


Speech

DR SAJAD AH.TAK

DNB-SS (NEUROLOGY)..1ST YEAR


- 
- ▶ Basic terminology
 - ▶ Anatomy of Speech
 - ▶ Disorders of Speech
 - ▶ Examination of Speech

Basic terminology

- ▶ **Phonation:** strictly defined, is the production of vocal sounds without word formation; it is entirely a function of the larynx.


Examplethe squeals of little girls, and singing a note with the mouth open are phonation.

vocalization is the sound made by the vibration of the vocal folds, modified by workings of the vocal tract.

- 
- ▶ **Articulation** is the enunciation of words and phrases; it is a function of organs and muscles innervated by the brainstem.
 - ▶ **Phonemes** are the smallest distinctive sound units; examplethe word “hat” has 3 phonemes... 'h' , 'a' , and 't'.

TYPES OF SPEECH SOUNDS

- ▶ **Labials** (b, p, m, and w) are formed principally by the lips.
- ▶ **Labiodentals** (f and v) are formed by placing the teeth against the lower lip. .
- ▶ **Linguals** are sounds formed with tongue action. T, d, l, r, and n are tongue-point, or alveolar, sounds, formed by touching the tip of the tongue to the upper alveolar ridge.

- 
- ▶ S, z, sh, ch, and j are dentals, or tongue-blade sounds.
 - ▶ Gutturals (velars, or tongueback sounds, such as k, g,) are articulated between the back of the tongue and the soft palate.

SPEECH


- ▶ Speech is the articulation and phonation of language sounds;
- ▶ It is the mechanical aspect of oral communication'
- ▶ Dysarthria and dysphonia.

LANGUAGE

- ▶ Means of expressing thoughts and ideas by speech (auditory symbols), by writing (graphic sym) or by gestures and pantomime (motor symbols)...
- ▶ It is the ability to converse, comprehend, repeat, read, and write.
- ▶ Aphasia

Anatomy of Speech (Normal Phonation and Articulation)

- ▶ Highly coordinated sequence of contractions of the respiratory musculature, larynx, pharynx, tongue, and lips.
- ▶ These muscles are innervated by the facial, vagal, hypoglossal, and phrenic nerves.
- ▶ Their nuclei controlled by the motor cortices through the corticobulbar tracts.
- ▶ Coordinationdirect control (motor cortex) and indirect control (basal ganglia and cerebellum)



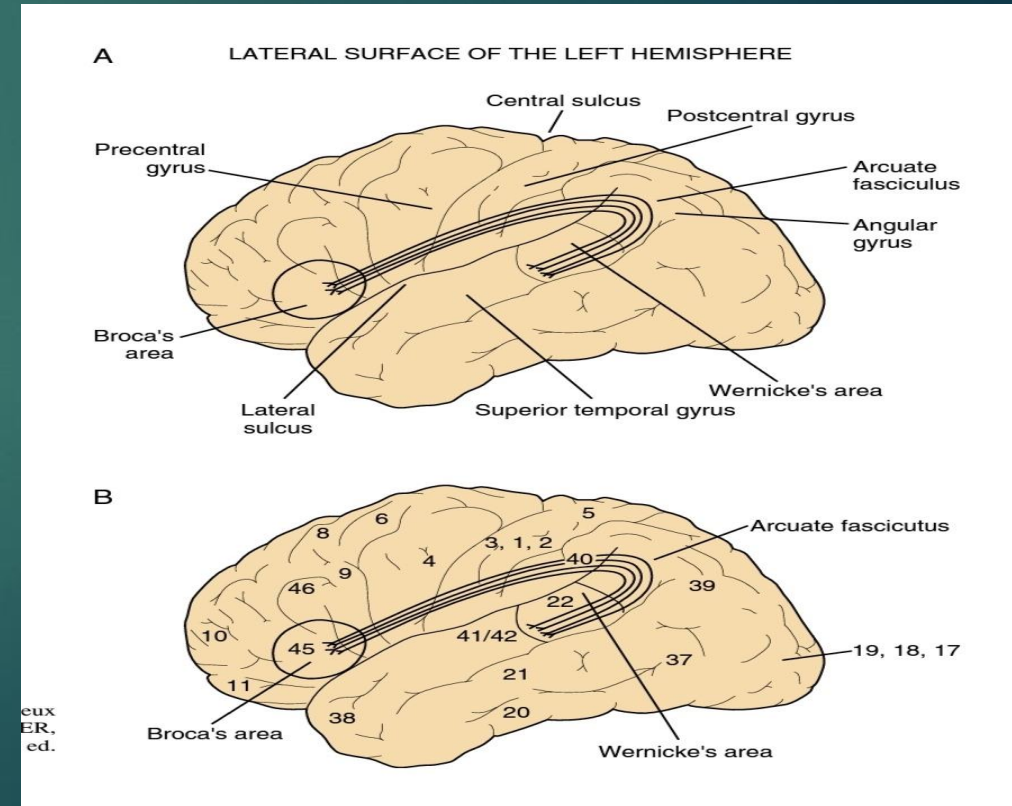
The basal ganglia and the cerebellum are also important participants in producing the prosodic aspects of speech (pitch or frequency, stress or the differential emphasis placed on syllables, and rhythm).



Anatomy

► Language processes are lateralized to the dominant, usually left, hemisphere.

► Words → peripheral auditory apparatus → electrical impulses that travel to the brain stem cochlear nucleus → medial geniculate nucleus of the thalamus via the trapezoid body and lateral lemniscus, finally reaching the primary auditory cortex (Heschl's gyrus) in the superior temporal gyrus.



The auditory language→ decoded in the auditory association cortex, Wernicke's area (Brodmann's area 22) located in the posterior third of the left superior temporal gyrus (see Fig. 6-2).

- ▶ The angular gyrus, provides the semantics (the meaning) and relate it to other incoming words, other sensory modalities, and past experiences.
- ▶ Repetition..... the auditory information is transmitted forward to Broca's area directly via arcuate fasciculus.
- ▶ Broca's area initiates a motor plan that is transmitted to the primary motor cortex (Brodmann's area 4) to pronounce the words. The motor cortex, in coordination with the supplementary motor area, basal ganglia, and cerebellum, sends corticobulbar fibers to implement speech sounds.

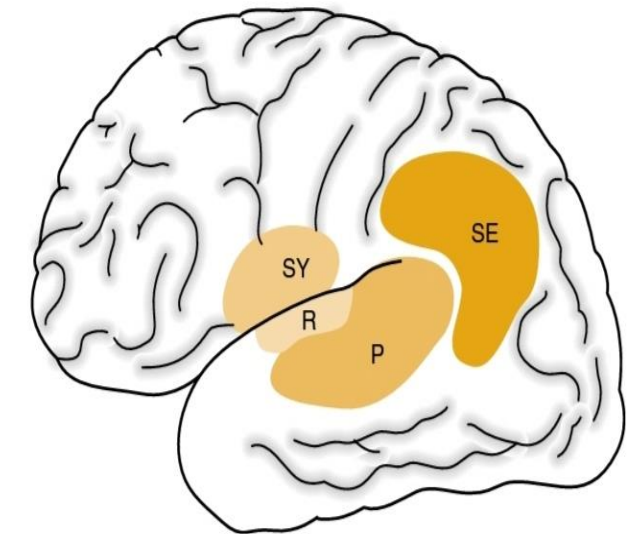



Figure 6-2. Artist's rendition of the four areas involved in comprehension of spoken language. P, perceptive area (auditory association cortex); R, receptive area (Heschl's gyrus); SE, semantic interpretation area (angular gyrus); SY, syntactical interpretation area (Broca's area). (From Benson DF, Ardila A: Aphasia: A Clinical Perspective. New York, Oxford University Press, 1996.)

Reading and Writing

- ▶ Reading depends on visual stimuli (written words) reaching the primary visual cortex (Brodmann's area 17).
- ▶ The visual stimuli → primary visual cortex → visual association cortex .
- ▶ The word stimuli are further processed in the heteromodal association cortex, the angular gyrus, for semantic meaning and integration with other sensory modalities and past experiences.
- ▶ If the words are to be read aloud, the information is transmitted forward from the visual association cortex to Broca's area through the arcuate fasciculus,

- 
- ▶ The ability to convey emotional meaning in speech, facial expressions, and gestures is a function of the right inferior frontal lobe (pars opercularis).
 - ▶ The striatum is involved in speech output and prosody; the thalamus is important for cortical arousal and language comprehension.

Disorders of speech

- ▶ Dysarthria
- ▶ Dysphonia
- ▶ Speech Apraxia
- ▶ Other disorders

Dysarthrias.

- ▶ Abnormal articulation of sounds or phonemes, or more precisely, abnormal neuromuscular activation of the speech muscles, affecting the speed, strength, timing, range, or accuracy of movements involving speech (Duffy, 1995).
- ▶ The most consistent finding in dysarthria is the distortion of consonant sounds. Dysarthria is neurogenic, related to dysfunction of the central nervous system, nerves, neuromuscular junction, or muscle.
- ▶ Speech abnormalities secondary to local, structural problems of the palate, tongue, or larynx do not qualify as dysarthrias

Disorders of speech


TABLE 14.1 Classification of the Dysarthrias

Type	Localization	Auditory Signs	Diseases
Flaccid	Lower motor neuron	Breathy, nasal voice, imprecise consonants	Stroke, myasthenia gravis
Spastic	Bilateral upper motor neuron	Strain-strangle, harsh voice, slow rate, imprecise consonants	Bilateral strokes, tumors, primary lateral sclerosis
	Unilateral upper motor neuron	Consonant imprecision, slow rate, harsh voice quality	Stroke, tumor
Ataxic	Cerebellum	Irregular articulatory breakdowns, excessive and equal stress	Stroke, degenerative disease
Hypokinetic	Extrapyramidal	Rapid rate, reduced loudness, monopitch and monoloudness	Parkinson disease
Hyperkinetic	Extrapyramidal	Prolonged phonemes, variable rate, inappropriate silences, voice stoppages	Dystonia, Huntington disease
Spastic and flaccid	Hypernasality, lower motor neuron	Amyotrophic strain-strangle, harsh voice, slow rate, imprecise consonants	Upper lateral sclerosis, multiple strokes

Adapted from Duffy, J.R., 1995. Motor Speech Disorders: Substrates, Differential Diagnosis, and Management. Mosby, St. Louis; and from Kirshner, H.S., 2002. Behavioral Neurology: Practical Science of Mind and Brain. Butterworth-Heinemann, Boston.


Dysphonia


- ▶ Dysphonia is the inability or reduced ability to vocalize due to a disorder of the larynx or its innervation.
- ▶ Dysphonic patients have a breathy sound /hoarse voice resulting from abnormal apposition of the vocal cords.
- ▶ Laryngitis , vocal cord polyp or nodule , laryngeal ca .
- ▶ Variable hypophonia ...NMJ disorder

- 
- ▶ **Spasmodic dysphonia** occurs in middle-aged or elderly individuals.
 - ▶ Spasmodic dysphonia involves dystonic spasms of the laryngeal muscles. In the most common form, the adductor type, the voice will be strained, high-pitched, and commonly punctuated by repetitive brief interruptions of speech.

Apraxia of Speech

- ▶ Apraxia of speech is a disorder of the programming of articulation of sequences of phonemes, especially consonants . .
- ▶ **Hillis and colleagues** (2004) gave a more informal definition of apraxia of speech, in terms of a patient who “knows what he or she wants to say and how it should sound” yet cannot articulate it properly.
- ▶ Patients have special difficulty with polysyllabic words and consonant shifts, as well as in initiating articulation of a word.
- ▶ Errors are inconsistent from one attempt to the next, in contrast to the consistent distortion of phonemes in dysarthria. This inconsistency can be documented by asking the patient to repeat a difficult word such as “catastrophe” five times.

- 
- ▶ The four cardinal features of apraxia of speech are:
 - ▶ (1) effortful, groping, or “trial-and error” attempts at speech, with efforts at self-correction;
 - ▶ (2) dysprosody;
 - ▶ (3) inconsistencies in articulation errors; and
 - ▶ (4) difficulty with initiating utterances

- 
- ▶ Testing of patients for speech apraxia includes the repetition of sequences of phonemes (pa/ta/ka),
 - ▶ . Repetition of a polysyllabic word (e.g., “catastrophe” or “television”) is especially likely to elicit apraxic errors, and having the subject repeat the same word five times will bring out the inconsistency in the apraxic utterances.

Aphemia

- ▶ **Aphemia :**

The term has been reserved for a syndrome of near muteness, with normal comprehension, reading, and writing.

- ▶ Patients are often anarthric, with no speech whatever, and then effortful, non fluent speech emerges.

Some patients have persisting dysarthria, with dysphonia and sometimes distortions of articulation that sound similar to foreign accents .

- ▶ Aphemia is likely to involve lesions in the vicinity of the primary motor cortex and perhaps Broca area.

“Foreign Accent Syndrome”

- ▶ An acquired form of motor speech disorder, related to the dysarthrias, in which the patient acquires a dysfluency resembling a foreign accent, usually after a unilateral stroke

(Kurowski et al., 1996; Marien et al., 2019; Takayama et al., 1993).


- ▶ Lesions may involve the motor cortex of the left hemisphere.

Acquired Stuttering

- ▶ Acquired stuttering involves hesitancy in producing initial phonemes, with an associated dysrhythmia of speech.
- ▶ Acquired stuttering has been described most often in patients with left hemisphere cortical strokes (Franco et al., 2000; Turgut et al., 2002),
- ▶ Also been reported with subcortical lesions including infarctions of the pons, basal ganglia, and subcortical white matter (Ciabarra et al., 2000).


Opercular Syndrome


- ▶ Also called Foix-Chavany-Marie syndrome or cheiro-oral syndrome (Bakar et al., 1998; Bogousslavsky et al., 1991),
- ▶ It is a severe form of pseudobulbar palsy in which patients with bilateral lesions of the perisylvian cortex or subcortical connections become completely mute.
- ▶ patients can follow commands involving the extremities but not the cranial nerves.
- ▶ The ability to follow limb commands shows that the disorder is not an aphasic disorder of comprehension.

- 
- ▶ They may be unable to open or close their eyes or mouth or smile voluntarily, yet they smile when amused, yawn spontaneously, and even utter cries in response to emotional stimuli.
 - ▶ The discrepancy between automatic activation of the cranial musculature and inability to perform the same actions voluntarily has been called an “automatic-voluntary dissociation.”

NONORGANIC SPEECH DISORDERS


- ▶ Most common nonorganic voice disorders are dysphonia and aphonia.
- ▶ Onset is often abrupt, perhaps in association with emotional trauma; there may be periods of remission, and the condition may suddenly disappear.
- ▶ The speech defect may vary in type from time to time.


- 
- ▶ .In hysterical aphonia, there is profound speech difficulty but no disturbance of coughing or respiration.
 - ▶ Two common nonorganic dysphonias seen in children and adolescents are the whispering syndrome, seen primarily in girls, and mutational falsetto (hysterical high-pitched voice), seen primarily in boys.

- 
- ▶ Palilalia, echolalia, and perseveration are often manifestations of psychosis. (can b seen in frontal lobe disorders)
 - ▶ Palilalia is the repetition of one's own speech. Echolalia is the meaningless repetition of heard words. Perseveration is the persistence of one reply or one idea in response to various questions

EXAMINATION OF ARTICULATION

- ▶ Examination of articulation begins with noting the patient's spontaneous speech in normal conversation.
- ▶ Assessment of different components of speech....volume , rate , resonance , prosody (variability in pitch, rhythm , differential emphasis on words).
- ▶ phrase “puhtuhkuh” or “pataka” tests all three: labials (puh/pa), linguals (tuh/ta), and velars (kuh/ka).
- ▶ Have the patient repeat a syllable such as “puh” over and over as rapidly as possible. Normally the syllable can be pronounced accurately at a rate of 5 to 7 Hz. Then try for “tuh” and “kuh.” Listen for abnormally slow or rapid repetition, regularity and evenness, uniform loudness, or tremulousness.

- 
- ▶ Weakness and fatigueability of articulation, such as might occur in myasthenia gravis, may be brought out by having the patient count to 100 at about one number per second, enunciating each number clearly. Listen for the voice to become hoarse, hypernasal, slurred, or breathy. .
 - ▶ Normal resonance depends on an adequate seal between the oropharynx and nasopharynx (velopharyngeal competence). When palatal weakness causes an inadequate seal on pronouncing sounds that require high oral pressure, the voice has a nasal quality.

- 
- ▶ To check for nasal air leakage, hold a smooth glass or metal surface, such as one lens of a pair of spectacles, under the patient's nostrils.
 - ▶ Pronouncing sounds with a nasal component (m, n, ng) as in the phrase “ming, ping, ring, sing,” will normally produce slight condensation and fogging of the surface.
 - ▶ Have the patient say a phrase with no sounds having a nasal component (“we see three geese”).

THANK YOU