

Apraxia

Last updated: May 8, 2019

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DEFINITIONS, CLINICAL FEATURES

- acquired inability (of previously normal patient) to execute **skilled (s. learned) movements**.
- properly known as **DYSPRAXIA** because disorder is rarely complete.

- patient seems to have *lost motor templates for skilled movements*.
- APRAXIAS are body-movement equivalents of APHASIAS.
- to be classified as apraxia, patient's inability to perform learned movements cannot be caused by:
 - 1) sensory disturbances
 - 2) weakness
 - 3) ataxia
 - 4) seizures
 - 5) involuntary movements (tremor, dystonia, chorea, ballismus, athetosis, myoclonus).
 - 6) cognitive, memory, motivational, attention disorders.
 - 7) consciousness disorders.

N.B. diagnosis of apraxia is in part *diagnosis of exclusion!*

ANATOMINIS SUBSTRATAS

- **association cortex**, dalyvaujantis in MOTOR PLANNING (**prefrontal cortex, posterior parietal cortex**) pažeidimas:
 - 1) hemispheric strokes
 - 2) Alzheimer disease
 - 3) trauma

TYPES

Types of errors seen in patients:

ERROR TYPE	DESCRIPTION	EXAMPLE
I. PRODUCTION ERRORS - assuming wrong posture, moving incorrect joints, improperly coordinating multijoint movements, assuming incorrect orientation, making timing errors		
Spatial:		
1. Postural	Use body part as tool	Pantomiming scissors use, patients use fingers as blades (N.B. normal subjects can make similar errors - it is important to instruct patient specifically not to use body part as tool; unlike normal subjects, patients continue to use their body parts as tools despite these instructions).

2. Orientation	Fail to orient forelimbs to imaginary target	Pantomiming cutting piece of paper in half with scissors, patients orient scissors laterally or not in consistent plane.
3. Movement	Incorrect joint movement (stabilize joint that should be moving and move joints that should not be moving).	Pantomiming screwdriver use, patients rotate arm at shoulder and fix elbow.
Timing	Increased latency, incorrect speed, brief multiple stops (stuttering movements).	Absence of smooth sinusoidal speeds of movement when cutting with knife.
II. CONTENT ERRORS - semantically related productions (pantomiming playing trumpet rather than trombone) and unrelated responses (e.g. making hammering movements rather than those associated with trombone).		
Tool-object action knowledge	Lack of knowledge of type of actions associated with tools, utensils, objects.	When pantomiming or using screwdriver, patient pantomimes hammering movement or uses screwdriver as hammer.
Tool-object association knowledge	Lack of knowledge of association of specific tool with specific object.	When shown partially driven nail, patient may select screwdriver instead of hammer from array of tools.
Mechanical knowledge	Lack of knowledge of overall mechanics of use of tools.	When attempting to drive nail with no hammer available, patient selects screwdriver rather than heavier tool (pliers).

General categories:

1. **MOTOR (s. LIMB-KINETIC, INNERVATORY, CORTICAL) apraxia** (simple acts are incapable of being performed) – **PRODUCTION** errors (e.g. spatial and temporal errors) ≈ MOTOR APHASIA

- dažnai kartu esti ir galūnės parėzė, bet motorikos sutrikimas (clumsy movements) nepaaiškinamas vien parėze.

N.B. apraxia is useful sign to elicit because it **indicates that lesion** (causing hemiparesis) **involves cerebrum** (apraxia is not seen in lesions that involve internal capsule or lower).

2. **IDEATIONAL apraxia** - unable to carry out ideational plan (*series of acts in proper sequence*); although many spontaneous actions are carried out easily ≈ SENSORY APHASIA

e.g. when writing and sending letter, patient seals envelope before inserting letter.

- to observer, patient appears uncertain about what to do next.
- **bilateral frontal & parietal dysfunction** - disrupted motor plans for chain of individual movements involved in complex behaviors.

3. **IDEOMOTOR (s. transcortical, ideokinetic, conduction) apraxia** ≈ CONDUCTION APHASIA

- motor behavior is intact when executed spontaneously, but faulty when attempted in response to verbal command (inability to carry out imagined act, e.g. *pretend that you have a book of matches and show me how you would light a match*).

- patients comprehend examiners' pantomimes and gestures but cannot perform movements on command* - interrupted connections between volition (ideas) and motor cortex.

* patient repeats poorly (!) - greater impairment when **imitating movements** than when **pantomiming** to command

- dažniausia apraxia forma.
- **IDEOMOTION** – movement under influence of dominant idea, being practically automatic and not volitional.

1) **posterior form** (*left angular / supramarginal gyrus* lesions) - difficulty **performing in response to command** and **imitation**; patients do not discriminate between poorly and well-performed acts.

- 2) **anterior form** (lesions *anterior to supramarginal gyrus* - disconnect visual kinesthetic motor engrams from premotor & motor areas) - also perform poorly to command or imitation but *can comprehend and discriminate pantomimes*.

Porūšis - **DISASSOCIATION apraxia** - cannot *gesture left* limbs to verbal command*.
 *dyspraxia of nondominant limbs often passes without notice

- *callosal lesions* – disconnect dominant hemisphere (comprehension of verbal commands) from another hemisphere that must move limb on verbal command.
- intact ability to *imitate motions* and *use objects*.

4. CONCEPTUAL apraxia - **CONTENT** errors.

- most commonly seen in *Alzheimer dementia*.

According to action:

SPEECH APRAXIA (S. MOTOR APHASIA) – left area 44 (Broca center).

WRITING APRAXIA (S. AGRAPHIA) – left angular gyrus.

DRESSING APRAXIA – right posterior parietal cortex.

GAIT APRAXIA – difūzinēs ligos (e.g. Alzheimer – esp. common in elderly).

CONSTRUCTIONAL APRAXIA (impaired building, assembling, drawing) – right parietal cortex, hepatic encephalopathy (test – “draw 5-pointed star”).

Types of errors in various apraxia types:

Apraxia Type	Errors to Command:		Discrimination:				
	Postural	Orientation	Movement	Comprehension	Imitation	Series	Mechanical Knowledge
Ideomotor:							
Anterior	+++	+++	O	O	++	O	O
Posterior	+++	+++	+++	+++	++	O	O
Conduction	O	O	O	O	+++	O	O
Disassociation	+++	+++	O	O	O	O	O
Ideational	O	O	O	O	O	+++	O
Conceptual	O	O	O	O	O	O	+++

DIAGNOSIS

Most patients **do not recognize their disability or complain about it:**

- a) **anosognosic** for apraxia.
- b) in **hemiparesis**, patients perform skilled acts with *nonpreferred arm* – patients attribute difficulty to premorbid clumsiness of nonpreferred arm (but this may be not true and reflects apraxia!).

ANAMNESIS - inquired about ACTIVITIES:

- 1) common bathroom tools (toothbrushes, razors, combs, brushes).
- 2) preparation of meals, use typical kitchen utensils (forks, knives, spoons).

OBJECTIVE EXAMINATION - see EXAMINATION TECHNIQUES

TREATMENT

- little is presently known about rehabilitation of patients with apraxia.

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