LECTURE 23

Physiology of Speech

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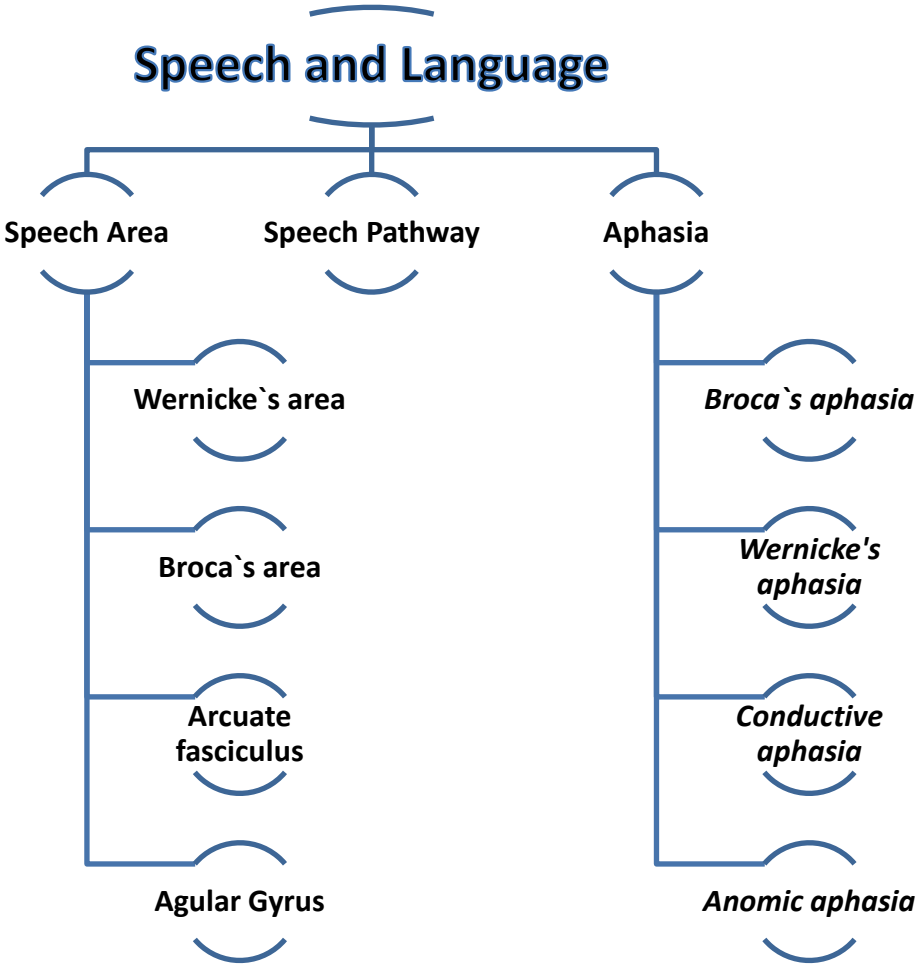
MIND MAP



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SPEECH AND LANGUAGE

- It is the highest function of the nervous system
- Involves understanding of spoken & printed words
- It is the ability to express ideas in speech & writing

SPEECH AREAS

Wernicke`s area	At the posterior end of the superior temporal gyrus	• Closely associated with 1 & 2 (Primary and secondary) auditory areas • Responsible about comprehension of auditory & visual information, then project it to Broca`s area via Arcuate fasciculus	• Interpretations of sensory experience so, it's called Sensory Area of speech. • Formation of thought in response to sensory experience. • Choice of words to express thoughts.
Broca`s area	At the lower end of premotor area	• Process information received from W. area into detailed & co-ordinated pattern for vocalization • Then project to motor cortex to initiate the appropriate movement of the lips & larynx to produces speech (responsible for motor reaction) If the response is by body language, vocalization or writing it will send orders to the motor cortex responsible for that	In adult who learn second language during adulthood. The MRI shows portion of Broca`s area concerned with it is adjacent to but separate from area concerned with the native language. But in children who learn second language early in life there is only single area involved for both languages .
Arcuate fasciculus	bundle of axons connecting Wernicke's area to the Broca's area.		
Agular Gyrus	behind Wernicke's area fused posteriorly into the visual cortex	interpretation of information obtained from reading from visual cortex (responsible of visual experience)	

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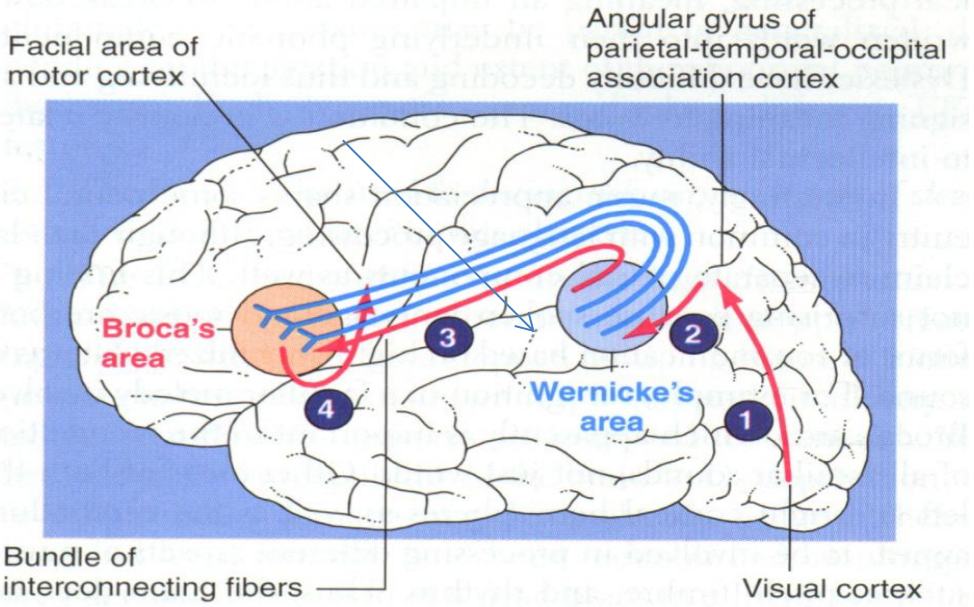
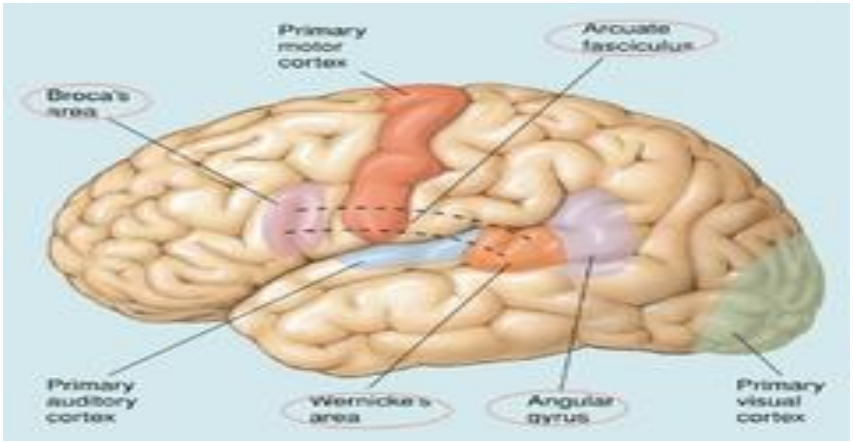
SPEECH PATHWAY





Vision → Visual area → Agular Gyrus

Hearing → Auditory area

Agular Gyrus + Auditory area → W. area receive information from both auditory & visual areas Project it to B. areas via Arcuat fasciculus

→ Broca`s area process information received into co-ordinated pattern of vocalization & then project that pattern to the motor area

→ Initiation of movement of muscle of speech in tongue, larynx & lips.

CONT. SPEECH PATHWAY

If writing is concerned, then information received from W. area is processed in the area of hand skills

→ coordinated pattern of muscle movement projected to the arms & hand region of the motor cortex

→ initiation of necessary muscle movement in the hand & arms required for writing a particular word

حياتهم سهلة

Phasia: speech and language function
Dysphasia: *disturbance* of speech and language function
Aphasia: *complete* disturbance of speech and language function
Arthria: articulation النطق
Dysarthria: *difficulty to articulate due to local injury (in mouth, pharynx,…etc*

APHASIA

- Abnormality of language function due to injury of language centres in cerebral cortex.
- Comprehension or expression of words will be affected
- Due to thrombus or embolism of cerebral vessels, or trauma.

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TYPES OF APHASIA

Types of Aphasia	Motor or Broca`s aphasia (non fluent)	Sensory or Wernicke's aphasia (fluent)	Conductive aphasia (fluent)	Anomic aphasia	Global aphasia
Lesion Area	Lesion of Broca`s area	Lesion of Wernicke's area +/- (with or without) Arcuate fasciculus	Lesion of nerve fibres of Arcuate fasciculus	Lesion of angular gyrus, thus B. & W. are intact	Mixture of all : Broca's area Wernicke's area Arcuate fasciculus
Lesion Effect	Patient will understand spoken & written words but find it difficult to speech or to write	Impaired comprehension Loss of intellectual function(manly after car accident) If the Doctor tell the patient to set he will not response.	Patient understand speech of others but can not repeat it. Meaningless speech. If the Doctor tell the patient to set he will change his position not necessarily set.	Speech & auditory comprehension is normal but visual comprehension is abnormal, due to visual information is not processed & not transmitted to W. area	Unable to interpret the thought Motor Aphasia . The patient can neither speak nor understand language. It is due to widespread damage to speech areas
	Poorly articulated speech, slow with great effort & abnormal rhythm In some cases speech may be limited to 2-3 words.	Failure to interprets meaning of written or spoken words Meaningless & excessive talk (in sever cases).		Dyslexia (word blindness) interruption in the flow of visual experience into W. area from visual area. Number or letter that seen in other way.	is the commonest aphasia after a severe left hemisphere infarct. Writing and reading are also affected.

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DIFFERENT BETWEEN RIGHT AND LEFT HEMISPHERES

Right Hemisphere (The representational hemisphere)	Left Hemisphere (The categorical hemisphere)
The right hemisphere controls the left side of the body Temporal and spatial relationships (time and space)	The left hemisphere controls the right side of the body Produce and understand language
Analyzing nonverbal information. Communicating emotion. recognition of emotion. Recognition of tunes, rhythms. Holistic problem solving.	understanding and manipulating language: recognition, use, and understanding of words and symbols. Speech. Identification of objects by name. Mathematics, logic, analysis.

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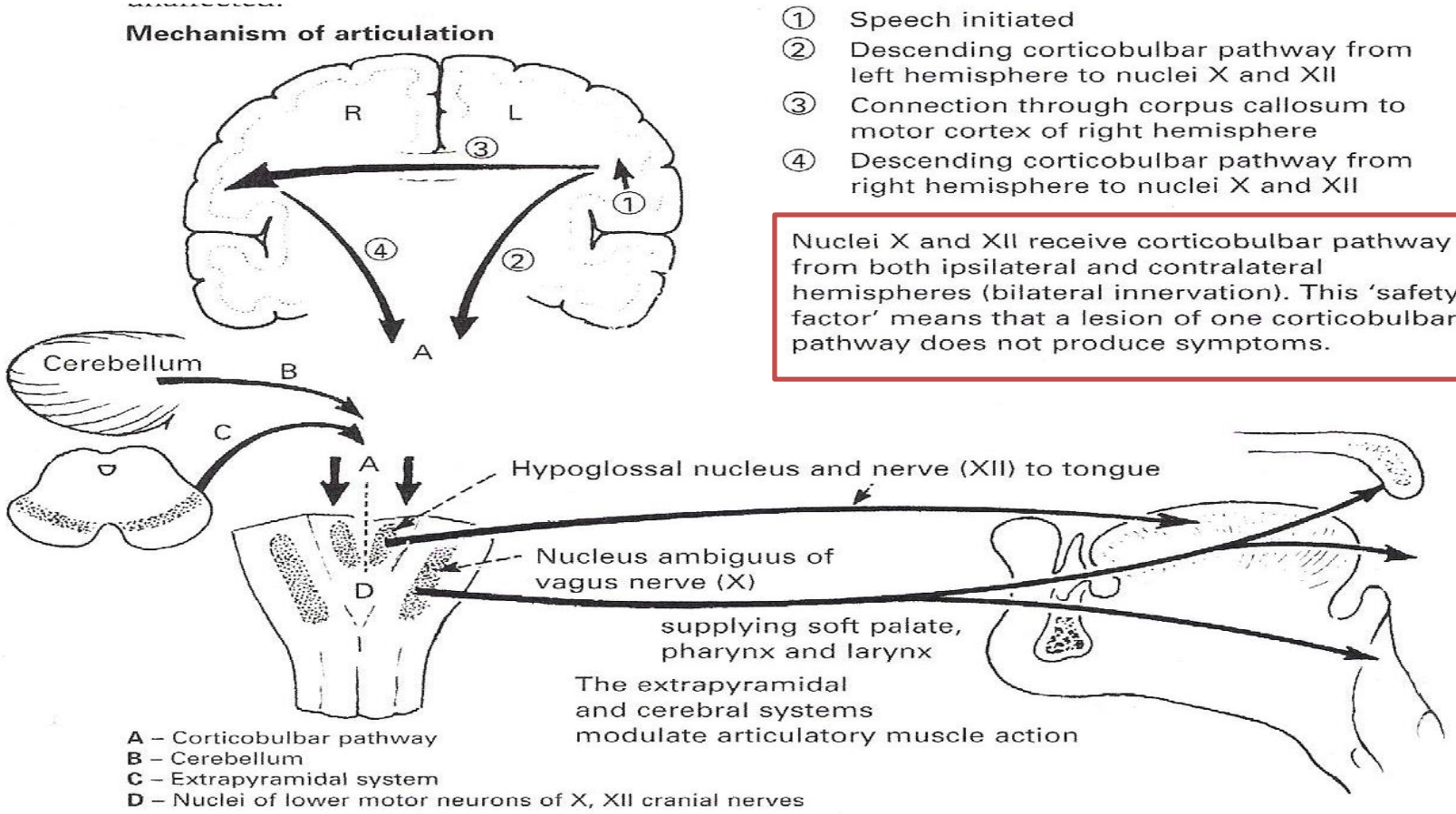
MECHANISM OF ARTICULATION

Boy's slide



① Speech initiated
② Descending corticobulbar pathway from left hemisphere to nuclei X and XII
③ Connection through corpus callosum to motor cortex of right hemisphere
④ Descending corticobulbar pathway from right hemisphere to nuclei X and XII

Nuclei X and XII receive corticobulbar pathway from both ipsilateral and contralateral hemispheres (bilateral innervation). This 'safety factor' means that a lesion of one corticobulbar pathway does not produce symptoms.

Muscles of expression, innervated by the facial nerve, play an additional role in articulation and weakness also results in dysarthria.

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Slides | Important | Doctor's Notes | Explanation | Boy's Slides

STUTTERING

- Have right cerebral dominance and widespread overactivity in the cerebral cortex and cerebellum. This includes increased activity of the supplementary motor area.

PHONATION

- Sound production by passage of air over the vocal cord.
- **Dysphonia:** Abnormal sound production due to problem in vocal cord e.g., paralysis, CVA, other causes
  Causes: Paralysis of both vocal cord e.g whispering sound and inspiratory strider
- **Paralysis of left vocal cord:** The voice becomes week and cough bovine. Mainly due to recurrent laryngeal palsy

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SUMMARY

- **WERNICKE`S AREA** sensory experience Formation of thought, and choice of words.
- **BROCA`S AREA** Process information received from W. area into co-ordinated pattern, then project it to motor cortex.
- **ARCUATE FASCICULUS** The bundle of axons connecting the Wernicke's area to the Broca's area.
- **AGULAR GYRUS** interpretation and translation of information obtained from reading from visual cortex
- **SPEECH PATHWAY** see Slide 4
- **BROCA`S APHASIA (NON FLUENT) AND ANOMIC APHASIA** both understand spoken words but seeing written words is affected in Anomic aphasia.
- **WERNICKE'S APHASIA AND CONDUCTIVE APHASIA** both fluent with Meaningless speech but the conductive aphasia with understanding (because W.area is work)
- **DYSLEXIA (WORD BLINDNESS)** interruption in the flow of visual experience into W. area from visual area
- **RIGHT (THE REPRESENTATIONAL) HEMISPHERE** controls the left side of the body, has temporal and spatial relationships, and holistic problem solving.
- **LEFT (THE CATEGORICAL) HEMISPHERE** controls the right side of the body, responsible of produce and understand language, speech, and Mathematics, logic analysis.

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QUESTIONS

1. A
2. C
3. C

1. Which one of the following area is responsible of formation of thought, and choice of words:

A. Wernicke`s area
B. Broca`s area
C. Agular Gyrus

2. Sara is 10 years old went to the doctor because her mother notice that she has write number 2 in different way. The doctor test her and the result was as shown in the picture and she was dyslexic, what is the cause:

A. Wernicke's aphasia
B. Conductive aphasia
C. Anomic aphasia

3. Which hemisphere is responsible of temporal and spatial relationships:

A. Right Hemisphere
B. Representational hemisphere
C. A and B

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THE END

If there are any Problems or Suggestions,
Feel free to contact:

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THANK YOU