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The impact of the PNF method on stroke patients with sensory disturbances.

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Introduction

Every 6.5 minutes someone in Poland experiences a stroke. Stroke affects about 75,000 people in Poland each year and is the third cause of death, after heart disease and tumor, and the most common cause of permanent disability in people over 40. Stroke patients often experience motor deficits that include hemiparesis and impaired sensation in half of the body. Both of these components directly reduce the motor efficiency of patients. Superficial and deep sensation provide the central nervous system to obtain information about the position of the body in space. Without this information, the functioning of the nervous system is disturbed. Adequate muscle strength is not enough to maintain the correct body position, ability to move and perform complex activities.

Topic of the doctoral thesis

Investigation of the impact of sensory disturbances and methods targeting them, in the context of the effectiveness of rehabilitation of motor deficits in acute phase of stroke.

The aim of the study

Determination of the frequency of sensory disturbances in patients after stroke. Examination of the effectiveness of the PNF technique as a method of stimulation of disturbed sensory perception, its impact on the improvement of sensation, muscle strength and return to functional efficiency.

Research hypothesis: Additional sensory stimulation using the PNF method improves sensation, muscle strength and increases the functional efficiency of patients.

Subject of research:
The first part of the study: 46 stroke patients.
The second part of the study: 15 patients with a comparable motor deficit, who (in the first stage of the study) were diagnosed with deep sensation disorders with paresis of the limbs at the level of 2-3 on the MRC scale. Patients were divided into two groups - control and research.
Control group: 7 patients who underwent standard physiotherapy in the stroke ward (passive/active-passive/active limb exercises, learning to turn while lying down, learning to sit actively, verticalization and gait reeducation).
Research group: 8 patients, in whom, apart from standard physiotherapy, an additional form of sensory stimulation was used - PNF therapy (neurorehabilitation method).

Inclusion criteria: age >18 years, diagnosis - first ever vascular incident - ischemic or hemorrhagic stroke, and in the case of the second part of the study, the presence of sensory disturbances with motor deficit (2-3 on the MRC scale).
Exclusion criteria: the presence of significant sensory aphasia, significant hearing loss that makes communication difficult (which cannot be corrected with a hearing aid), significant dementia that does not guarantee the reliability of the physical examination, neglect syndrome, previously diagnosed polyneuropathy, as well as other neurological diseases with motor and/or sensory deficits (e.g. CNS tumors, multiple sclerosis).

Methodology

The first stage of the study involved 46 patients and included testing of sensation, muscle strength and functional status. The study included directly affected upper and lower limbs, as well as unaffected limbs to compare sensory perception on both sides of the body.
Examination:

- ✓ Superficial sensation:
  - ✓ touch perception – Semmes-Weinstein fiber (monofilament fiber)
  - ✓ pain feeling - Neuropen device with a neurotip
  - ✓ temperature feeling - Thip-therm test device
- ✓ Deep (proprioceptive) sensation:
  - ✓ position – mirror test
  - ✓ vibration sensation – 128Hz tuning fork
- ✓ Muscle strength - MRC (Medical Research Council) scale
- ✓ Functional Status - Rivermead Motor Assessment (RMA) and Barthel Index (BI)
- ✓ CT (Computed Tomography)

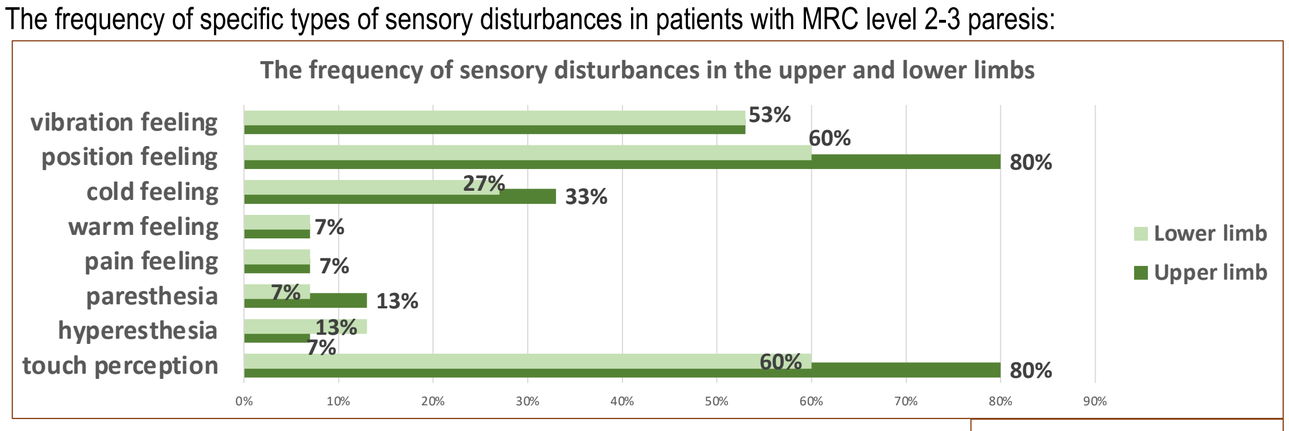
In the second stage of the study patients from the control and study groups were subjected to physiotherapeutic therapy 1.5 h/day for 8 days. The control group received only standard physiotherapy in a stroke unit, while the study group had additional stimulation with PNF therapy. After 8 days, all patients underwent a re-examination of sensation, muscle strength and functional status in order to examine the appropriateness of using additional stimulation with the PNF method.

PNF (Proprioceptive Neuromuscular Facilitation) is a method of kinesiotherapy based on neurophysiological principles. It focuses on sense of position of the body and movement feeling (proprioception). PNF therapy improves coordination and balance, increases muscle strength, improves deep sensation, and increases range of motion. In addition, it improves the technique of performing various types of movements.

Results

In the group od 46 patients participating in the first part of the study ischemic stroke occurred in 44 individuals and hemorrhagic stroke in 2 patients. Right hemisphere stroke occurred in 55% of subjects and left hemisphere stroke in 45% of patients. Sensory disturbances occurred in 50% of all individuals. 15 patients had sensory disturbances co-occurring with limb paresis at the level 2-3 according to the MRC scale, who were qualified for the second stage of the study. None of the patients qualified for the study presented selective disorders of superficial sensation. Patients presented with either only deep sensation alternations or disturbances of deep sensation co-occurring with alternations of superficial sensation.

The frequency of specific types of sensory disturbances in patients with MRC level 2-3 paresis:



Source: own elaboration

Sensory disturbances in the study group occurred more often in the upper limb than in the lower limb. Within the upper and lower limbs, the most common types of sensory alternations were disturbances of touch perception (UL 80%, LL 60%) and position feeling (UL 80%, LL 60%).

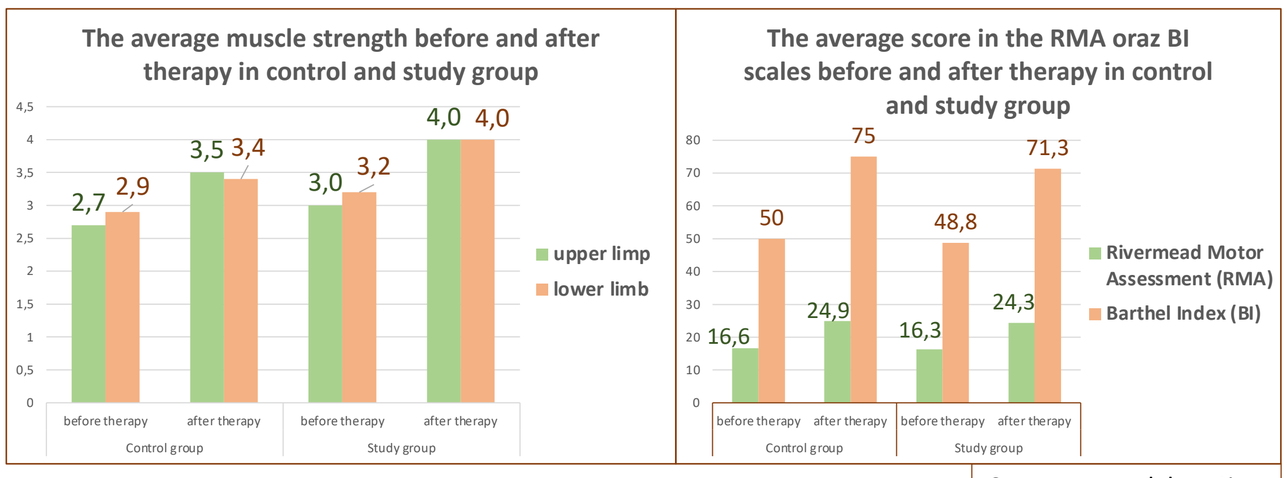
The incidence of sensory disturbances before and after physiotherapy in the control and study group is presented in the table below:

	Control group				Study group			
	Upper limb		Lower limb		Upper limb		Lower limb	
	before therapy	after therapy	before therapy	after therapy	before therapy	after therapy	before therapy	after therapy
touch perception	100%	71%	86%	71%	63%	25%	38%	25%
hypersthesia	14%	0%	14%	0%	0%	0%	13%	13%
paresthesia	14%	14%	0%	0%	13%	25%	13%	13%
pain feeling	0%	0%	0%	0%	13%	0%	13%	0%
warm feeling	0%	0%	0%	0%	13%	13%	13%	13%
cold feeling	29%	14%	14%	14%	38%	13%	38%	13%
position feeling	86%	43%	57%	43%	75%	13%	63%	13%
vibration feeling	57%	43%	43%	29%	50%	25%	63%	38%

Source: own elaboration

In the control group, the greatest improvement in sensation was observed in the position feeling (in the upper limb) and in the light touch (in the lower limb). In the research group, patients have achieved the greatest progress in improving the feeling of positioning both in the upper and lower limbs. Taking into account the improvement of all types of sensation, better therapeutic effects were achieved in the study group compared to the control group.

The average value of muscle strength according to the MRC scale and the average score in the RMA and BI scales in the control and study group is presented in the charts below:



Source: own elaboration

A greater improvement in muscle strength after therapy was observed in the study group (both in the upper and lower limbs). Both in the control group and in the study group, after the therapy, an improvement in the score in the RMA and BI scales was observed, which indicates an improvement in the functional status of patients. There were no significant disproportions in the improvement of score between the control and study groups.

Conclusions

Sensory disturbances occurred in 50% of the examined patients. PNF method positively influenced the improvement of sensory perception, muscle strength and functional status. The use of PNF therapy allowed patients to achieve better results in terms of regaining sensation and muscle strength. This therapy did not result in a greater improvement in functional status compared to patients who received only standard therapy in a stroke unit.