**Motor rehabilitation of aphasic stroke patient: the possibility of Rood’s approach**

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Aphasia is an acquired neurogenic language disorder that makes patients unable to comprehend or form sentences with language impairment. Patients suffering from aphasia face difficulties in reading, writing, and expressing themselves. The causes of aphasia are stroke, trauma, brain tumor, and injury, particularly to the left hemisphere. About 20% of acute stroke cases in the world account for aphasia. Aphasia is categorized into: non-fluent and fluent forms. Non-fluent is further classified based on language and comprehension into: 1) Broca’s aphasia, 2) transcortical motor aphasia, 3) global aphasia, and 4) transcortical mixed aphasia. In transcortical mixed aphasia, the language and comprehension are intact, whereas, in global aphasia, they are distorted. Transcortical mixed aphasia is also called isolation aphasia and it is equivalent to global aphasia. Comprehension of spoken language is severely disturbed in patients having this syndrome. It is common in occlusion of the internal carotid artery. In fluent aphasia, fluent aphasia is also classified according to language and comprehension into conduction aphasia, anomic aphasia, Wernicke’s aphasia, and transcortical sensory aphasia. The language and comprehension in anomic aphasia are intact, while they are impaired in Wernicke’s aphasia and transcortical sensory aphasia. Aphasia such as conduction aphasia and subcortical aphasia are considered “exceptional aphasia,” since they do not fit neatly into this or similar classification systems.

Aphasia is divided into two components: 1) language impairment after a brain injury to the dominant hemisphere of the body instead of the alternate side. Therefore, an individual with right-handedness who has suffered a stroke in the right hemisphere would exhibit crossed aphasia. Likewise, damage to subcortical brain regions (e.g., the thalamus or basal ganglia) can lead to subcortical aphasia, and the symptoms can mimic those seen in cortical lesions (Goodglass and Kaplan, 1972; Rogers, 2004; Davis, 2007; Code, 2021).

Rehabilitating stroke patients with aphasia can be challenging. As other aphasic strokes, there are still controversies regarding potential rehabilitation approaches. Amongst several rehabilitation approaches, most physiotherapists choose passive movements. In addition, training is a crucial part. We cannot utilize proprioceptive neuromuscular facilitation exercises because they require verbal commands. Neurodevelopmental treatment, which inhibits abnormal reflexes and allows for acquiring normal tone, provides better cognition via an activity-based approach, making it better suited for rehabilitation. Implementing the Brunstrom approach also requires better cognition. In Rood’s approach, exteroceptive and proprioceptive stimuli are generated to stimulate muscle tone, providing the same joint compressions are employed to inhibit abnormal hypertonia. When we stimulate the exteroceptors, we also tend to stimulate the sympathetic nervous system, which, in turn, excites the motor system. The improvement of tone in the acute stage of stroke can prevent various morbidities and mortality, including deep venous thrombosis, pressure ulcers, pneumonia, and contractures. Rood’s approach is relatively easy to apply and makes no cognitive demands on the patient, making it convenient for both patients and caregivers (Bordoloi and Deka, 2020).

In Rood’s approach, a sensory stimulus is used to determine specific motor responses, developmental sequences are used, i.e., from lower to higher levels, and practice of sensory-motor response until learning is achieved. The rules of sensory input are: 1) a fast, brief stimulus produces synchronous movement output, 2) a fast, repetitive stimulus produces a sustained response, 3) a maintained sensory input produces a sustained response, and 4) a slow, repetitive, and rhythmic stimulus decreases the tone in muscle response. Additionally, we can use neck flexion, rotation, and side-bending of the neck to stimulate the vestibular receptors. We can even use symmetrical and asymmetrical tonic neck reflexes to generate tone in the flexors and extensors, which, in turn, excites the motor system. Further, the implementation of Rood’s approach for facilitation of tone involves: 1) mobilizing touch and tactile stimulation, 2) brushing against the skin, 3) quick icing (if the patient tolerates it), 4) quick stretching, 5) tapping on the belly and tendon, 6) rubbing the skin to stimulate receptors below the skin, 7) heavy joint compression, 8) rolling, and 9) neutral warmth. A fast repetitive stimulus decreases the muscle tone that is abnormally high. A. Tactile stimulation, brushing to the skin, quick icing, quick stretch, and rubbing of the skin causes stimulation of exteroceptors and produces a protective withdrawal response and hence movement in the extremities. B. Tapping muscle and rubbing skin causes stimulation of proprioceptors including stimulation of muscle spindle, Golgi tendon organ, and receptors around the joint which results in muscle contraction. These sensory organs can be stimulated by quick stretch, tapping over the muscle belly, and rubbing. C. Heavy joint compression is applied through the longitudinal axis of the bone causing co-contraction around the joint. It can be combined with an ontogenetic pattern such as prone on the elbow, quadruped position, sitting, or standing. Pressure can be applied manually and with weight cuffs also. D. Gentle rolling and proprioception. E. Neutral warmth relaxes muscles and tendons and hence normalizes the tone.

Rood has stated four types of receptors that can be stimulated to acquire desired muscular response - proprioceptive receptors, exteroceptive receptors, vestibular receptors, and special sense organs. Different smells, music, vestibular mobilization, and modulated color light can affect the autonomic nervous system, which in turn leads to better consciousness (Bordoloi and Deka, 2019).

In acute cases, there may be a lack of voluntary control in the muscles. Stimulation of the skin with strokes, moving touch, quick icing, and brushing will stimulate sensory tracts, leading to muscle contractions. In the face of rapid stretching and heavy joint compression, the proprioceptors located in the muscles and surrounding the joint will activate, resulting in muscular contraction through the reflex arc, spinocerebellar tract, lemniscal tract, and corticospinal tract, and this, in turn, will stimulate muscle tone. The vestibular system and muscle tone are also stimulated by tilting and rotating the head by utilizing symmetrical and asymmetrical tonic neck reflex. To stimulate the brain, familiar smells, faces, and favorite music can be used to stimulate various sense organs (Figure 1).

There are other neurorehabilitation approaches that require patient cognition. These approaches become limited in the event of aphasia. Rood’s approach is such an approach that is both easy to follow up and also can yield positive results, but it has never been tried before. Patients with aphasia are left for natural recovery which takes a long time and causes spasticity, contracture, and poor quality of life, which is also a burden on caregivers. Taking this approach is easy for caregivers as well. Training caregivers will enable them to continue the treatment at home, leading to better results.

Due to the fact that this approach does not place cognitive demand on the patient, it can be applied to all stroke patients with aphasia regardless of the type of aphasia, stroke type, or side affected. In addition, there are a number of markers we can use to assess neuroplasticity, including brain-derived neurotrophic factor, glial cell-derived neurotrophic factor, nerve growth factor, and vascular endothelial growth factor. With a fruitful recovery rate, we continue to provide this treatment along with other regular procedures to stroke patients with aphasia.

**References**

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