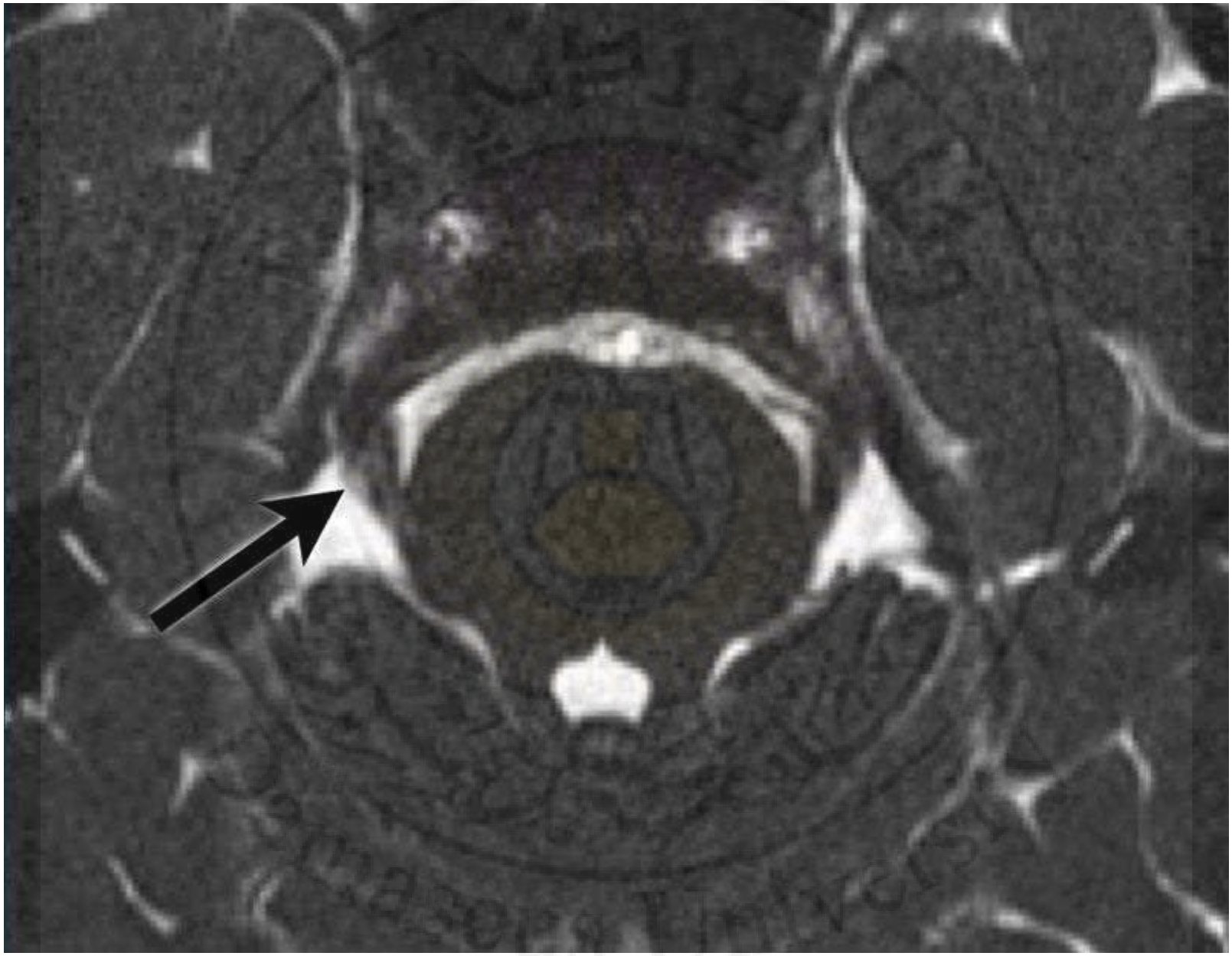
Neurovascular compression

Neurovascular compression is defined by specific radiologic criteria:

The blood vessel concerned is almost always an artery
The nerve and the blood vessel run perpendicular to each other
There is mass effect of the vessel on the nerve
The contact between blood vessel and nerve occurs in the root entry zone of the nerve.

Neurovascular compression of the trigeminal nerve is most often caused by contact with the superior cerebellar artery (SCA) or less frequently the anterior inferior cerebellar artery (AICA), or smaller branches of the basilar artery.

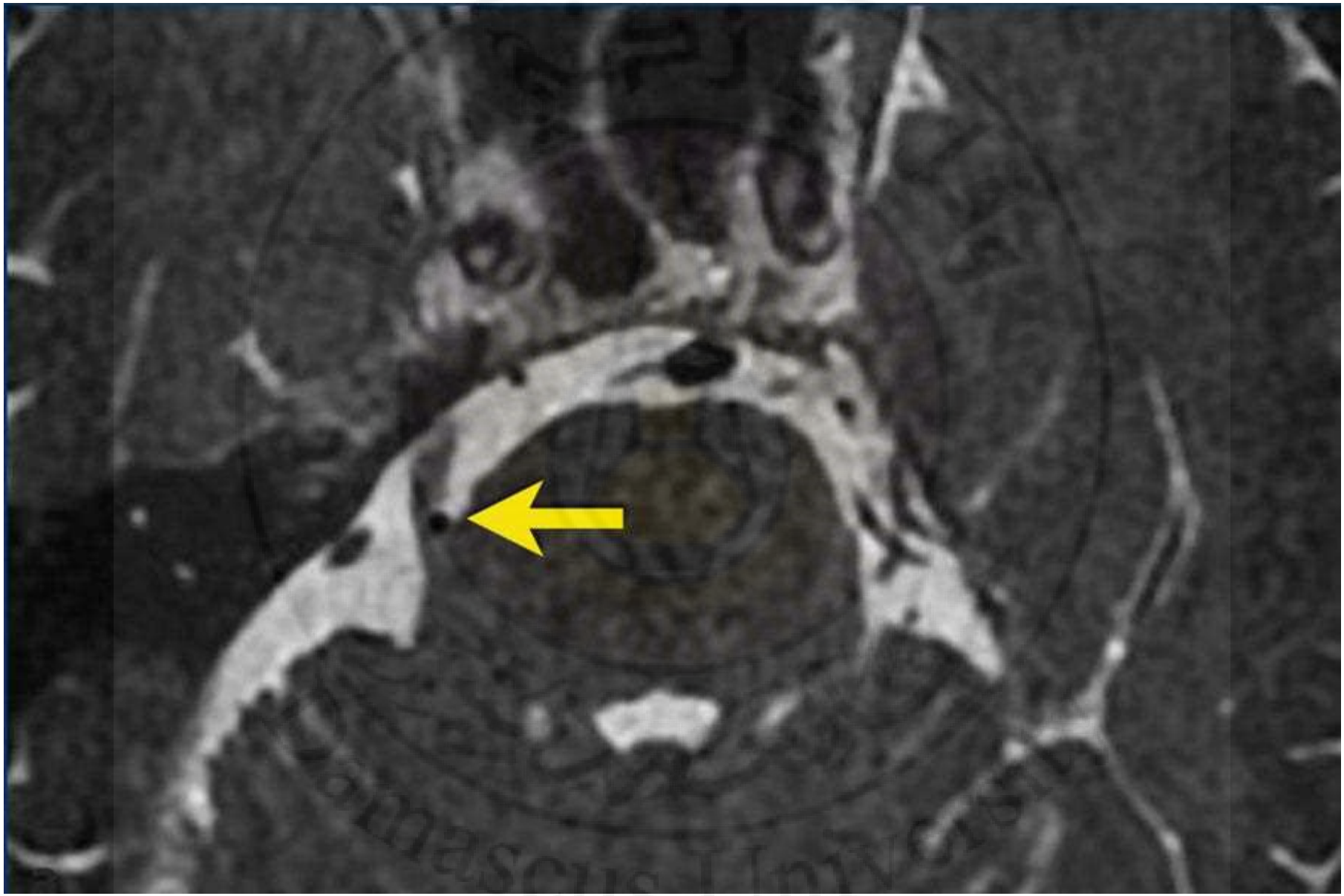
Only a few cases have been reported in which neurovascular compression was caused by contact with an aneurysm, vertebrobasilar dolichoectasia, an AVM, an AV-fistula or even a vein.



Root entry zone
The cisternal segment starts where the trigeminal nerve enters the prepontine cistern.
This is called the root entry zone.
The root entry zone comprises the transition zone from central myelin (oligodendrocytes) to peripheral myelin (Schwann cells).

This transition zone measures approximately 2 mm long and is situated at approximately 5-7 mm from the surface of the pons.
At this point, the nerve is vulnerable to pressure.

In the prepontine cistern, the sensory and motor divisions have a parallel but separate course, creating a characteristic fan-like appearance (arrow).



Neurovascular compression at the root entry zone

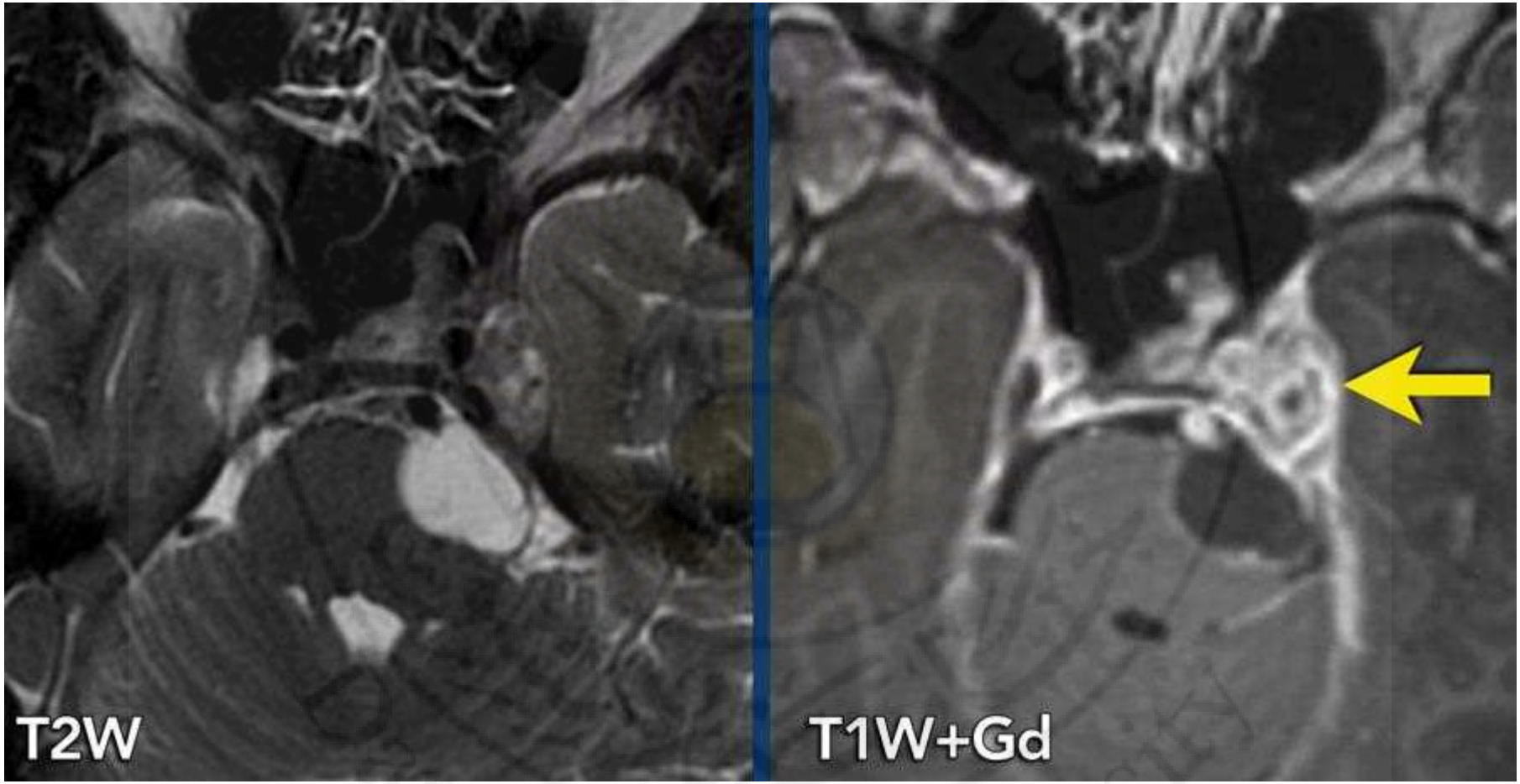
A 74 year old male has been experiencing an ‘220V-like’ pain in his right eyebrow, cheek and mandible.
These symptoms are evoked by washing his face and brushing his teeth.

Scroll through the axial 3D FIESTA images and the postcontrast axial 3D T1W images. Then continue reading.

Both the axial 3D FIESTA and postcontrast axial 3D T1W images show:

A close relationship between the right trigeminal nerve (arrow) and the superior cerebellar artery (dashed arrow)
Located at the root entry zone of the nerve
The nerve and the vessel course perpendicular to each other
The nerve is displaced laterally

These findings fulfill the criteria for a neurovascular compression.



Trigeminal schwannoma

These images are of a 49-year old male with sensory problems in the left side of his face and pressure behind his left eye.

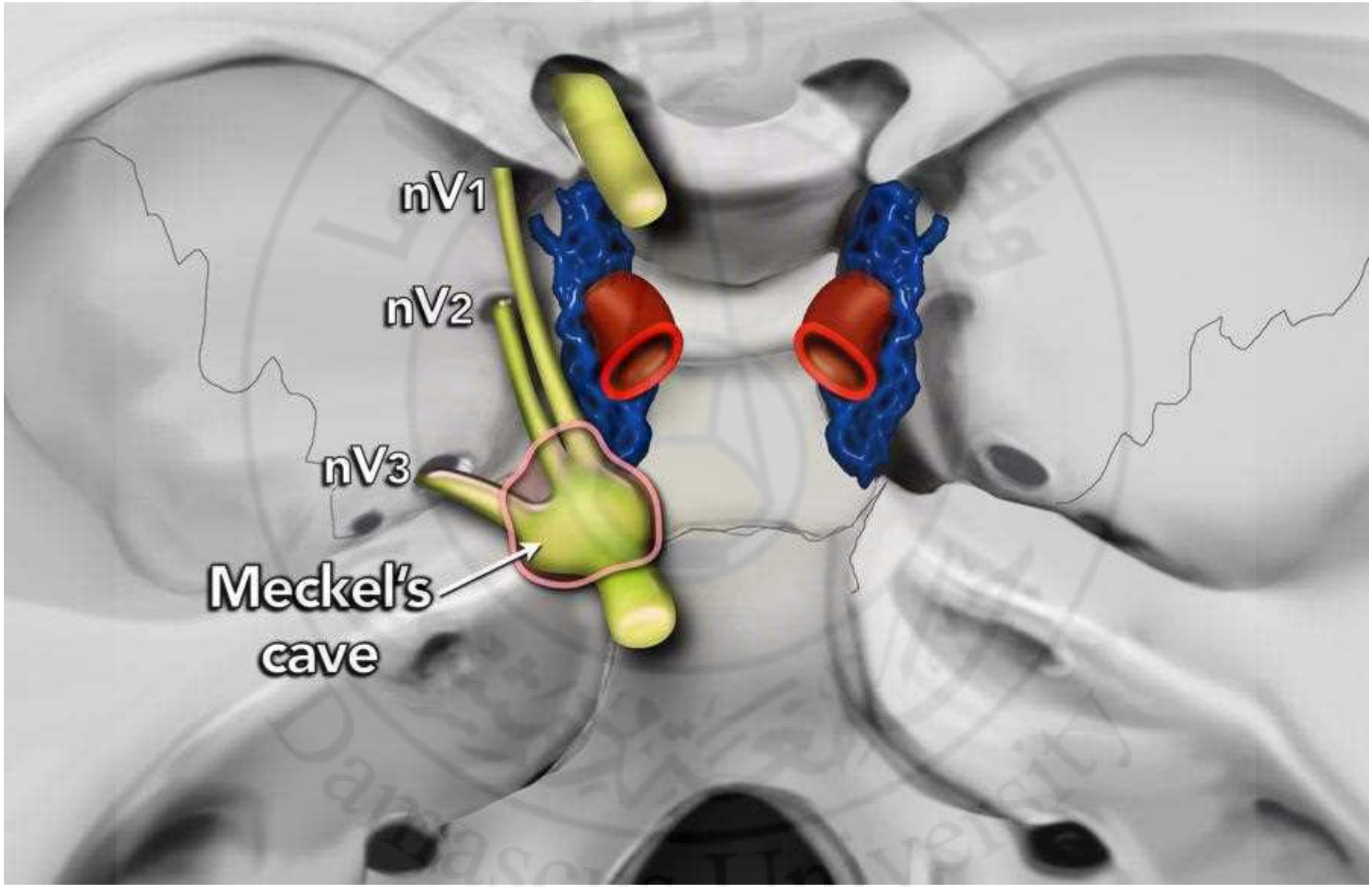
The axial T2W shows a lesion in Meckel's cave and the cisternal segment of the trigeminal nerve. The component in Meckel's cave is solid and shows homogeneous enhancement on post-contrast T1W imaging (arrow).
The component in the cerebellopontine cistern is almost completely cystic and shows only rim enhancement.

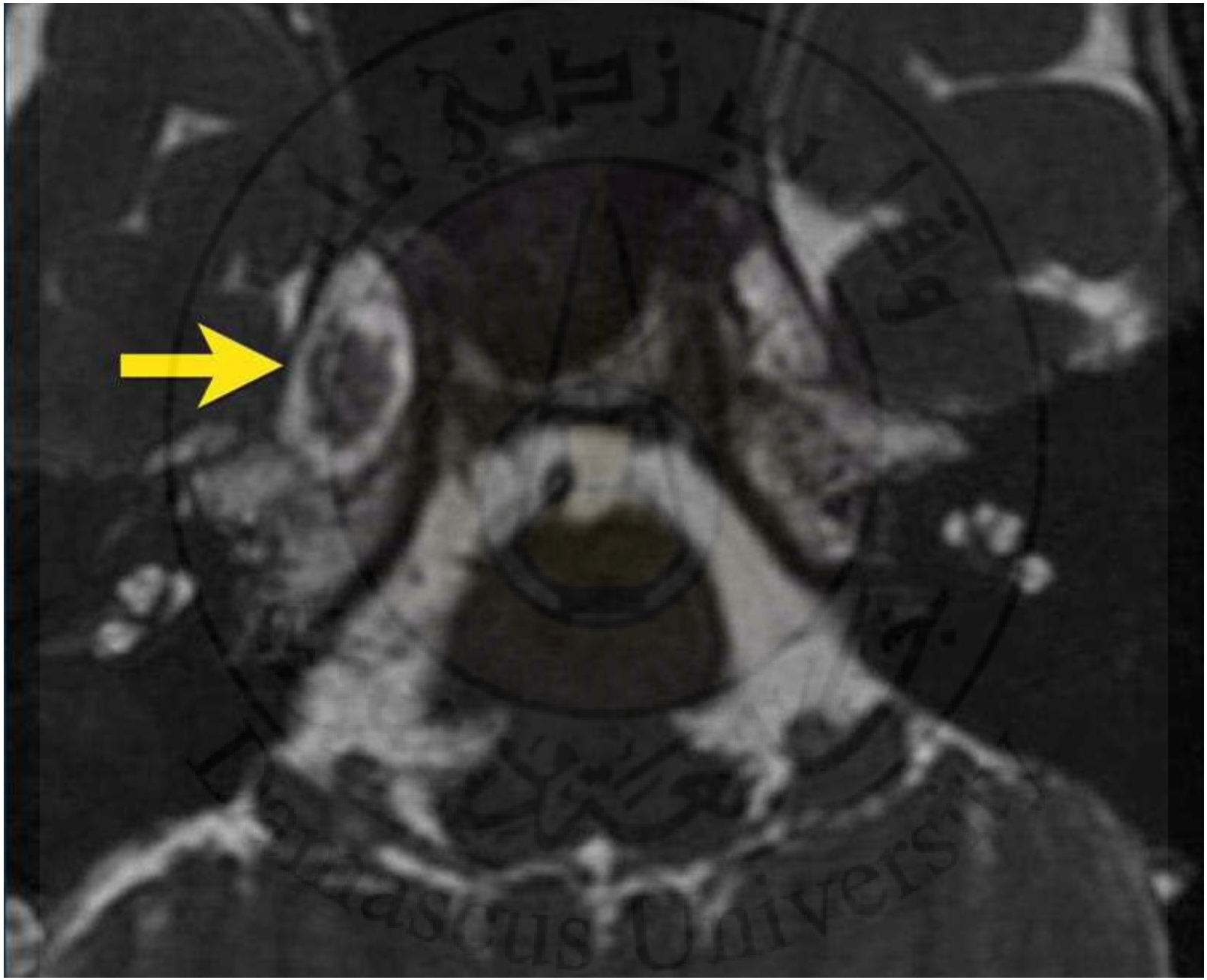
The lesion is a trigeminal schwannoma. The growth of this lesion along the nerve, leading to a constriction at the entrance of Meckel's cave, causes the classic 'dumbbell shape'.

Dd Meckel's cave segment

Neoplasms
- schwannoma,
- meningioma,
- epidermoïd
- perineural spread
- skull base lesion

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nV1
nV2
nV3
Meckel's cave

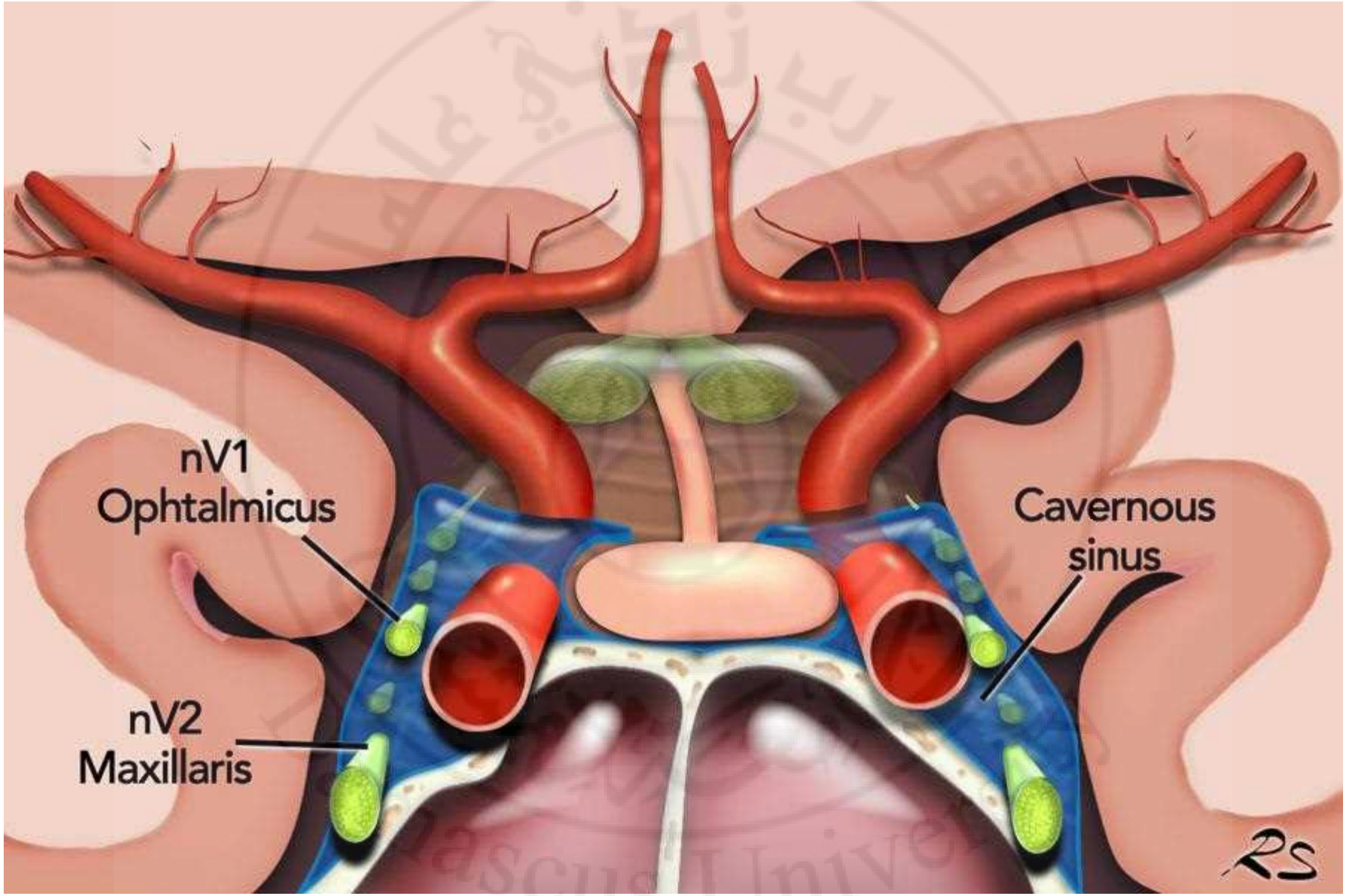


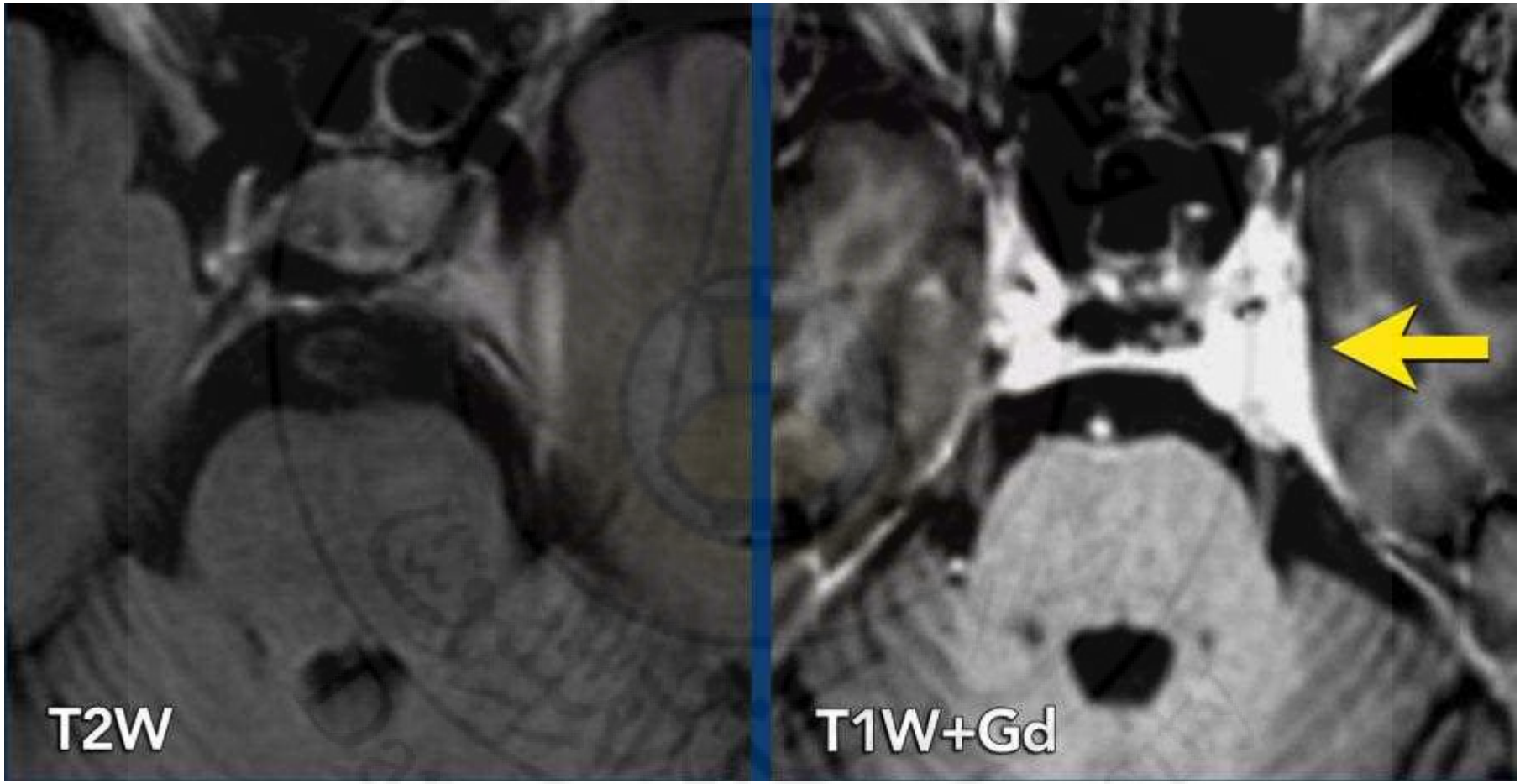
A 45 year-old female with a history of pain on the right side of the mandible, alleviated by extraction of multiple dental elements. However, since one month, she is experiencing the same type of pain once more. The pain is sharp and radiates from the chin, via the right side of the face to the skull. The pain is evoked by talking, eating, and touching the right sides of the face.

Image
3D FIESTA shows a lesion in Meckel's cave, hyperintense on DWI, hypo-intense on ADC (not shown), extending into the cisternal segment.
This lesion is suspicious for an epidermoid.

Dd Cavernous segment

- Neoplasm:
  - Schwannoma
  - meningioma
  - metastasis
  - perineural spread
  - skull base lesions
- Vascular: aneurysm
- Infection / inflammation: Tolosa-Hunt


nV1
Ophtalmicus
nV2
Maxillaris
Cavernous
sinus
RS


T2W
T1W+Gd

67- year old female with a history of breast cancer with metastases to bone and liver. She presents with numbness on the left side of her face.

Axial 2D FLAIR show an asymmetric cavernous sinus, with dural thickening on the left.
Post-contrast imaging shows increased enhancement of the left side of the cavernous sinus, extending into Meckel's cave.

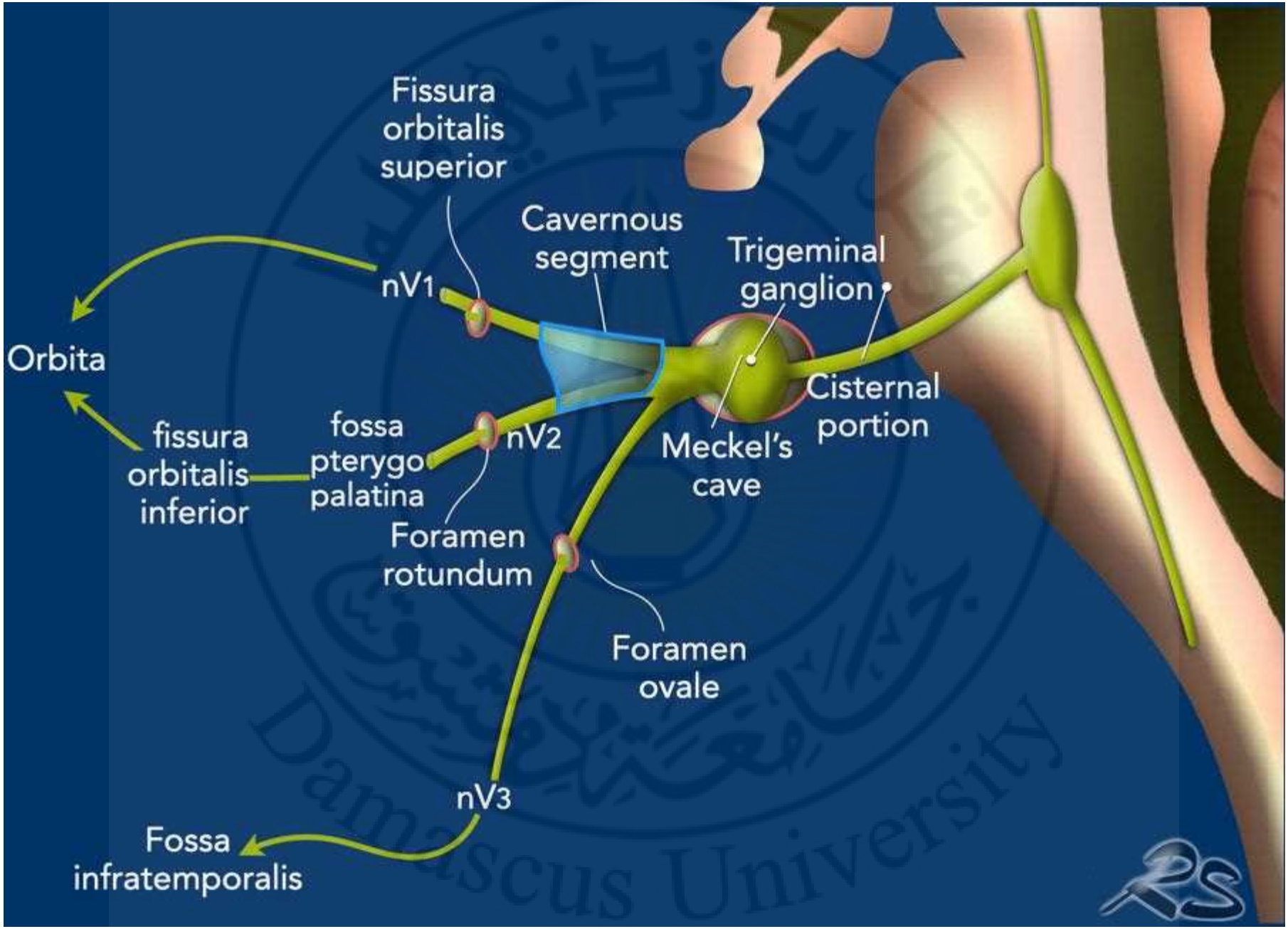
Suspicious for metastasis of breast carcinoma.

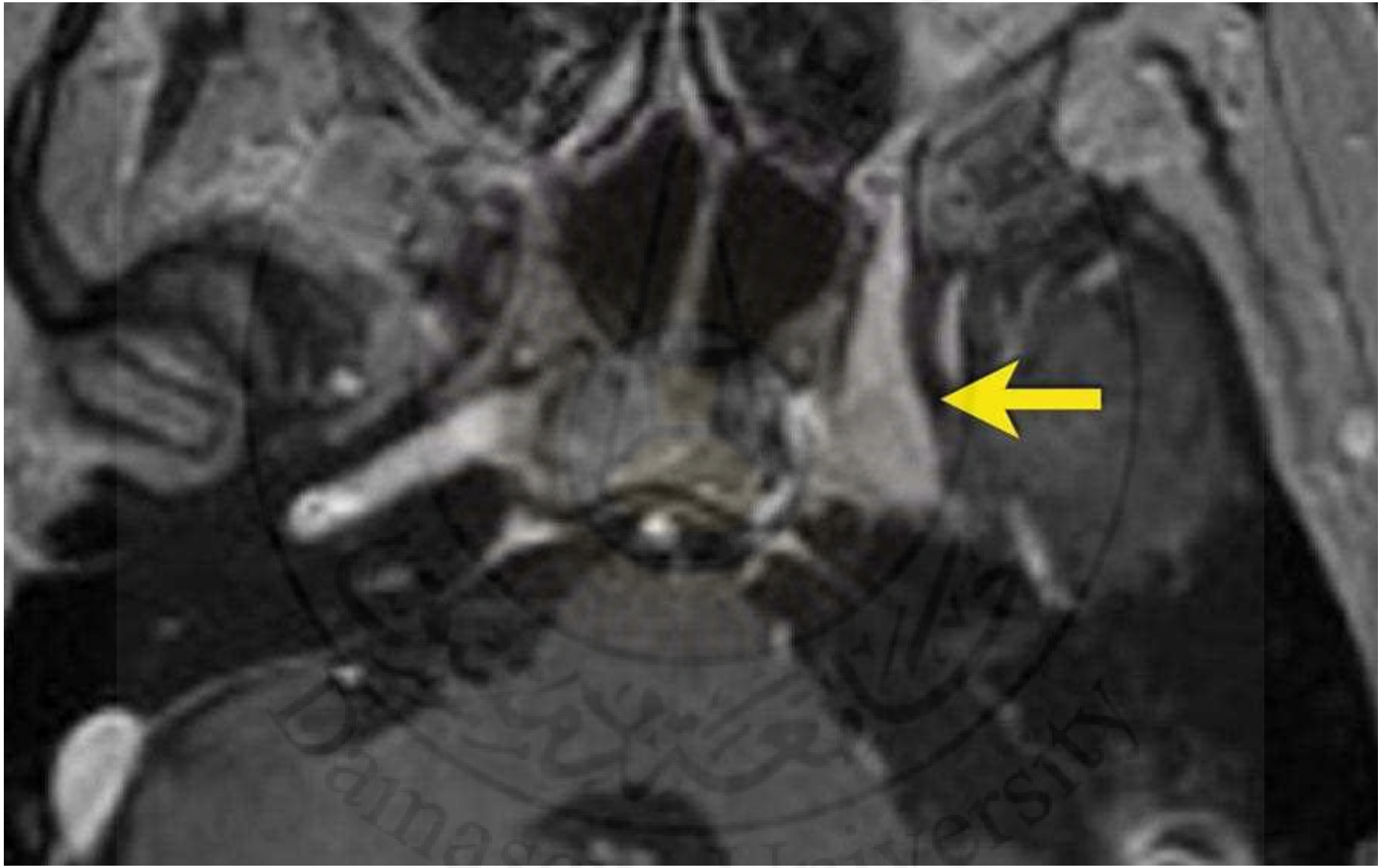
Dd Peripheral segment

Neoplasms - perineural spread,
- schwannoma,
- neurofibroma

Infection - sinonasal
inflammation

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Fissura orbitalis superior
Cavernous segment
Trigeminal ganglion
nV1
Orbita
fissura orbitalis inferior
fossa pterygo palatina
nV2
Meckel's cave
Cisternal portion
Foramen rotundum
Foramen ovale
nV3
Fossa infratemporalis



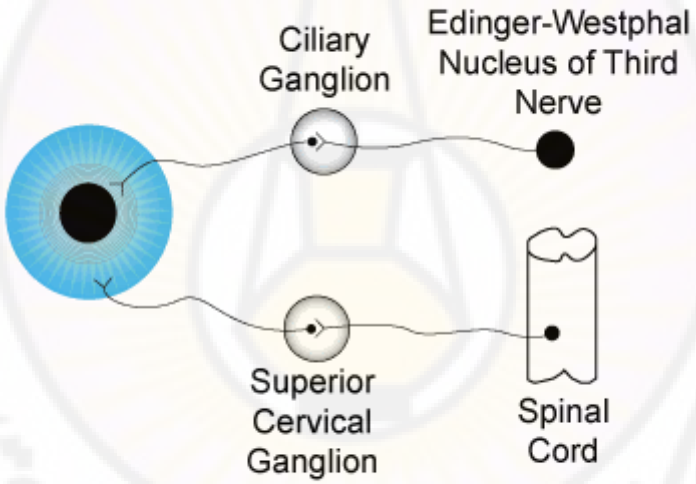
70 year old male with a history of melanoma and orbital exenterition. Recently, he has been experiencing tingling and numbness in the left side of his face. These symptoms cannot be evoked and respond well to pain medication.

Scroll through the axial and coronal postcontrast 3D T1W images. Then continue reading.

Axial and coronal postcontrast 3D T1W images show thickening and enhancement of nV1 in the supra-orbital fissure (a and b, arrow), nV2 in the foramen rotundum (a and b, dashed arrow), and nV3 in the foramen ovale (c and d, arrow).

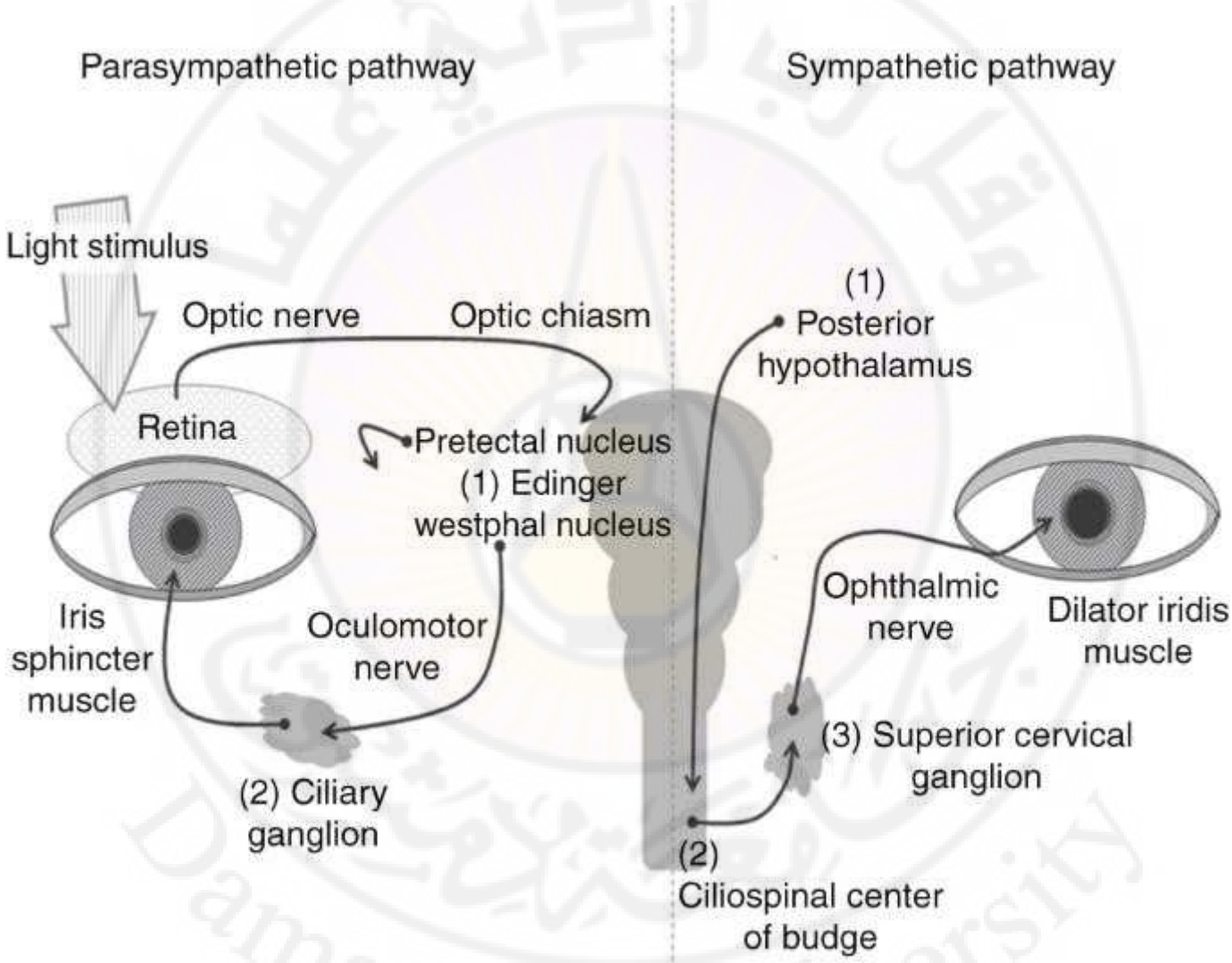
These abnormalities are suspicious for perineural spread of melanoma.

Constriction (Parasympathetic)



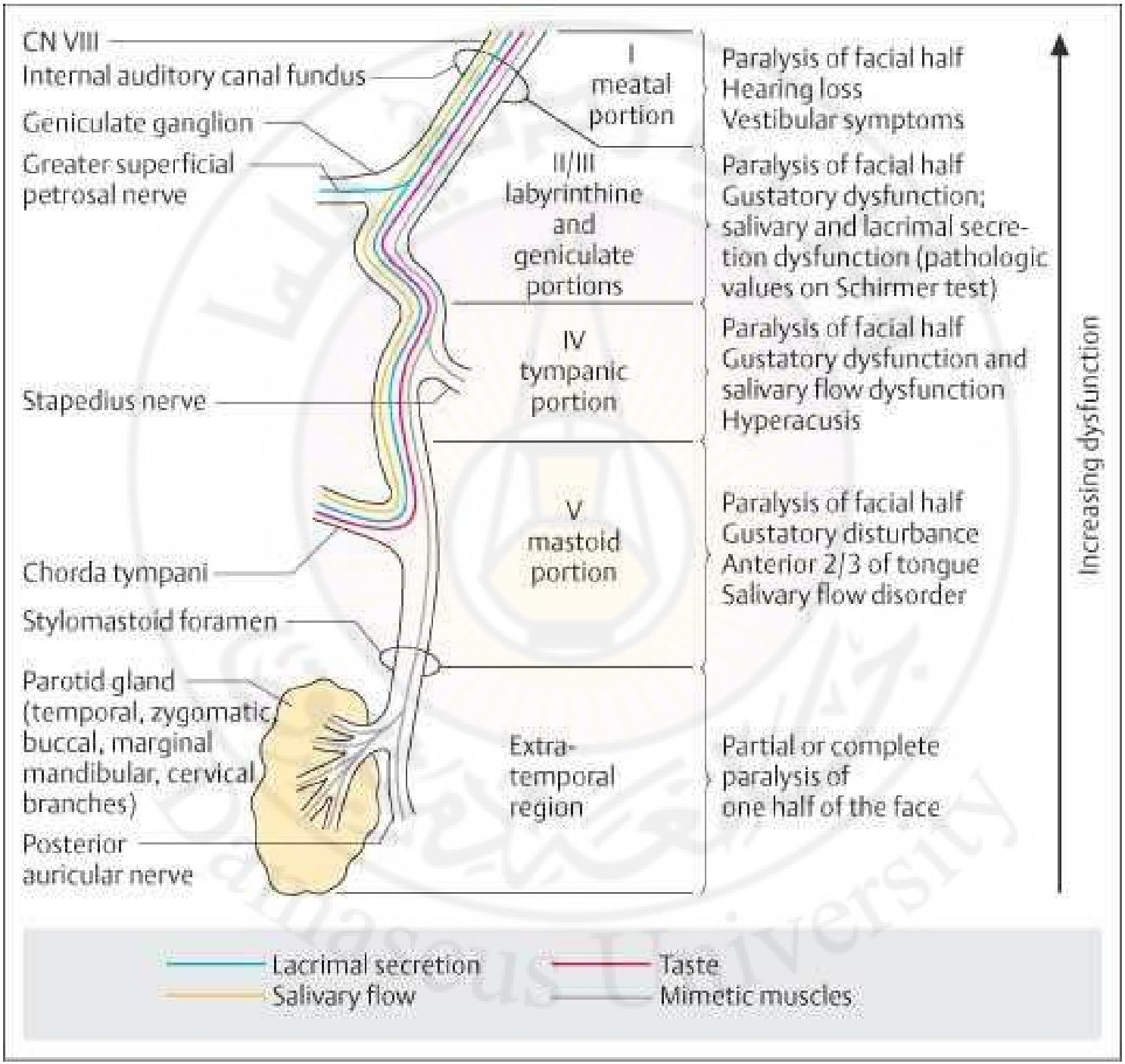
Dilation (Sympathetic)

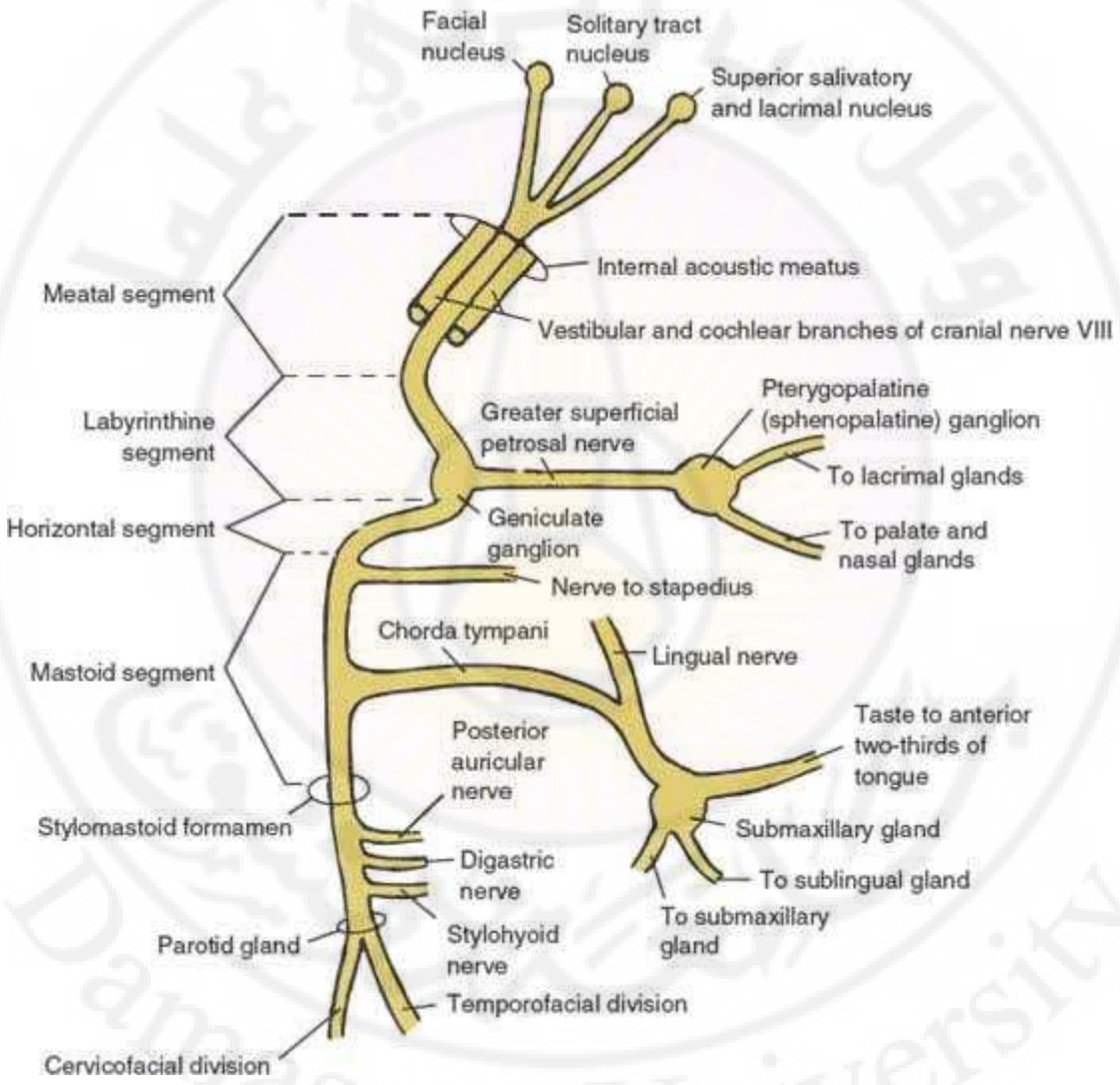
Stanford Medicine 25

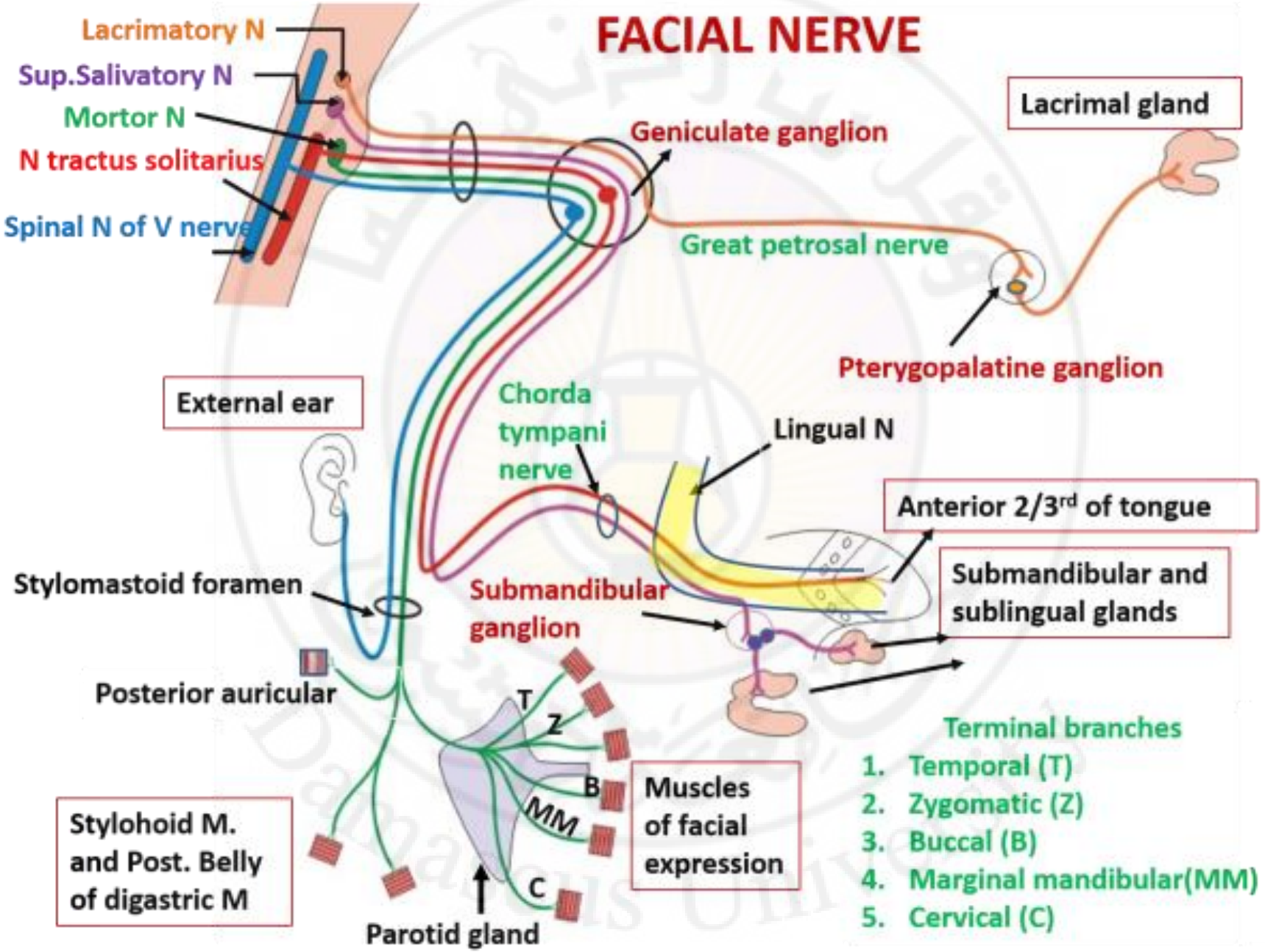

Parasympathetic pathway
Sympathetic pathway
Light stimulus
Optic nerve
Optic chiasm
(1)
Posterior
hypothalamus
Retina
Pretectal nucleus
(1) Edinger
westphal nucleus
Ophthalmic
nerve
Dilator iridis
muscle
Iris
sphincter
muscle
Oculomotor
nerve
(3) Superior cervical
ganglion
(2) Ciliary
ganglion
(2)
Ciliospinal center
of budge

Signs/Symptoms	Etiologies to Consider
"Worst headache of my life"	Subarachnoid hemorrhage
Headache + CN palsy	Consider pituitary apoplexy, ophthalmoplegic migraine
Large unreactive pupil	Compressive lesion on CN III, often aneurysm near the posterior communicating artery
CN V involvement with reduced facial sensation i V1 and V2 distributions	Consider cavernous sinus lesion
Diplopia with areflexia, ataxia	Miller Fisher variant of Guillain-Barre Syndrome
Diplopia, dysarthria, dysphonia, dysphagia	Botulism or tick paralysis
Headache, jaw claudication, fever, fatigue, transient/permanent vision loss	Giant cell arteritis
Contralateral hemiparesis	Weber syndrome (midbrain infarct)
Contralateral choreiform movements	Benedikt Syndrome (midbrain infarct)
Contralateral ataxia, hemiparesis, hemiplegia of lower face/tongue/shoulder	Claude syndrome (midbrain infarct)
Ptosis, diplopia, with fatiguability	Myasthenia gravis
Proptosis, chemosis, eyelid retraction; often with vertical diplopia and limited upgaze	Thyroid eye disease (causes fibrosis of extraocular muscles, starting with inferior rectus)
Multiple cranial nerve involvement with decreased vision	orbital apex pathology

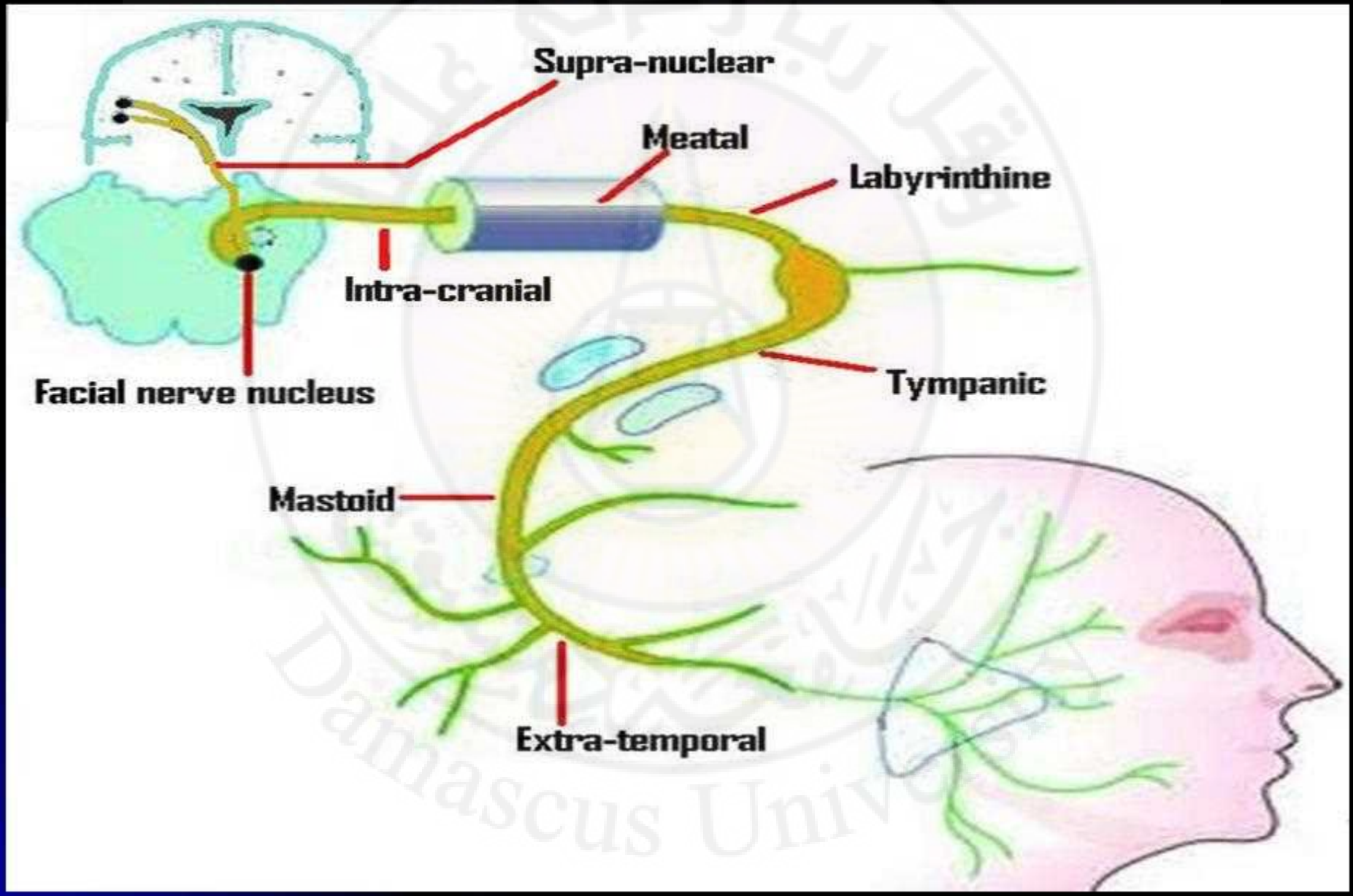
Table 2 –Clusters of signs and symptoms suggestive of specific etiologies to consider in patient presenting with diplopia with associated neurologic signs and symptoms

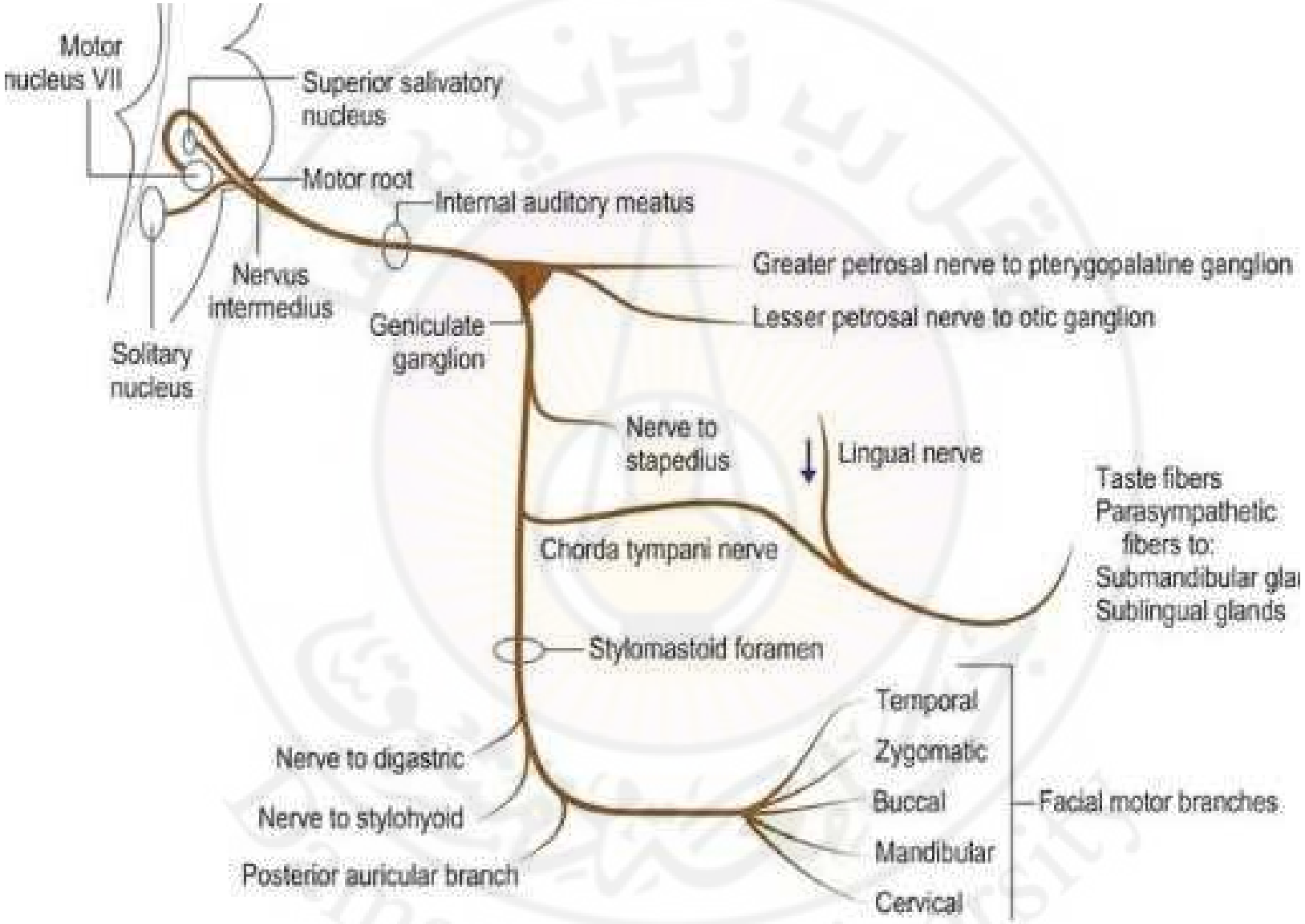

CN VIII
Internal auditory canal fundus
Geniculate ganglion
Greater superficial petrosal nerve
Stapedius nerve
Chorda tympani
Stylomastoid foramen
Parotid gland (temporal, zygomatic, buccal, marginal mandibular, cervical branches)
Posterior auricular nerve
I meatal portion
II/III labyrinthine and geniculate portions
IV tympanic portion
V mastoid portion
Extra-temporal region
Paralysis of facial half
Hearing loss
Vestibular symptoms
Paralysis of facial half
Gustatory dysfunction; salivary and lacrimal secretion dysfunction (pathologic values on Schirmer test)
Paralysis of facial half
Gustatory dysfunction and salivary flow dysfunction
Hyperacusis
Paralysis of facial half
Gustatory disturbance
Anterior 2/3 of tongue
Salivary flow disorder
Partial or complete paralysis of one half of the face
Increasing dysfunction
Lacrimal secretion
Salivary flow
Taste
Mimetic muscles


Facial nucleus
Solitary tract nucleus
Superior salivatory and lacrimal nucleus
Internal acoustic meatus
Meatal segment
Vestibular and cochlear branches of cranial nerve VIII
Labyrinthine segment
Greater superficial petrosal nerve
Pterygopalatine (sphenopalatine) ganglion
To lacrimal glands
Horizontal segment
Geniculate ganglion
To palate and nasal glands
Nerve to stapedius
Chorda tympani
Lingual nerve
Mastoid segment
Taste to anterior two-thirds of tongue
Posterior auricular nerve
Stylomastoid formamen
Submaxillary gland
Digastric nerve
To sublingual gland
To submaxillary gland
Parotid gland
Stylohyoid nerve
Temporofacial division
Cervicofacial division


FACIAL NERVE
Lacrimatory N
Sup.Salivatory N
Mortor N
N tractus solitarius
Spinal N of V nerve
Geniculate ganglion
Lacrimal gland
Great petrosal nerve
Pterygopalatine ganglion
External ear
Chorda tympani nerve
Lingual N
Anterior 2/3rd of tongue
Stylomastoid foramen
Submandibular ganglion
Submandibular and sublingual glands
Posterior auricular
T
Z
B
MM
C
Muscles of facial expression
Stylohoid M. and Post. Belly of digastric M
Parotid gland
Terminal branches
1. Temporal (T)
2. Zygomatic (Z)
3. Buccal (B)
4. Marginal mandibular(MM)
5. Cervical (C)

Course of facial nerve



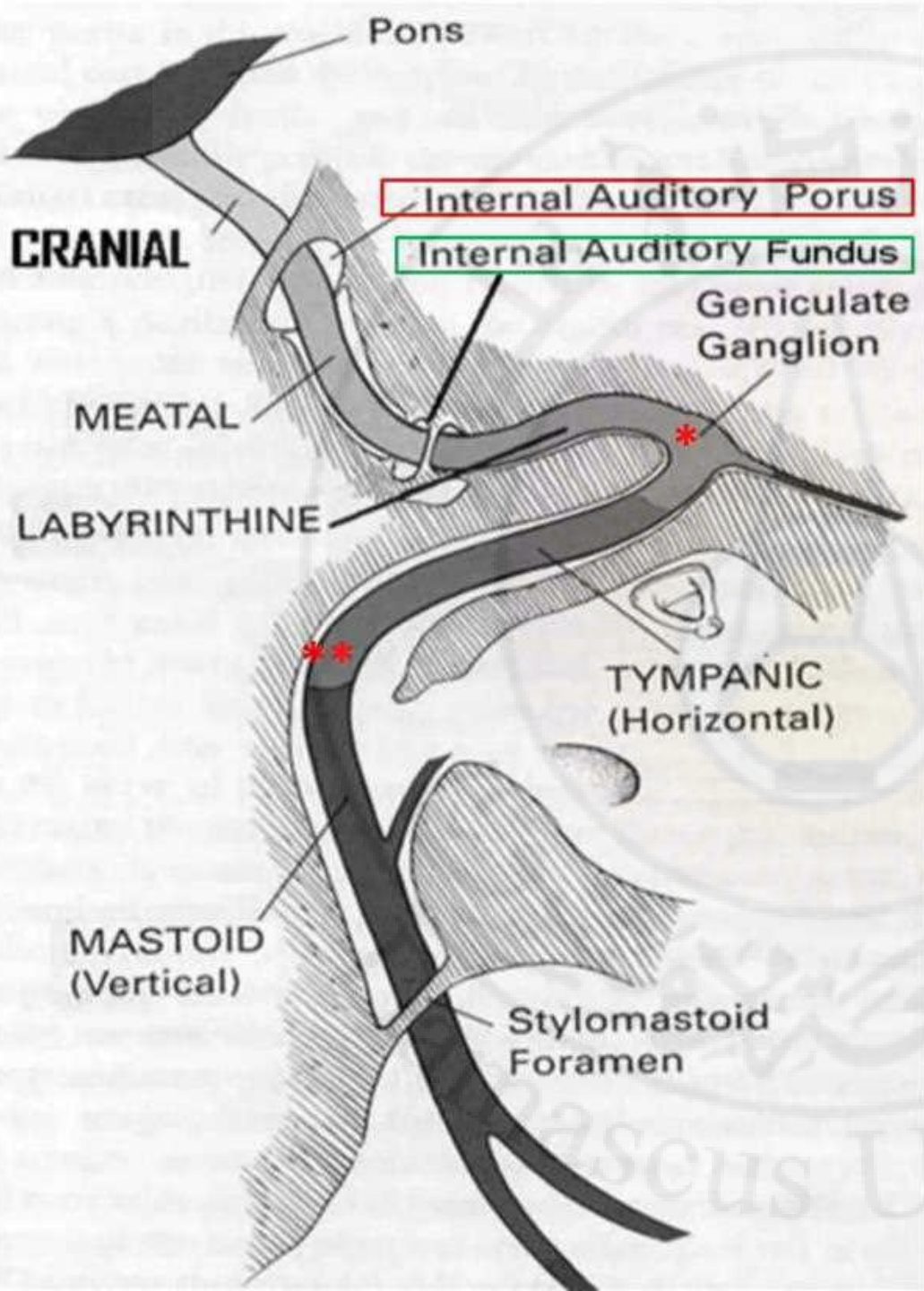


https://www.medicosite.com

Table 1

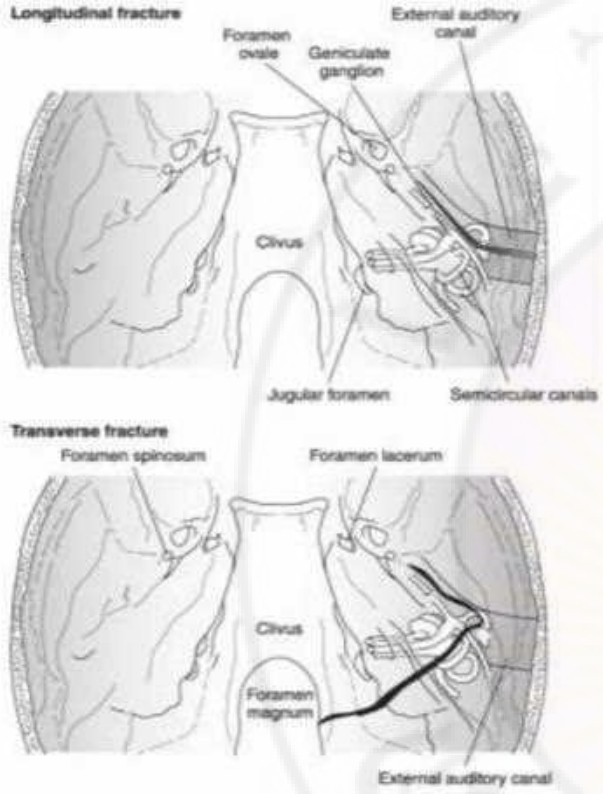
Differential Diagnosis for Facial Nerve Palsy

DISEASE	*CAUSE*	*DISTINGUISHING FACTORS*
Nuclear (peripheral)		
Lyme disease	Spirochete*Borrelia burgdorferi*	History of tick exposure, rash, or arthralgias; exposure to areas where Lyme disease is endemic
Otitis media	Bacterial pathogens	Gradual onset; ear pain, fever, and conductive hearing loss
Ramsay Hunt syndrome	Herpes zoster virus	Pronounced prodrome of pain; vesicular eruption in ear canal or pharynx
Sarcoidosis or Guillain-Barré syndrome	Autoimmune response	More often bilateral
Tumor	Cholesteatoma, parotid gland	Gradual onset
Supranuclear (central)		Forehead spared
Multiple sclerosis	Demyelination	Additional neurologic symptoms
Stroke	Ischemia, hemorrhage	Extremities on affected side often involved
Tumor	Metastases, primary brain	Gradual onset; mental status changes; history of cancer



1. Supranuclear: Fibers in cerebral cortex to brain stem
2. Brain stem/intramedullary: from BS nuclei to its exit point
3. Intra-cranial/cisternal(12 mm): exit point to entry into IAC
4. Meatal (10 mm): Within Internal Auditory Canal
5. Labyrinthine (4 mm): Fundus of I.A.C. to Geniculate ganglion
6. Tympanic (11 mm): Geniculate ganglion to pyramid
7. Mastoid (13 mm): Pyramid to stylomastoid foramen

Others causes of PFP

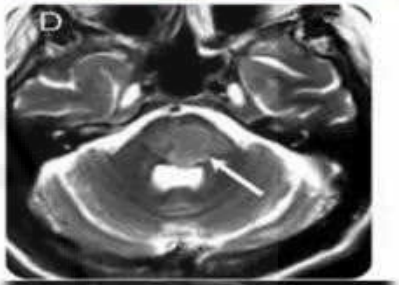








Foville Syndrome





Möbius syndrome





Melkerson-Rosethal syndrome



Millard-Gubler Syndrome



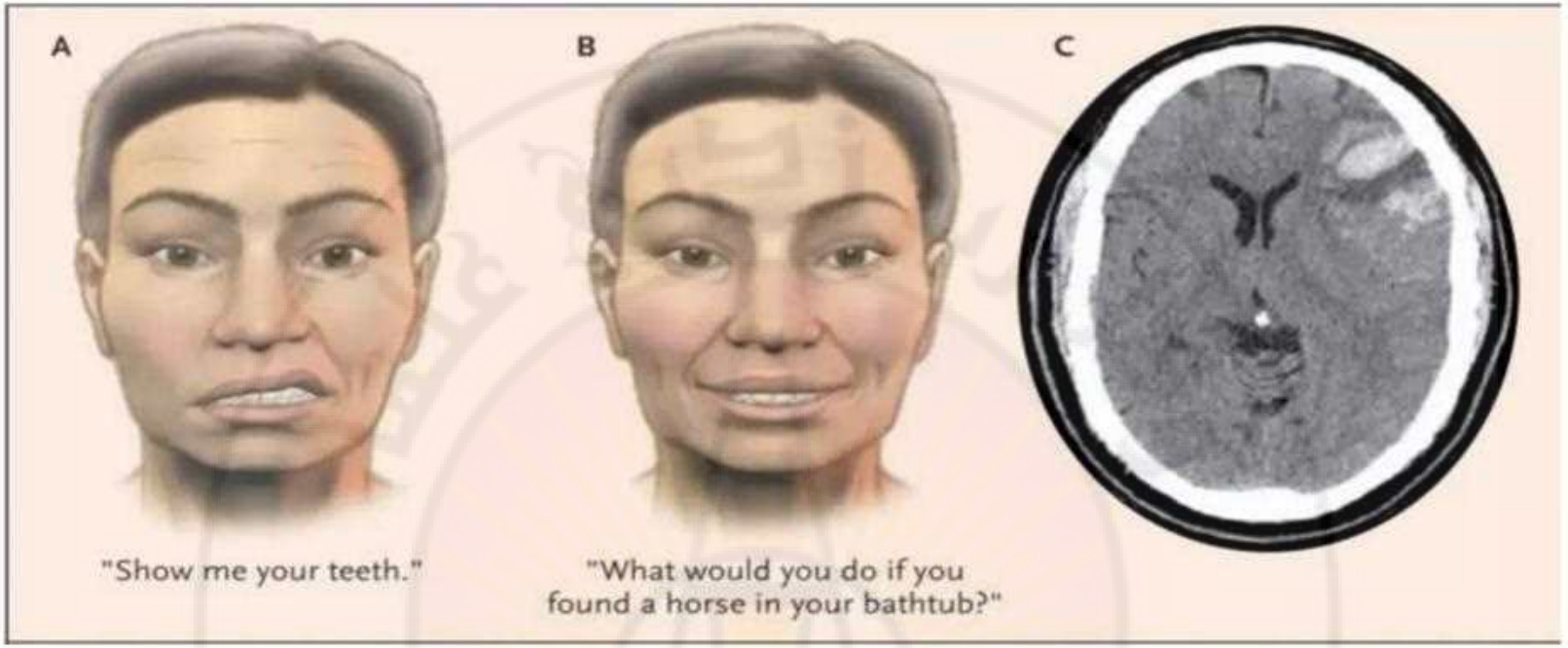
Wartenberg syndrome

Facial Weakness of Central Origin

- Weakness of C/L lower face with relative sparing of upper face/ paralysis rarely complete
- Subtle weakness of orbicularis oculi But involvement of frontalis & corrugator is unusual
- Always able to close eye/ Bell phenomenon absent/ corneal reflex present
- In most cases, facial asymmetry present in both voluntary & spontaneous facial movement; But when it is more marked with one than other (Dissociation)

❑ Two variations:

1. Volitional/voluntary: Facial asymmetry more marked during voluntary contraction/ Lesion of lower third of the precentral gyrus or the corticobulbar tract
2. Emotional/mimetic: Thalamic or striatocapsular lesions



Voluntary Central Facial Weakness > Mimetic (Involuntary) Central Facial Weakness



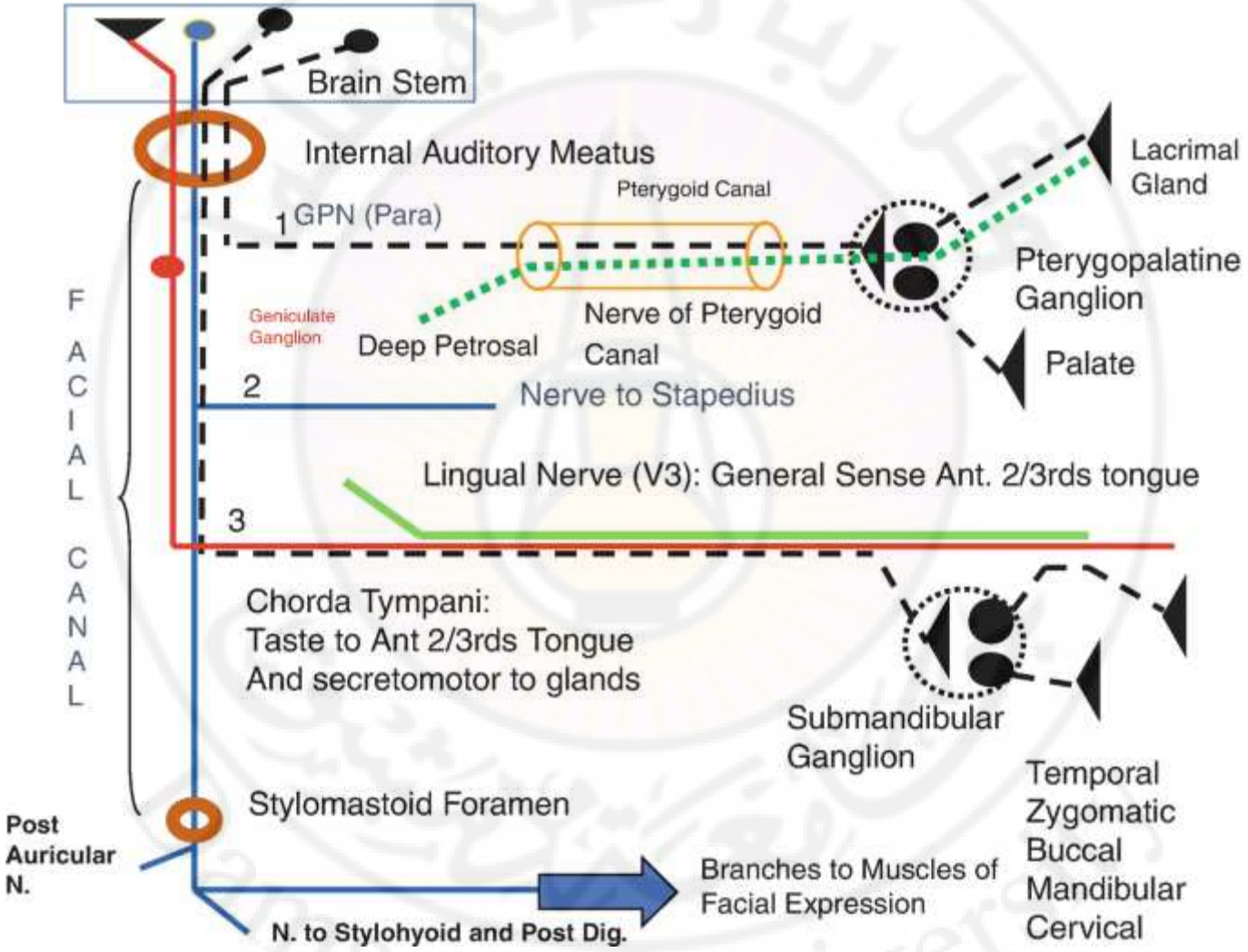
Mimetic (Involuntary) Central Facial Weakness > Voluntary Central Facial Weakness

Localization of Lesions Affecting CN VII

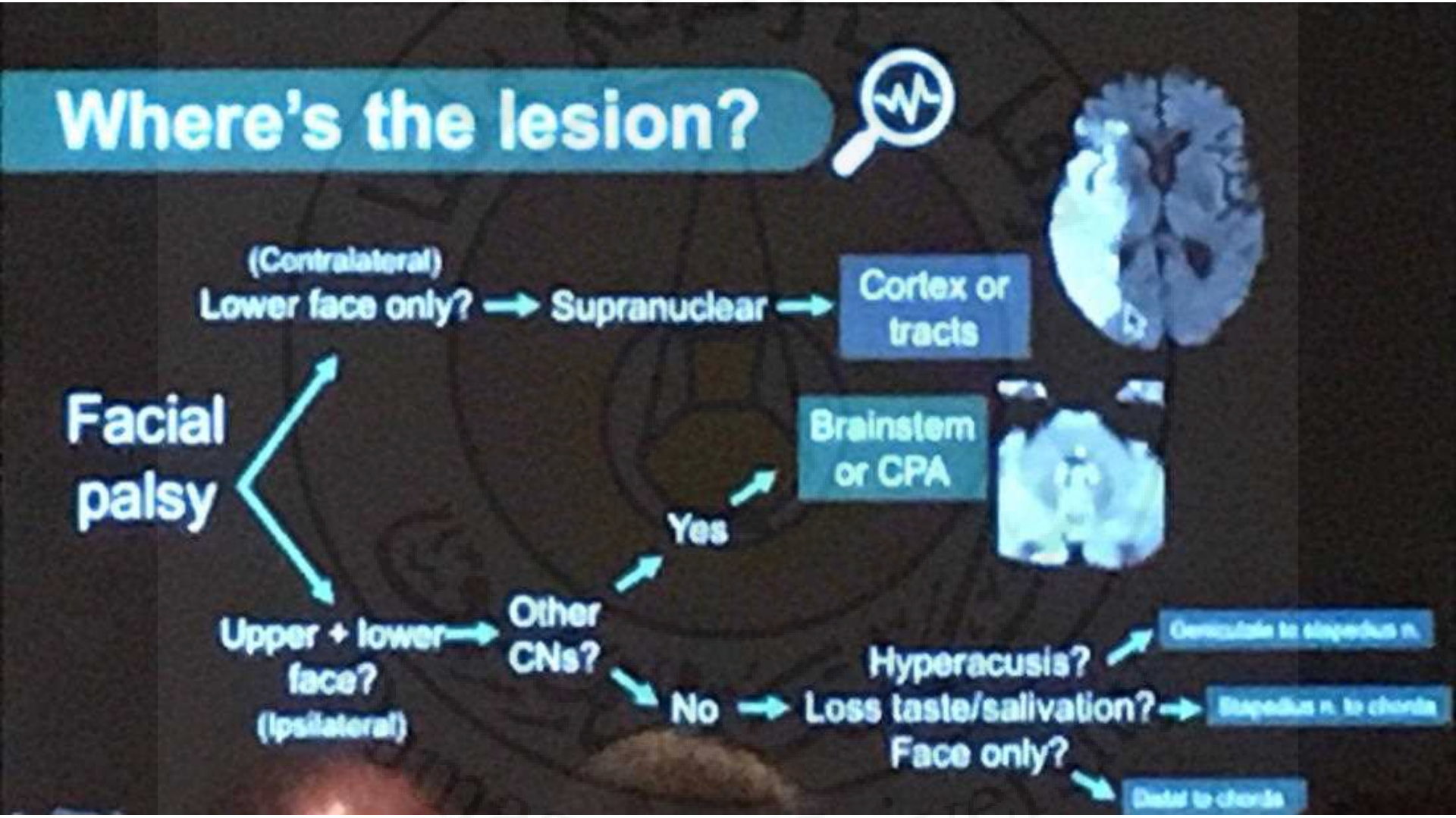
Site of Damage	Facial-Nerve Signs	Common Associated Features
Cortex, subcortical region	Contralateral central facial weakness; lacrimation, salivation, and taste intact	Contralateral hemiparesis and spasticity
Pons	Ipsilateral peripheral facial weakness; lacrimation, salivation, and taste intact	Contralateral hemiparesis, sensory loss, ataxia, nystagmus, ipsilateral abducens palsy, ophthalmoparesis
Cerebellopontine angle	Ipsilateral peripheral facial weakness; lacrimation, salivation, and taste usually intact	Tinnitus, facial numbness, ataxia, nystagmus
Facial nerve in internal auditory canal proximal to or involving geniculate ganglion	Ipsilateral peripheral facial weakness; lacrimation, salivation, and taste likely to be involved	Tinnitus, nystagmus, hearing loss
Facial nerve distal to internal auditory canal and geniculate ganglion	Ipsilateral peripheral facial weakness; lacrimation intact but salivation and taste impaired	Tinnitus, nystagmus, hearing loss
Facial nerve in stylomastoid foramen	Ipsilateral peripheral facial weakness; lacrimation, salivation, and taste intact	Head injury, parotid mass

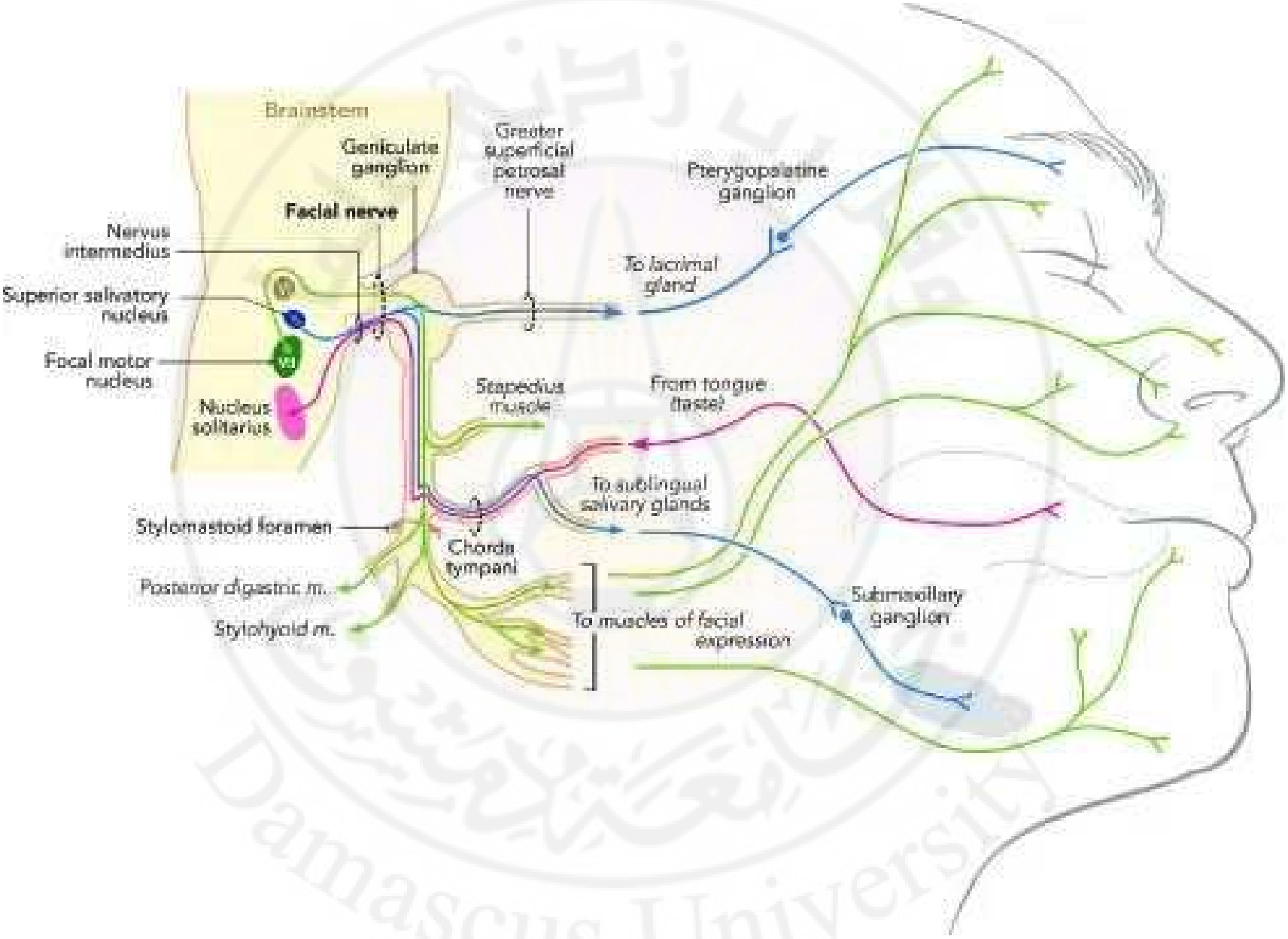
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Brain Stem
Internal Auditory Meatus
Pterygoid Canal
1 GPN (Para)
Lacrimal Gland
Pterygopalatine Ganglion
Geniculate Ganglion
Deep Petrosal
Nerve of Pterygoid Canal
Palate
2
Nerve to Stapedius
FACIAL CANAL
Lingual Nerve (V3): General Sense Ant. 2/3rds tongue
3
Chorda Tympani:
Taste to Ant 2/3rds Tongue
And secretomotor to glands
Submandibular Ganglion
Temporal
Zygomatic
Buccal
Mandibular
Cervical
Stylomastoid Foramen
Post Auricular N.
Branches to Muscles of Facial Expression
N. to Stylohyoid and Post Dig.

Where's the lesion?

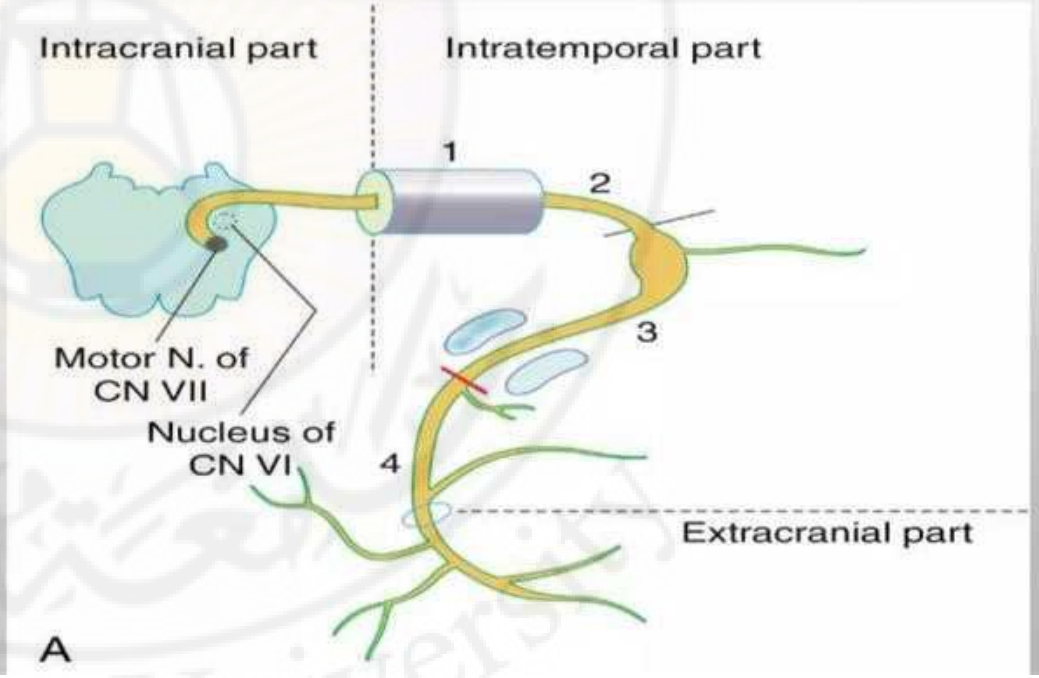



Brainstem
Geniculate ganglion
Facial nerve
Greater superficial petrosal nerve
Pterygopalatine ganglion
Nervus intermedius
Superior salivatory nucleus
Facial motor nucleus
Nucleus solitarius
To lacrimal gland
Stapedius muscle
From tongue (taste)
To sublingual salivary glands
Stylomastoid foramen
Chorda tympani
Posterior digastric m.
Stylohyoid m.
To muscles of facial expression
Submaxillary ganglion

COURSE OF FACIAL NERVE

Motor fibres take origin from the nucleus of VIIth nerve, hook round the nucleus of VIth nerve and are joined by the sensory root (*nerve of wrisberg*). Facial nerve leaves the brainstem at pontomedullary junction, travels through posterior cranial fossa and enters the internal acoustic meatus. At the fundus of the meatus (lateral most part of meatus), the nerve enters the bony facial canal, traverses the temporal bone and comes out of the stylomastoid foramen. Here it crosses the styloid process and divides into terminal branches.

Intratemporal part consists of four segments:
Meatal (1),
Labyrinthine (2),
Tympanic (3) and
Mastoid (4).



LOCALIZATION OF FACIAL LESION

A. CENTRAL FACIAL PARALYSIS

It is caused by cerebrovascular accidents (haemorrhage, thrombosis or embolism), tumour or an abscess. It causes paralysis of only the lower half of face on the contralateral side. Forehead movements are retained due to bilateral innervation of frontalis muscle. Involuntary emotional movements and the tone of facial muscles are also retained.

B. PERIPHERAL FACIAL PARALYSIS

All the muscles of the face on the involved side are paralyzed. Patient is unable to frown, close the eye, purse the lips or whistle.

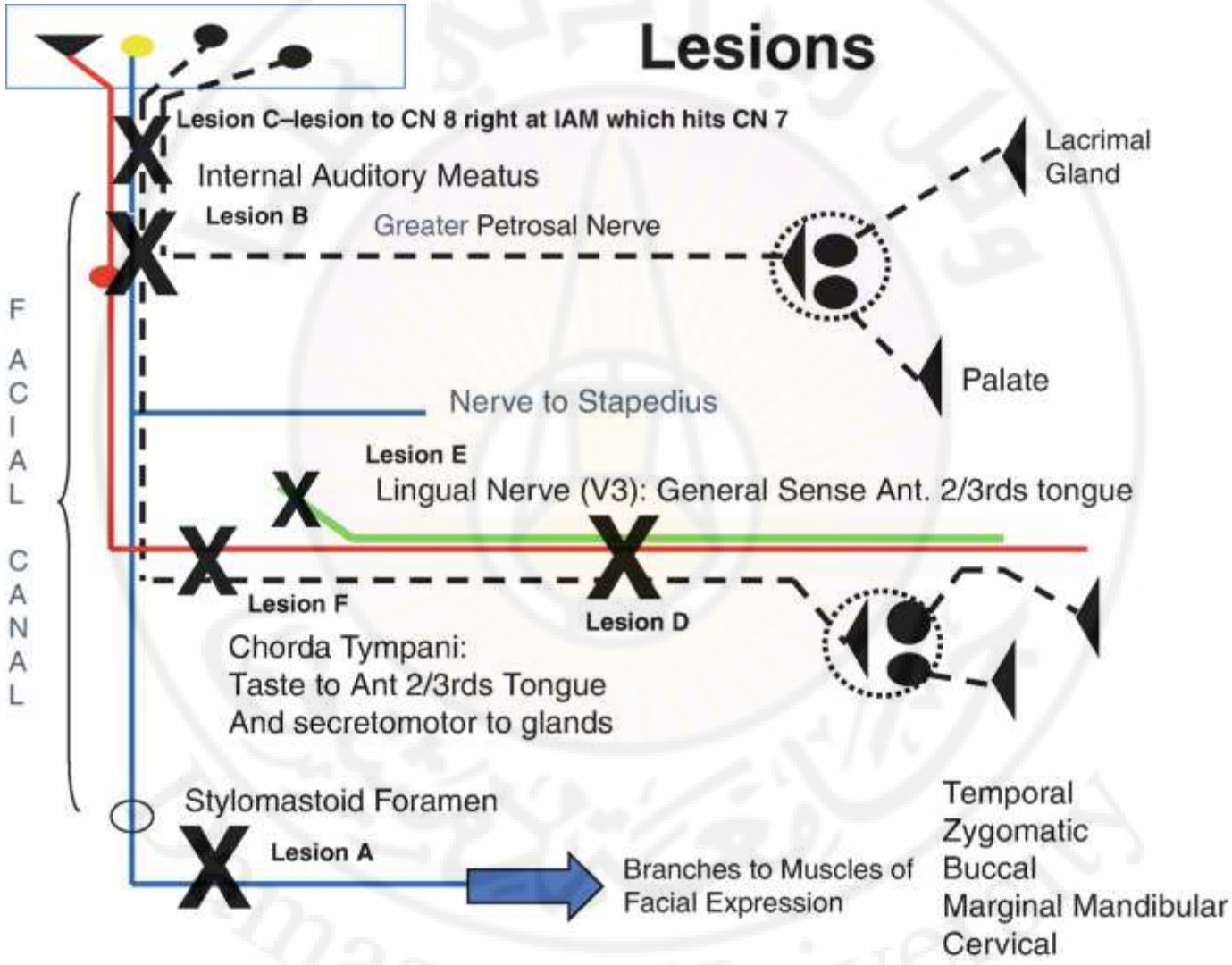
A lesion at *the level of nucleus* is identified by associated paralysis of VIIth nerve.

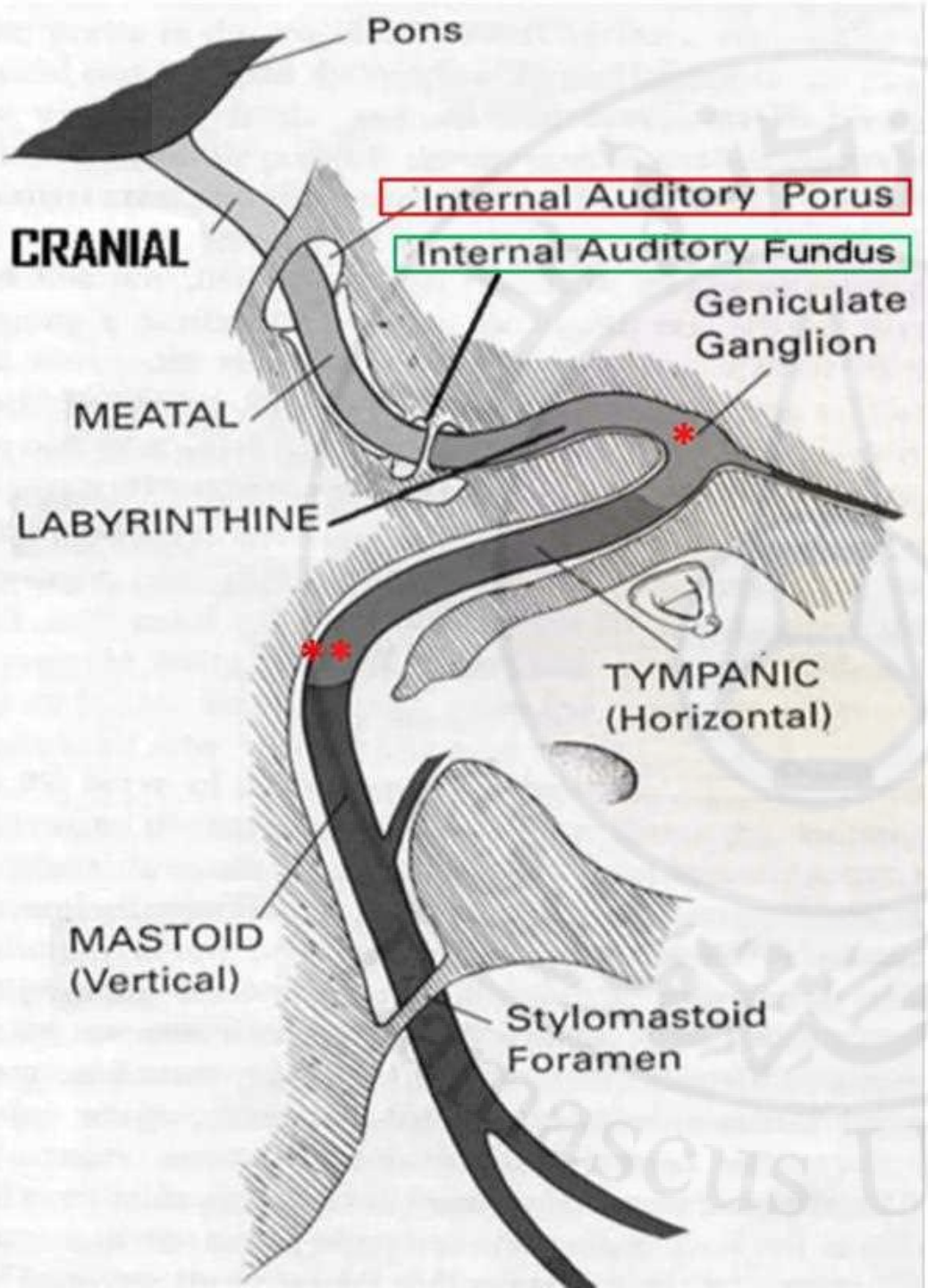
A lesion at *cerebellopontine angle* is identified by the presence of vestibular and auditory defects and involvement of other cranial nerves such as Vth, IXth, Xth and XIth.

A lesion in the bony canal, from internal acoustic meatus to stylomastoid foramen, can be localized by topodiagnostic tests.

A lesion outside the temporal bone, in the parotid area, affects only the motor functions of nerve. It may sometimes be incomplete as some branches of the nerve may not be involved in tumour or trauma.

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Lesions
Lesion C–lesion to CN 8 right at IAM which hits CN 7
Internal Auditory Meatus
Lesion B
Greater Petrosal Nerve
Lacrimal Gland
Palate
Nerve to Stapedius
FACIAL CANAL
Lesion E
Lingual Nerve (V3): General Sense Ant. 2/3rds tongue
Lesion F
Lesion D
Chorda Tympani:
Taste to Ant 2/3rds Tongue
And secretomotor to glands
Stylomastoid Foramen
Lesion A
Branches to Muscles of Facial Expression
Temporal
Zygomatic
Buccal
Marginal Mandibular
Cervical

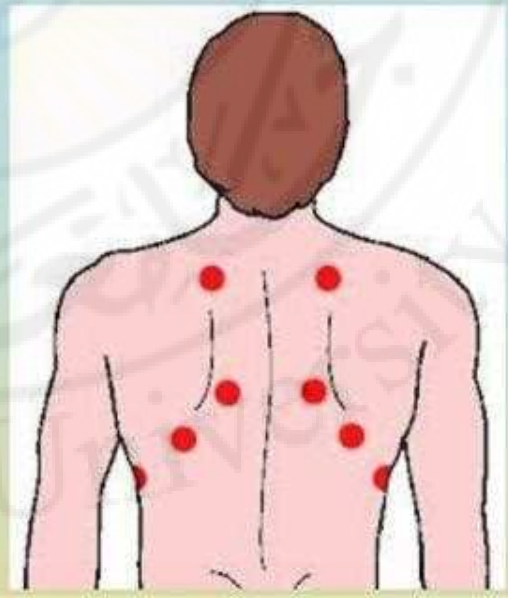

Pons
CRANIAL
Internal Auditory Porus
Internal Auditory Fundus
Geniculate Ganglion
MEATAL
LABYRINTHINE
TYMPANIC (Horizontal)
MASTOID (Vertical)
Stylomastoid Foramen

Auscultation of Breath Sounds

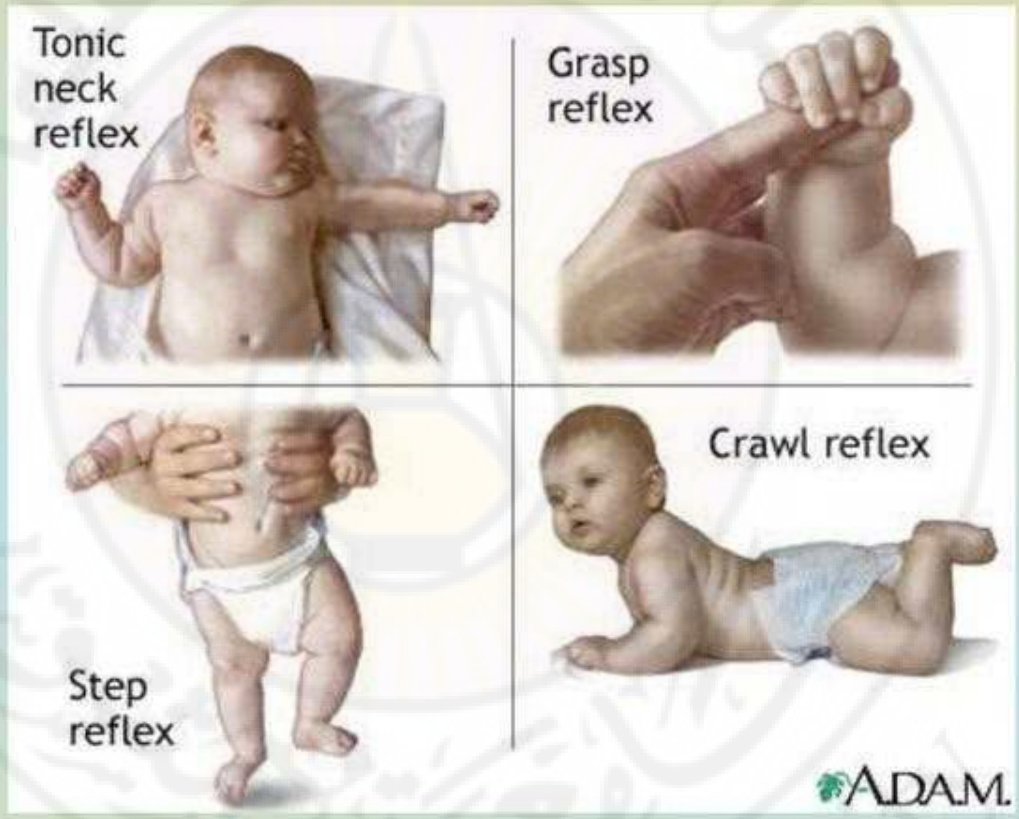
- Normal
- Crackles- light crackling, bubbling
- Rhonchi- coarse crackles
- Wheezes- creaking, whistling, high pitched

1 → 2
↓
4 ← 3
↓
5 → 6

Avoid bony areas



Baby Reflexes





What is Diplopia ?

- It is when more than one image (two) of the object of regard are seen simultaneously

- Physiological
- Pathological

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Monocular vs Binocular Diplopia

Key question

Is the double vision present even on monocular eye closure?

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Monocular diplopia

- More than one image of the object of regard is formed in the retinae of one or both eyes.....
  - Irregular astigmatism (corneal scars, haze, corneal distortion)
  - Subluxated clear lenses
  - Poorly fitting contact lenses
  - Early cataract
  - Macular disorders – edema, CNVM etc

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Binocular Diplopia

The eyes lose their simultaneous alignment with the object of regard in one or more directions of gaze

Key clues

- Anomalous Head Position
- Vision Blurry in one gaze position, better in another
- Obviously misaligned eyes,
- proptosis
- Presence of partial ptosis
- Nystagmus

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Purpose:

- Wether the misalignment is comitant or Incomitant

- Comitant strabismus are congenital in nature while Incomitant gives a picture of acquired abnormality / disorder

INCOMITANT	COMITANT
Results when there is limitation of ocular movement	Result of abnormality in establishment of normal BSV
Can be paralytic or non paralytic	Always non paralytic
limitation of ocular movement	normal extraocular motility
particular abnormal head posture develops ,I.E motor adatation occurs	no head posture ,instead sensory adaptation occurs
Muscle sequelae present in old cases	Absence of muscle sequelae

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الفوارق الرئيسية بين الحول الشللي والحول المصاحب

الحول الشللي Paralytic

- السبب معروف والبدء مفاجئ.
- يوجد شفع.
- تحدد في حركات العين.
- يختلف انحراف المحور البصري عندما يتغير اتجاه الحملقة.
- لا غمش (ضعف الرؤية دون سبب عضوي واضح)
- ارتسام خاطئ.
- قد يحدث دوار

الحول المصاحب Concomitant strabismus

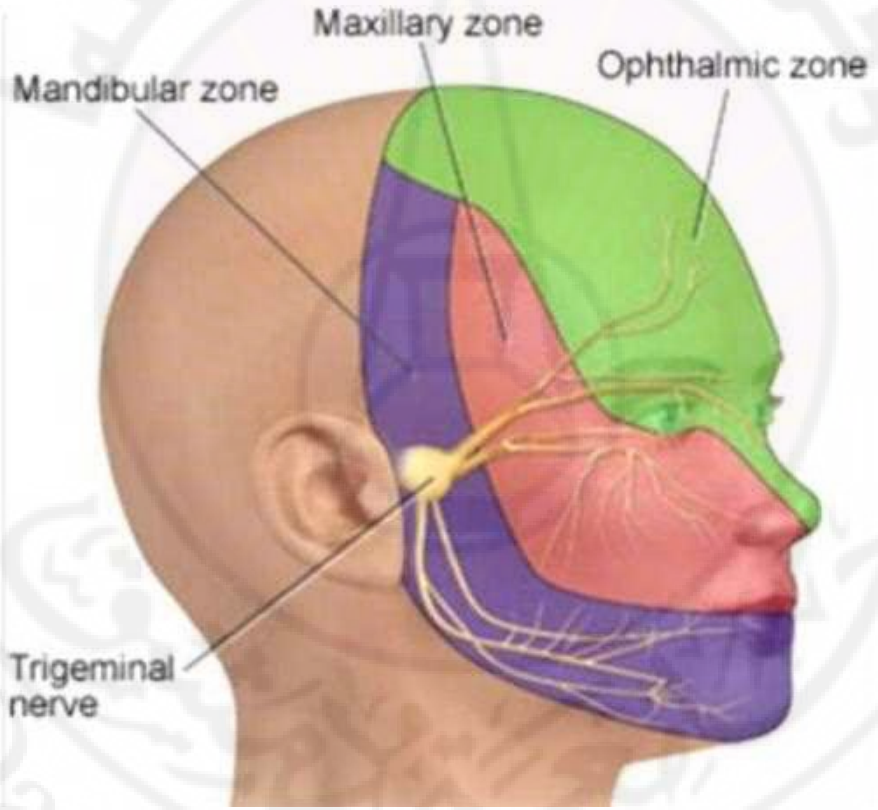
- البدء متدرج في الطفولة الباكرة.
- لا يوجد شفع.
- لا يوجد تحدد في الحركة.
- لا يختلف انحراف المحور البصري.
- قد تكون العين مصابة بالغمش.
- لا يوجد ارتسام خاطئ.
- لا يوجد دوار.

Causes of Diplopia:

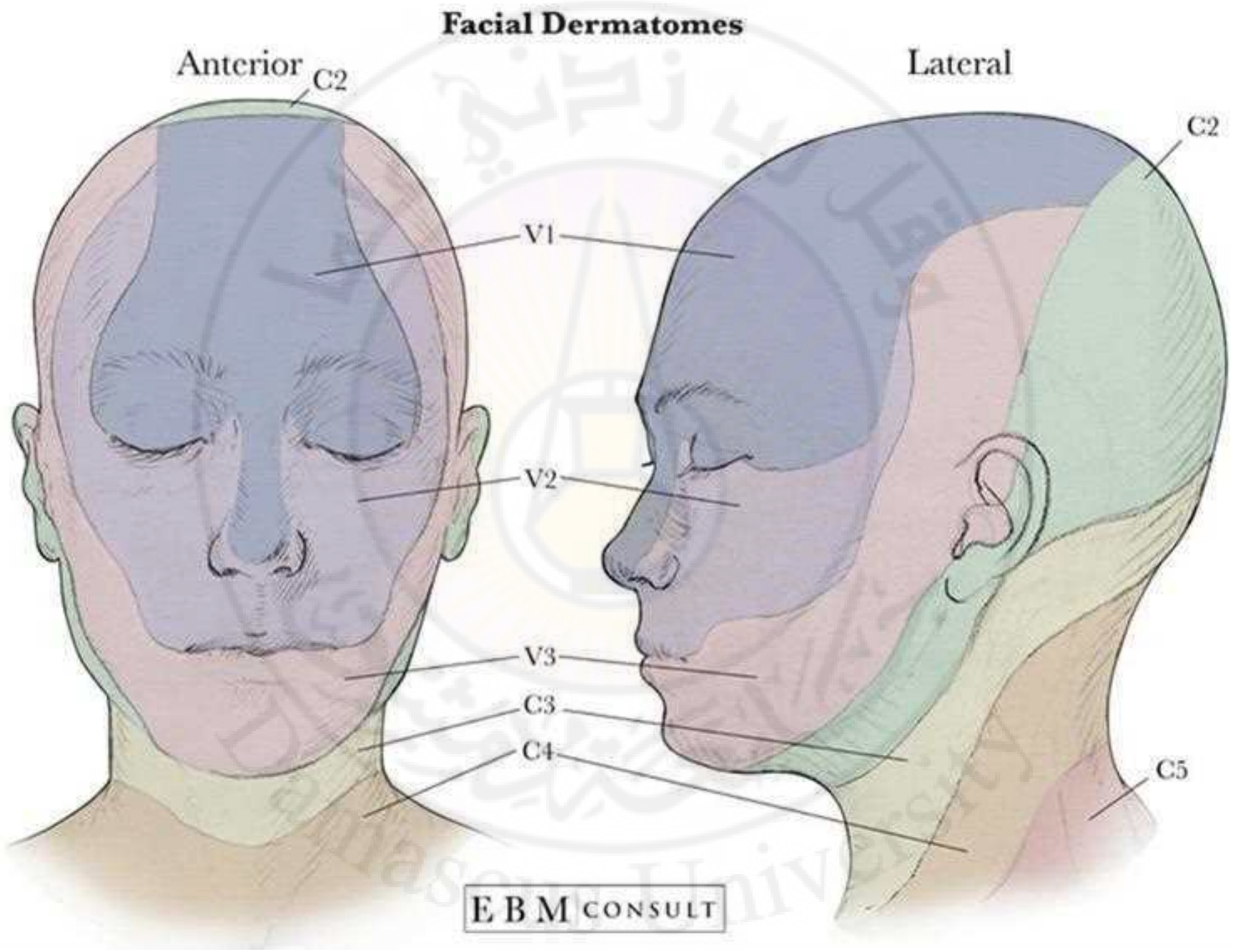
- Supranuclear
- Nuclear
- Internuclear
- Infranuclear
- Myopathic
- Restrictive
- Orbital

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V Trigeminal Nerve



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Facial Dermatomes
Anterior
C2
Lateral
C2
V1
V2
V3
C3
C4
C5
E B M CONSULT

Trigeminal Nerve General sensory

Trigeminal Nucleus

principal
spinal
mescencephalic

Ophthalmic N.

superior orbital fissure

Maxillary N.

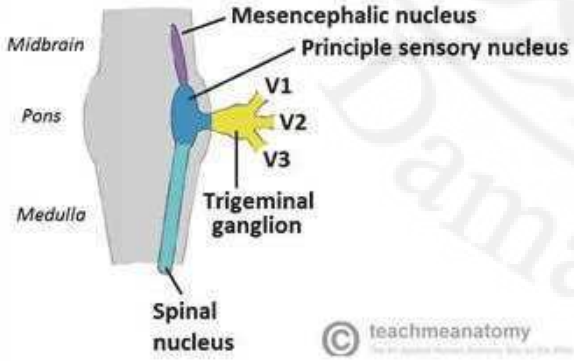
foramen rotundum

Mandibular N.

foramen ovale

Trigeminal Motor Nucleus

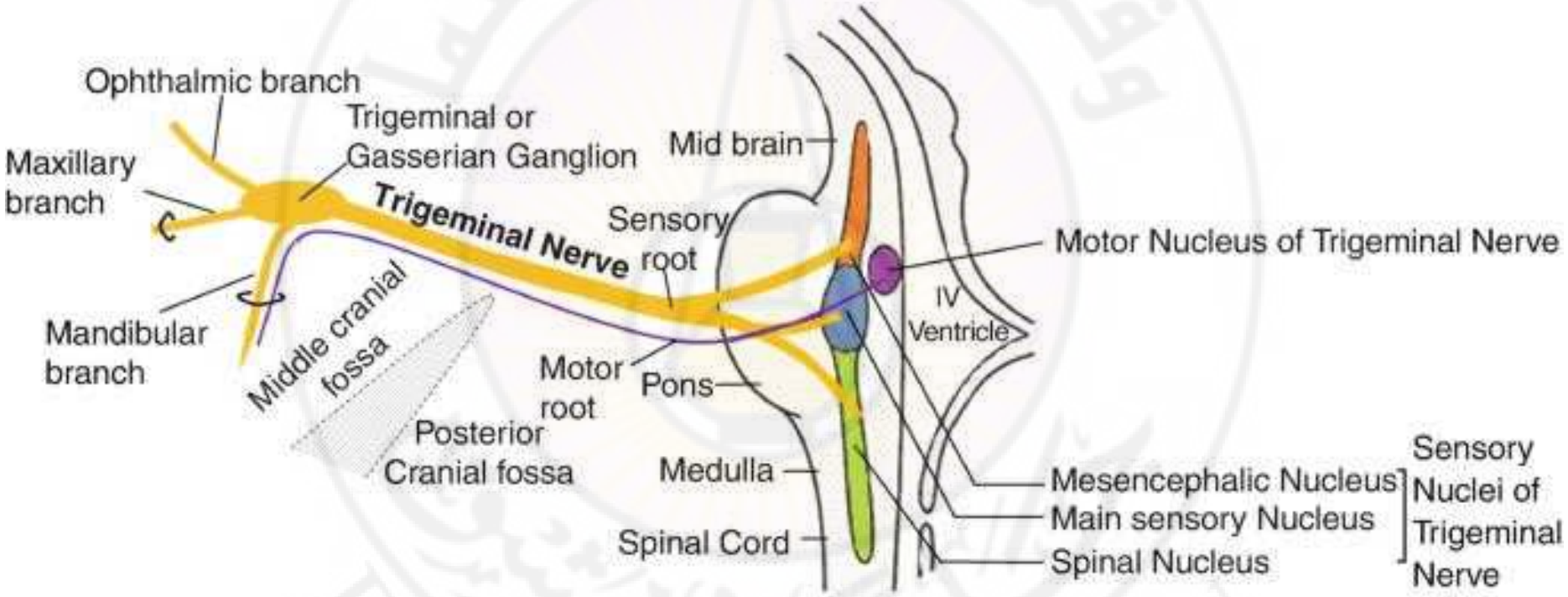
Trigeminal Nerve Branchial Motor



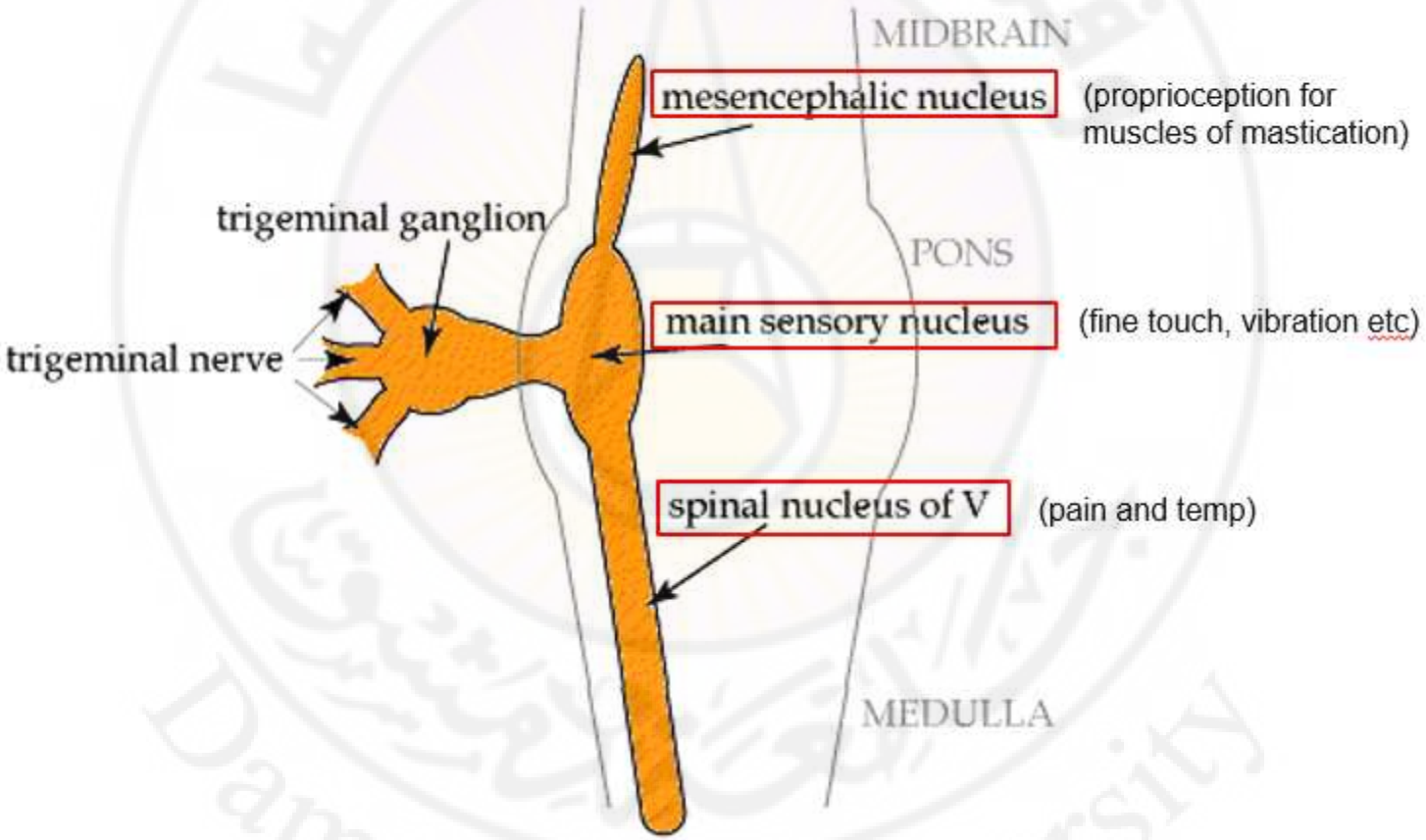
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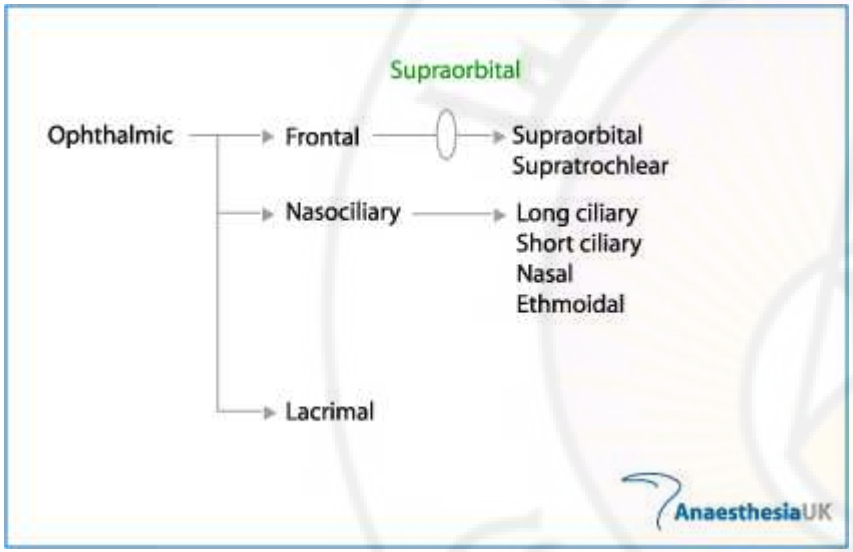
AnaesthesiaUK

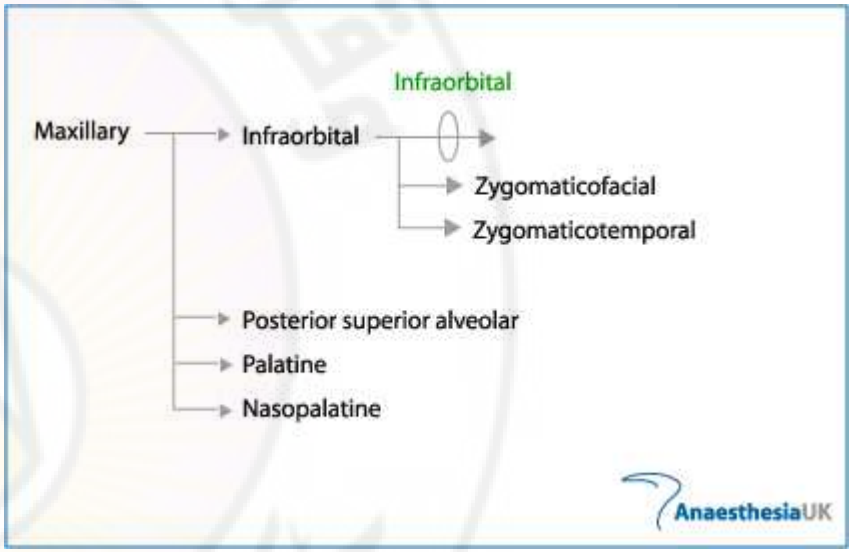

Ophthalmic branch
Trigeminal or
Gasserian Ganglion
Maxillary
branch
Trigeminal Nerve
Sensory
root
Mandibular
branch
Middle cranial
fossa
Motor
root
Pons
Posterior
Cranial fossa
Mid brain
Motor Nucleus of Trigeminal Nerve
IV
Ventricle
Medulla
Spinal Cord
Mesencephalic Nucleus
Main sensory Nucleus
Spinal Nucleus
Sensory
Nuclei of
Trigeminal
Nerve

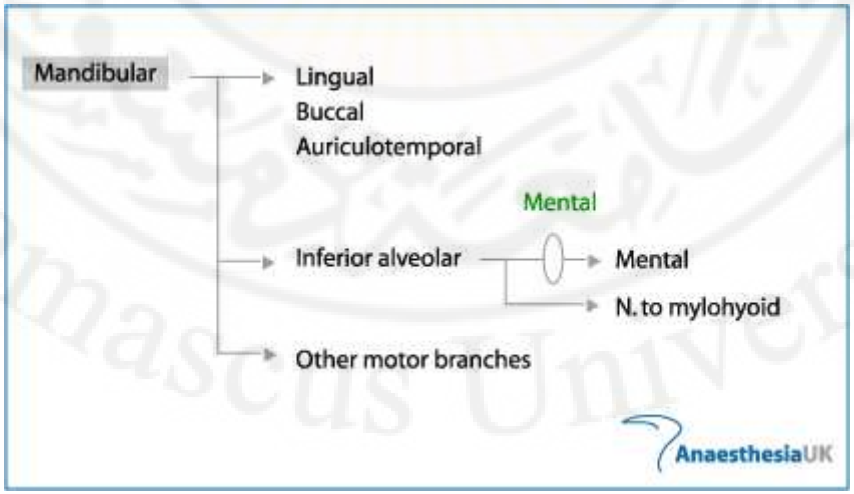
Three main divisions for the trigeminal nucleus



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Supraorbital
Ophthalmic
Frontal
Supraorbital
Supratrochlear
Nasociliary
Long ciliary
Short ciliary
Nasal
Ethmoidal
Lacrimal
AnaesthesiaUK


Infraorbital
Maxillary
Infraorbital
Zygomaticofacial
Zygomaticotemporal
Posterior superior alveolar
Palatine
Nasopalatine
AnaesthesiaUK


Mandibular
Lingual
Buccal
Auriculotemporal
Mental
Inferior alveolar
Mental
N. to mylohyoid
Other motor branches
AnaesthesiaUK

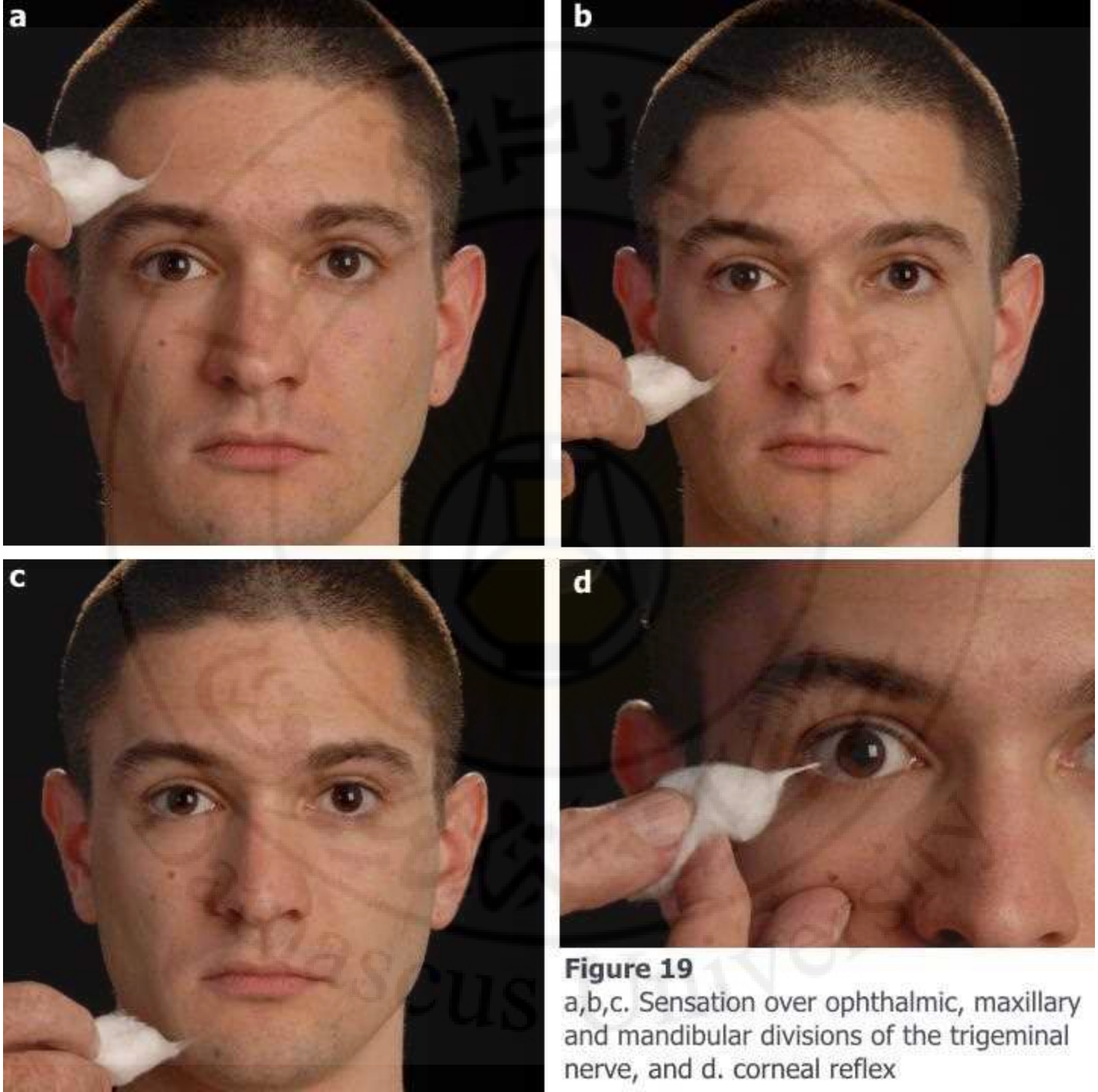
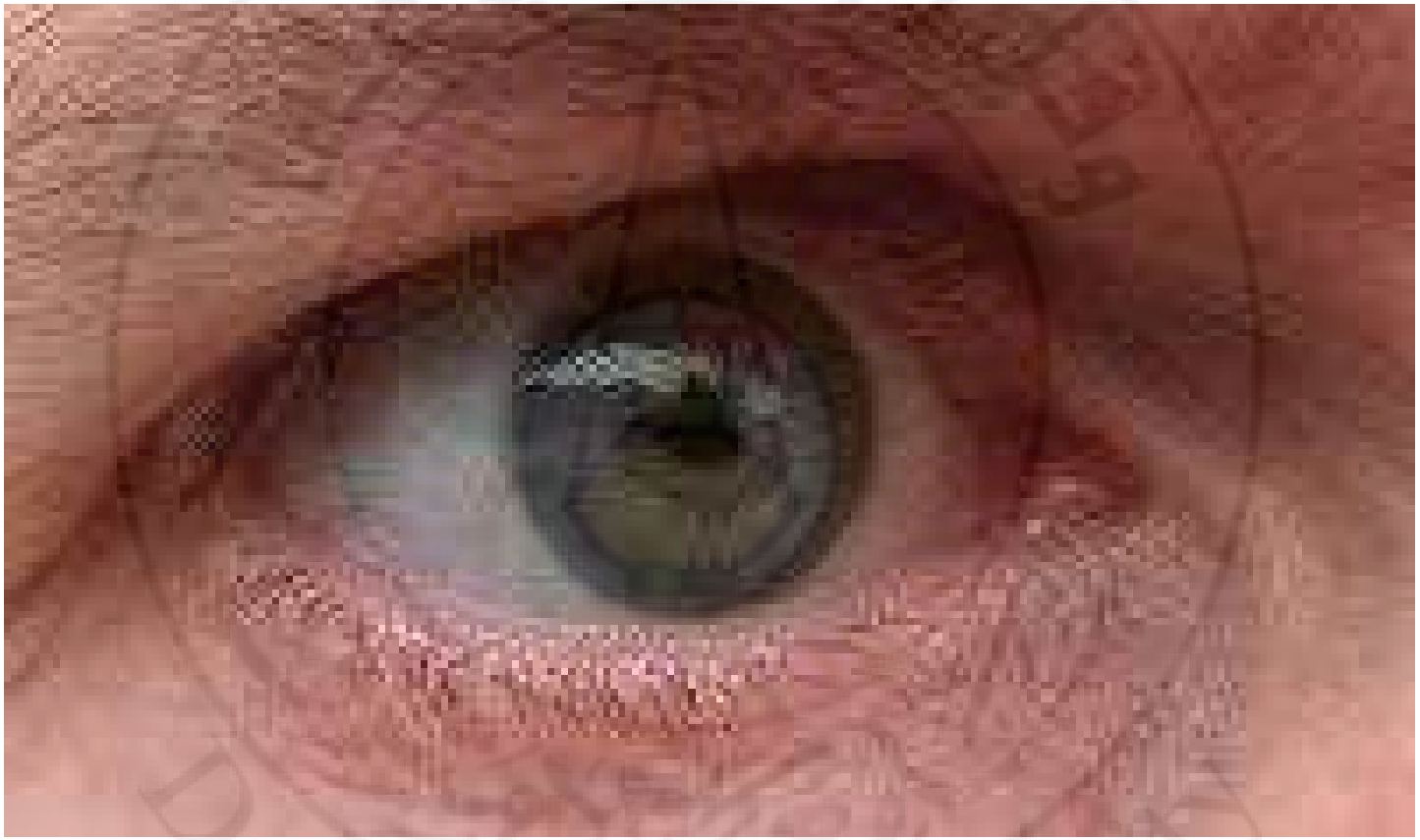
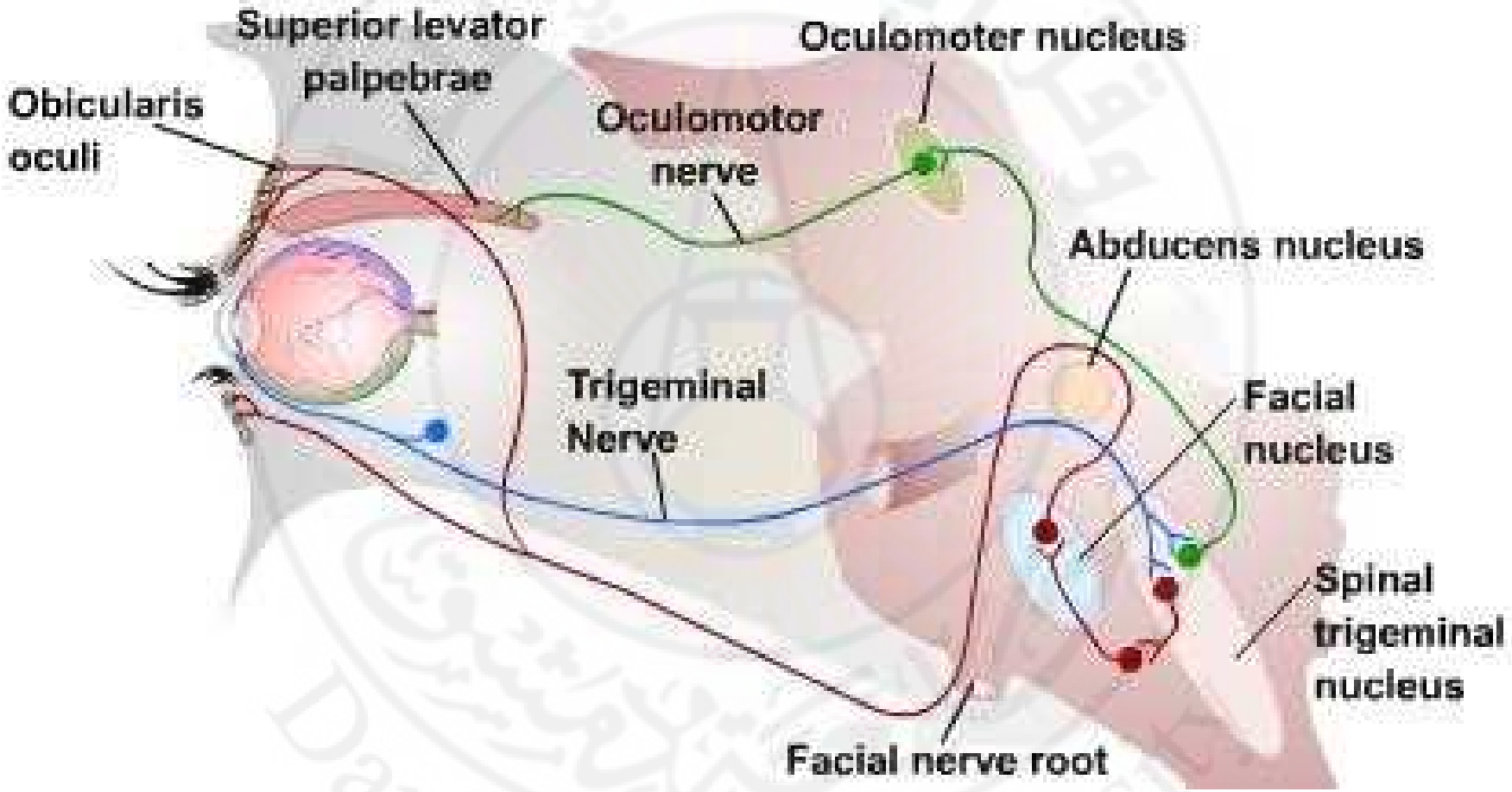


Figure 19
a,b,c. Sensation over ophthalmic, maxillary and mandibular divisions of the trigeminal nerve, and d. corneal reflex

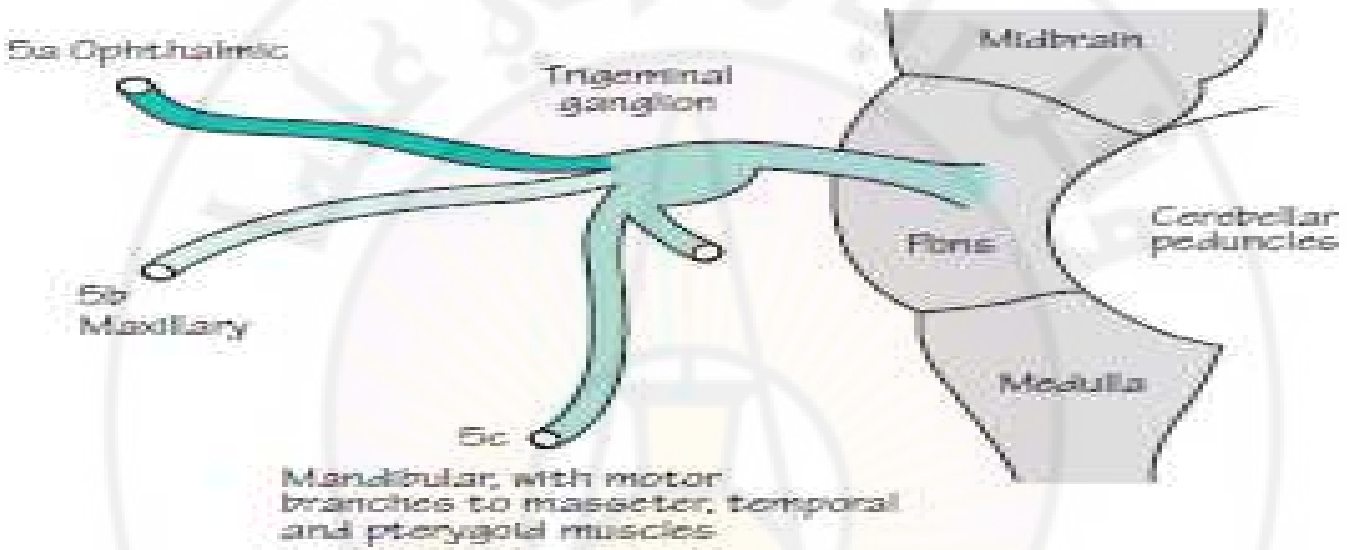





Superior levator palpebrae
Oculomoter nucleus
Obicularis oculi
Oculomotor nerve
Abducens nucleus
Trigeminal Nerve
Facial nucleus
Spinal trigeminal nucleus
Facial nerve root



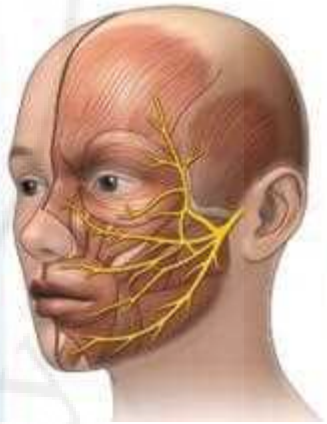




Orbital and cavernous sinus region	Ganglion	Cerebellopontine angle, subarachnoid space and skull base	Brainstem
Tumours	Herpes zoster	Acoustic neuroma	Cerebrovascular disease
Aneurysms		Basal meningitis	Multiple sclerosis
A–V fistula		Malignant infiltration from nasopharynx	Brainstem tumours
Pseudotumour		Trigeminal neuralgia	

Symptoms of Trigeminal Neuralgia

- Bouts of searing, severe, jabbing and shooting pain
- Pain that feels like an electric shock that is generally triggered by some things like chewing, touching the face, brushing teeth and speaking, smiling, washing your face, talking, drinking, eating, shaving and much more.
- The pain may take a few minutes to last
- Constant burning and aching feeling
- Pains in lips, gums, jaw, cheek and less often the forehead and eyes
- This issue becomes more intense and frequent over time



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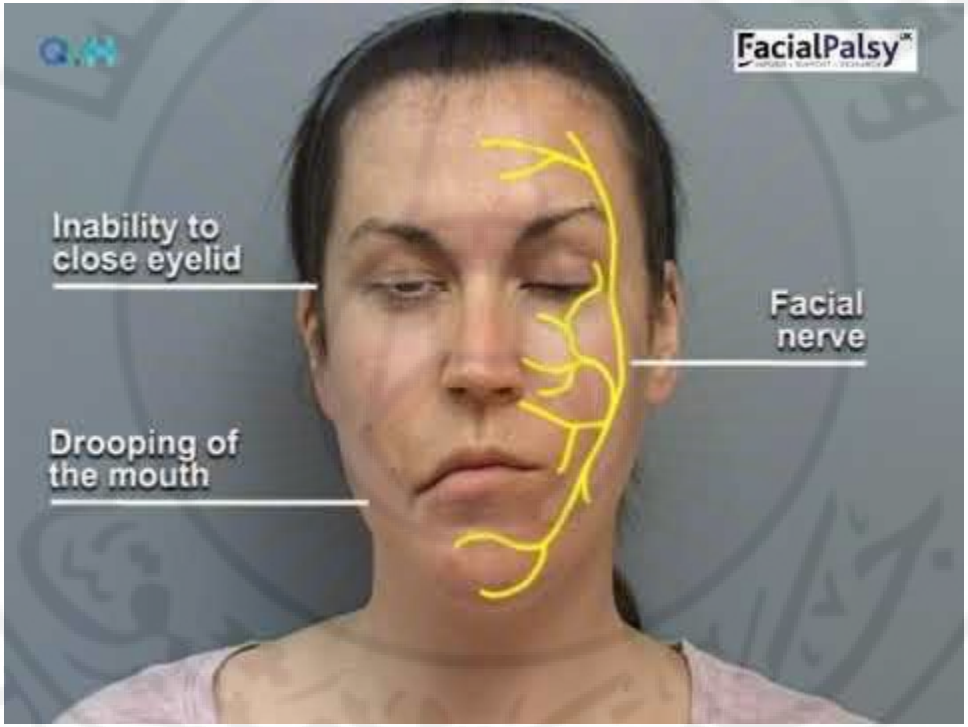




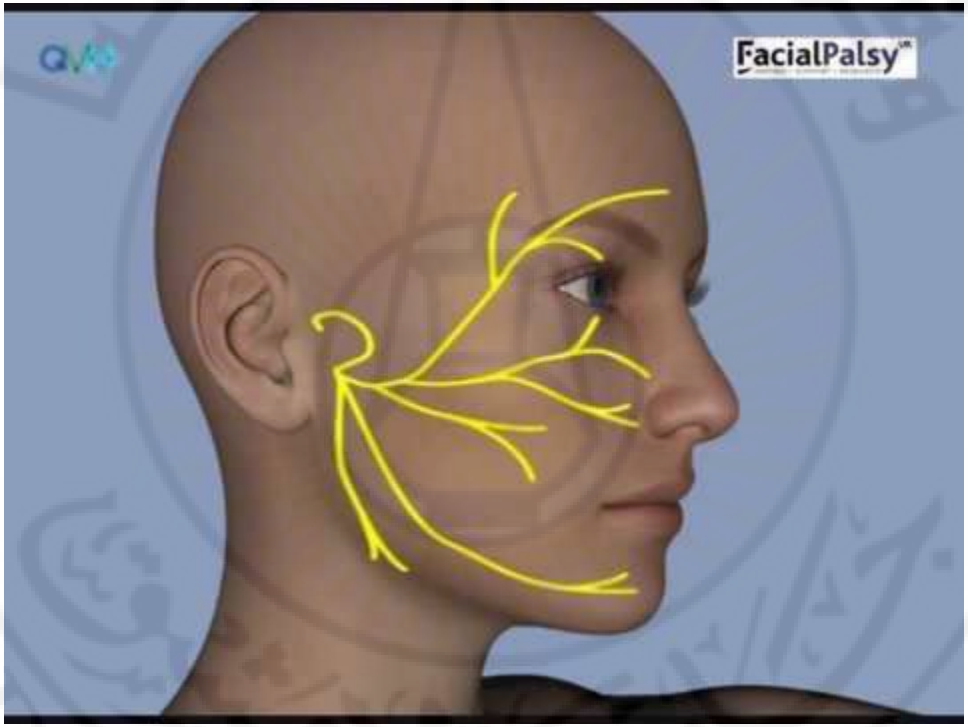


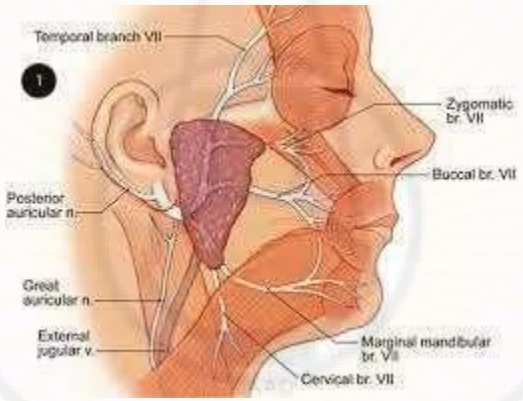


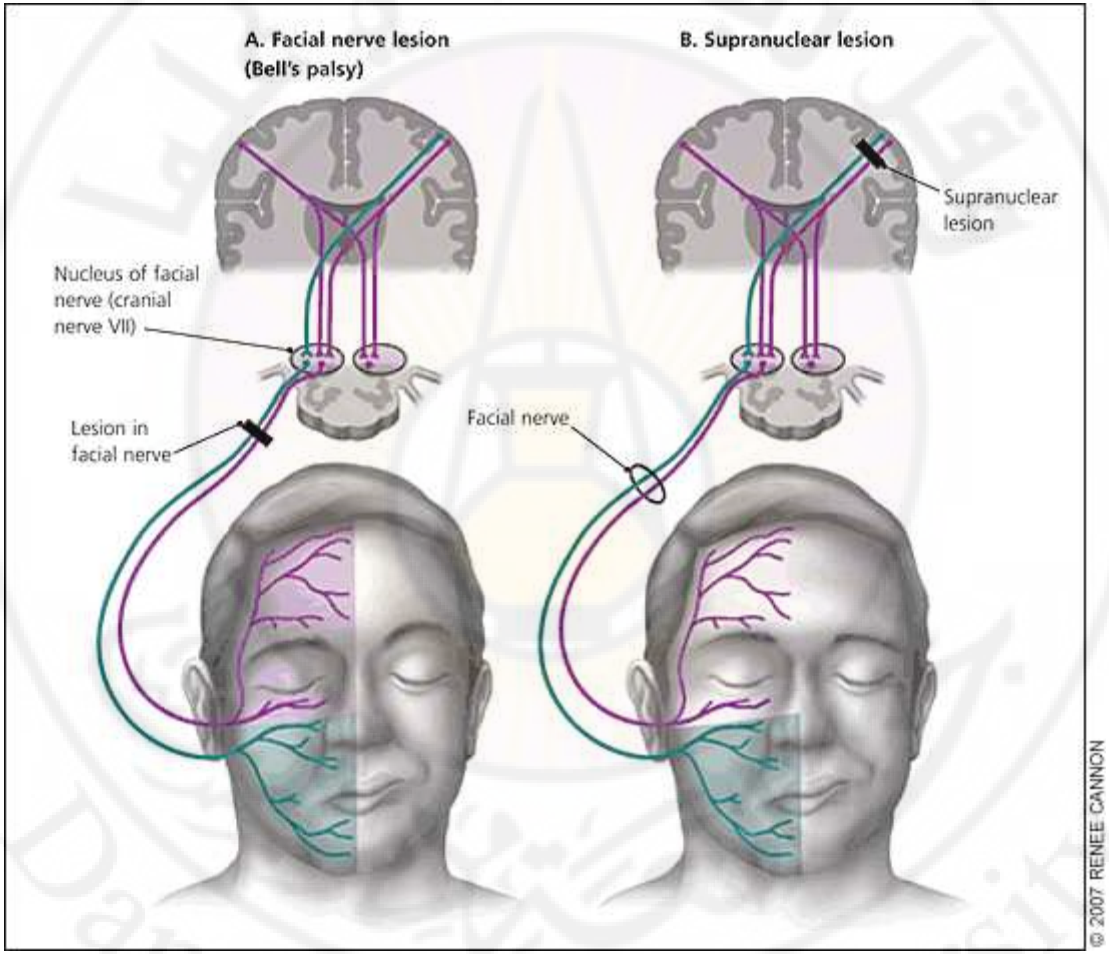




Damascus University

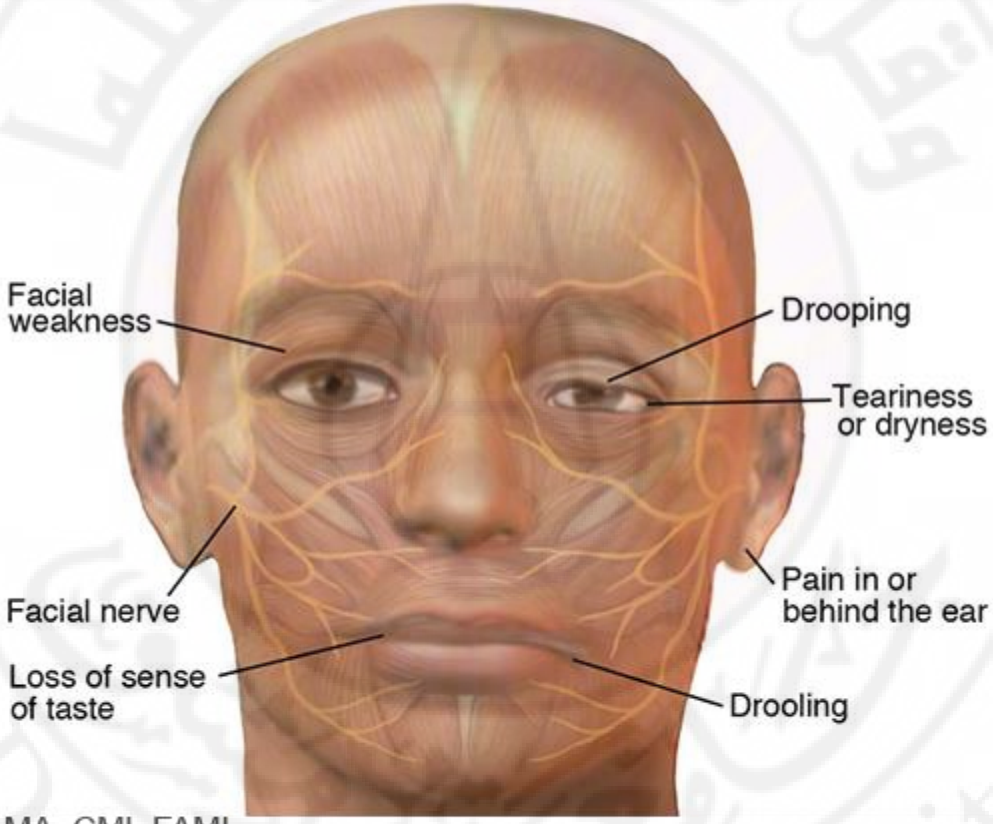

FacialPalsy


Temporal branch VII
1
Zygomatic br. VII
Buccal br. VII
Posterior auricular n.
Great auricular n.
External jugular v.
Marginal mandibular br. VII
Cervical br. VII

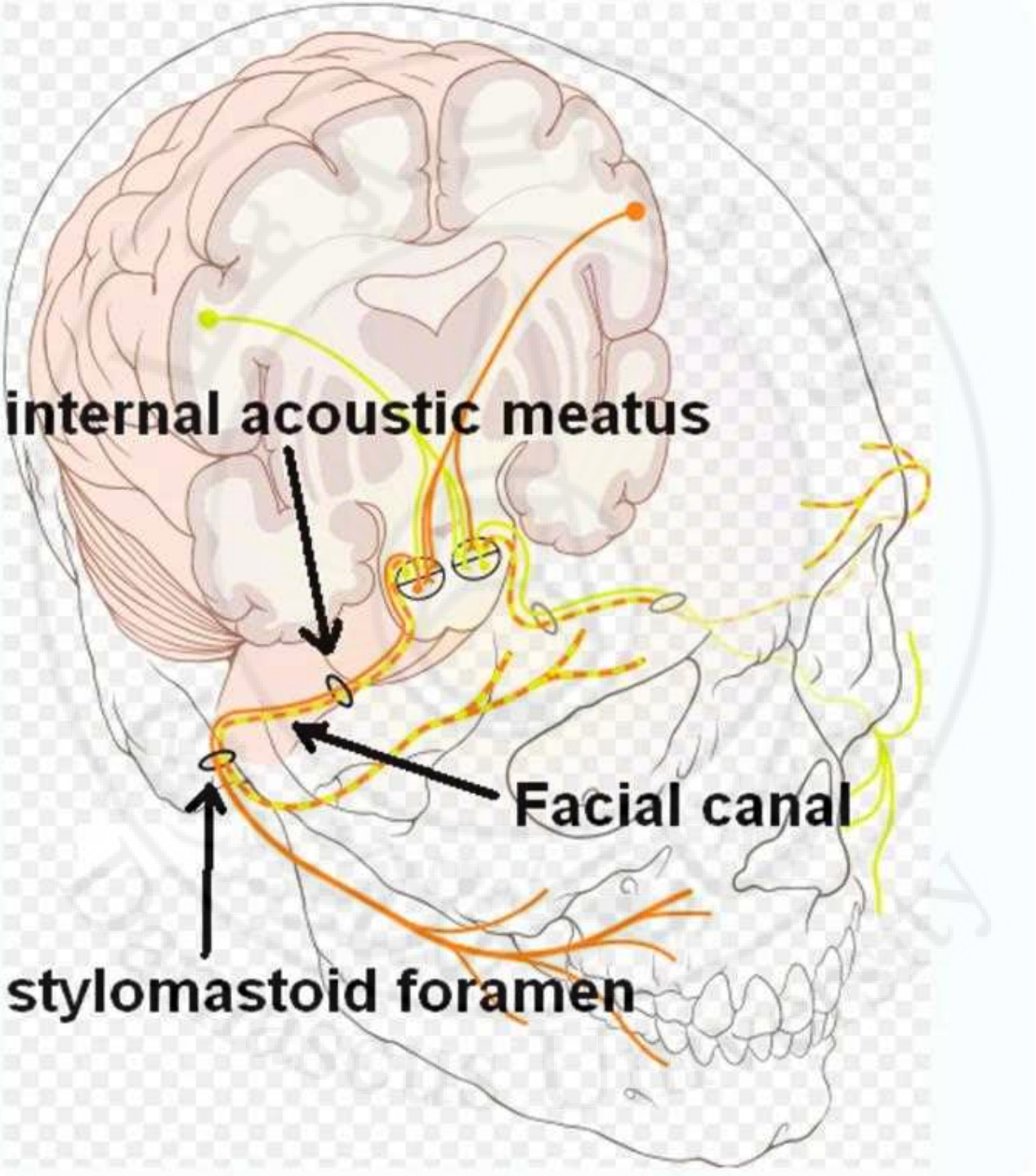

A. Facial nerve lesion
(Bell's palsy)
B. Supranuclear lesion
Supranuclear lesion
Nucleus of facial nerve (cranial nerve VII)
Lesion in facial nerve
Facial nerve
© 2007 RENEE CANNON

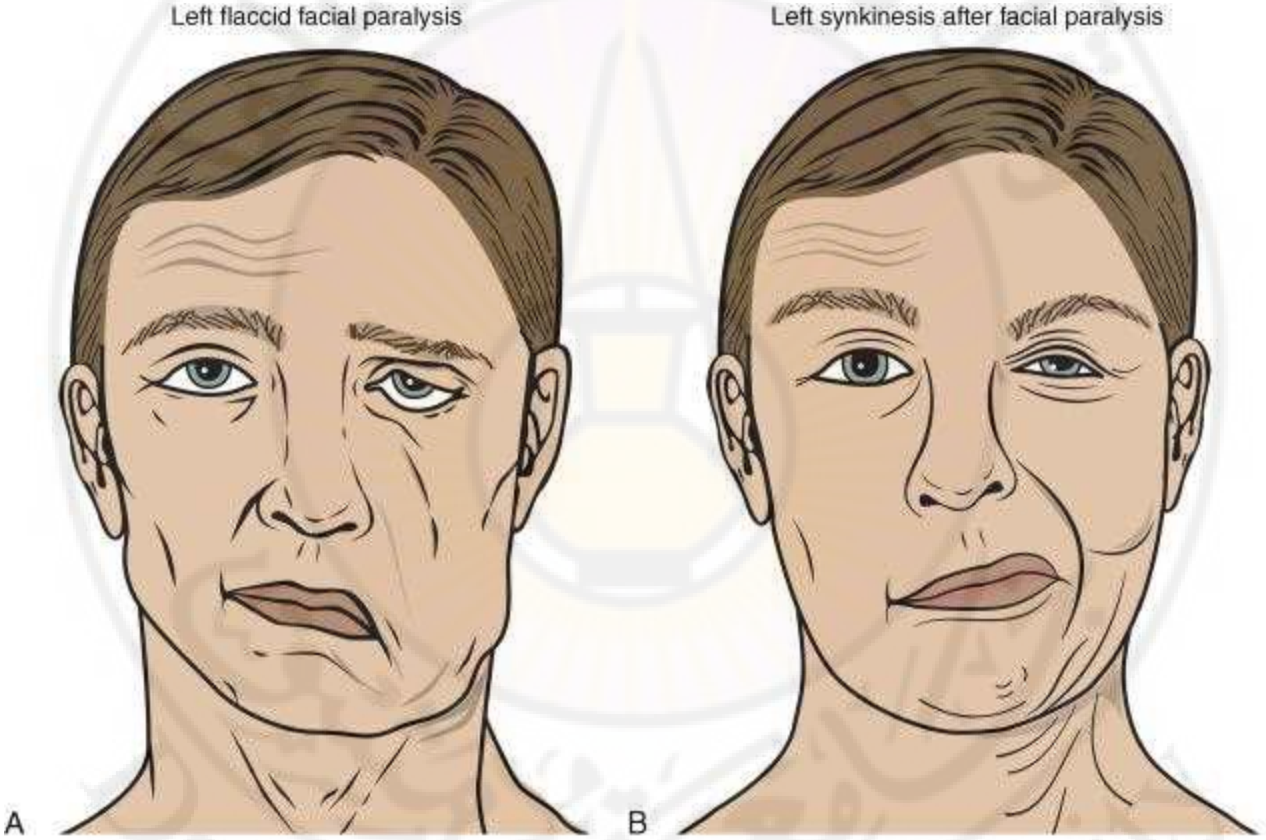

A
B

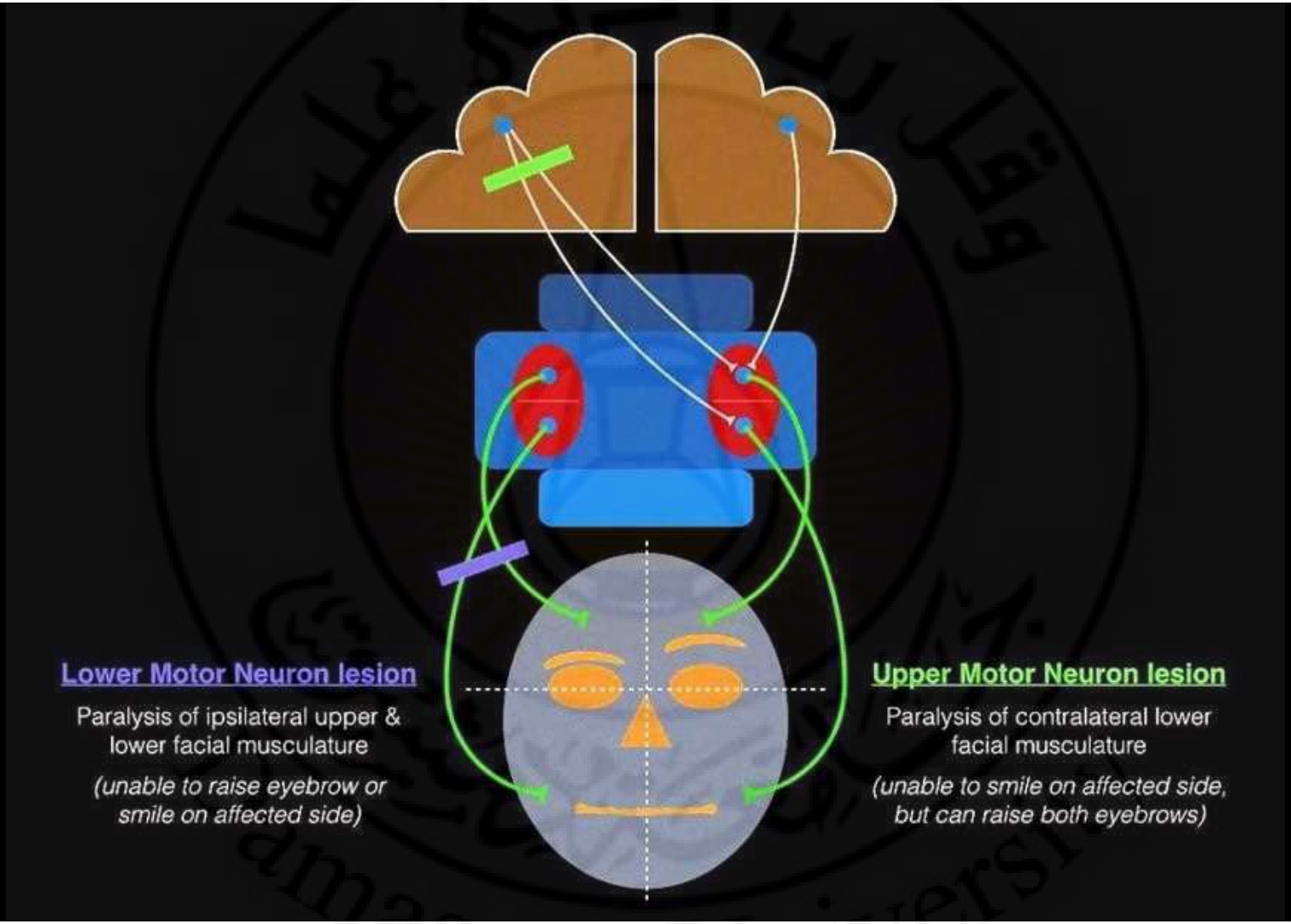
Bell's Palsy

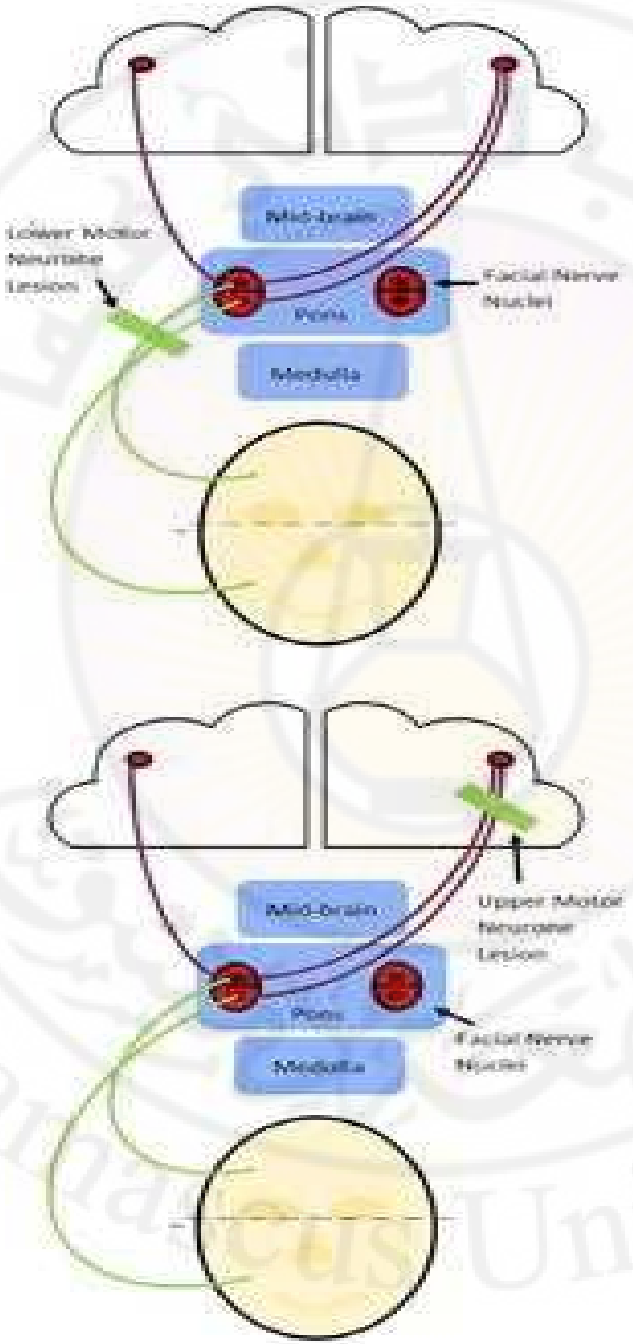


© Marie Dauenheimer, MA, CMI, FAMI

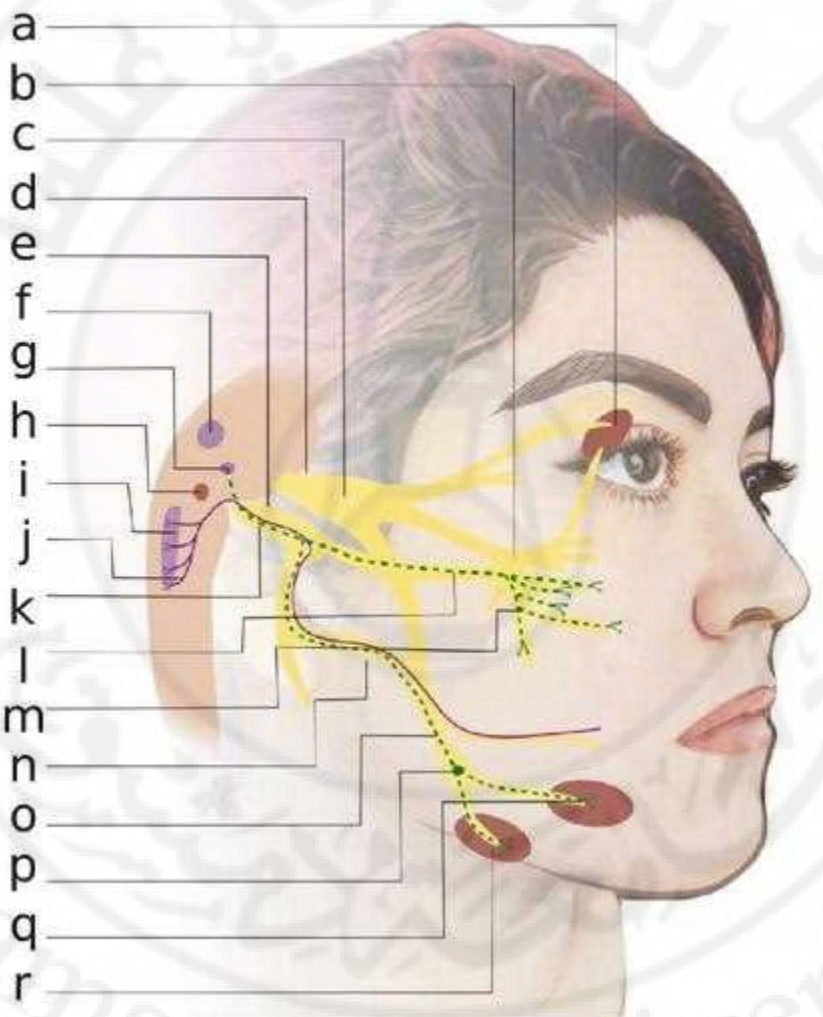

internal acoustic meatus
Facial canal
stylomastoid foramen


Left flaccid facial paralysis
Left synkinesis after facial paralysis
A
B


Lower Motor Neuron lesion
Paralysis of ipsilateral upper & lower facial musculature
(unable to raise eyebrow or smile on affected side)
Upper Motor Neuron lesion
Paralysis of contralateral lower facial musculature
(unable to smile on affected side, but can raise both eyebrows)

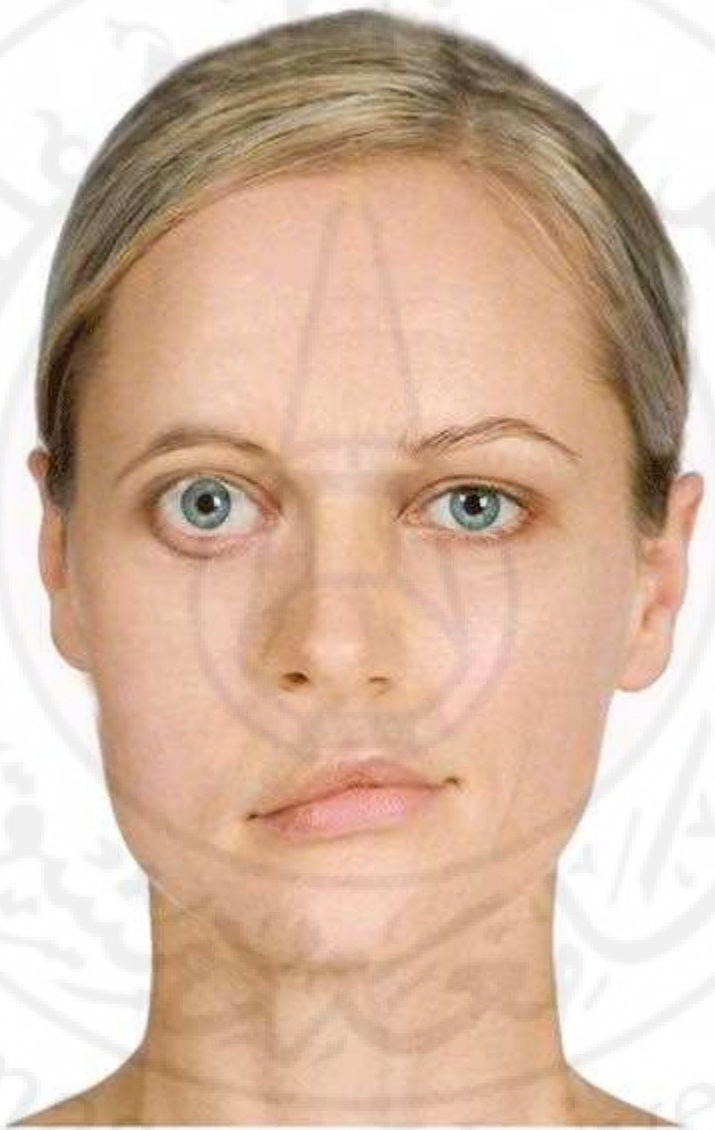

Lower Motor Neurotabe Lesion
Facial Nerve Nuclei
Pons
Medulla
Upper Motor Neurogear Lesion
Facial Nerve Nuclei
Pons
Medulla



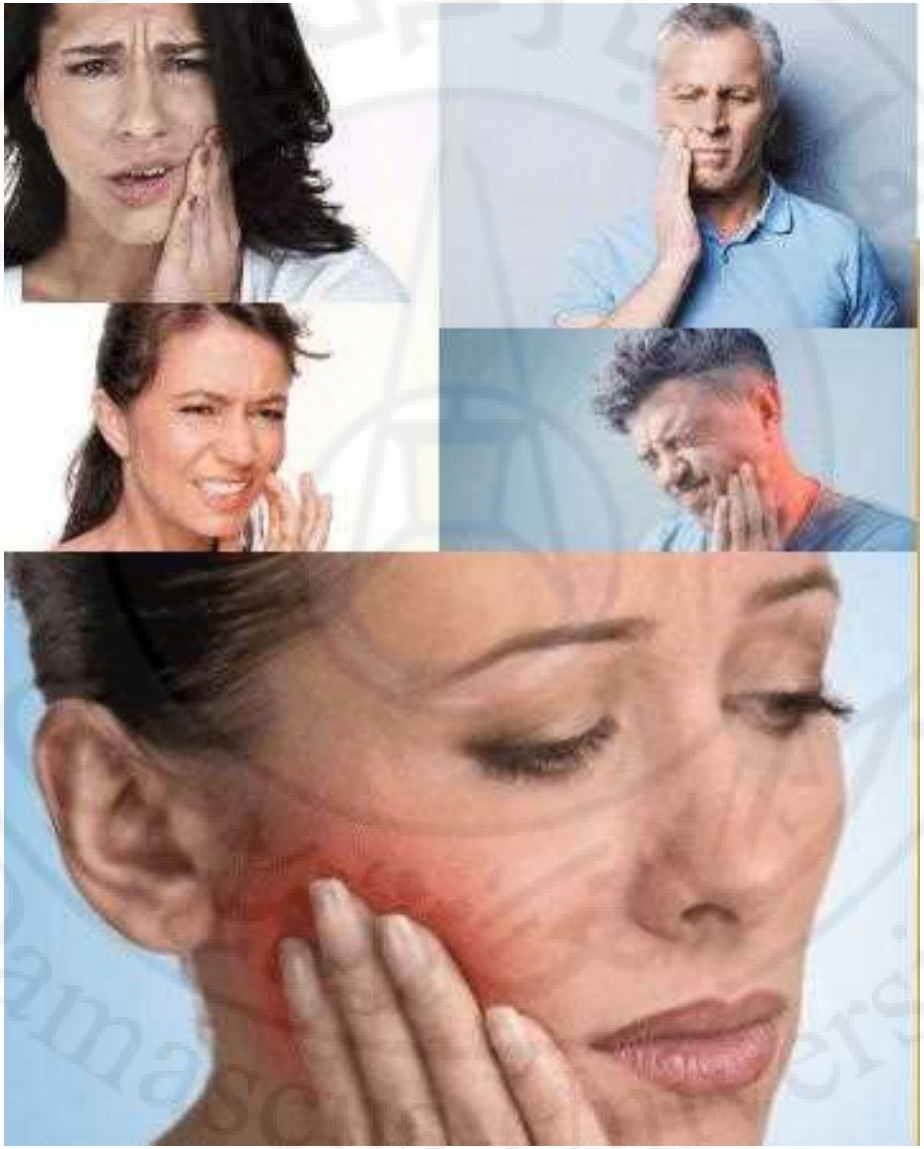

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r

Schematic diagram that features the facial nerves. The green lines show the parasympathetic fibers. The purple line is the visceral afferent fibers [15]. The labels states for: (a) lacrimal gland, (b) pterygopalatine ganglion, (c) trigeminal ganglion, (d) V n, (e) geniculate ganglion, (f) motor nucleus VI n, (g) superior salivatory nucleus, (h) motor nucleus VII n, (i) fasciculus solitarius, (j) nucleus fasciculus solitarius, (k) VII n, (l) major superficial petrosal nerve, (m) to nasal and palatine glands, (n) chorda tympani, (o) lingual nerve, (p) submandibular gland, (q) sublingual gland, and (r) submandibular gland.

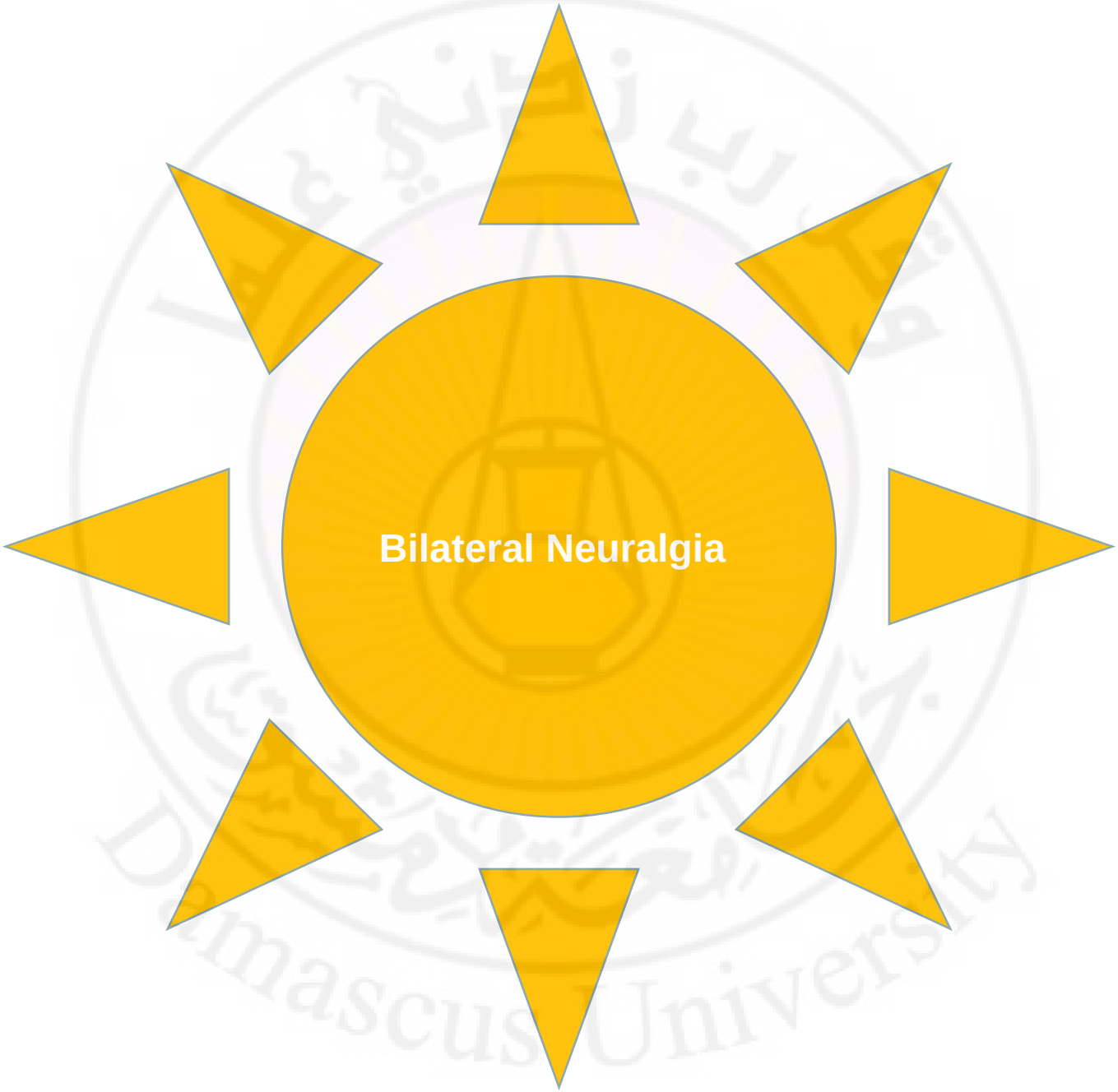
Facial palsy causes have been encompassed into four possible mechanisms: genetic, due to hereditary factors that have shown to be important. Vascular, where the edema occurs due to insufficient blood supply. Infectious causes. Undetermined etiologies and autoimmune processes. Table 1 lists the peripheral facial palsy, and Table 2 lists bilateral facial palsy causes found in the literature [2, 11, 12, 16]. Moreover, viral infections, ischemia, or autoimmune diseases have been postulated as possible pathomechanisms for Bell’s palsy



Before



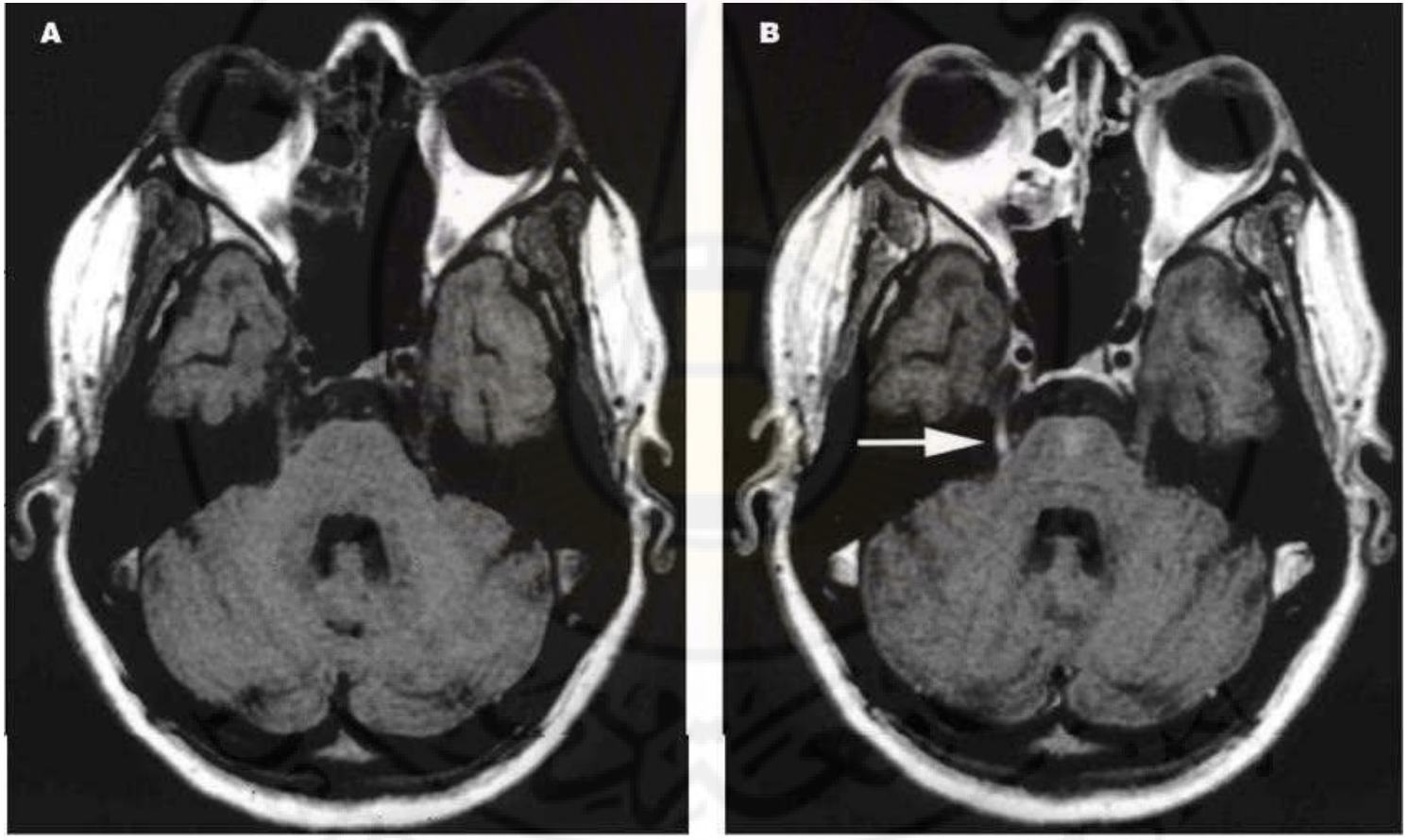

Red Flag Warning

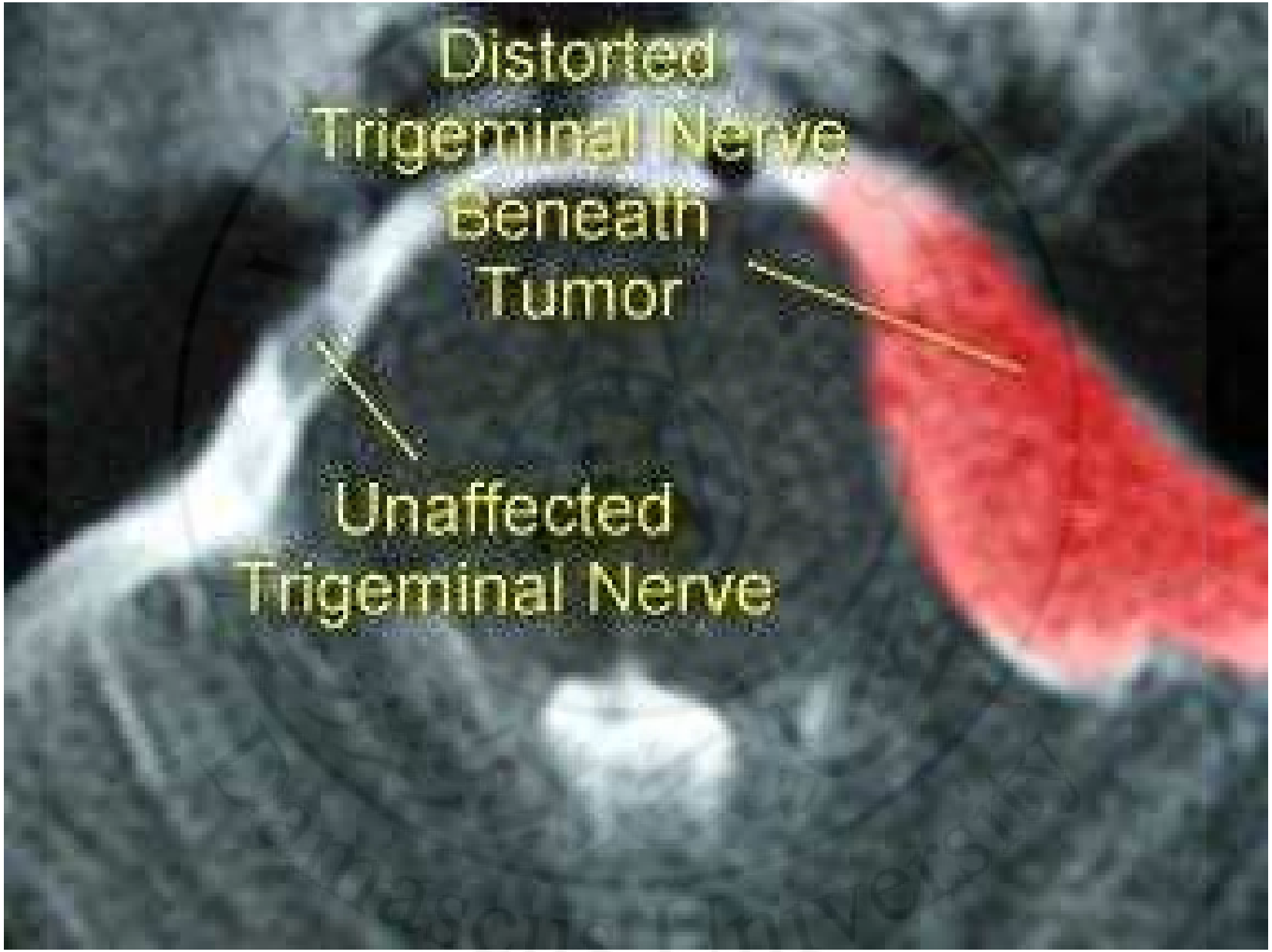

Bilateral Neuralgia

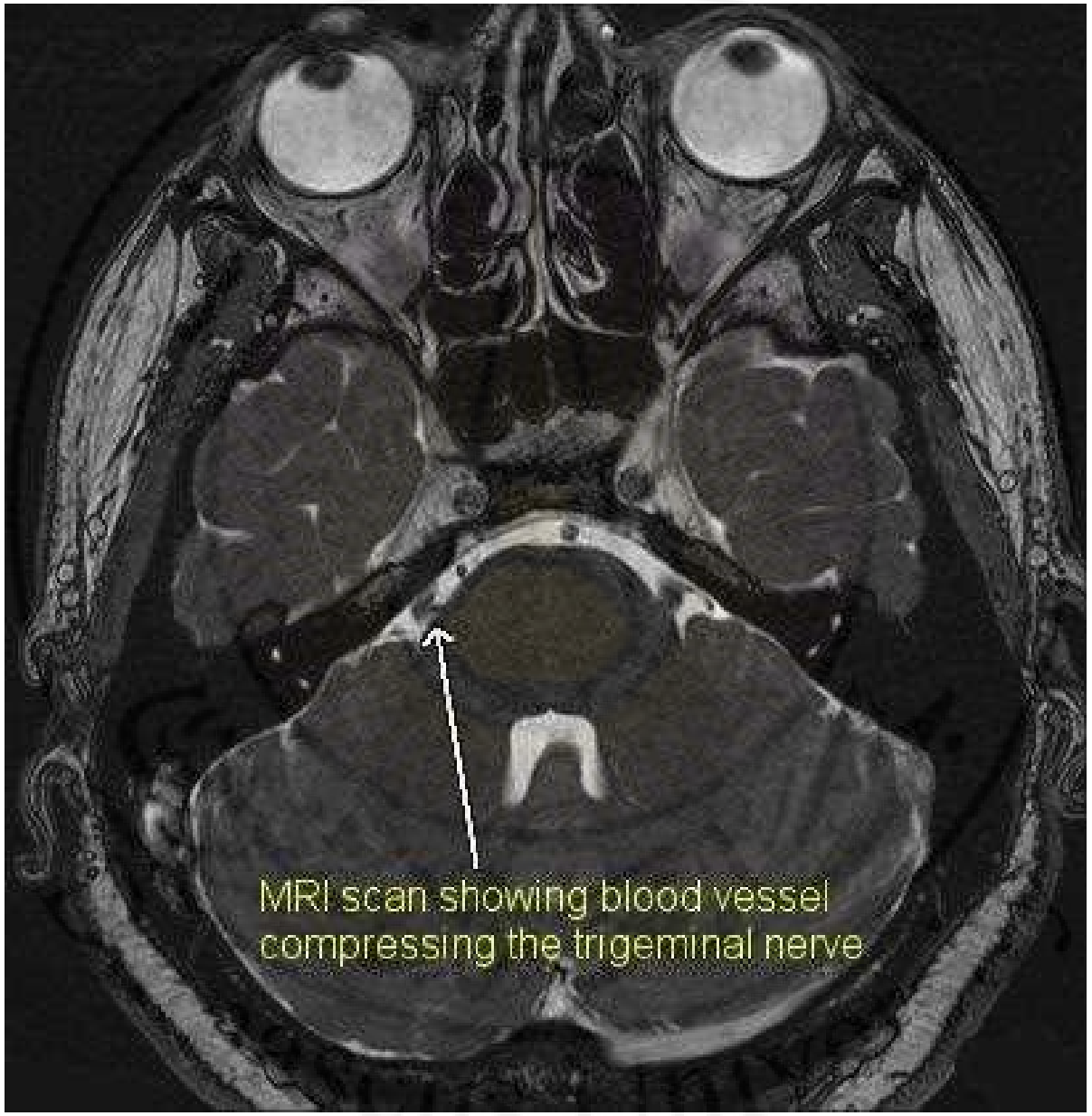
Neuralgia in young Patient

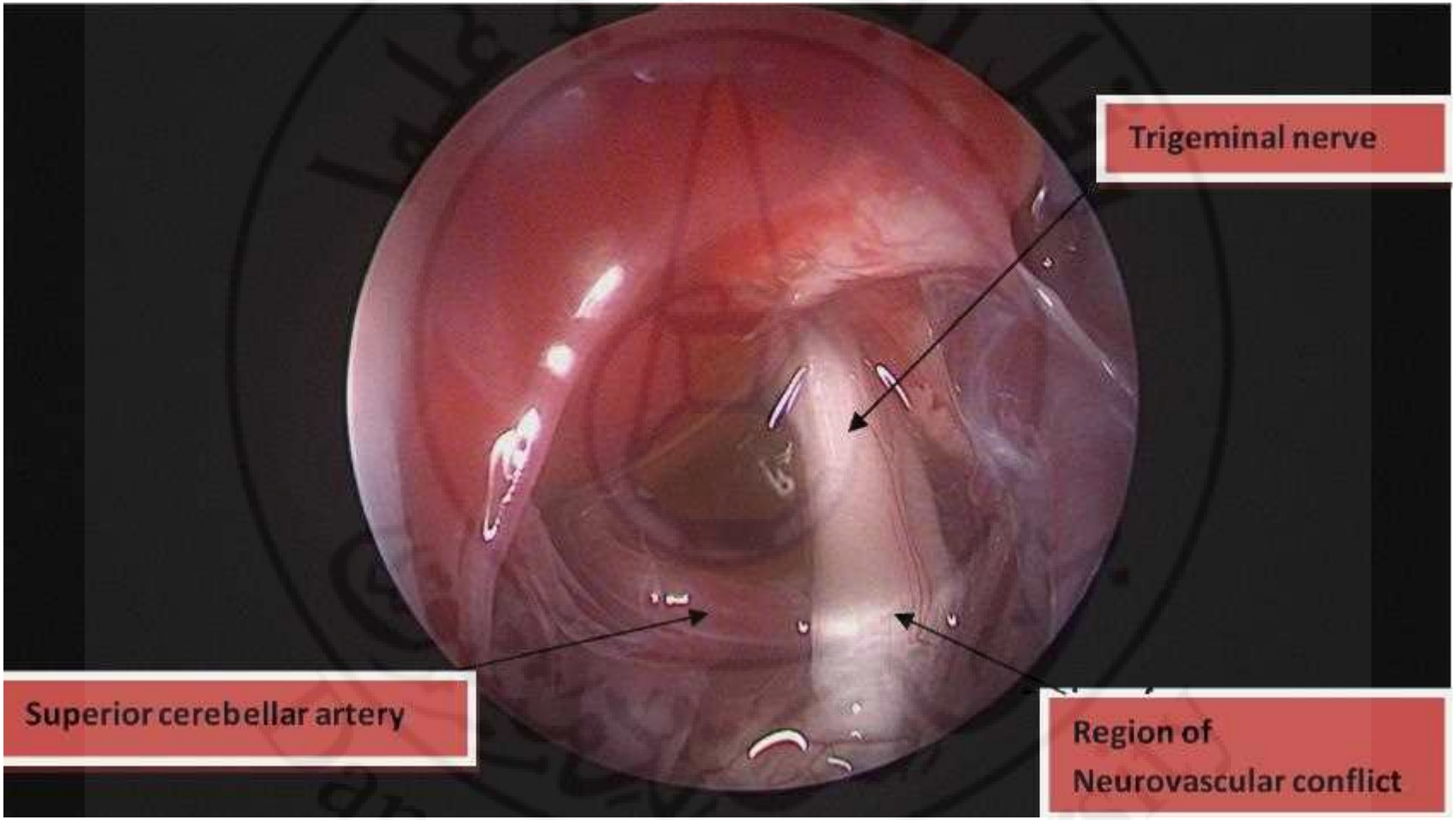
Trigeminal Neuralgia in the first branch

Enhancement of the trigeminal nerve on MRI in patients with multiple sclerosis




Distorted
Trigeminal Nerve
beneath
Tumor
Unaffected
Trigeminal Nerve


MRI scan showing blood vessel
compressing the trigeminal nerve


Trigeminal nerve
Superior cerebellar artery
Region of
Neurovascular conflict

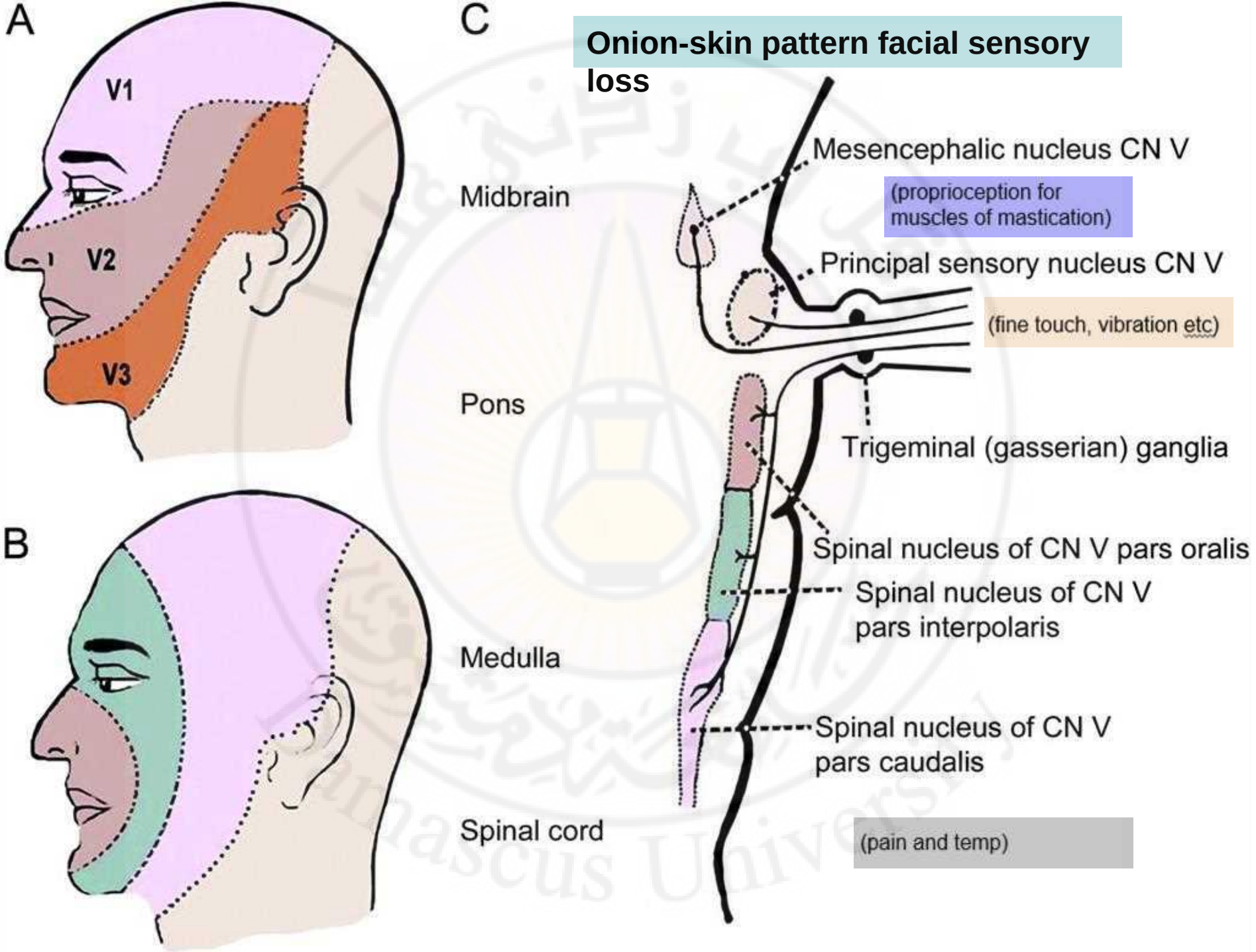


Herpes Zoster (V1 Distribution of Trigeminal Nerve)

Physical examination revealed graded loss of pain and temperature over the left half of her face with central sparing (an onion-skin distribution)



This segmental pattern of trigeminal sensory loss, in contrast to the divisional pattern, reflects the rostral-caudal somatotopic arrangement in the spinal tract nucleus of the trigeminal nerve with the perioral area represented rostrally and the lateral face caudally and helps in anatomic localization.

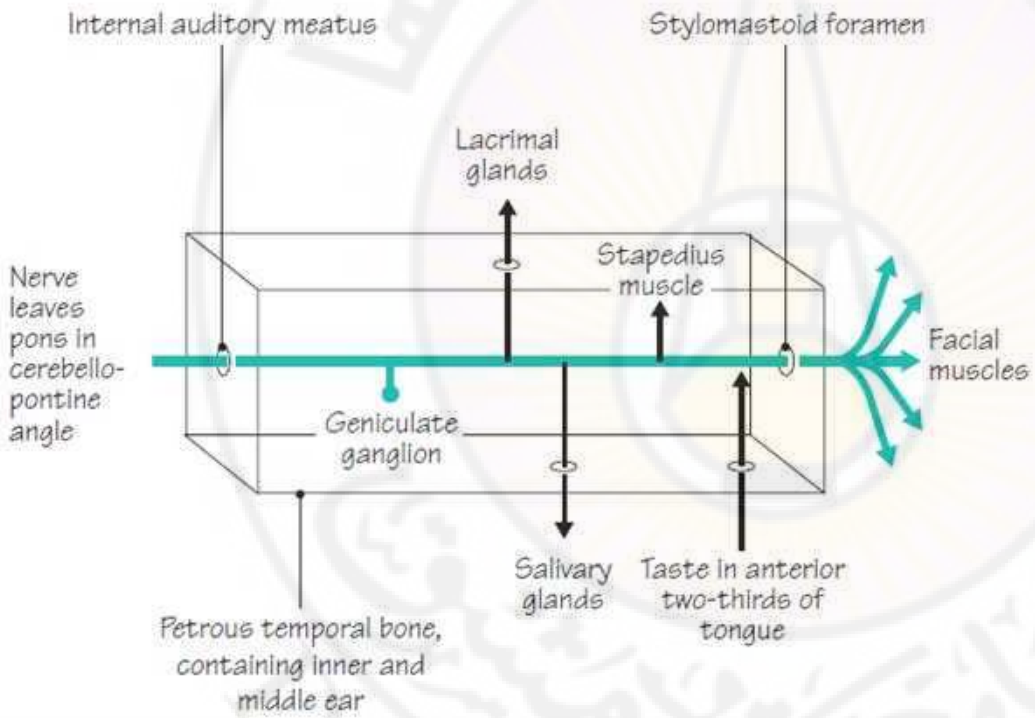

A
V1
V2
V3
B
C
Onion-skin pattern facial sensory loss
Midbrain
Pons
Medulla
Spinal cord
Mesencephalic nucleus CN V
(proprioception for muscles of mastication)
Principal sensory nucleus CN V
(fine touch, vibration etc)
Trigeminal (gasserian) ganglia
Spinal nucleus of CN V pars oralis
Spinal nucleus of CN V pars interpolaris
Spinal nucleus of CN V pars caudalis
(pain and temp)

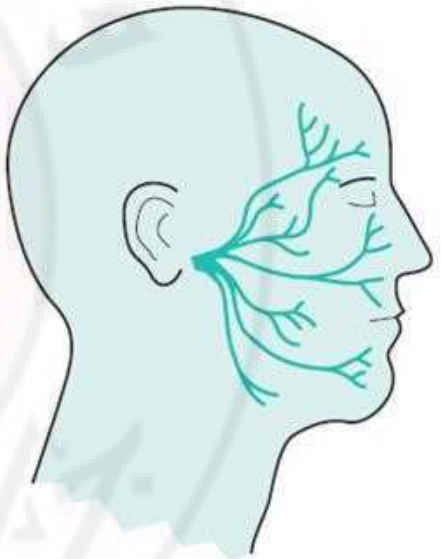
Facial Nerve Muscles

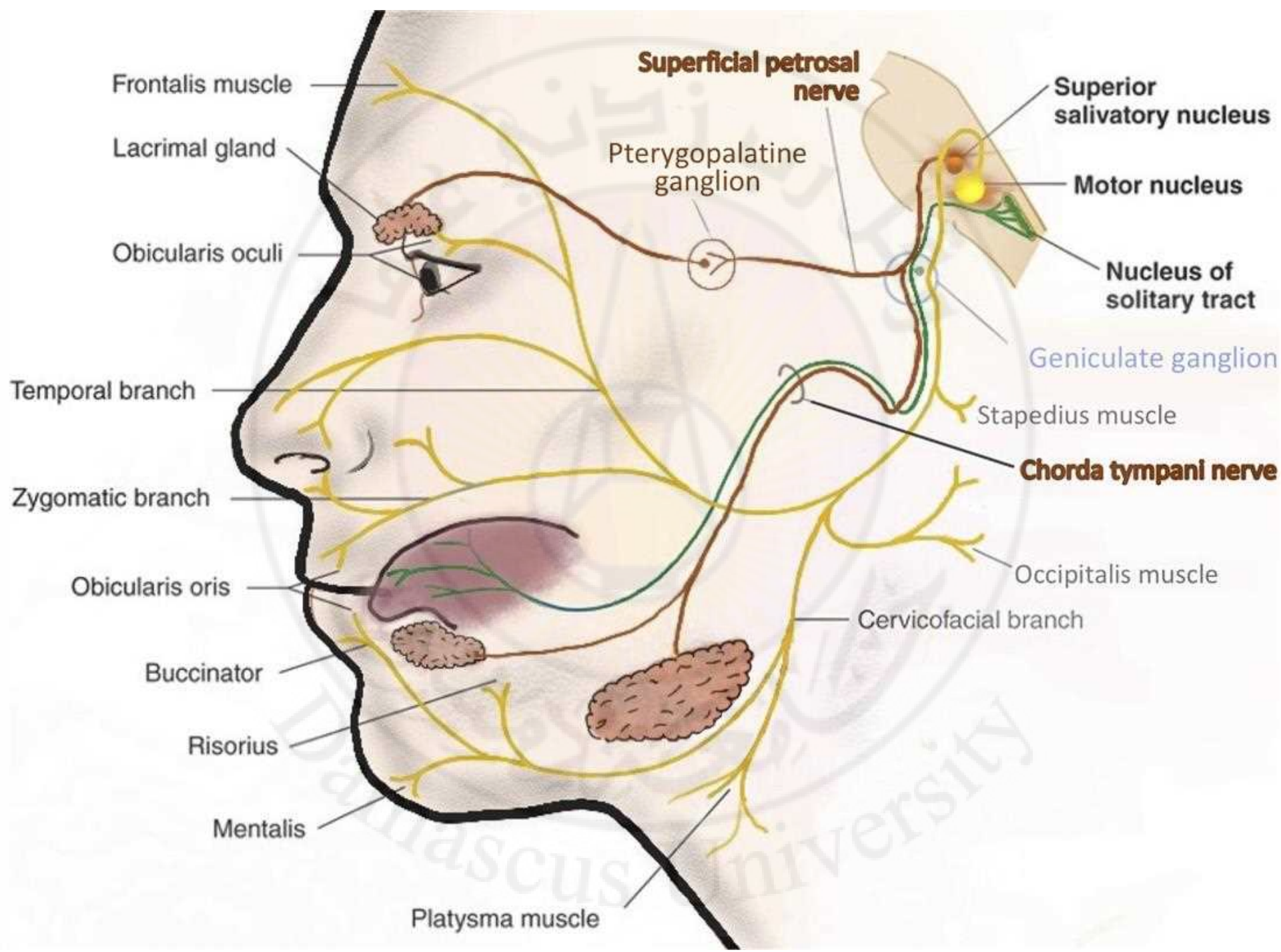


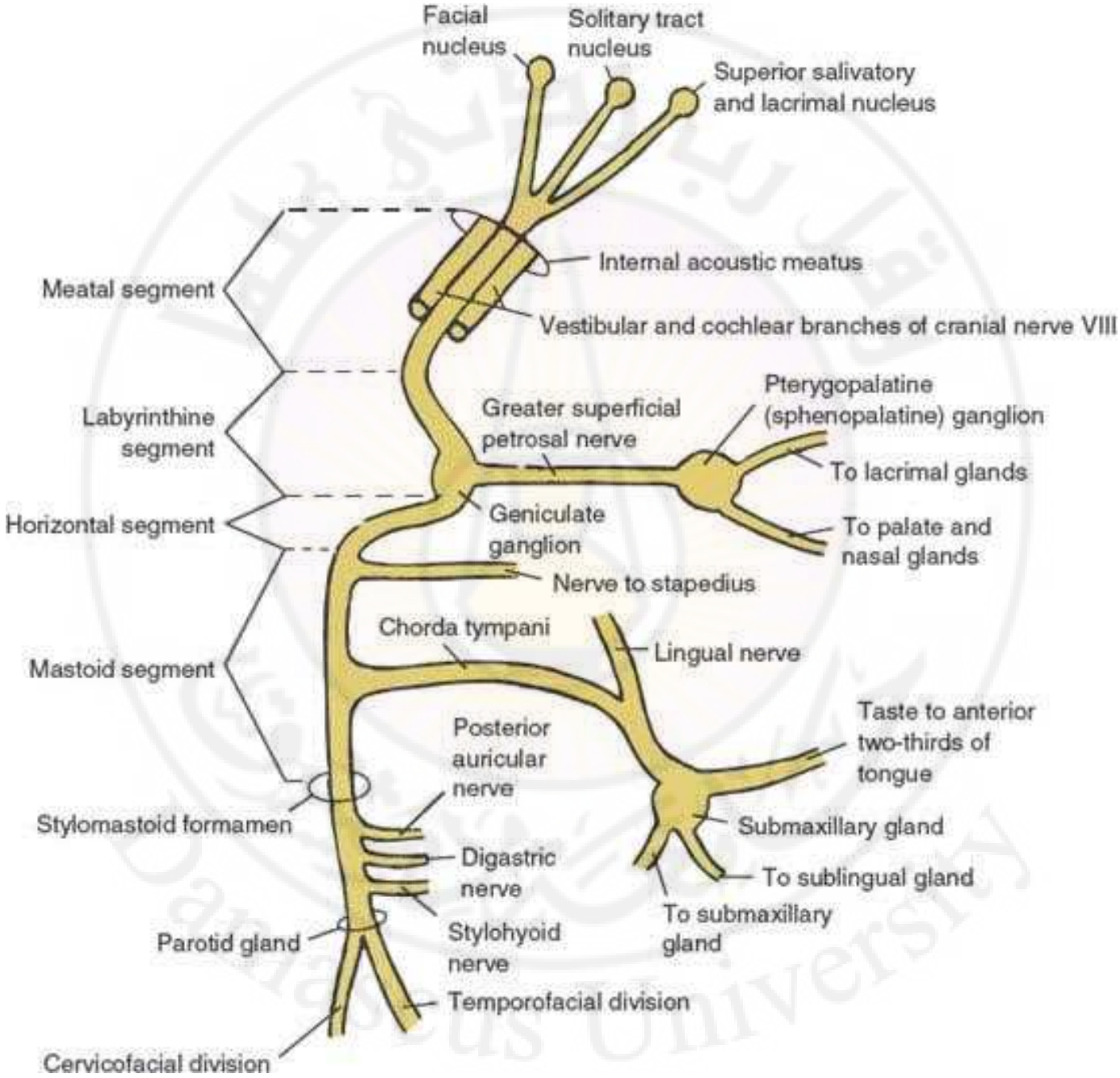
MUSCLES OF THE FACIAL EXPRESSIONS

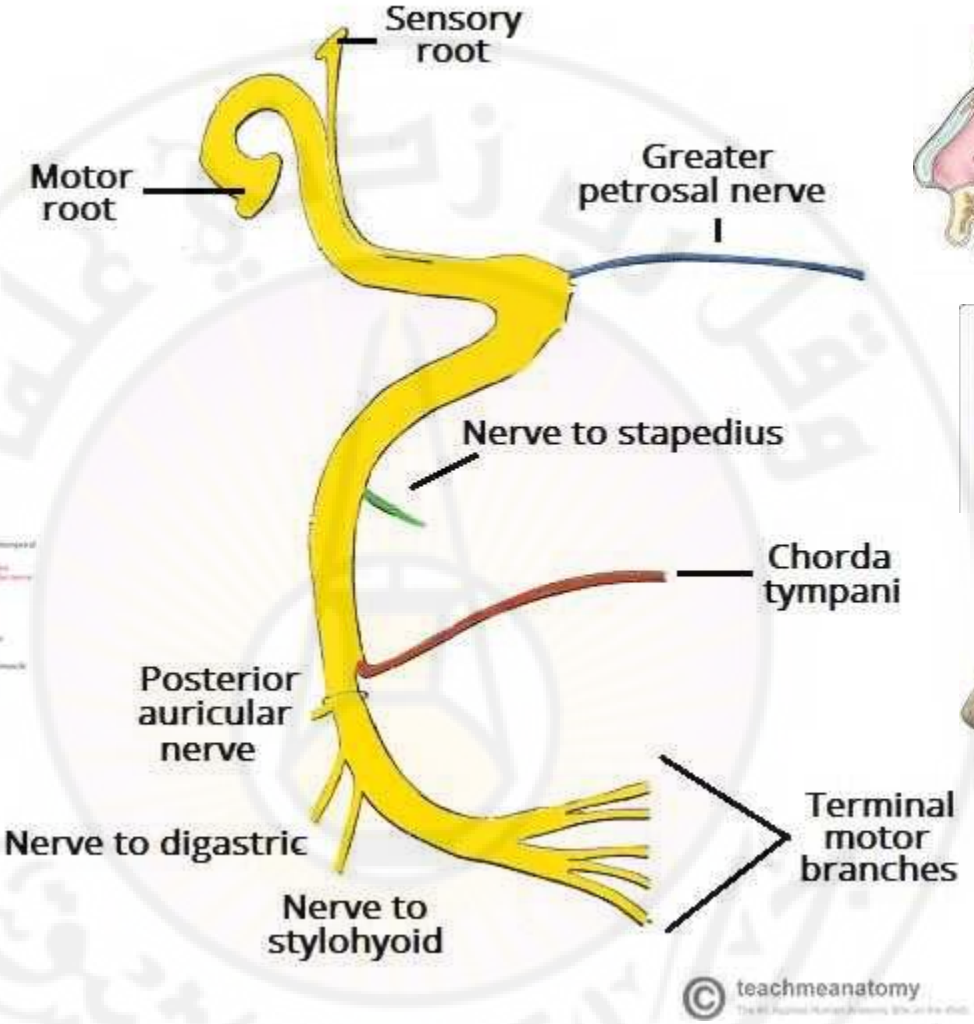


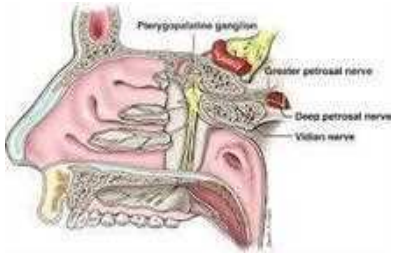

Internal auditory meatus
Stylomastoid foramen
Lacrimal glands
Stapedius muscle
Nerve leaves pons in cerebello-pontine angle
Facial muscles
Geniculate ganglion
Salivary glands
Taste in anterior two-thirds of tongue
Petrous temporal bone, containing inner and middle ear

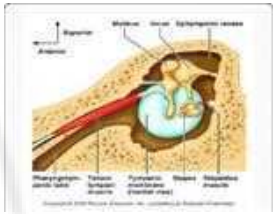


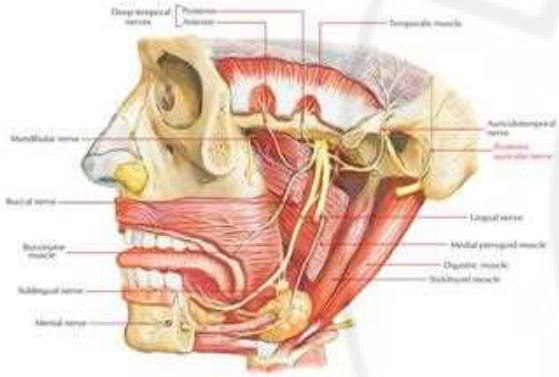

Frontalis muscle
Lacrimal gland
Obicularis oculi
Temporal branch
Zygomatic branch
Obicularis oris
Buccinator
Risorius
Mentalis
Platysma muscle
Superficial petrosal nerve
Pterygopalatine ganglion
Superior salivatory nucleus
Motor nucleus
Nucleus of solitary tract
Geniculate ganglion
Stapedius muscle
Chorda tympani nerve
Occipitalis muscle
Cervicofacial branch

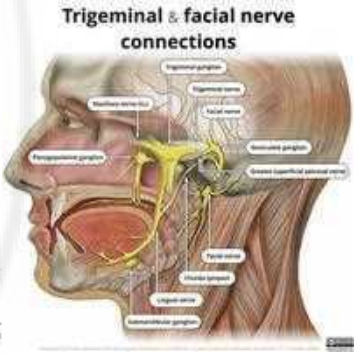

Facial nucleus
Solitary tract nucleus
Superior salivatory and lacrimal nucleus
Internal acoustic meatus
Meatal segment
Vestibular and cochlear branches of cranial nerve VIII
Pterygopalatine (sphenopalatine) ganglion
Labyrinthine segment
Greater superficial petrosal nerve
To lacrimal glands
Horizontal segment
Geniculate ganglion
To palate and nasal glands
Nerve to stapedius
Chorda tympani
Lingual nerve
Mastoid segment
Taste to anterior two-thirds of tongue
Posterior auricular nerve
Stylomastoid formamen
Submaxillary gland
Digastric nerve
To sublingual gland
To submaxillary gland
Parotid gland
Stylohyoid nerve
Temporofacial division
Cervicofacial division

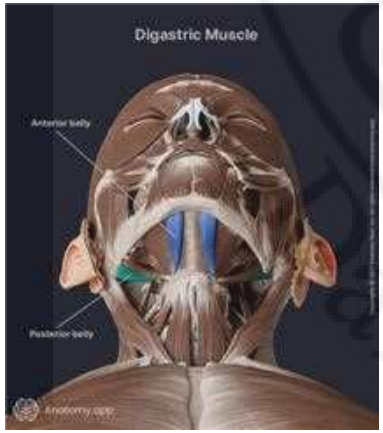

Sensory root
Motor root
Greater petrosal nerve
Nerve to stapedius
Chorda tympani
Posterior auricular nerve
Nerve to digastric
Nerve to stylohyoid
Terminal motor branches
© teachmeanatomy


Pterygopalatine ganglion
Greater petrosal nerve
Deep petrosal nerve
Vidian nerve



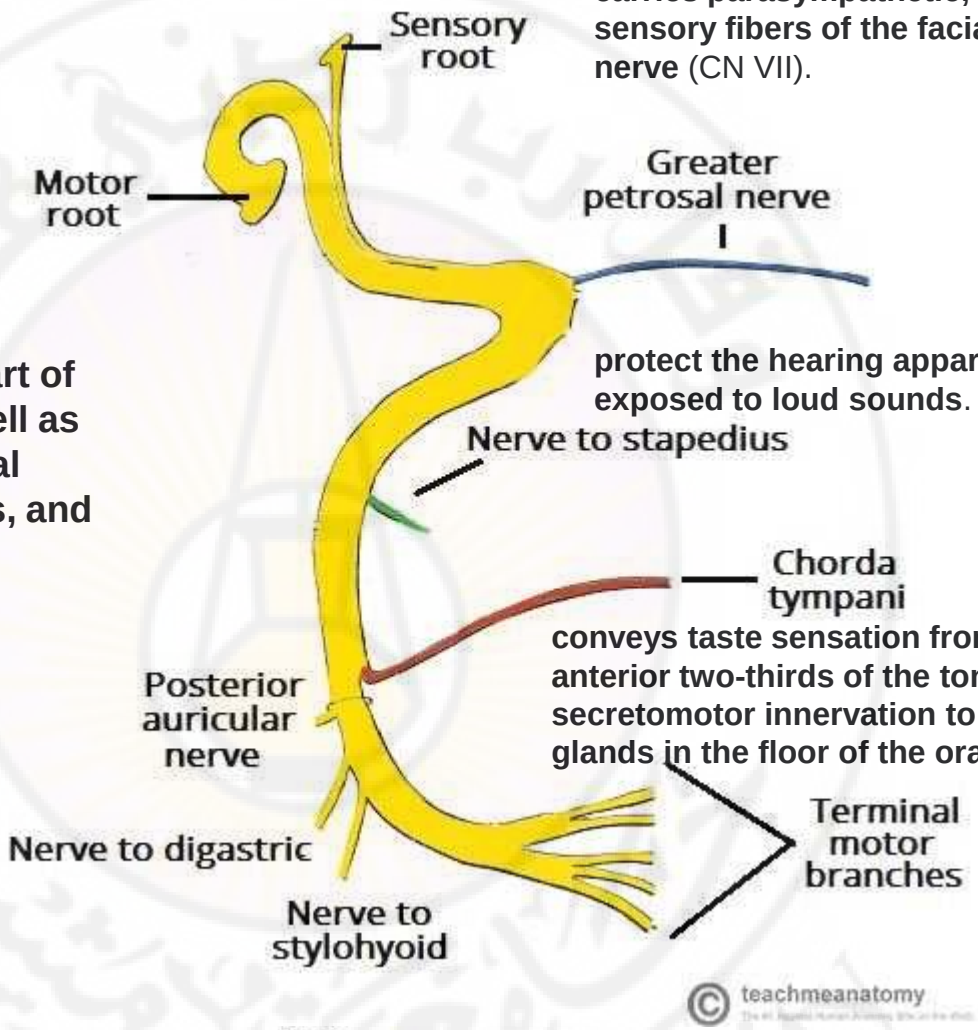



Trigeminal & facial nerve connections


Digastric Muscle
Anterior belly
Posterior belly


Digastric (anterior belly)
Mylohyoid
Stylohyoid
Geniohyoid
Digastric (posterior belly)

carries parasympathetic, taste, and sensory fibers of the facial cranial nerve (CN VII).

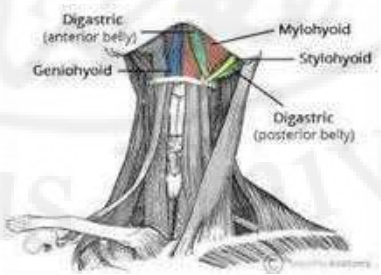


protect the hearing apparatus when exposed to loud sounds.

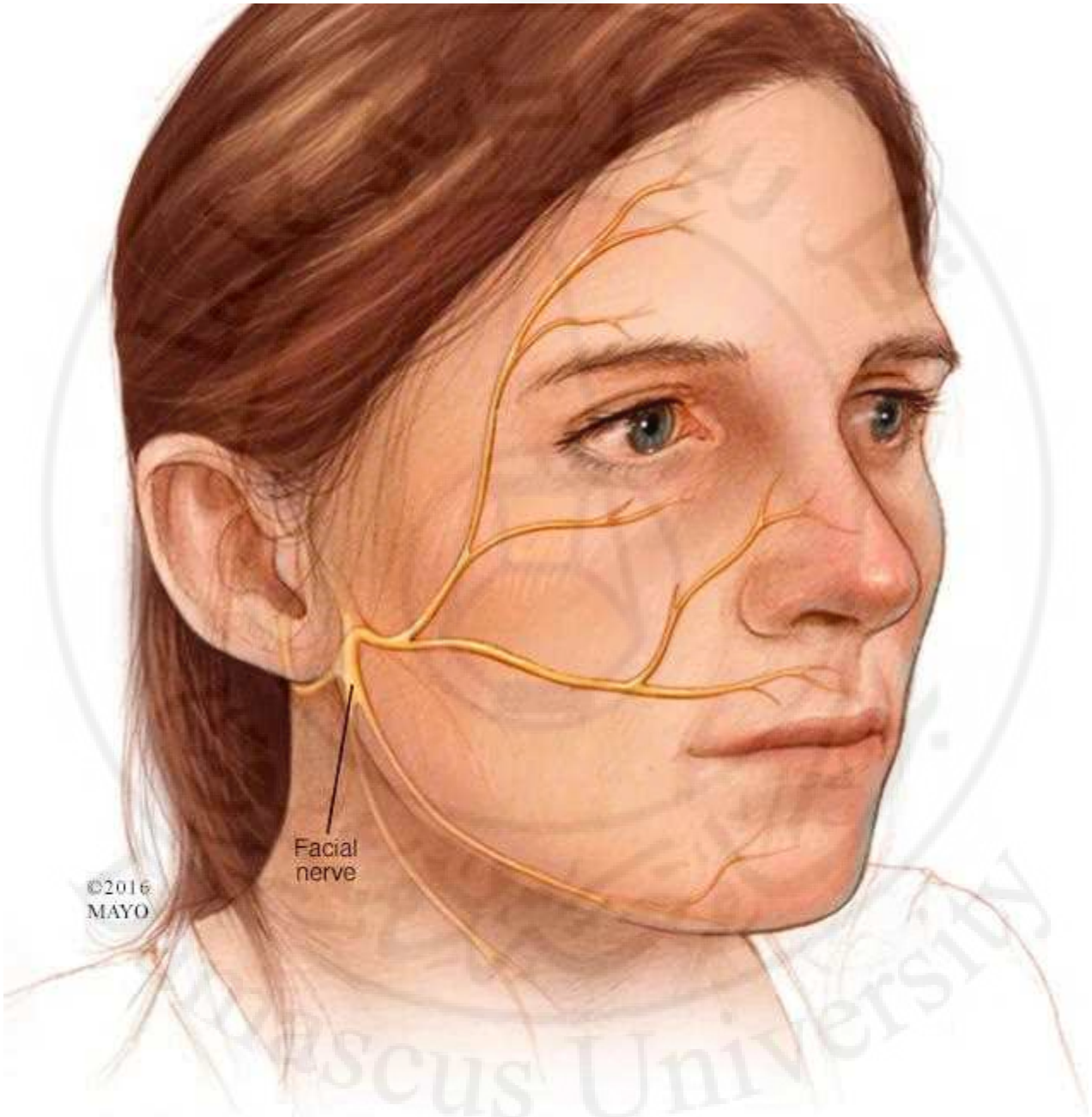
supplies the occipitalis muscle, part of the occipitofrontalis muscle, as well as the auricularis posterior (a vestigial muscle in humans), interscutularis, and intrinsic ear muscles

conveys taste sensation from the anterior two-thirds of the tongue and secretomotor innervation to the salivary glands in the floor of the oral cavity.

The digastric muscle functions during swallowing, chewing, and speech.



resulting in elevation of the base of the tongue and elongation of the floor of the mouth



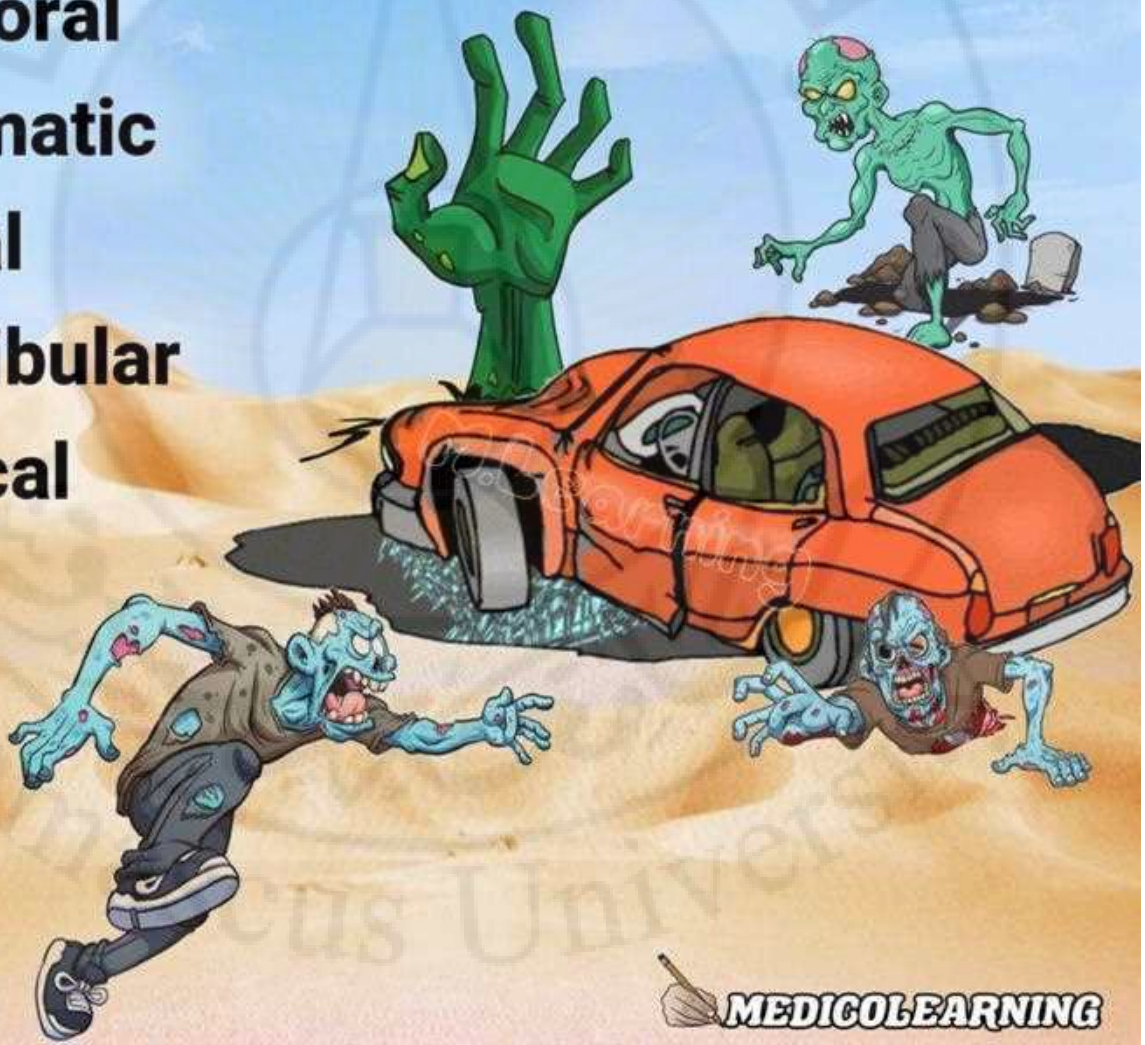
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Temporal
Zygomatic
Buccal
Mandibular
Cervical

Facial nerve Branches

mnemonic :- Two Zombies Broken My Car

- **T**emporal
- **Z**ygomatic
- **B**uccal
- **M**andibular
- **C**ervical

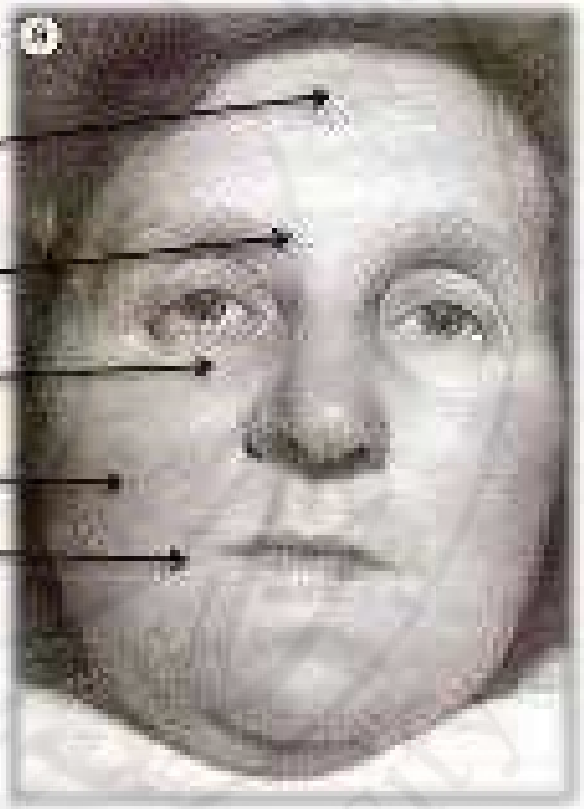


MEDICOLEARNING

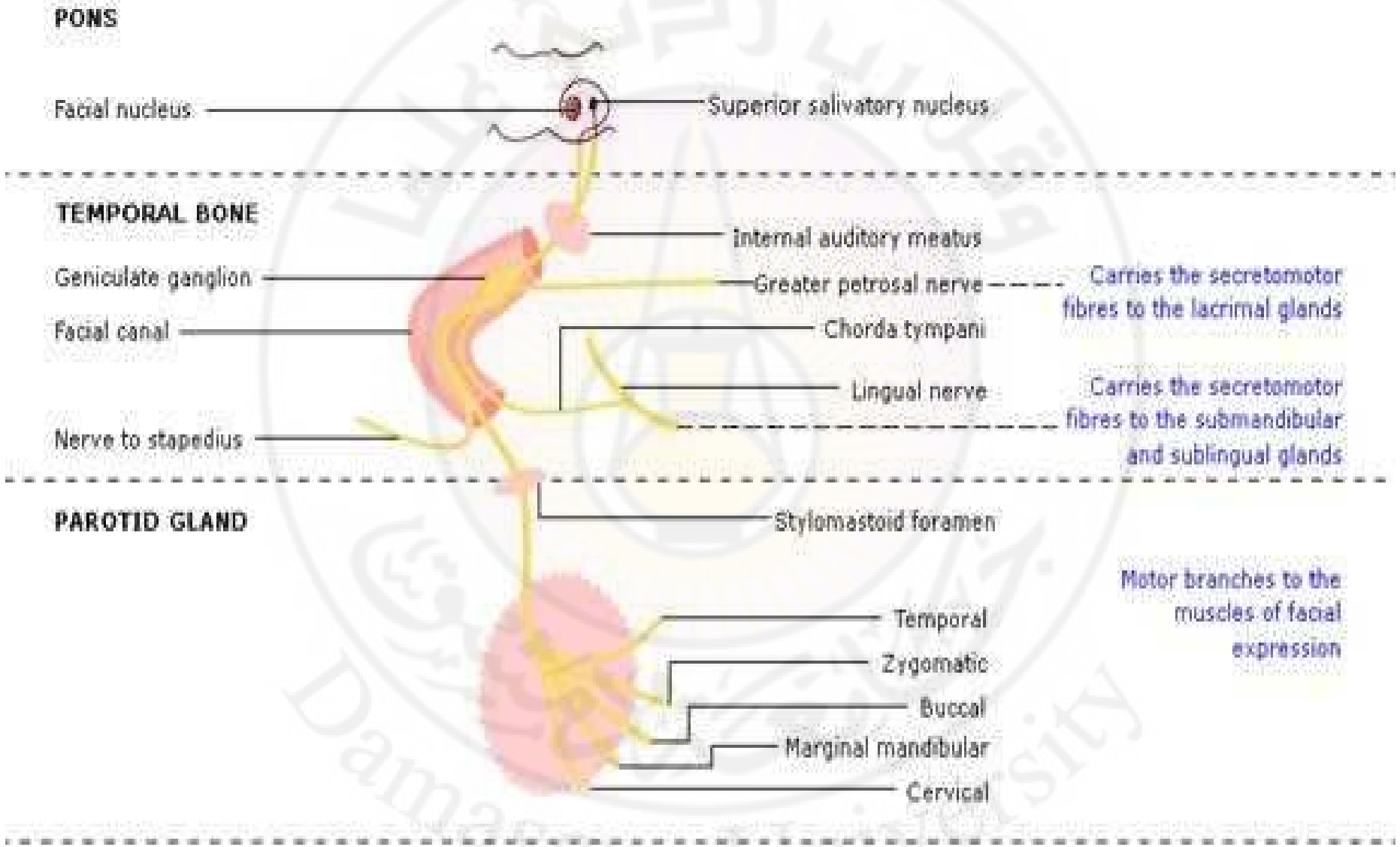
Clinical Examination of the facial nerve

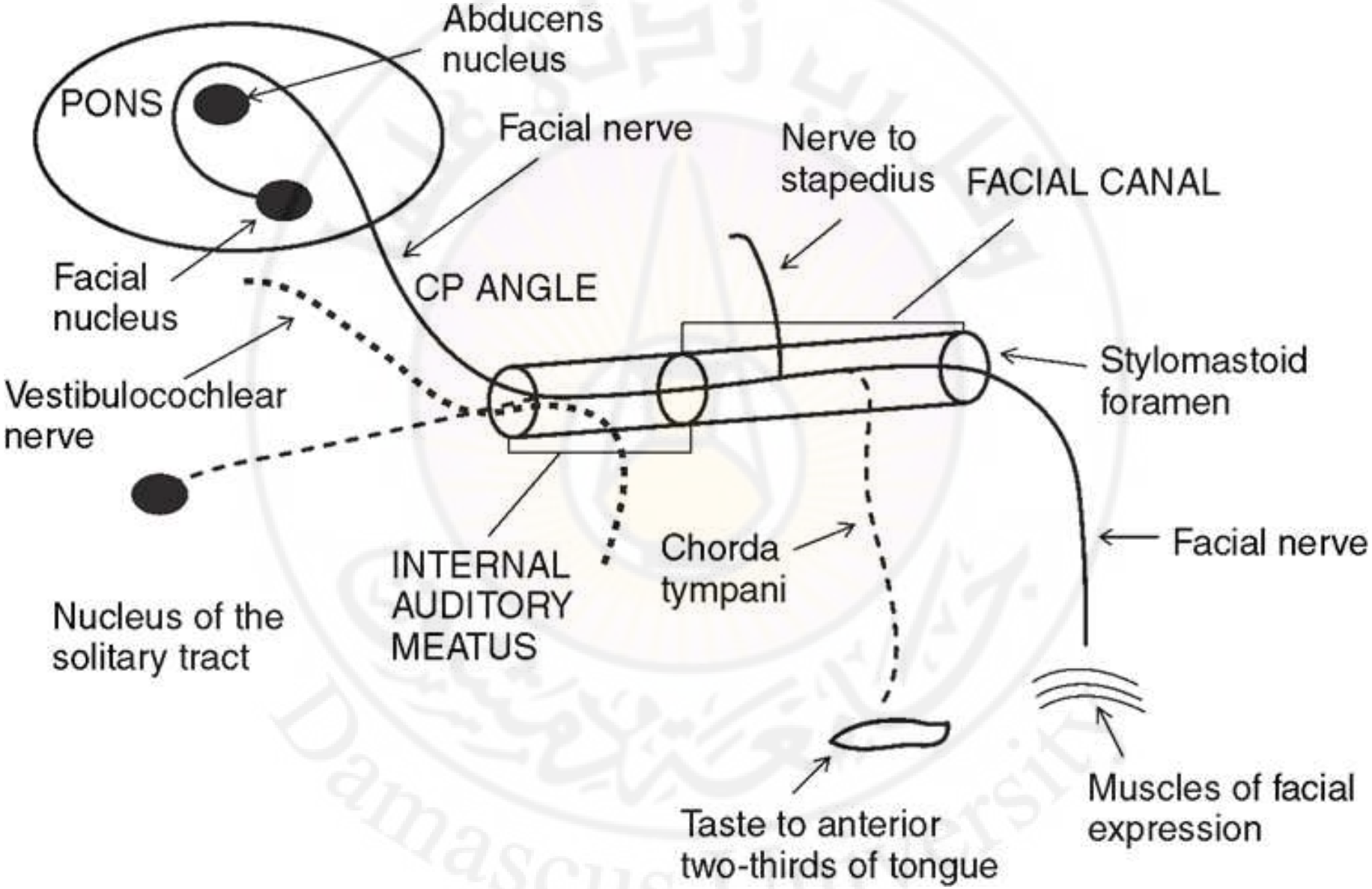
Motor

- Frontalis,
- Corrugator Supercilii
- Orbicularis oculi
- Buccinator
- Orbicularis Oris
- Platysma



Damascus University


PONS
Facial nucleus
Superior salivatory nucleus
TEMPORAL BONE
Internal auditory meatus
Geniculate ganglion
Greater petrosal nerve
Carries the secretomotor fibres to the lacrimal glands
Facial canal
Chorda tympani
Lingual nerve
Carries the secretomotor fibres to the submandibular and sublingual glands
Nerve to stapedius
PAROTID GLAND
Stylomastoid foramen
Motor branches to the muscles of facial expression
Temporal
Zygomatic
Buccal
Marginal mandibular
Cervical


Abducens nucleus
PONS
Facial nerve
Nerve to stapedius
FACIAL CANAL
Facial nucleus
CP ANGLE
Vestibulocochlear nerve
Stylomastoid foramen
INTERNAL AUDITORY MEATUS
Chorda tympani
Facial nerve
Nucleus of the solitary tract
Taste to anterior two-thirds of tongue
Muscles of facial expression

Muscles paralysed	Lacrimation	Hyperacusis	Sense of taste	Other features	Probable site of lesion	Type of lesion
Lower face	N	-	N	Emotional movement retained + monoparesis or hemiparesis + aphasia	Upper motor neurone (UMN)	Stroke (cerebrovascular accident) Brain tumour Trauma HIV infection
All facial muscles	-	+	-	+ VIth nerve damage	Lower motor neurone (LMN) Facial nucleus	Multiple sclerosis
All facial muscles	-	+	-	+ VIIIth nerve damage	Between nucleus and geniculate ganglion	Fractured base of skull Posterior cranial fossa tumours Sarcoidosis
All facial muscles	N	+	N or -	-	Between geniculate ganglion and stylomastoid canal	Otitis media Cholesteatoma Mastoiditis
All facial muscles	N	-	N	-	In stylomastoid canal or extracranially	Bell's palsy Trauma Local analgesia (eg misplaced inferior dental block) Parotid malignant neoplasm Guillain-Barre syndrome
Isolated facial muscles	N	-	N	-	Branch of facial nerve extracranially	Trauma Local analgesia

N = normal + = present - = reduced

Ask the patient to close his eyes tightly & try to open them by applying gentle upwards pressure (orbicularis oculi).

Ask the patient to show his teeth & look for any deviation of the angle of the mouth (orbicularis oris).

Ask the patient to puff out his cheeks & tap your finger on his inflated cheek (buccinator).

Ask the patient to whistle.

Check the (platysma) by asking the patient to clench teeth.



Crease up the forehead



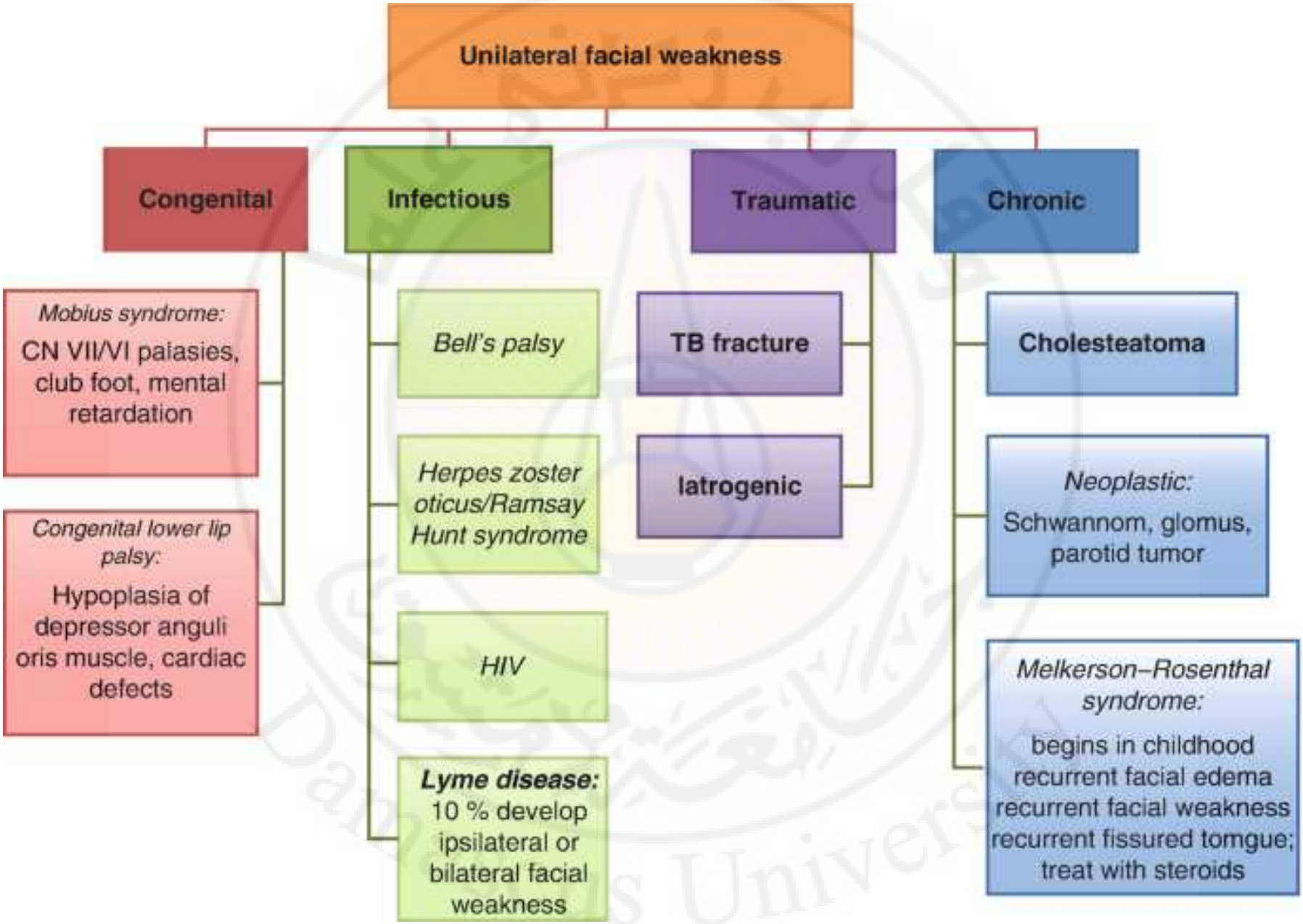
Keep eyes closed against resistance



Reveal the teeth

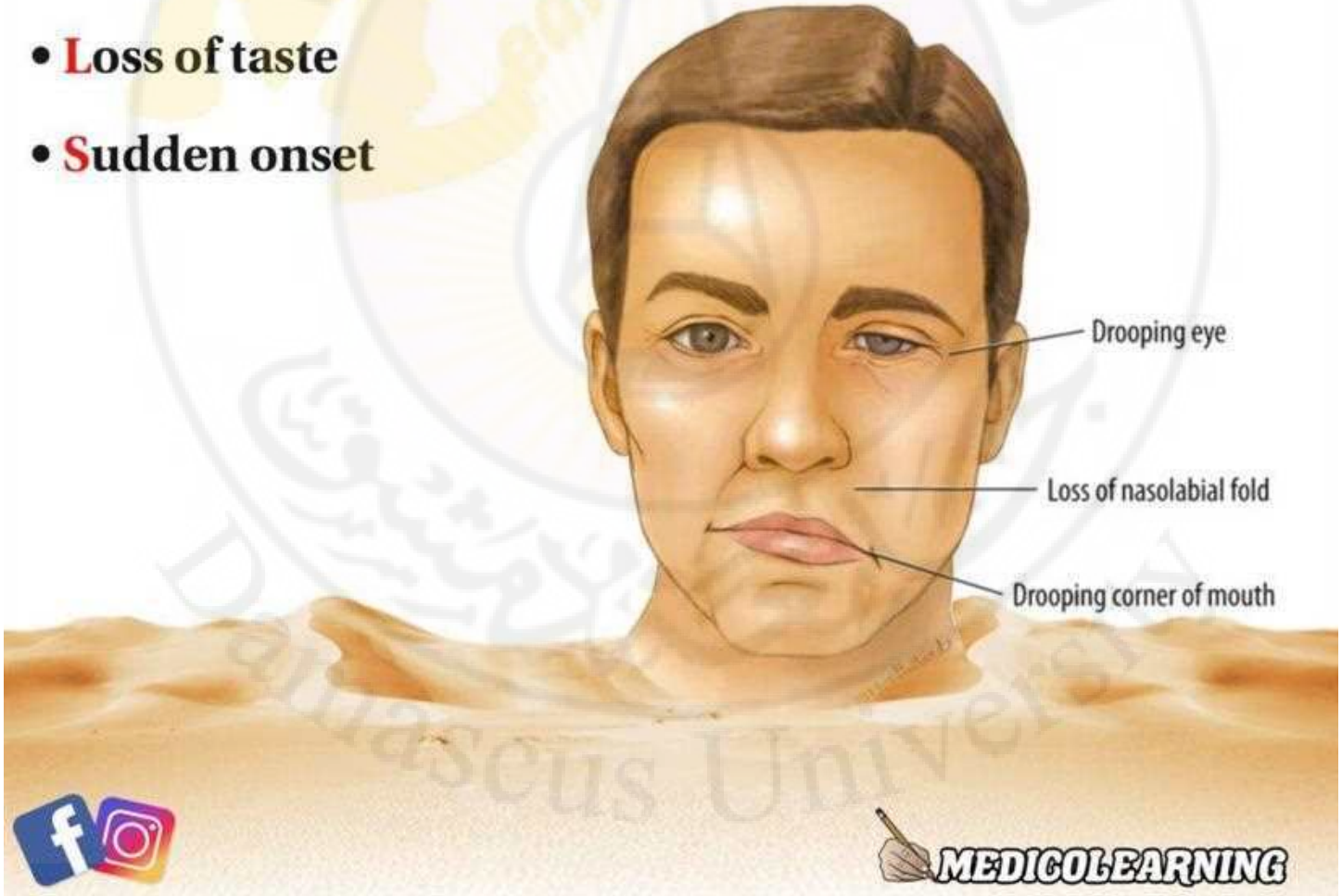


Puff out the cheeks


Unilateral facial weakness
Congenital
Infectious
Traumatic
Chronic
Mobius syndrome:
CN VII/VI palasies, club foot, mental retardation
Congenital lower lip palsy:
Hypoplasia of depressor anguli oris muscle, cardiac defects
Bell's palsy
Herpes zoster oticus/Ramsay Hunt syndrome
HIV
Lyme disease:
10 % develop ipsilateral or bilateral facial weakness
TB fracture
Iatrogenic
Cholesteatoma
Neoplastic:
Schwannom, glomus, parotid tumor
Melkerson–Rosenthal syndrome:
begins in childhood
recurrent facial edema
recurrent facial weakness
recurrent fissured tomgue;
treat with steroids

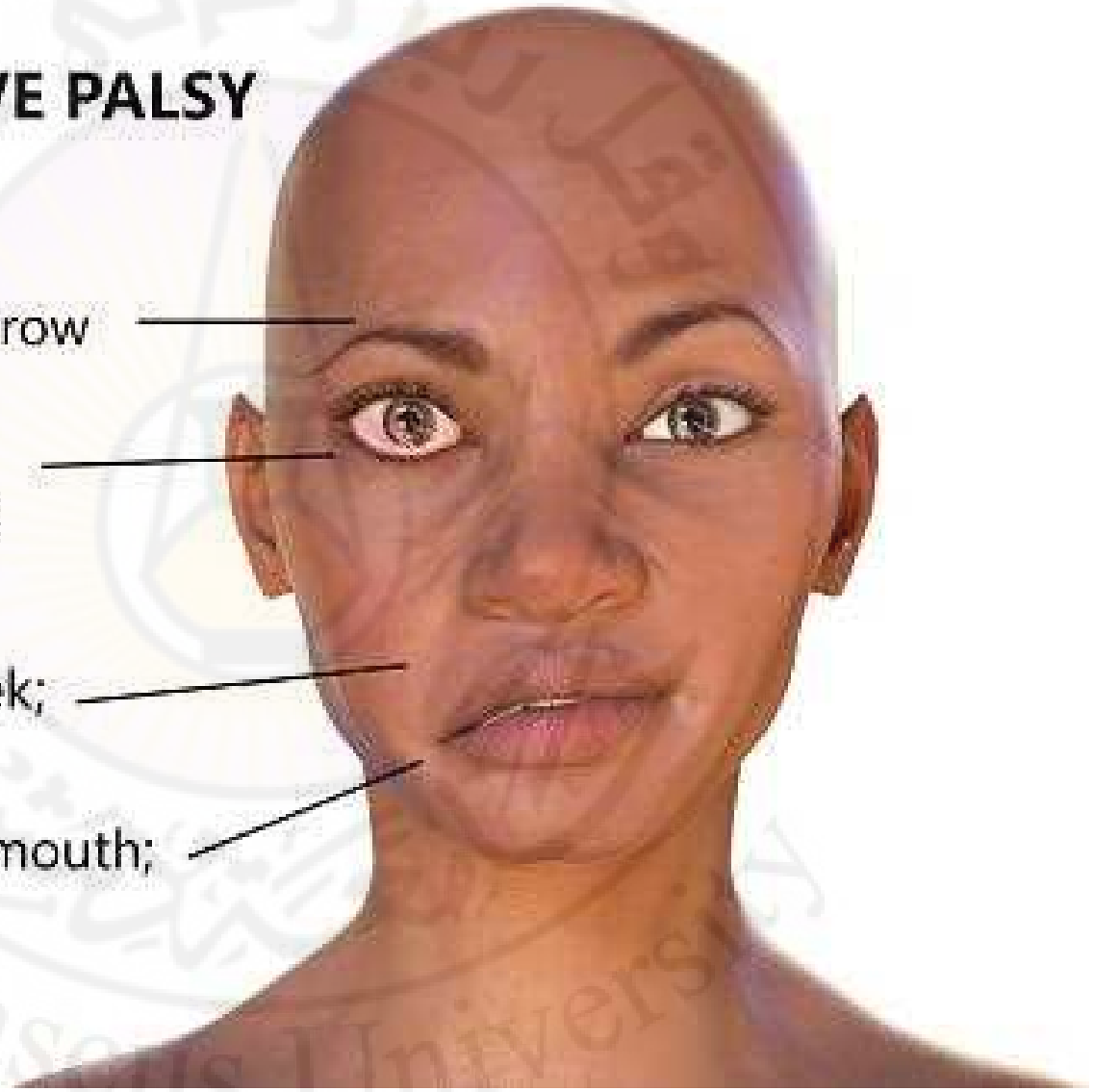
BELL'S Palsy

- **B**link reflex abnormal
- **E**arache
- **L**acrimation [deficient, excess]
- **L**oss of taste
- **S**udden onset



MEDICOLEARNING

FACIAL NERVE PALSY

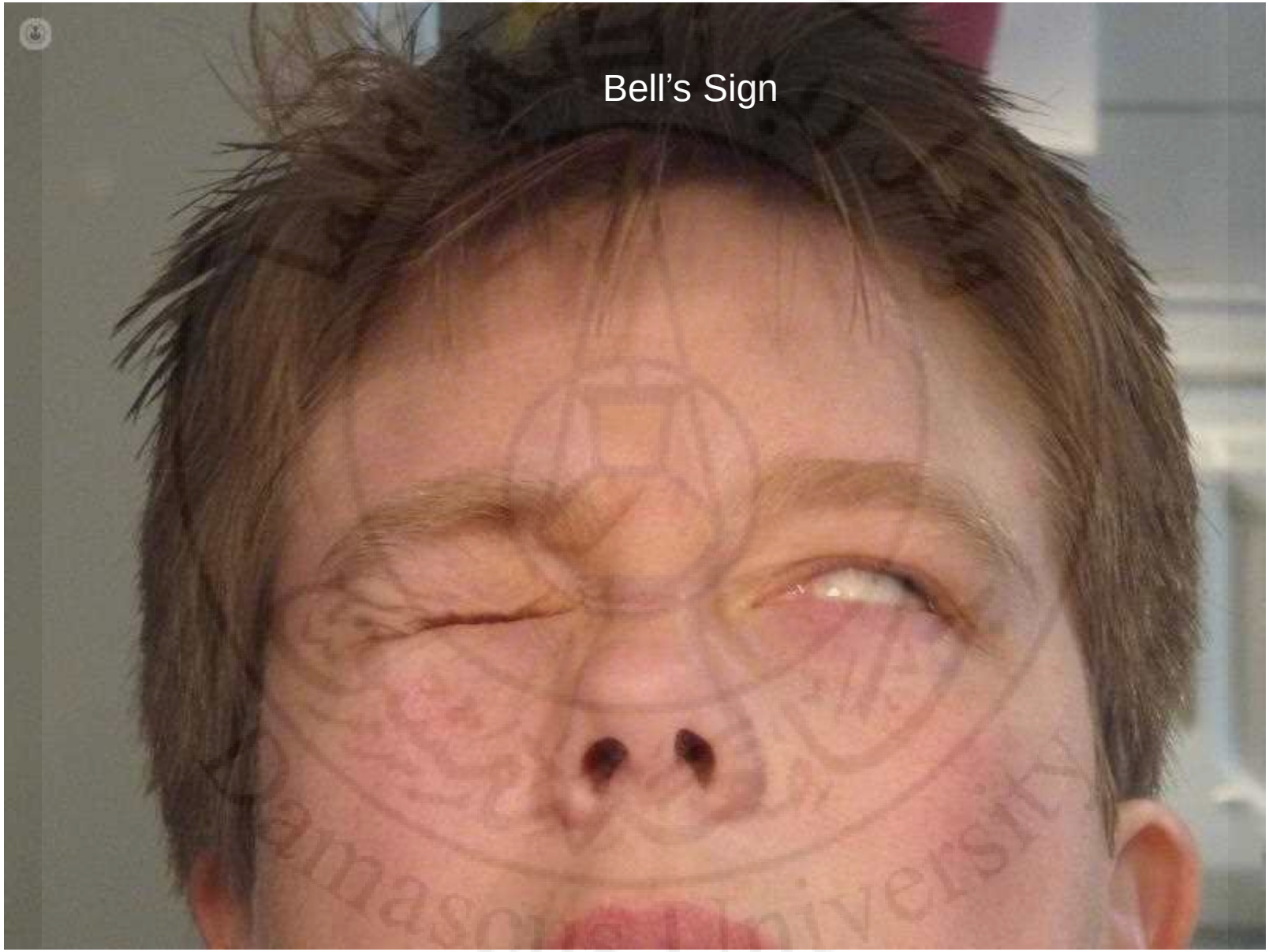


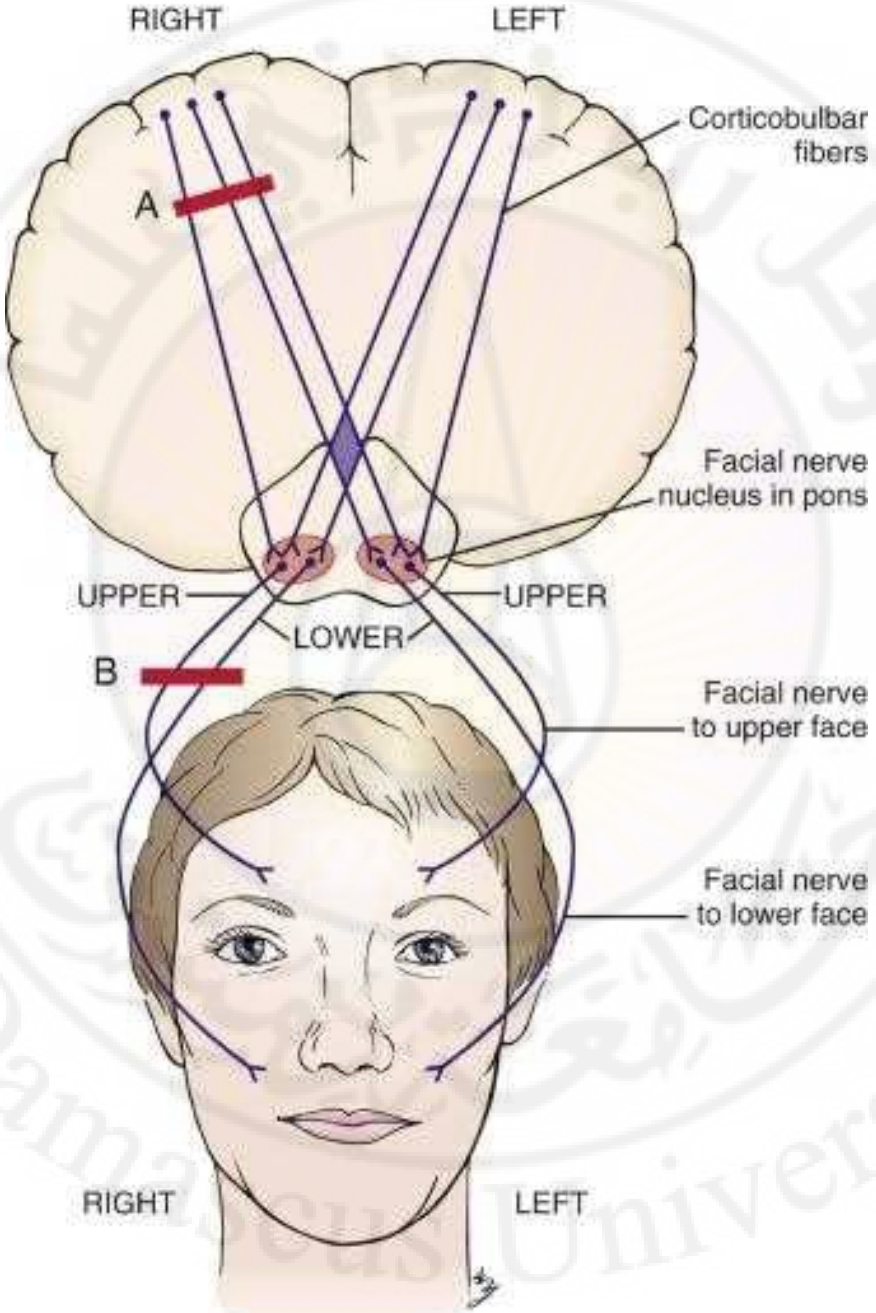
Bell's palsy

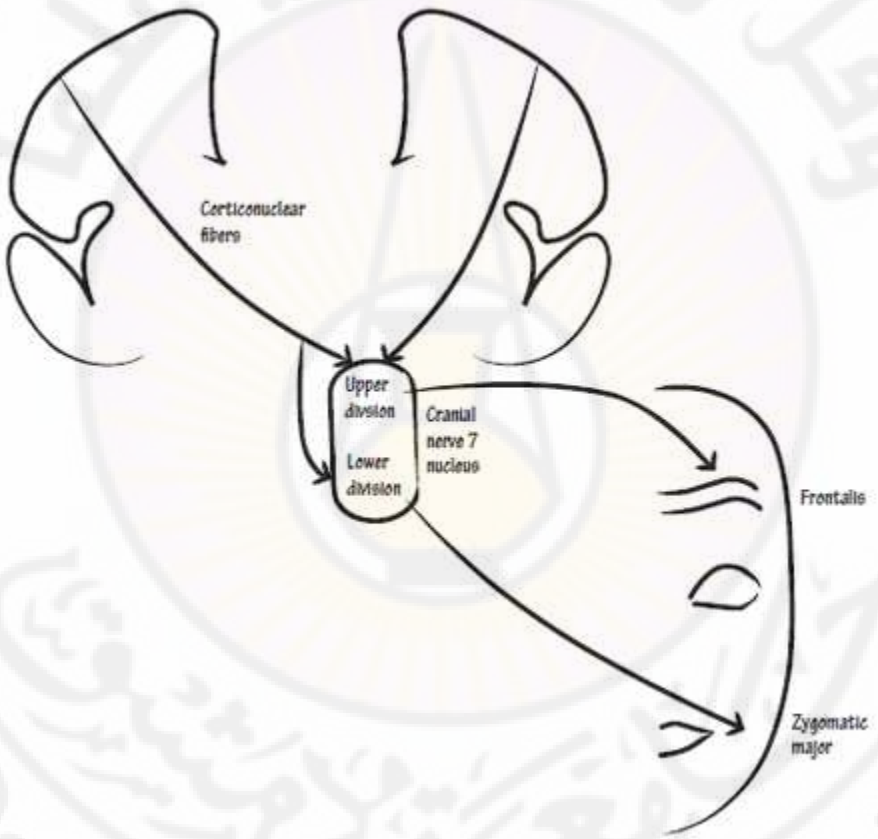
There are many different causes of Facial Nerve Palsy. However, the commonest cause of unilateral facial paralysis is the idiopathic variety known as **Bell's palsy**. (Described by Charles Bell in 1814)



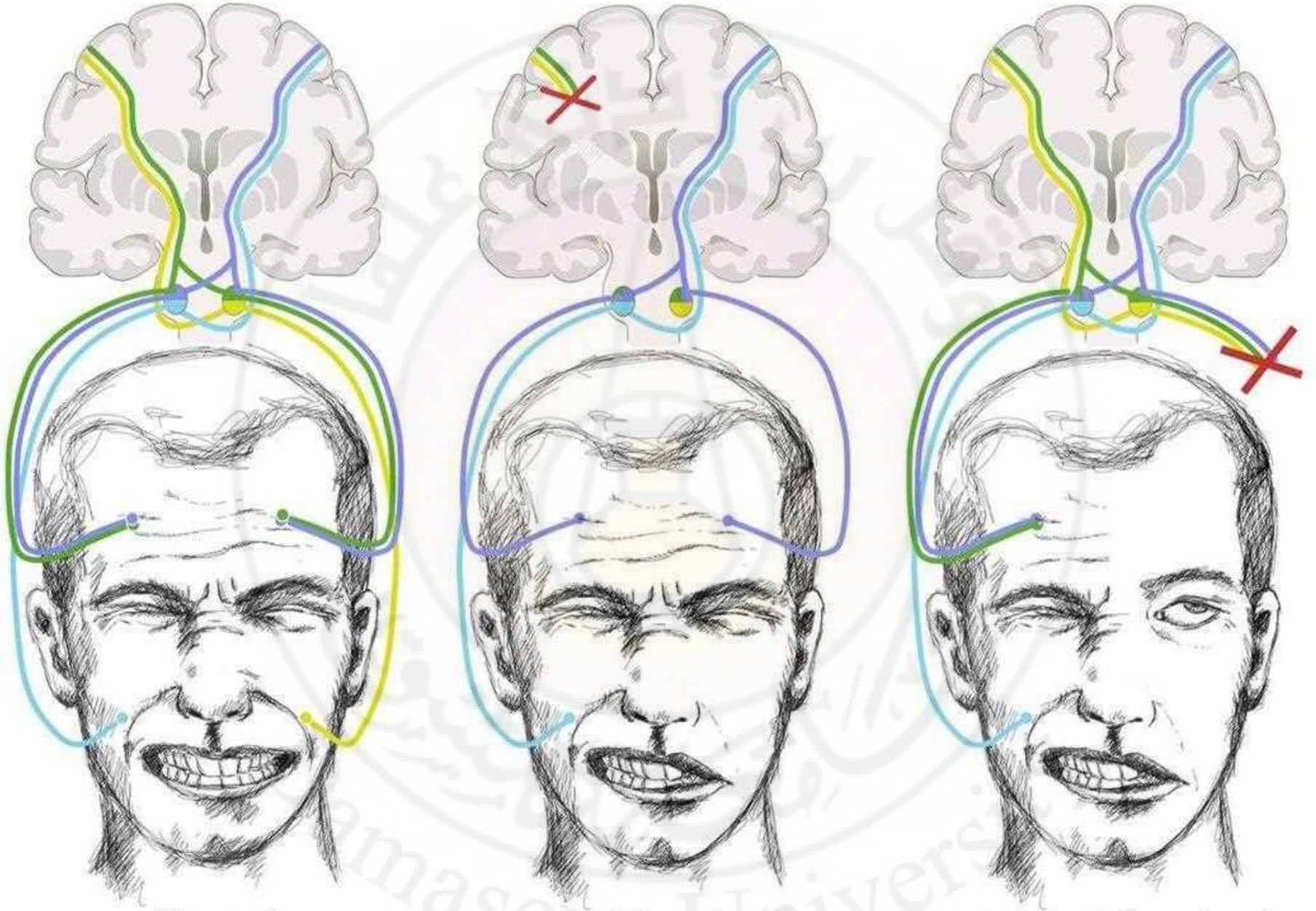
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Bell’s Sign


RIGHT
LEFT
Corticobulbar fibers
A
Facial nerve nucleus in pons
UPPER
UPPER
LOWER
B
Facial nerve to upper face
Facial nerve to lower face
RIGHT
LEFT

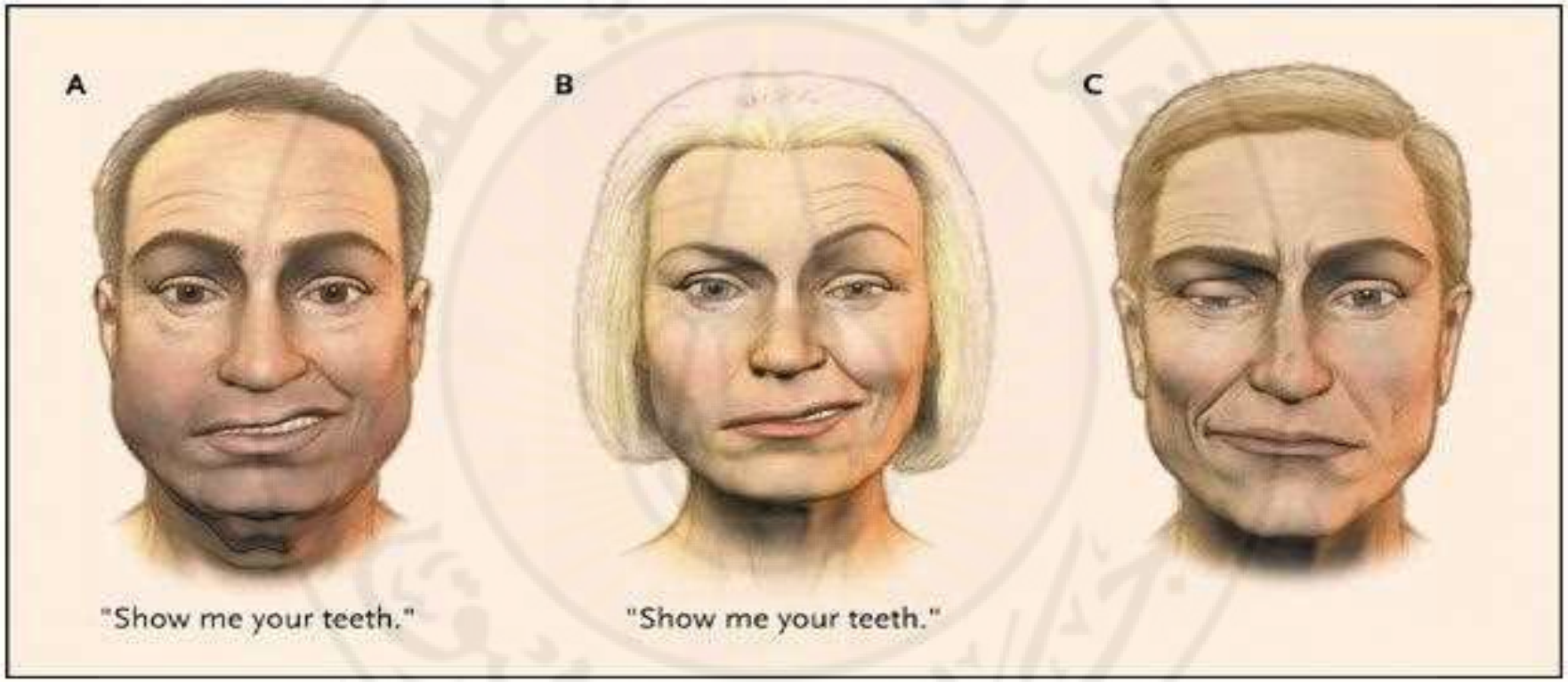


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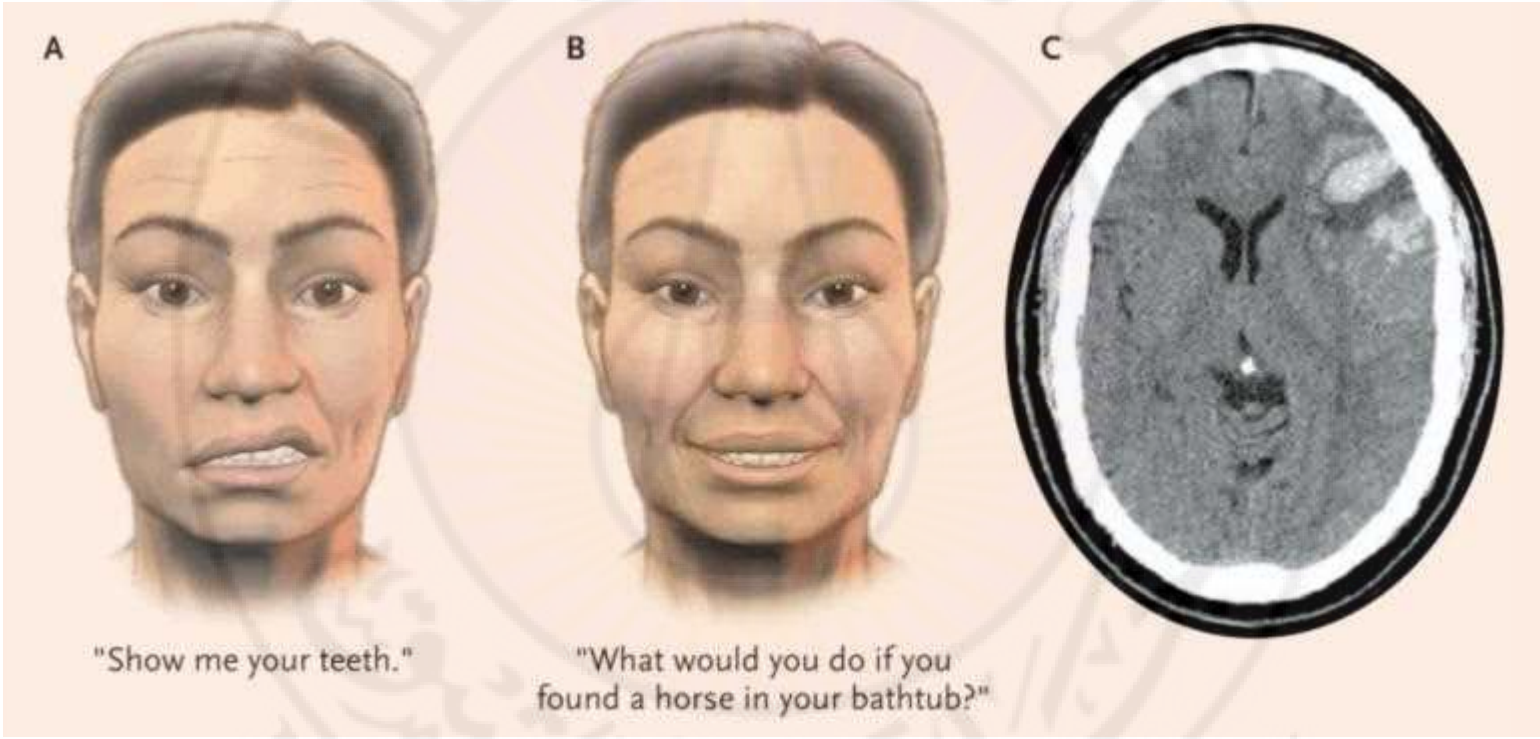

Normal
Central facial palsy
(supranuclear lesion)
Peripheral facial palsy


Loss of
nasolabial fold

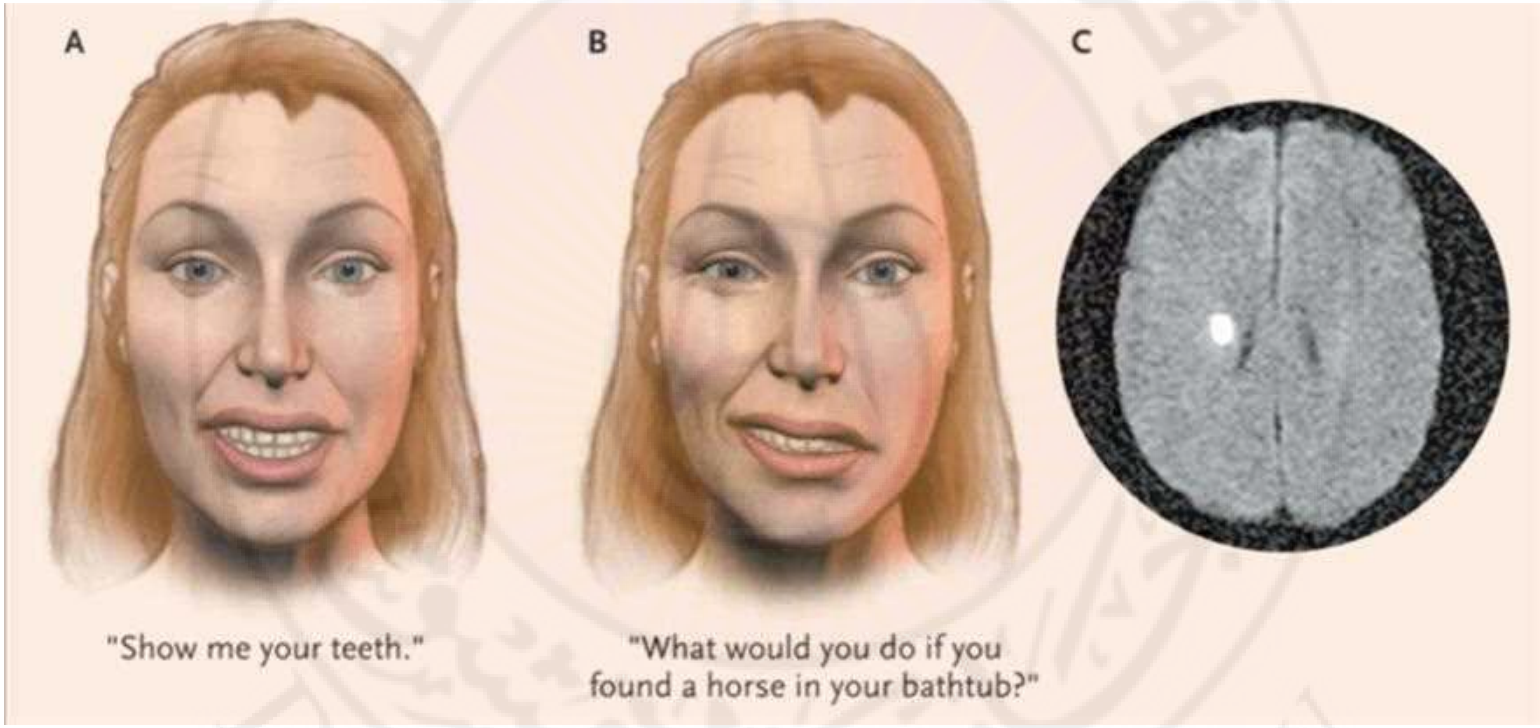

Loss of forehead
wrinkles



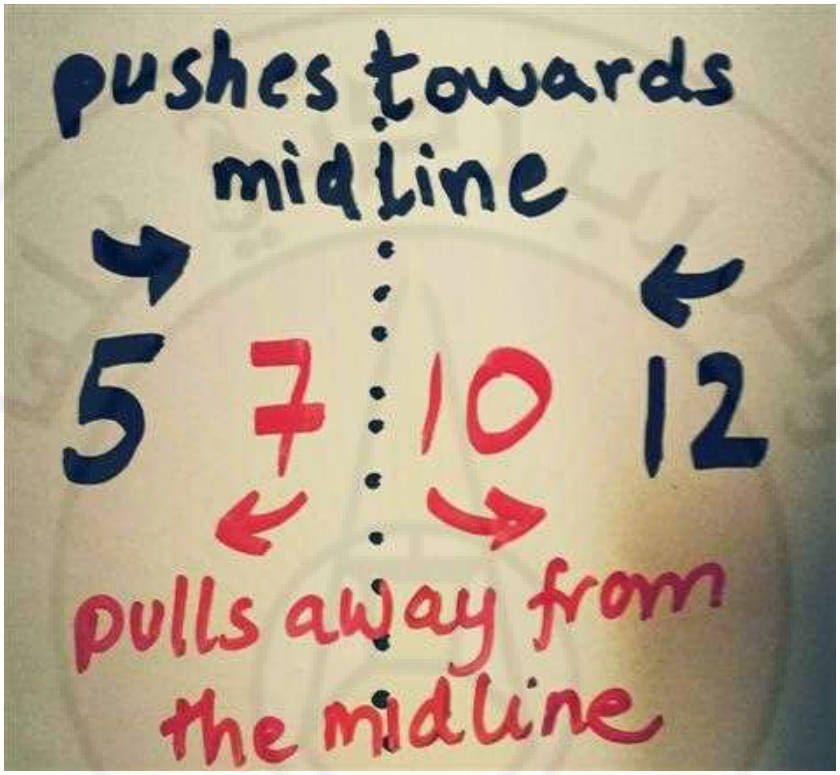
Central and Peripheral Facial Weakness.



The facial weakness is more marked during the voluntary than involuntary response. This indicates a cortical lesion



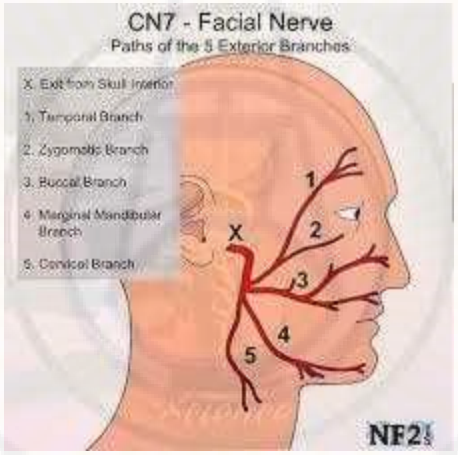
The involuntary response unmasks a more pronounced lesion. This indicates a deeper lesion.

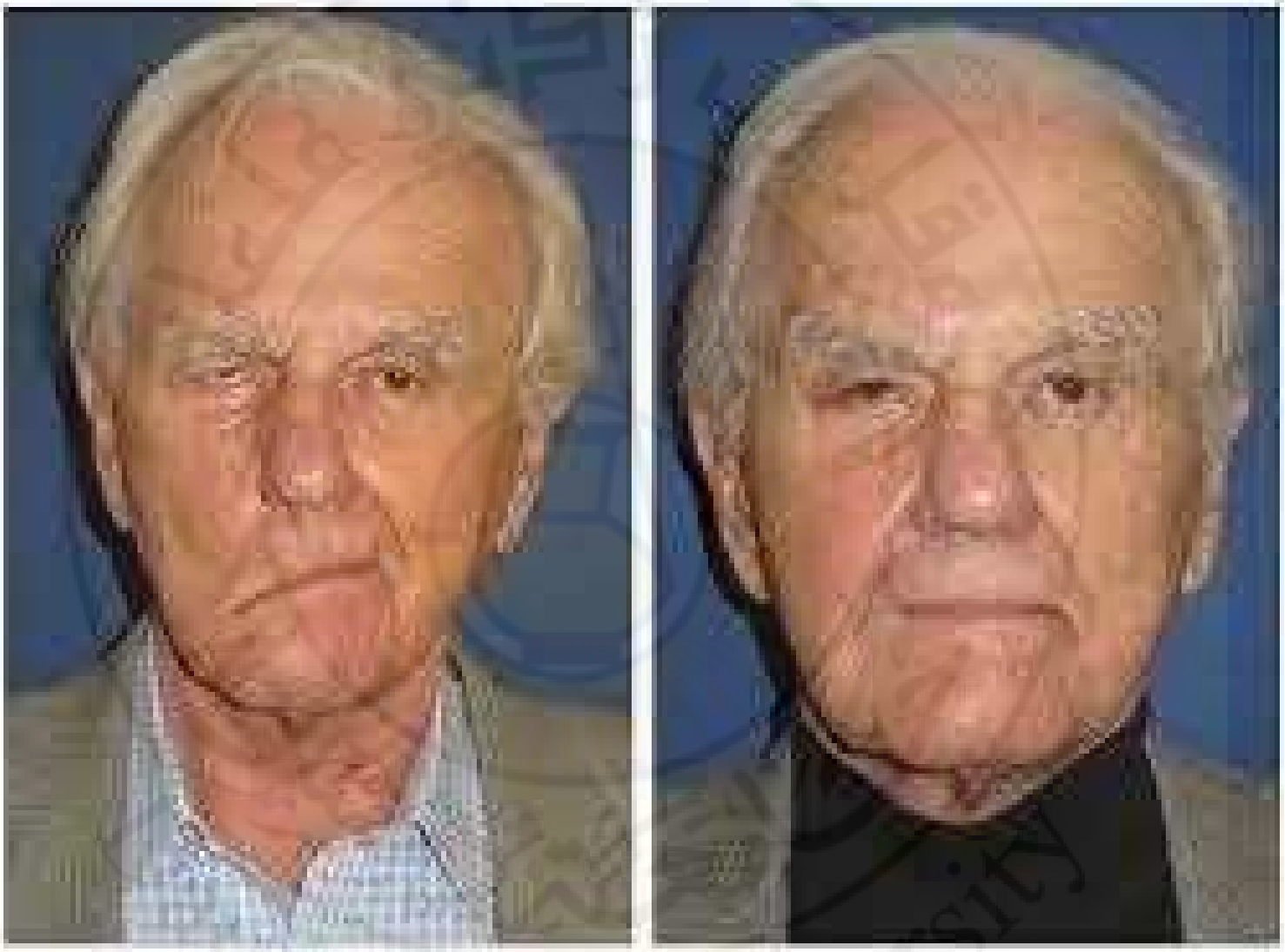


CRANIAL NERVE INJURY

SUM MUST 17
12+5=17 TOWARDS PARALYSED SIDE
10+7=17 TOWARDS NORMAL SIDE
12=HYPOGLOSSAL
5=TRIGEMINAL
10=VAGUS
7= FASIAL

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CN7 - Facial Nerve
Paths of the 5 Exterior Branches
X. Exit from Skull Interior
1. Temporal Branch
2. Zygomatic Branch
3. Buccal Branch
4. Marginal Mandibular Branch
5. Cervical Branch
X
1
2
3
4
5
NF2






A
B
C
D

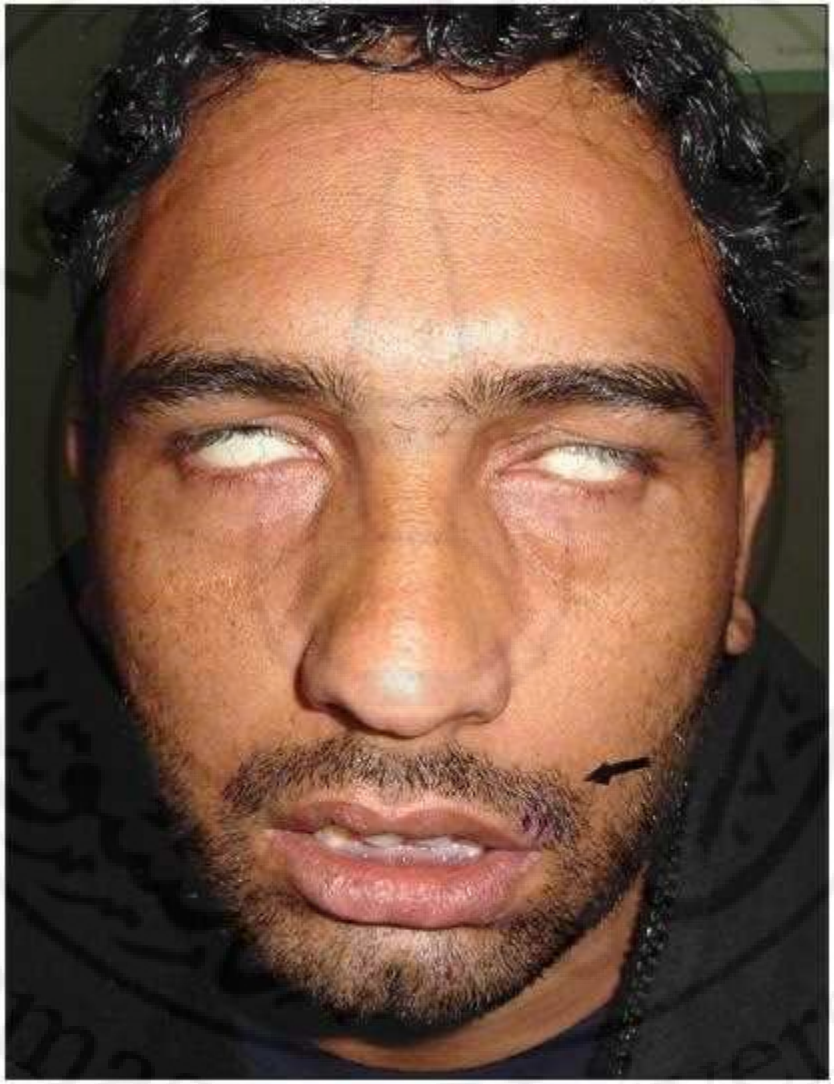




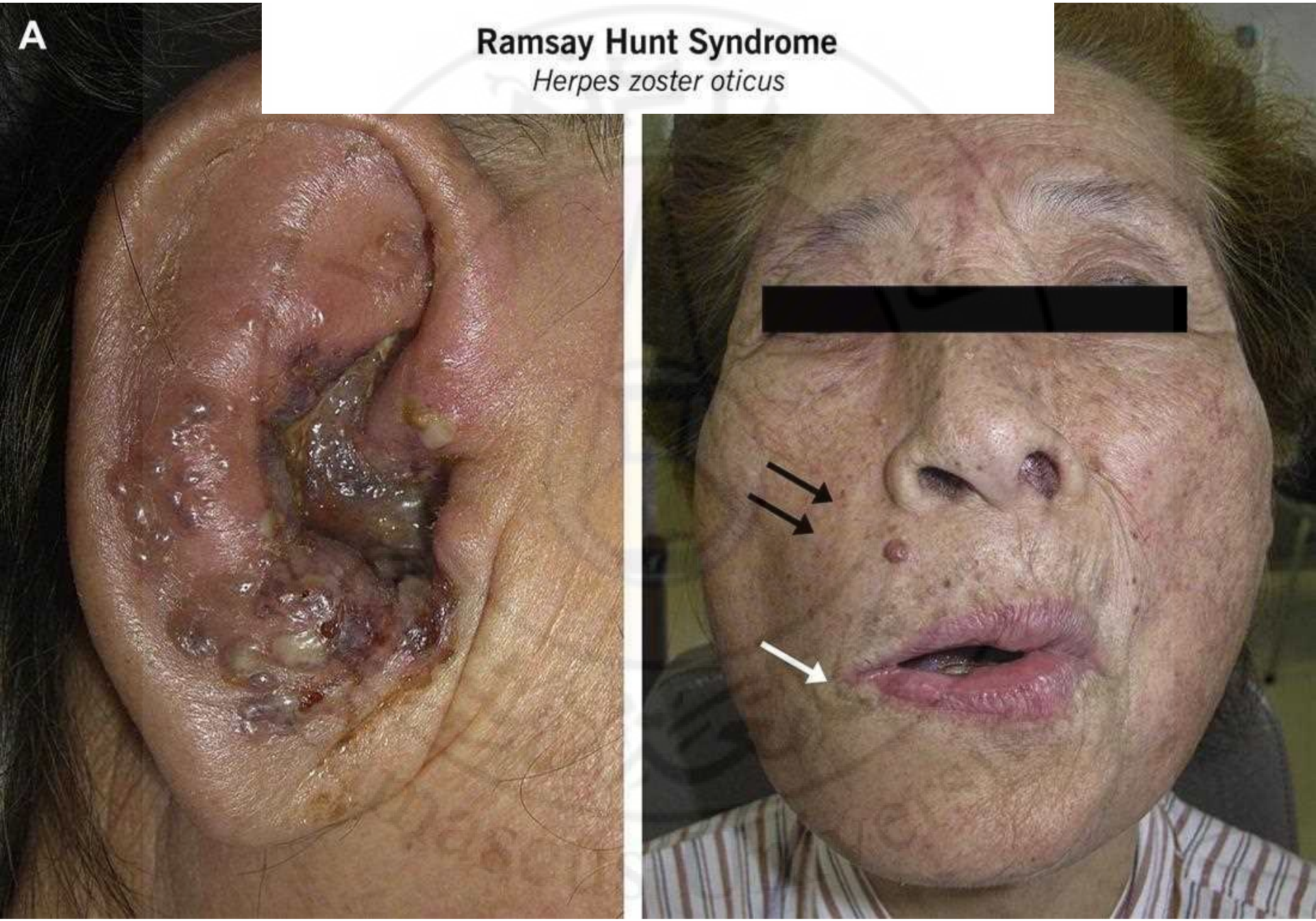
causes of Bilateral Facial nerve palsy →

SGPT

- Sarcoidosis
- GBS (GN)
- Polio
- Tick bite → Lyme Disease



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A
Ramsay Hunt Syndrome
Herpes zoster oticus


WRONG


No Sensory Sx


No Ptosis

BELL'S PALSY

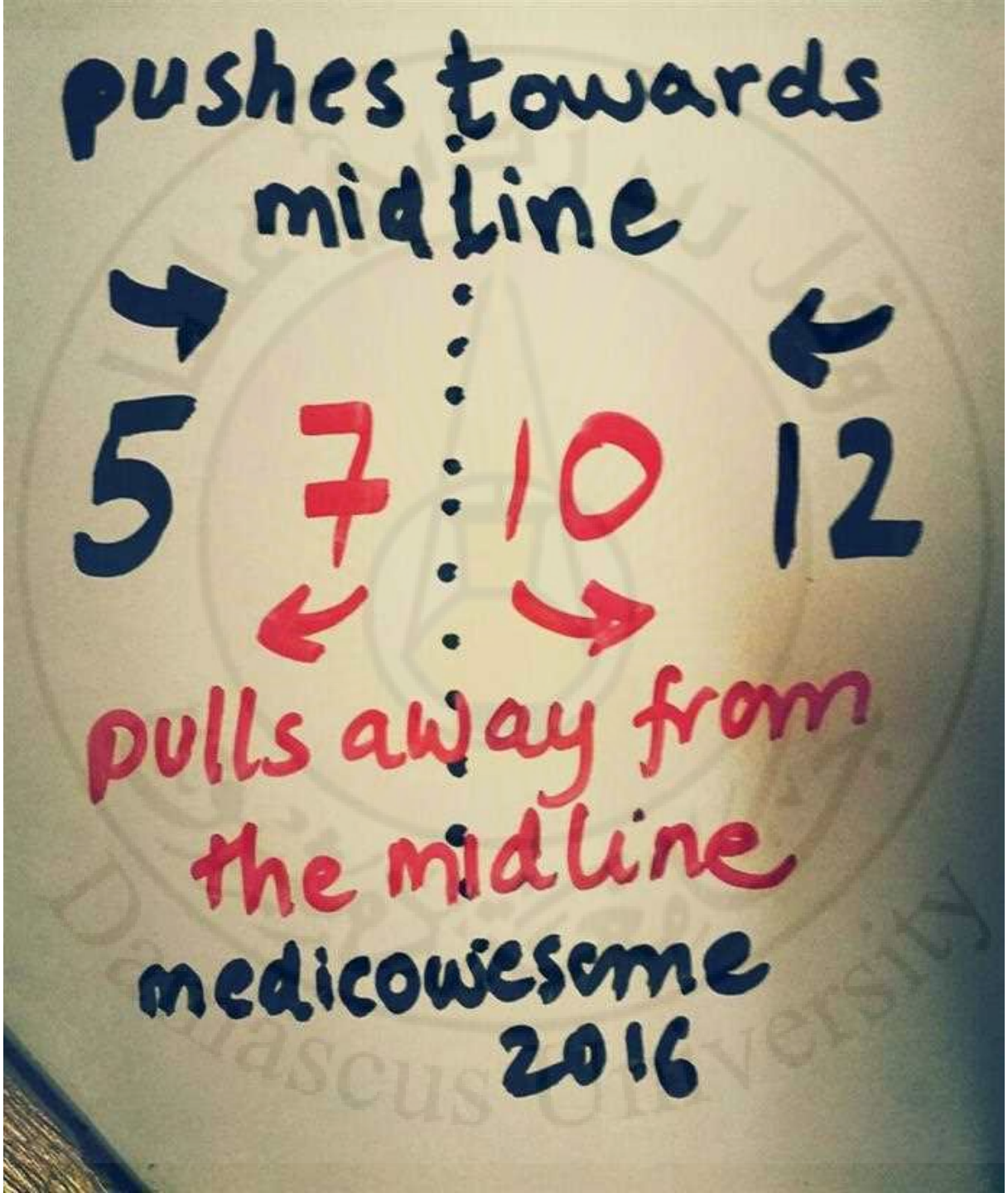
Most common cause of unilateral facial paralysis



DIAGNOSIS	CLINICAL - classically a cranial nerve 7 palsy. The forehead is involved (cannot wrinkle)	
CONSIDER	CVA (one case report of isolated CN7 palsy with pontine hemorrhage) - do a thorough neuro exam as most CVAs with facial droop have something else abnormal on neuro exam Lyme disease - treat if in endemic area Herpes simplex/zoster	
TREATMENT	CORTICOSTEROIDS - Strong evidence for improvement	Prednisone 1 mg/kg/day (up to 60 mg) x 6 days followed by 10 day taper
	ANTIVIRALS (acyclovir, valacylovir) - Weak evidence for modest benefit	Alone no better than placebo, but weak evidence that used with steroids may improve facial recovery.
	SUPPORTIVE CARE	OCULAR LUBRICANT TO PREVENT CORNEAL ABRASIONS MAY NEED TO TAPE EYE SHUT (can't close, subject to trauma and dryness)

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pushes towards midline
5
7
10
12
pulls away from the midline
medicowesome
2016



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