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Role of Continuous Passive Motion of Elbow to Improve Feeding in Stroke: A Comparative Study

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ABSTRACT

Methods: 30 subjects sub-acute-chronic stage of stroke are selected and randomly distributed into two groups. Subjects are assessed using pretest data of MAS & FIM Scale. Group-A received CPM intervention and feeding training for 8 weeks and Group-B received conventional O.T treatment and feeding training for 8 weeks. After 8 weeks subjects assessed. Results: The finding of the study suggest that the patient who have received CPM treatment has shown greater improvement as compared to the patient who have received conventional occupational therapy program. Conclusion: CPM is thus effective in releasing joint tightness and improves the range of motion of elbow to improve the feeding level. Further studies with larger sample sizes are needed to assess the efficacy of this intervention into a clinical treatment program. Hence the study may be considered among one of the preliminary studies in the area.

KEYWORDS: *continuous passive motion, feeding level*

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INTRODUCTION

WHO RA 21ST CENTURY RA DEFINATION OF STROKE ADD KARA

- Stroke is one of the most common reasons for a continuous motor impairment of the upper & lower limb. This is a medical, social & economic problem, the cause of which is the increasing aging population. In a large percentage of cases leads to severe disability (Ivelina Stefanova, 2016).
- There is evidence that stroke also is the leading cause of permanent disability in the world despite advances in prevention and novel interventional treatment. Randomized controlled studies have demonstrated the effectiveness of specialized post-stroke rehabilitation units, but administrative orders have severely limited the length of stay, so novel approaches to the treatment of recovery need to be tested in outpatients
- Although the mechanisms of stroke recovery depend on multiple factors, a number of techniques that concentrate on enhanced exercise of the paralyzed limb have demonstrated effectiveness in reducing the motor impairment.
- Neuroplasticity is the basic mechanism underlying improvement in functional outcome after stroke. Therefore, one important goal of rehabilitation of stroke patients is the effective use of neuroplasticity for functional recovery. Other principles of stroke rehabilitation are goal setting, high intensity practice, team care & task specific training.
- Therefore, high-dose intensive training& repetitive practice of specific functional tasks are important for recovery after stroke. These requirements make stroke rehabilitation a labor-intensive process.
- Upper extremity complications are common following stroke and may be seriously debilitating. Regaining mobility in the upper extremities is often more difficult than in lower

extremities, which can seriously impact the progress of rehabilitation. A large body of research exists around upper extremity complications but debate continues regarding the timing of treatment and adequate prognostic factors. This review provides current information regarding upper extremity interventions.

- Eating is a complex form of behavior, normal eating presupposes that different factors interacts successfully.
- The cerebral regulation of hunger and satiation, food palatability, food habits and the ability to perform these motor actions necessary for eating are examples of such factors.
- Continuous passive motion has been use to improve range of motion, it also induces, relaxation of the involved muscles.

RATIONALE

- Several studies (Patrizio Sale, Valentina Lombardi, 2012), have been done to improve feeding capacity of stroke patients by using Conventional Occupational Therapy but adequate number of studies are not available on comparison between Continuous Passive Motion (CPM) and conventional Occupational Therapy intervention in stroke patient to Improve feeding.
- In this study patients voluntary motor action on feeding is emphasized.

AIMS & OBJECTIVES

AIM- To determine the effect of Continuous Passive Motion (CPM) in improving the level of feeding in stroke patient.

OBJECTIVES

- Reduce spasticity of upper extremity.
- Improve Range of Motion.
- Improve hand to mouth movement.

HYPOTHESIS

- **HYPOTHESIS-**Conventional occupational therapy along with continuous Passive Motion (CPM) can enhance therapeutic effect on feeding status of stroke patient.
- **NULL HYPOTHESIS-**There is no difference in feeding status when Continuous Passive Motion (CPM) is used along with Conventional Occupational Therapy.

METHODOLOGY

STUDY DESIGN- An experimental pre-test post-test study design was used

TOTAL NO OF SUBJECTS- 30 (both male & female) (dominant hand).

SAMPLING- Convenient sampling with random distribution.

DURATION OF STUDY- 8 weeks for both experimental and control group

GROUPS-

1. Control group(15)
2. Experimental group(15)

SELECTION OF SUBJECTS- Department of Occupational Therapy, SV NIRTAR, olatpur, Cuttack.

TREATMENT MODALITY-

1. Continuous Passive Motion(CPM)
2. Conventional Occupational Therapy

INCLUSION CRITERIA

- Diagnosed cases of stroke
- Subacute- Chronic stage stroke(3 months – 1 year)
- Brunnstrom Stage-

1. Arm-4
2. Hand-4
3. M.M.S.E score>24.

EXCLUSION CRITERIA

- No bony deformity
- No contracture
- Problem in deglutition.
- Problem in mastication.
- Facial weakness.
- G.I tract problem

RELATED LITERATURE

CVA or Stroke, describes a variety of disorders characterised by sudden onset of neurological deficits caused by a sudden onset of neurological deficits caused by vascular injury to the brain. vascular damage in the brain disrupts blood flow, limits oxygen supply to surrounding cells, and leads to brain tissue death / infarction (Trombley et al 2002).

EPIDEMOLOGY AND ETIOLOGY

Stroke is the fourth leading cause of death and the leading cause of long- term disability among adults in the united states. An estimated 7,000,000 Americans older than 20 years of age have experienced a stroke.

Each year approximately 795,000 individuals experience a stroke; approximately 610,000 are first attack and 185,000 are recurrent strokes.

Compared to whites, African Americans have twice the risk of first – ever stroke; rates are also higher in Mexican Americans, American Indians and Alaska natives.

The incidence of stroke increases dramatically with age, doubling in the decade after 65 years of age.

Twenty – eight percent of strokes occur in individuals younger than 65 years of age.

Between 5% and 14% of persons who survive an initial stroke will experience another one within 1 year; within 5 years stroke will recur in 24% of women and 42% of men. Current data reveal that stroke incidence has been declining in recent years in a largely white adult cohort.

The incidence of stroke deaths is greater than 143,000 annually, and strokes account for 1 of every 18 deaths in the united states (Truelsen et al 2000).

Men are more likely to experience stroke, compared to women, with a ratio of 1.35: 1 for haemorrhagic stroke, respectively.

80% of ischaemic stroke patients and 85% of haemorrhagic stroke patient experience hemiparesis/ hemiplegia during the sub-acute ad/ or chronic stages. This occurs more commonly on the right side of the body (Ingrid Brenner).

CAUSATION

Strokes are usually classified by the mechanism and location of vascular damage. The two broad causes are ischaemic or haemorrhagic.

Ischemic strokes results from a blockage of a cerebral vessel and can further be categorized as caused by thrombosis or embolism.

Thrombosis is the stenosis or occlusion of a vessel usually as the result of atherosclerosis.

This occlusion is typically a gradual process, often with preceding warning signs, such as transient ischaemic attack (TIA). An embolism is dislodged platelets, cholesterol or other materials that travel in the blood stream and blocks a vessel. Ischaemic strokes are the most common type, representing roughly 80 % of strokes (Brandstater, 2005).

Haemorrhagic strokes results from a rupture of a cerebral blood vessel. In such strokes, blood is released outside of the vascular space, cutting off pathways and leading to pressure injuries to brain tissue. Haemorrhages which are either intracerebral or subarachnoid may be caused by hypertension, arteriovenous malformation, cerebral aneurysm (Bartels,2004).

Haemorrhagic strokes are less common, but they result in a higher mortality rate than ischaemic strokes (America Heart Association, 2005).

PATHOPHYSIOLOGY

Transient ischaemic attack (TIA): Symptoms of TIA include the focal deficits of an ischaemic stroke and a clearly vascular distribution, but TIAs are reversible defects because no cerebral infarction ensues. By definition, the effects of TIA must resolve in less than 24 hours. It may result from the formation of micro thrombi and their embolization. Large vessel thrombosis also can occur in extra cranial vessels, such as the vertebral and carotid arteries, leading to devasting strokes.

Thrombotic stroke can result from a variety of causes, but most causes are related to the development of abnormalities in the arterial vessel wall. Thrombosis and embolism are often both present, especially in patients with atherosclerotic disease. The exact mechanism of infarction from thrombosis still is being debated, but atherosclerosis does play a significant role.

Hypertension with associated micro- trauma of the arterial intima is thought to play a role, as is hypercholesterolemia.

Atherosclerotic plaque formation is greatest at the branching points of major vessel and also forms in areas of turbulent flow. Chronic hypertension is common precursor, and damage to the intimal wall may be followed by lymphocyte infiltration. Foam cells then developed and, the stage of atherosclerosis is formed. Calcification and narrowing with resultant turbulent flow follow. In this setting the turbulent flow, plaque ulceration can become a site for thrombus formation, If the thrombus forms and is degraded rapidly, a transient ischaemic phenomenon can occur, which is the setting of TIA.

The size and severity of the infarction depends on available collateral circulation and the size of the occluded vessel. In patient with extensive atherosclerotic disease, however a limited amount of collateral circulation is available.

A Lacunar stroke occurs in one of the perforating branches of the circle of Willis, the middle cerebral artery stem, or the vertebral or basilar arteries. The occlusion of these vessels results from the atherothrombotic or lipohyalinotic blockage of one of these arteries.

Haemorrhagic stroke has 4 most common causes i.e. Deep hypertensive intracerebral haemorrhages, ruptured saccular aneurysms, bleeding from an arteriovenous malformation (AVM), and spontaneous lobar haemorrhage.

Hypertensive bleeding usually occurs in four sites: the putamen and internal capsule, the pons, the thalamus and the cerebellum. Usually these haemorrhages develop from small penetrating arteries in the deep brain.

SYMPTOMS OF STROKE

MCA infract:

- Paralysis of the contralateral face, arm and leg.

- Sensory impairment over the contralateral face, arm and leg (pinprick, cotton touch, vibration, position, two-point discrimination, stereognosis, tactile localization, Bara gnosis, cutaneographia).
- Motor speech disorder.
- Central aphasia, word deafness, anomia, jargon speech, alexia, agraphia, acalculia, finger agnosia, right-left confusion (the last four comprise the Gerstmann syndrome)
- Apractagnosia (amorphosynthesis), anosognosia, hemi asomatognosia, unilateral neglect, agnosia for the left half of external space, "dressing apraxia", "constructional apraxia", distortion of visual coordinates, inaccurate localization in the half field, impaired ability to judge distance, upside- down reading, visual illusions.
- Homonymous hemianopia (often superior homonymous quadrantanopia).
- Paralysis of conjugate gaze to the opposite side.
- Avoidance reaction of opposite limbs.
- Miscellaneous:
- Ataxia of contralateral limb(s) So- called.
- Apraxia of gait.
- Loss or impairment of optokinetic nystagmus.
- Limb-kinetic apraxia.
- Mirror movements.
- Cheyne-stokes respiration, contralateral hyperhidrosis, mydriasis (occasionally).
- Pure motor hemiplegia.

ACA INFARCT:
- Paralysis of opposite foot and leg.
- A lesser degree of paresis opposite arm.
- Cortical sensory loss over toes, foot, and leg.
- Urinary incontinence.
- Contralateral grasp reflex, sucking reflex, gegenhalten (paratonic rigidity), "frontal tremor".
- Abulia (akinetic mutism), slowness, delay, lack of spontaneity, whispering, motor inaction, reflex distraction to sights and sounds.
- Mental impairment (perseveration and amnesia).
- Miscellaneous:
- Dyspraxia of left limbs.
- Tactile aphasia in left limbs.
- Cerebral paraplegia.
- Impairment of gait and stance ("gait apraxia").
- Mental impairment (perseveration and amnesia).
- Miscellaneous: dyspraxia of left limbs tactile aphasia in left limbs.
- Cerebral paraplegia.

PCA INFARCT:
- Thalamic syndrome: sensory loss (all modalities), spontaneous pain and dysesthesias, choreoathetosis, intention tremor, spasms of hand, mild hemiparesis
- Thalamoperforate syndrome: (1) superior, crossed cerebellar ataxia; (2) inferior, crossed cerebellar ataxia with ipsilateral third nerve palsy (Claude syndrome)
- Weber syndrome -third nerve palsy and contralateral hemiplegia.
- Contralateral hemiplegia.
- Paralysis or paresis of vertical eye movement, skew deviation, sluggish pupillary responses to light, slight miosis and ptosis (retraction nystagmus and "tucked-in" eyelids may be associated)
- Contralateral ataxic or postural tremor
- Decerebrate attacks
- Homonymous hemianopia
- Bilateral homonymous hemianopia, cortical blindness, unawareness or denial of blindness; achromatopsia, failure to see to-and-fro movements, inability to perceive objects not centrally located, apraxia of ocular movements, inability to count or enumerate objects.
- Dyslexia without agraphia, colour anomia.
- Memory defect
- Topographic disorientation and prosopagnosia
- Simultagnosia
- Unformed visual hallucination, metamorphopsia, teleopsia, illusory visual spread, palinopsia, distortion of outlines, photophobia.

PROGNOSIS

Impaired upper extremity function has been reported for approximately 70% of stroke survivors on admission and for 40% at3 months. Recovery follows a nonlinear pattern, and the main improvement occurs within the first months after stroke.

Evaluation of patient's recovery, functional improvement, or the efficacy of a treatment requires valid, reliable, and responsive outcome measures during all stages of stroke rehabilitation.

Most outcome measures used to assess the upper extremity are observational rating scales and rely on subjective standardized assessments rather than objective quantitative measurements.

Kinematic analysis of upper extremity movement has been increasingly employed in stroke subjects, to study motor recovery or to evaluate the effects of therapeutic interventions.

Reaching and reach to grasp food are commonly studied and measures of movement time, smoothness, and compensatory movement patterns are frequently reported. However, reliability, responsiveness and clinical relevance of kinematic measures are not well studied.

Movement time, smoothness, and trunk displacement in the reach to grasp food have been reported to be stable and reliable measures of motor performance in person with stroke. (**Margit Alt Murphy 2013**)

Oral, pharyngeal and oesophageal swallowing is a sequential event that transports saliva, ingested solids and fluids from the mouth to stomach and protects the airways during swallowing. Pharyngeal function involves numerous interacting control mechanism that ultimately link pharyngeal contraction patterns to the adjacent oral cavity and oesophagus. (**Margareta Bulow 2018**)

LITERATURE REVIEW

Richard W. Bohannon et al. in 1991 investigated the relationship between each of three independent variables and the completion of the hand- to – mouth manoeuvre in 23 hemiparetic stroke patient. The independent variables were elbow extensor muscle tone (graded using the Modified Ashworth Scale); active elbow flexion strength measured without the influence of gravity with a hand – held dynamometer. The hand-to-mouth manoeuvre was graded according to the degree of completion using a three-level ordinal scale. Sperman (rs) correlations demonstrated a significant relationship between the extent of completion of the hand-to- mouth manoeuvre and both the active elbow-flexor-range deficit (rs= -.853) and the elbow-flexor muscle force (rs=.829). The correlation of the manoeuvre with elbow-extensor muscle tone (rs=-.063) was not significant, but the relationship may have been influenced by the fact that only a minority of subjects had elevated tone and that elevation was minimal. The results suggest that both active – movement deficits and muscle strength may be important to upper extremity function.

Irene Aprile et al. in 2014 analysed quantitatively and qualitatively the motor strategies employed by stroke patients when reaching and drinking from a glass. They enrolled 6 hemiparetic poststroke patients and 6 healthy subjects. Motion analysis of the task proposed (reaching for the glass, bring it to the mouth, and putting it back on the table) with the affected limb was performed. Clinical assessment using Fugl-Meyer Assessment for Upper extremity was also included. During the reaching for the glass the patients showed a reduced arm elongation and trunk axial rotation due to motor deficit. For this reason, as observed, they carried out compensatory strategies which included trunk forward displacement and head movements. These preliminary data should be considered to address rehabilitation treatment. Moreover, the kinematic analysis protocol developed might represent an outcome measure of upper limb rehabilitation process.