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PHYSICAL THERAPY AND REHABILITATION FOR HEMIPLEGIC STROKE

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Abstract:

Introduction: *When should physician order rehabilitation after a stroke? This may sound a very easy question, but in reality, it is a very challenging question and continue to be one of the most controversy ones. Recent results from studies conducted on animals revealed that after ischemic injury, a consequence of genetic, molecular, cellular, and electrophysiological events is stimulated which activate neural recovery. All together, these consequences lead to cortical reorganization and regeneration, and can add the neural substrate for spontaneous recovery.*

Aim of work: *In this review, we will discuss Physical Therapy and Rehabilitation for Hemiplegic Stroke*

Methodology: *We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: physical therapy, rehabilitation, hemiplegia, quadriplegia, neuroplasticity change.*

Conclusions: *The best timing to start rehabilitation after a stroke is a controversial subject. After twenty-four hours, rehabilitation of diverse types appears to be a reliable and safe, however a well-defined "plastic window" in humans, during which injured brain is particularly primed for rehabilitative intervention, continues to be elusive. The optimal outcomes in the early time window have been seen in upper extremity CIMT studies. In the realms of dysphagia and neglect, early intervention has shown some promise, but the results are so limited, and the high proportion of spontaneous recovery makes it hard to evaluate the true impact of early intervention.*

Key words: *Physical Therapy, Rehabilitation, Hemiplegic Stroke, Recovery.*

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INTRODUCTION:

When should physician order rehabilitation after a stroke? This may sound a very easy question, but in reality, it is a very challenging question and continue to be one of the most controversy ones. Recent results from studies conducted on animals revealed that after ischemic injury, a consequence of genetic, molecular, cellular, and electrophysiological events is stimulated which activate neural recovery. All together, these consequences lead to cortical reorganization and regeneration, and can add the neural substrate for spontaneous recovery. In animals, these consequences begin within hours after stroke, peak at ten days, and are nearly complete at thirty days [1]. This time course corresponds with the period of maximal spontaneous recovery in rodents, which has been proven in several studies to take place almost entirely within one month after stroke [2-3].

Investigators have theorized that neuroplasticity during the dynamic early period after stroke can be improved and probably prolonged. Results from clinical studies based on this hypothesis, But, have been unconvincing and contradictory. Furthermore, concerns have emerged, first models and more recently in human trials, that rehabilitation delivered too early, or too intensively during the very early period, could harmful. Here, Studies on rehabilitation in this interval is very scant, largely due to logistical difficulties, involving medical instability in many acute stroke patients, and the difficulty of conducting research across different care settings in the USA. This discrepancy leads to a dearth of high-quality evidence on best practices and mechanisms of recovery during the crucial first days after stroke. The goal of this review is to explore existing evidence regarding rehabilitation in the early period after stroke, in the domains of mobility, upper extremity function, language, neglect, and dysphagia. In this review, we will discuss the most recent evidence regarding Physical Therapy and Rehabilitation for Hemiplegic Stroke.

METHODOLOGY:

• Data Sources and Search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: physical therapy, rehabilitation, hemiplegia, quadriplegia, neuroplasticity change

• Data Extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were resolved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

The study was approved by the ethical board of King Abdulaziz University Hospital

Neuroplastic Changes Following Stroke

Cortical Reorganization

One of the most important parts of post-stroke neuroplasticity is cortical reorganization, a process in which functions of the injured brain migrate to other, uninjured brain regions. In mice, within one to three days of stroke, stimulation of limbs contralateral to the stroke produces activity in the ipsilateral cortex, suggesting reorganization of sensory inputs to the intact hemisphere. By one to two weeks post-stroke, activity changes back to the injured hemisphere, with spared perilesional cortex taking on functions of the damaged brain [4-5].

Evidence for the Benefit of Early Rehabilitation in Animal Models

Many researches have revealed that animals exposed to locomotor exercise beginning twenty-four to forty-eight hours post-stroke have much improved behavioral results and smaller ischemic volumes than control animals who receive delayed or no exercise training [6]. One study clearly compared initiation of treadmill training at different time points and found behavioral gains in rats who began training at five days, and to a lesser extent fourteen days, but not thirty days post-stroke.

Human Trials

Very Early Mobilization

Lately, a hypothesis has gotten attention that the classical practice of forced bedrest after stroke may be dangerous, and that mobilizing patients as early as possible could prevent complications and promote recovery in humans. In the past five years, 4 trials have sought to test this hypothesis. The biggest one is the multicenter AVERT (A Very Early Rehabilitation Trial for Stroke) [7]. AVERT tested a very early mobilization (VEM) protocol consisting of three core elements: initiation within twenty-four hours of stroke onset; focus on out-of-bed (OOB) activity (i.e., sitting, standing, and walking); and addition of at least three OOB sessions to standard care (SC) The difference in intensity, however, was huge.

Physiotherapeutic Approaches: Lower Extremity

Function and Gait

A research found two good-quality clinical trials of early lower extremity and gait rehabilitation. One study questioned the efficacy of Weight Supported Balance Therapy (WSBT) in acute stroke patients, with therapy initiated on average thirteen days post-stroke [8]. Patients were randomly assigned to WSBT plus standard PT or standard PT alone, and the primary results were pre-post-intervention changes in Fugl-Meyer Balance (FM-B).

Another multicenter study investigated the effect of timing for 2 various used physical therapy programs: Proprioceptive Neuromuscular Facilitation (PNF) and Cognitive Therapeutic Exercise (CTE) [9]. This study was conducted on more than three hundred adults, all of whom presented within twenty-four hour of stroke onset. The early groups began therapy within twenty-four hours of admission; the delayed groups began four days after stroke onset. All groups received one hour of therapy, which was a mix of in-bed and OOB activity.

Upper Extremity

Research study found three newly conducted clincial trials of early upper limb rehabilitation. The multicenter EXPLICIT-Stroke trials recruited a total of more than one hundred adults, an average of eight days after ischemic stroke, and tested two different interventions [10]. For patients with favorable prognoses, defined as more than ten degrees of voluntary finger extension, mCIMT daily for 3 weeks was compared with SC. In the larger second trial of patients without voluntary finger extension, electromyography-triggered neuromuscular stimulation (EMG-NMS) of the finger extensors in comparison to SC. Both trials utilized the Action Research Arm Test (ARAT) at five weeks from stroke as the primary outcome measure. The mCIMT arm of the trial was positive, with a significant six-point difference in ARAT in arms of the group at 5five weeks post-stroke. [10]

Non-invasive Brain Stimulation in Motor Rehabilitation

Non-invasive brain stimulation (NIBS), that involved repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS), has revealed higher promise in changing the brain activity and enhancing motor function after stroke. They found 4 studies examined NIBS in early stroke motor rehabilitation published in the past five years, with perfect safety outcomes with different efficacy. There were no statistically significant differences between both groups. [11]

Robotics

A study identified studies of robotic interventions in early stroke rehabilitation. A 2013 study tested robotic tilt-table stepper training, beginning within five days of ischemic stroke, with or without functional electrical stimulation, against SC. The primary result measure was the changes in Medical Research Council (MRC) strength scale. The study concluded that leg strength increased significantly in both experimental groups compared to the control group. [3]

Aphasia

Early aphasia management has been investigated in new clinical trials. The largest and most robust of these is the Rotterdam Aphasia Therapy Study-3(RATS-3), which enrolled more than one hundred subjects in fourteen centers across the Netherlands. RATS-3 enrolled patients within fourteen days of a first stroke causing aphasia. [9]

Neglect

New clinical trials of management for unilateral visuospatial and/or motor neglect early after right hemisphere stroke. The first trial studied right hemifield eye patching (HEP) in subjects within fifteen days of stroke. Patching is designed to redirect attention to the neglected hemifield by obscuring the normal field via opaque patches worn on glasses. Subjects in the intervention group wore patches for eight hour per day for fifteen days and received no other specific therapy for neglect. [9]

CONCLUSIONS:

The best timing to start rehabilitation after a stroke is a controversial subject. There is huge evidence that rehabilitation within the first twenty first hour, particularly intensive rehabilitation, is possibly harmful, and we would advise caution in pursuing further investigations of intensive rehabilitation within this timeframe. After twenty-four hours, rehabilitation of diverse types appears to be a reliable and safe, however a well-defined “plastic window” in humans, during which injured brain is particularly primed for rehabilitative intervention, continues to be elusive. The optimal outcomes in the early time window have been seen in upper extremity CIMT studies. In the realms of dysphagia and neglect, early intervention has shown some promise, but the results are so limited, and the high proportion of spontaneous recovery makes it hard to evaluate the true impact of early intervention.

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