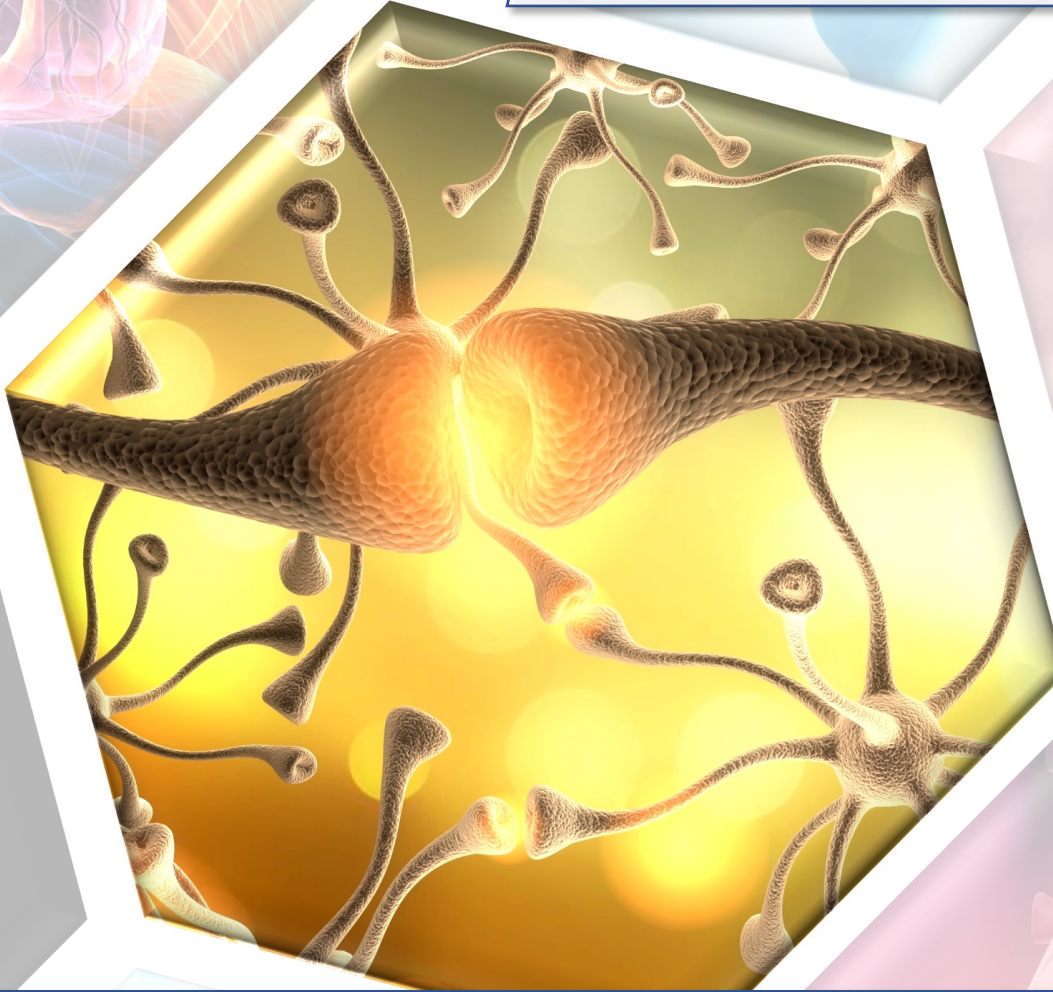


# IMPERIAL

## Neurological disorders tutorial



Dr Paul Strutton – [p.strutton@imperial.ac.uk](mailto:p.strutton@imperial.ac.uk), extra images courtesy of Dr Laura Canevari

# Case 1 – paralysis

Over a period of several days a 35-year-old man developed total paralysis of his body and most of his face. He could not swallow or speak. Horizontal eye movements were impaired but vertical eye movements and eye blinks were maintained. Communication via a code of eye movements showed that he remained mentally alert and that sensation over his whole body remained intact. A brainstem vascular lesion was suspected.



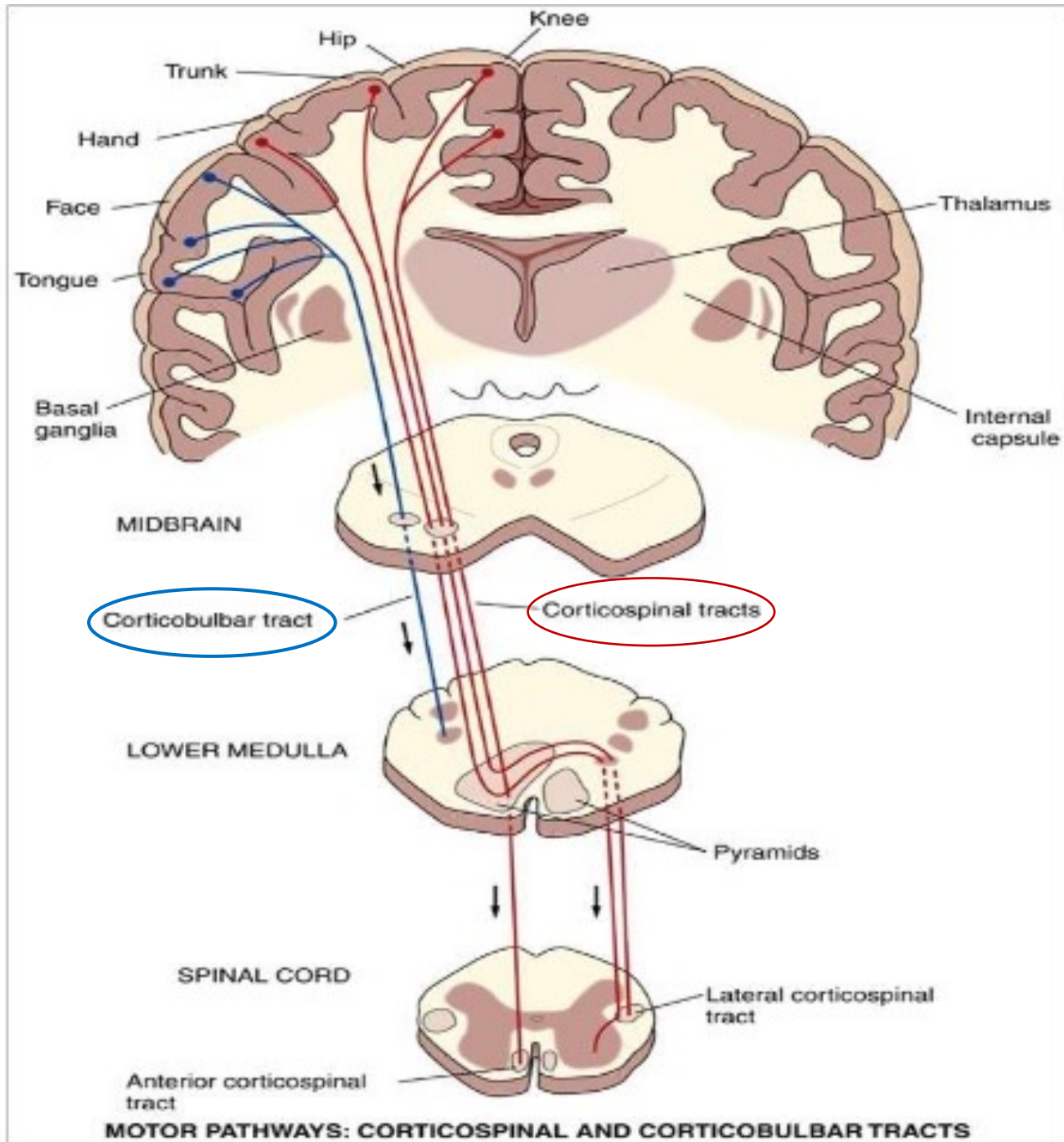
# Case 1 - question 1

Which pathway has been affected?

Corticospinal and corticobulbar tracts projecting to spinal and brainstem motor neurones respectively.

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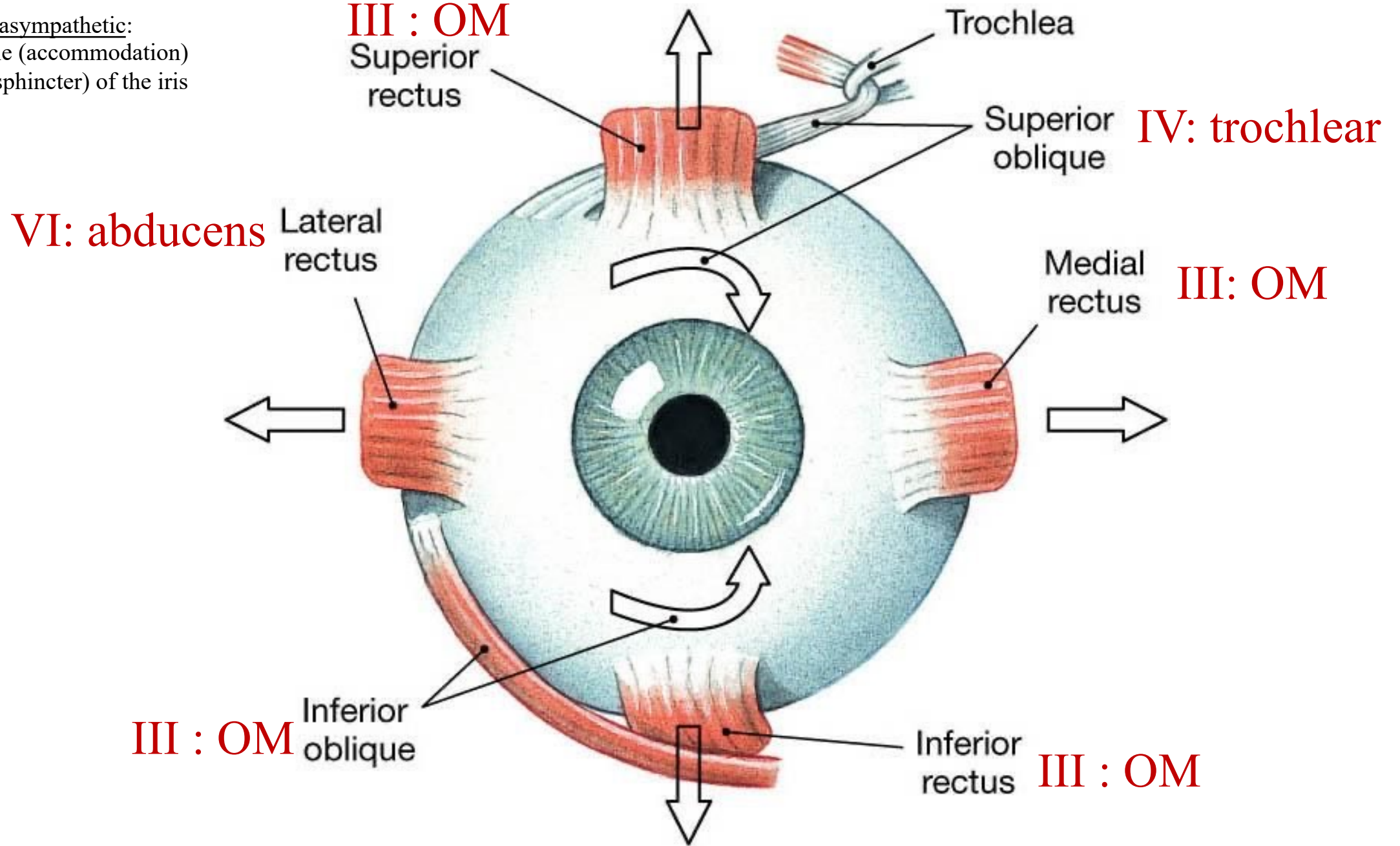


# Case 1 - question 2

Why are vertical but not horizontal eye movements maintained?

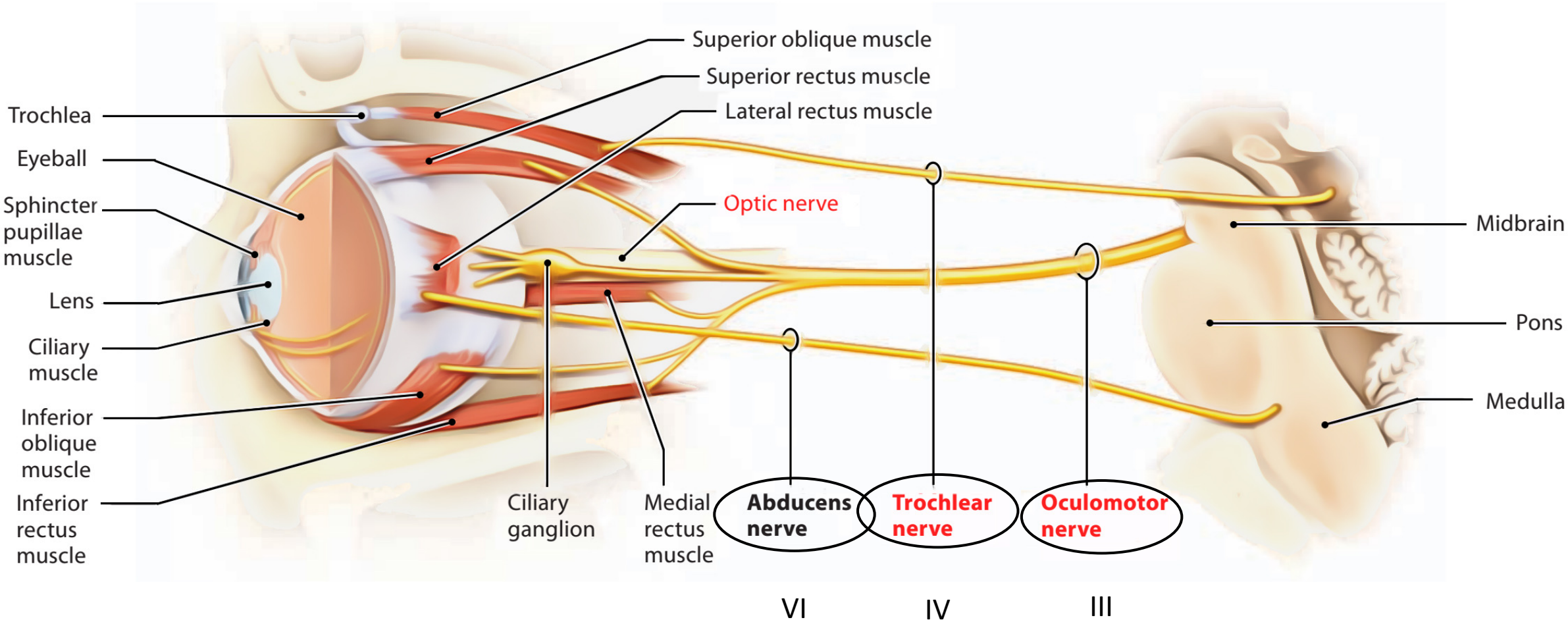
The lesion must be below the level of the oculomotor nucleus (vertical eye movements spared) but above that of the abducens (lateral eye movements lost) and all lower motor nuclei. The preserved “eyeblinks” are not true reflexes as the motor nucleus of the facial nerve is below the level of the lesion. They will be intermittent upward movements of the eyelid made by the oculomotor innervation of the levator palpebrae muscles.

**III** is also parasympathetic:  
Ciliary muscle (accommodation)  
Constrictor (sphincter) of the iris



(c) Anterior view, right eye

# Oculomotor nerve





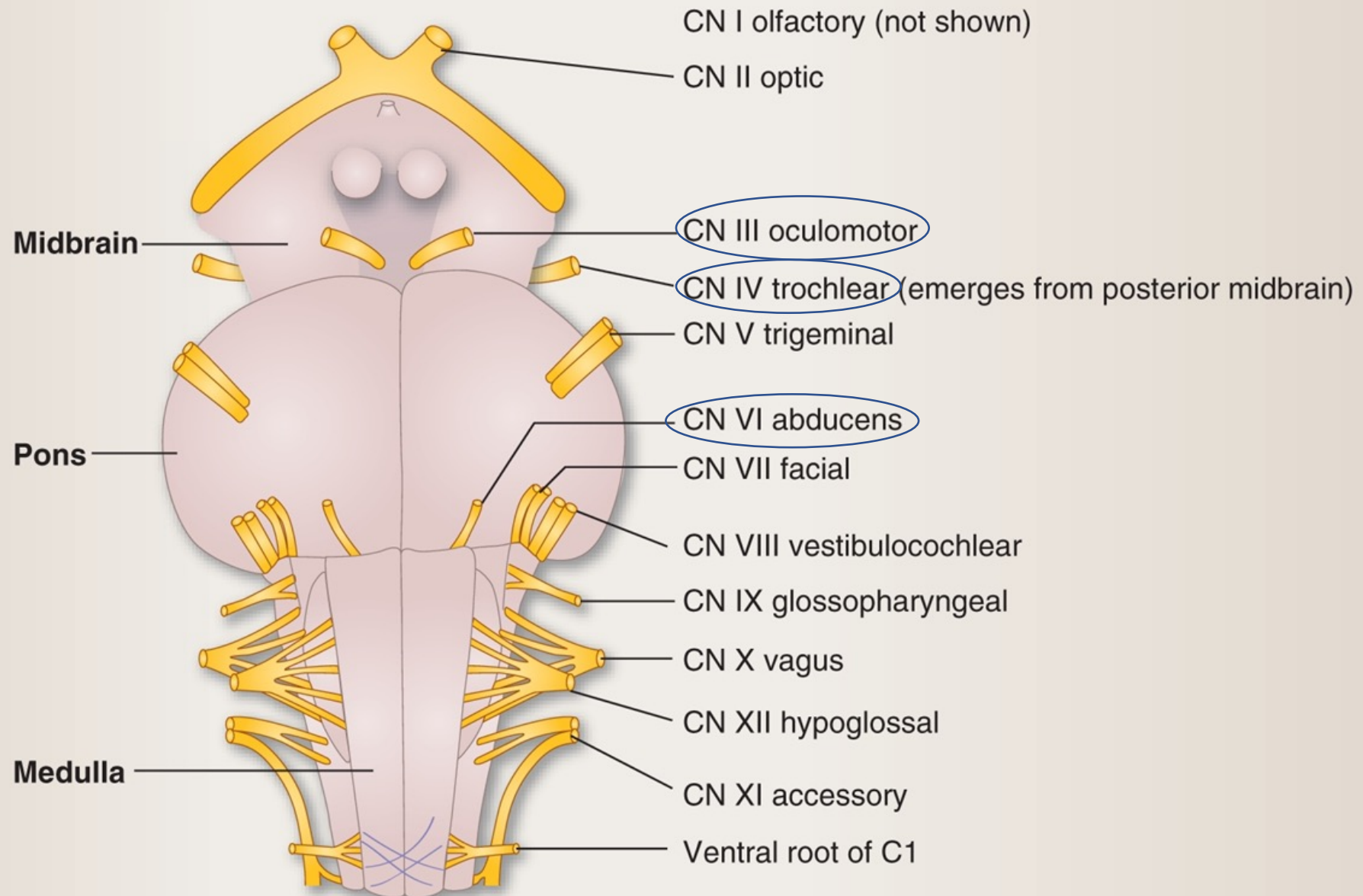
# Case 1 - question 3

Where in the brainstem is the lesion?

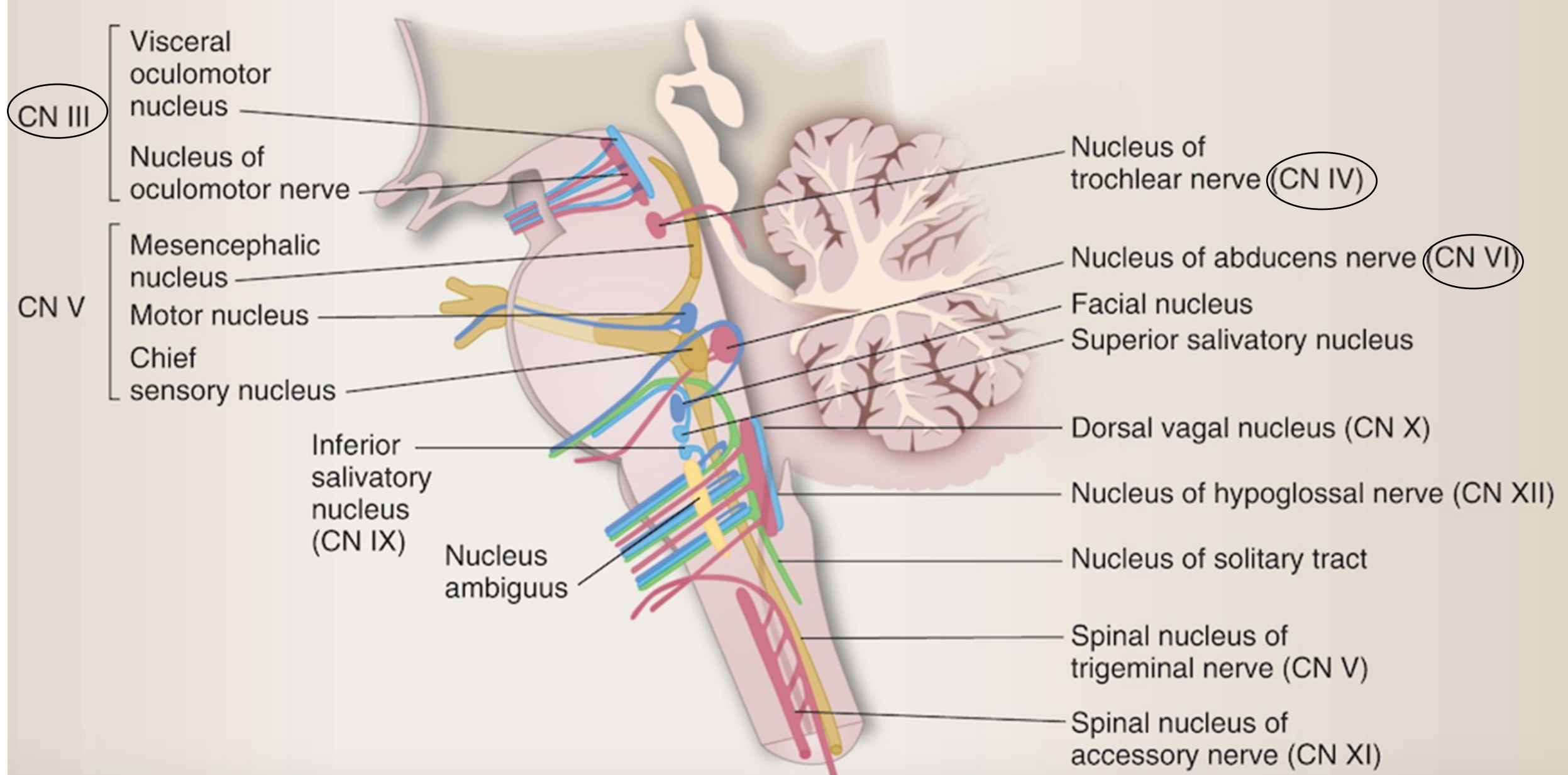
Basal part of the upper pons (locked-in syndrome – mercifully rare)

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Where is the lesion?





# Case 1 - question 4

Why are sensation and consciousness not affected?

The lesion is confined to the ventral (anterior) part of the brainstem thus sparing the ascending sensory tracts and reticular formation which are more dorsally (posteriorly) located.

Where is the lesion?

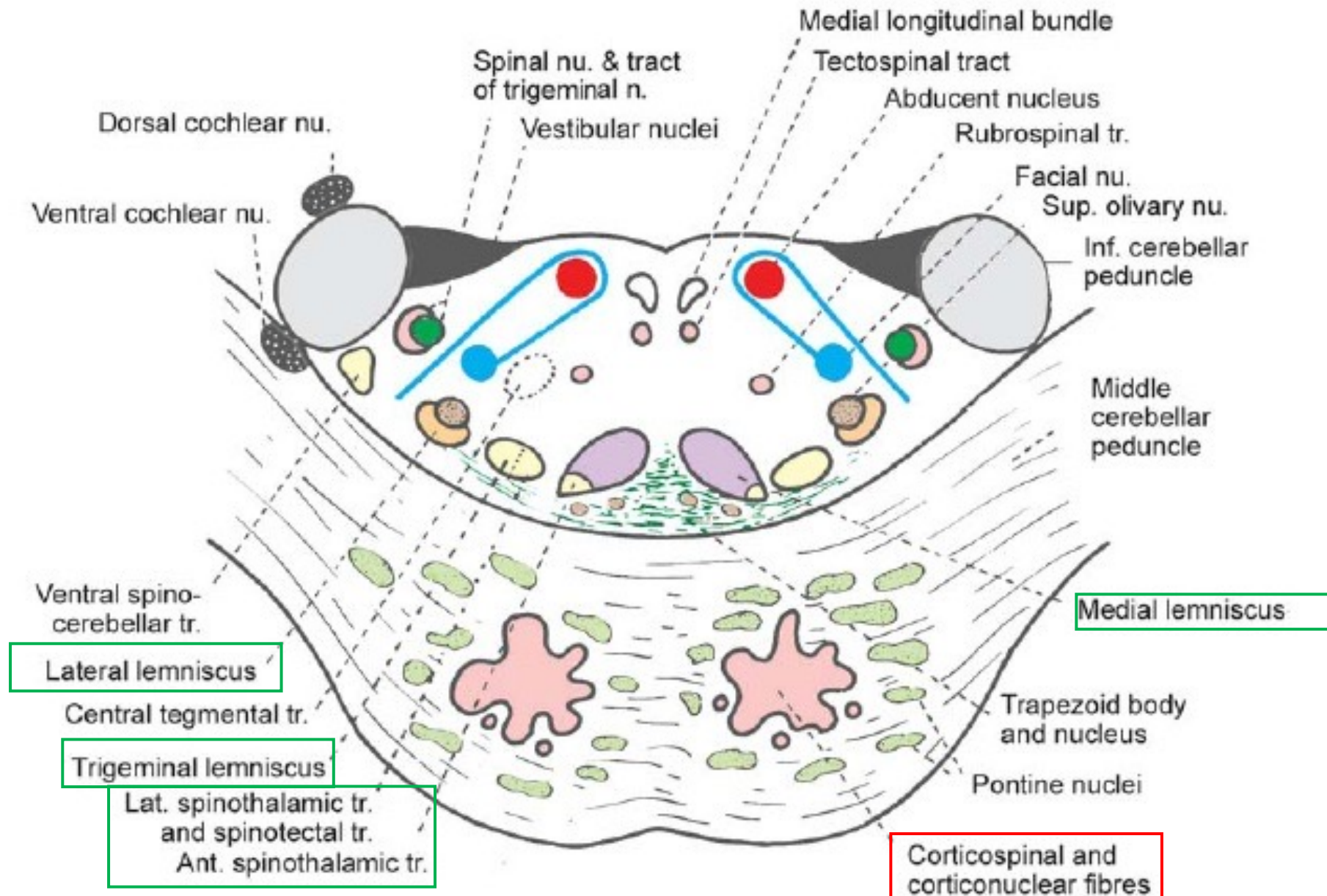


Fig. 11.5. Transverse section through the lower part of the pons.

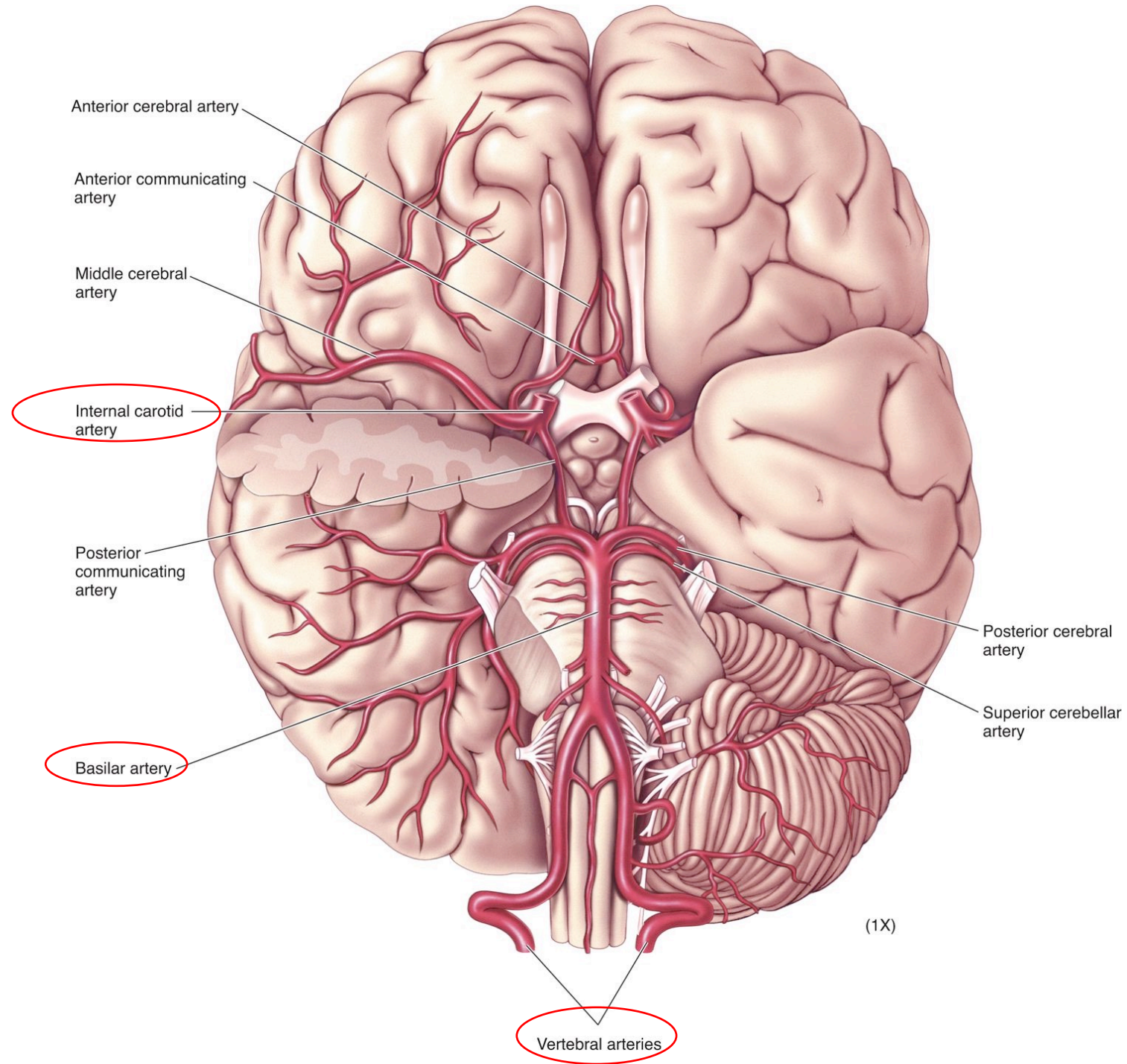




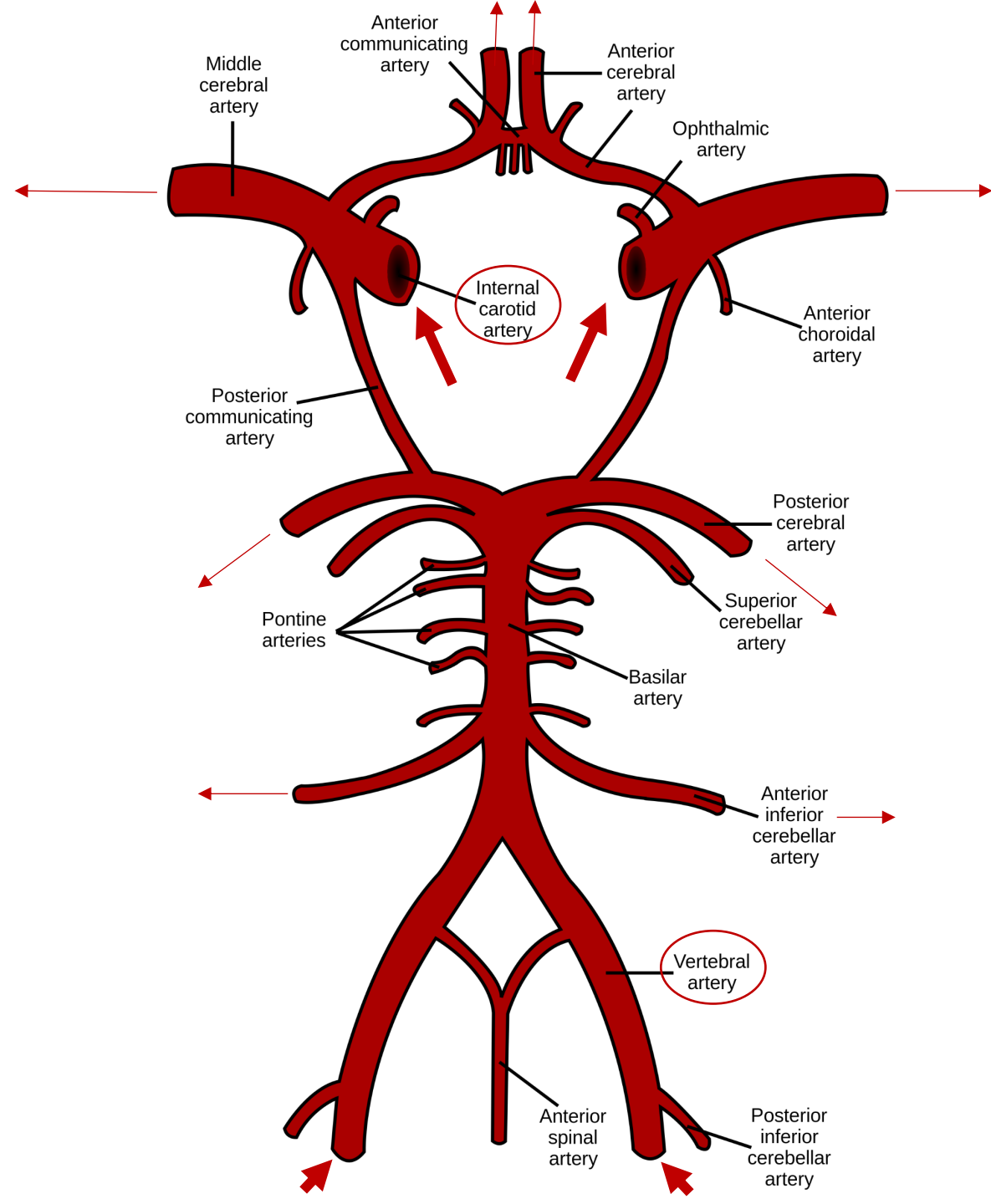
# Case 1 - question 5

Which artery is most likely to have been involved?

Thrombosis of the basilar artery leads to this isolated lesion. The medulla is still supplied by branches of the vertebral arteries while the internal carotid arteries maintain the circle of Willis for supply of the forebrain and midbrain.



# The circle of Willis



## Case 2 – Facial weakness and impaired hearing

A 46-year-old woman presented with weakness of the muscles of the left side of her face, accompanied by reduced sensation in the same area. On examination she was found to have reduced hearing in the left ear. She thought the deafness had been present for several months and also admitted to occasional bouts of dizziness.





# Case 2 - question 1

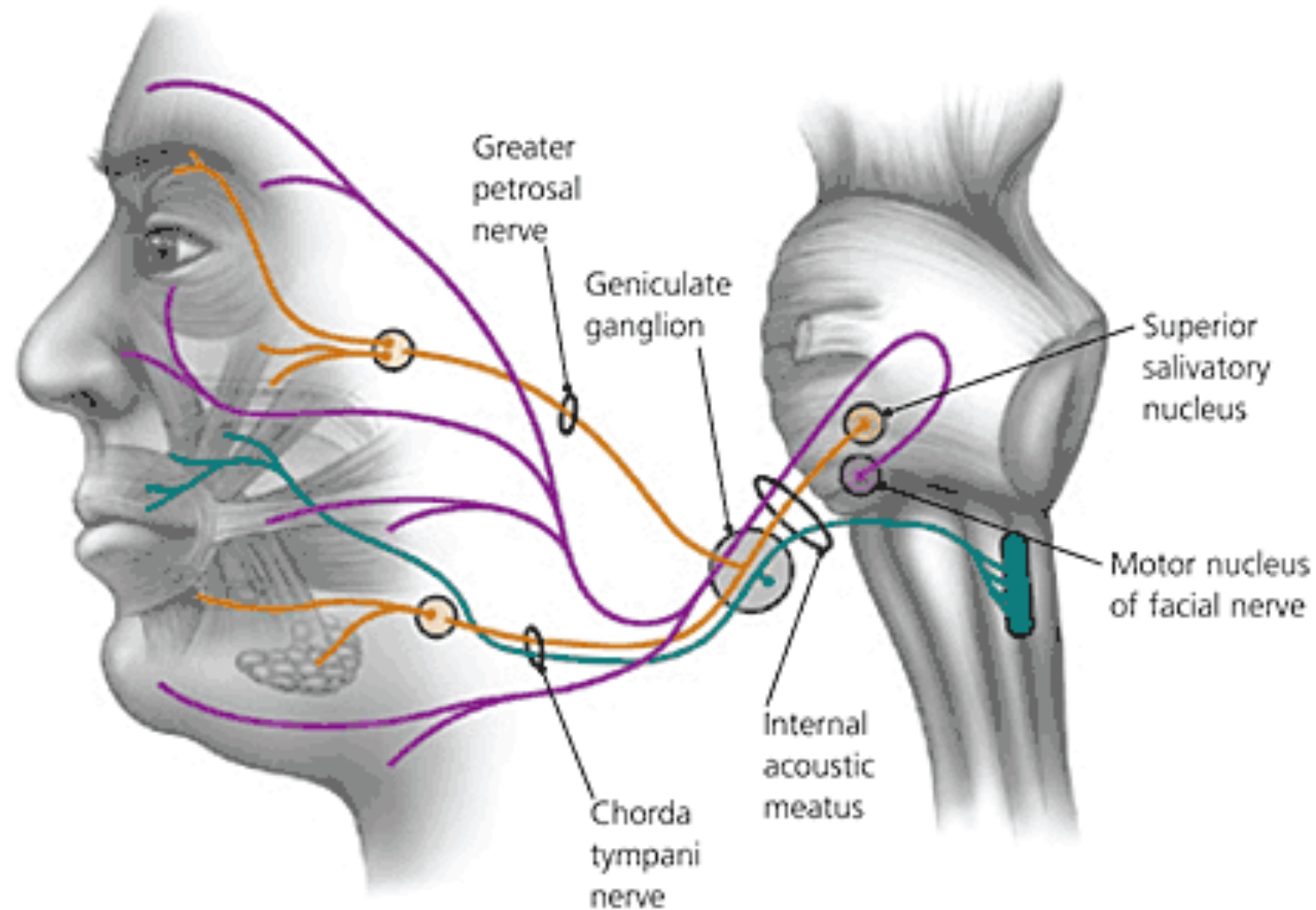
These symptoms are all caused by a single lesion – where?

In or near the left internal acoustic meatus.

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# FACIAL NERVE (VII)

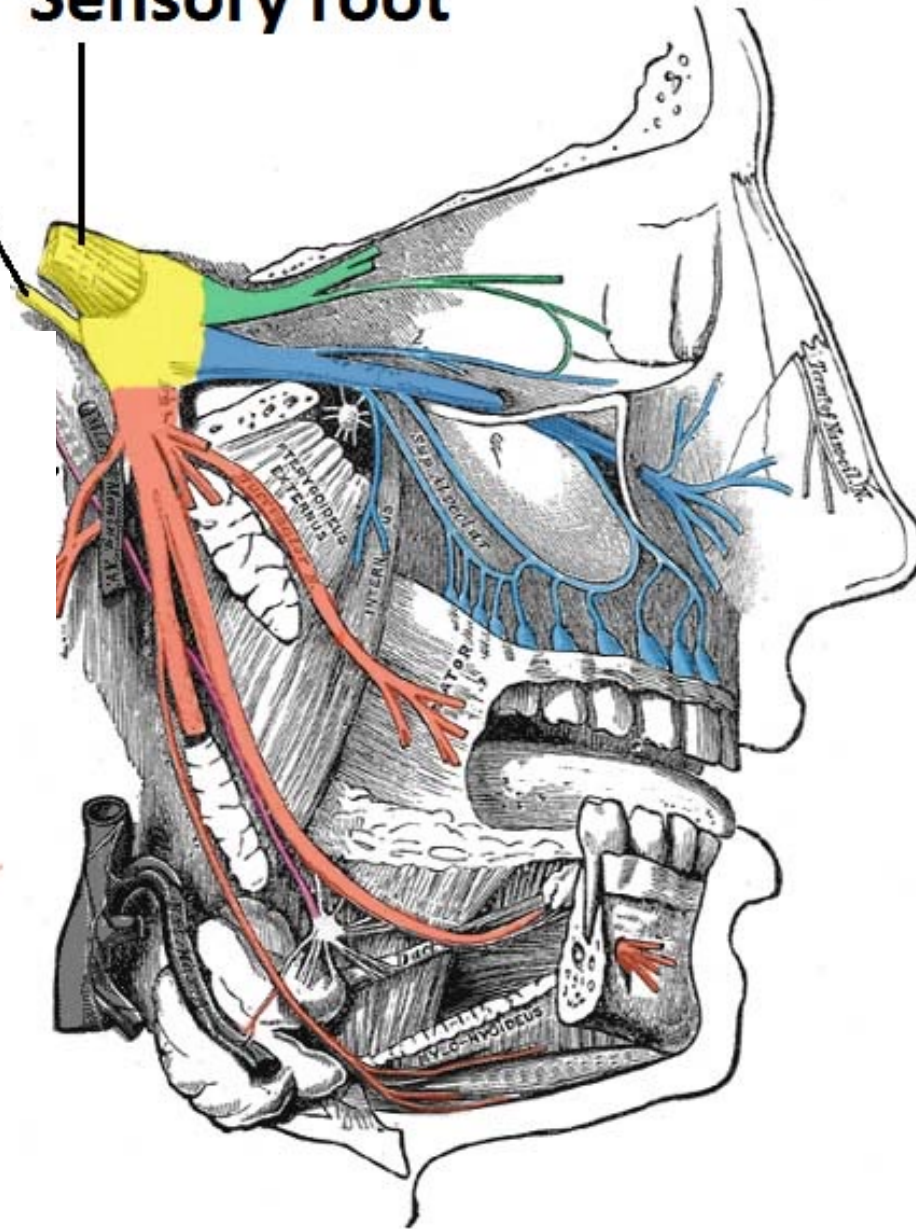
- somatic efferent fibers (facial expression muscles, stapedius muscle)
- Visceral motor fibers (lacrimal, salivary glands)
- Special sensory fibers (supplies taste to anterior two thirds of the tongue)



# TRIGEMINAL NERVE (V)

**Motor root**

**Sensory root**



 Ophthalmic (V1)

 Maxillary (V2)

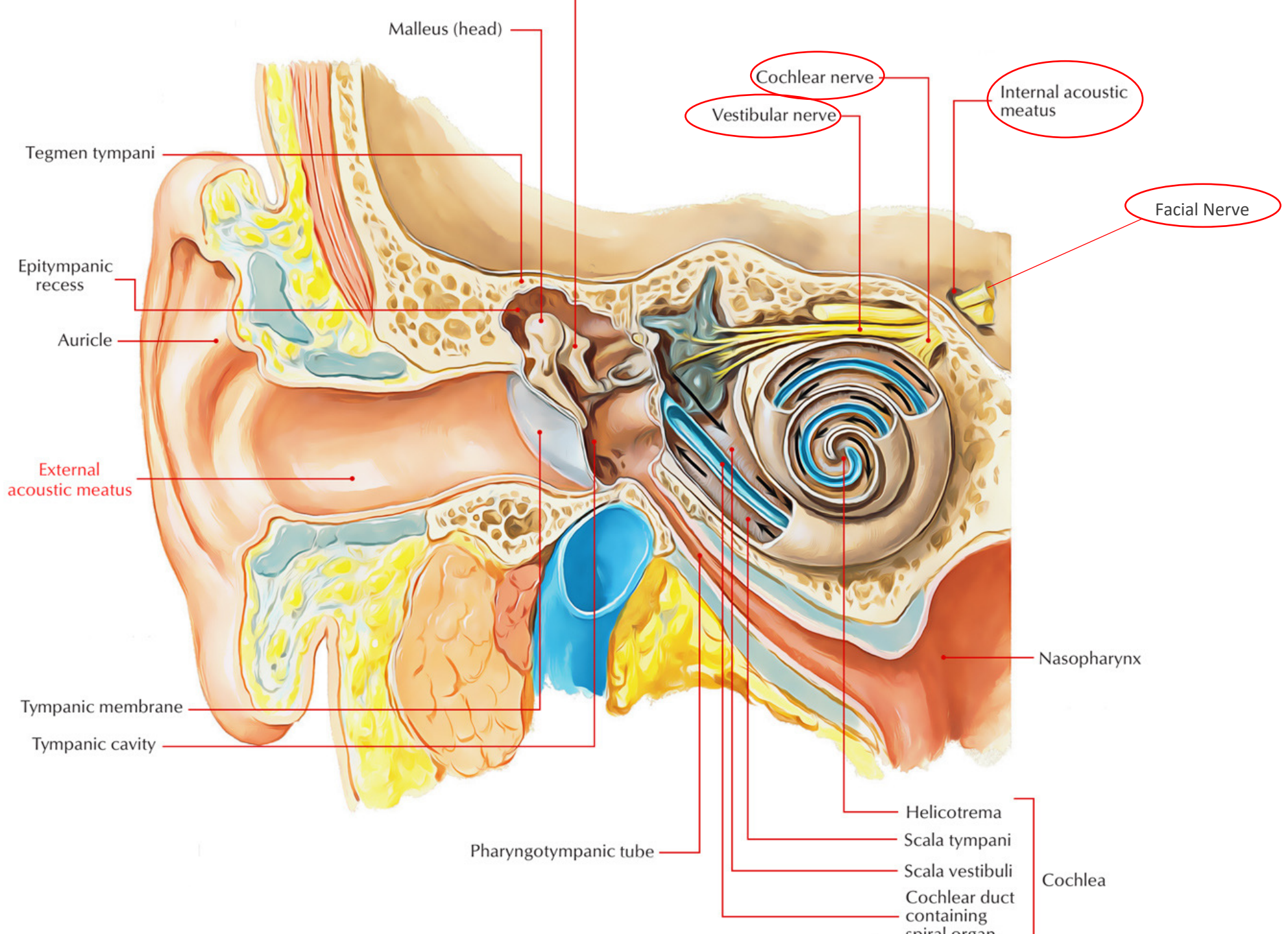
 Mandibular (V3)



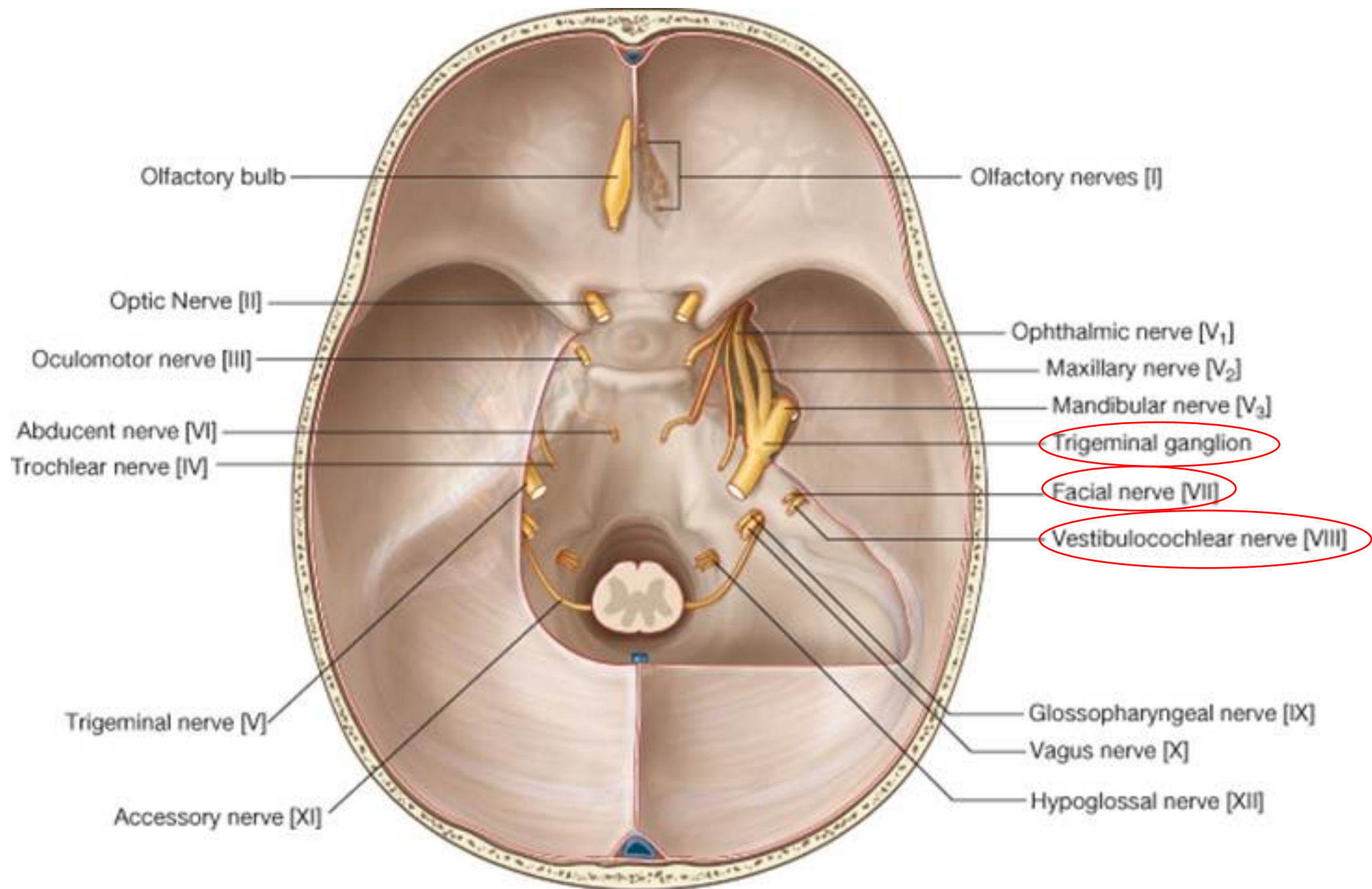
**teachmeanatomy**

The #1 Applied Human Anatomy Site on the Web.











## Case 2 - question 2

What type of lesion is it?

A vestibular schwannoma (also called acoustic neuroma) - a benign tumour which develops slowly on the vestibular part of the VIII cranial nerve.

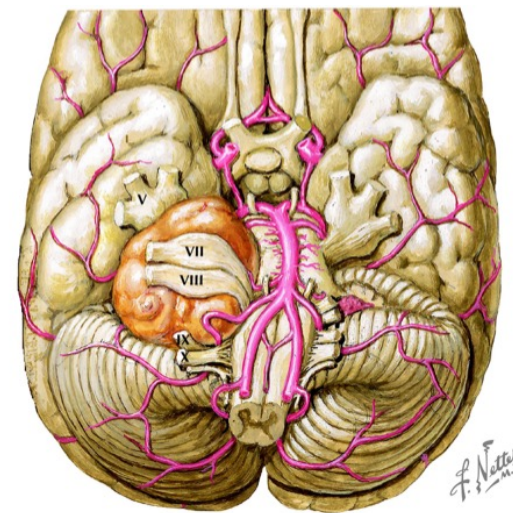
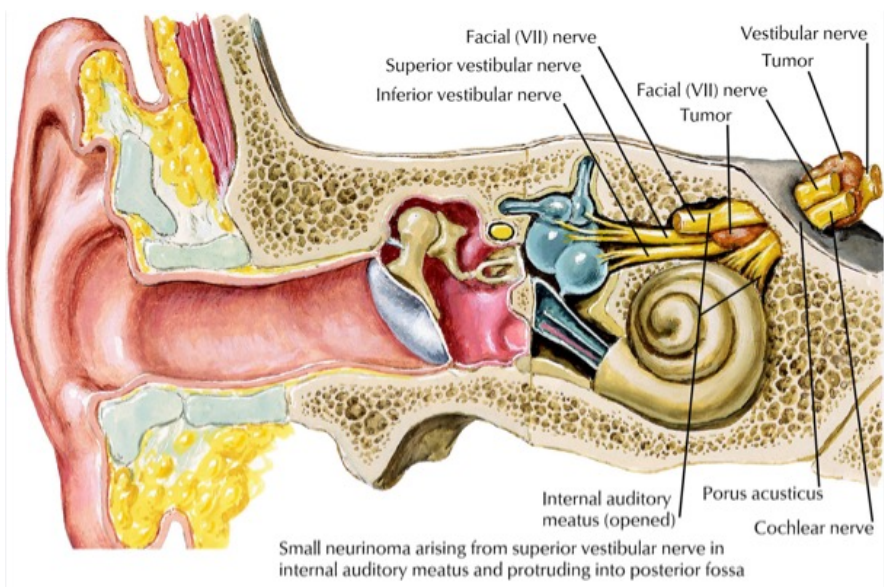
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## Case 2 - question 3

Explain the symptoms in terms of the structures involved.

The first signs are usually sensorineural deafness due to pressure on the auditory part of the nerve, accompanied or followed by tinnitus and/or vertigo. As the tumour grows out into the posterior fossa, there may be impaired facial sensation (e.g. demonstrated by loss of the corneal reflex) due to distortion of cranial nerve V, and weakness of the facial muscles due to stretching of nerve VII.



Large acoustic neurinoma filling cerebellopontine angle, distorting brainstem and cranial nerves V, VII, VIII, IX, X



## Case 2 - question 4

How can the condition be treated?

Removed surgically but there is usually residual deafness.

From <https://www.nhs.uk/conditions/acoustic-neuroma/>

Monitoring the tumour – small tumours often just need to be monitored with regular MRI scans, and the treatments below are generally only recommended if scans show it's getting bigger

Brain surgery – surgery to remove the tumour through a cut in the skull may be carried out under general anaesthetic if it's large or getting bigger

Stereotactic radiosurgery – small tumours, or any pieces of a larger tumour that remain after surgery, may be treated with a precise beam of radiation to stop them getting any bigger





## Case 2 - question 5

What is likely to happen if the condition is left untreated?

Further growth of the tumour could put pressure on the cerebellum and brainstem, causing unilateral ataxia + signs of raised intracranial pressure.