

An Analysis of Morphological Changes of White Matter Recovery and Neural Connectivity Using Functional Mri (Dti) In The Post Stroke Individuals Undergone Bobath Concept and Conventional Method of Stroke Management

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I. Introduction

The role of physiotherapy in post stroke survivors has become highly significant in relation with functional recovery that they attain after regular physiotherapy intervention in the hands of neurophysiotherapist irrespective of the approaches that they follow for the good prognosis in the affected patients. But the gap has been found in the aspect of finding significant effect after a required period of physiotherapy intervention at the site of lesion in connection with morphological changes that happens in relation with functional outcome that they found as a result of their intervention in the patients. Keeping this in mind the researcher in this study made an attempt to find the changes that occur at the site of lesion after a reacquired period of intervention with renowned skills of Physiotherapy such as Bobath concept and conventional approach of stroke management. After a continuous intervention with above skills in two groups of patients shown significant functional recovery in both the groups. The time and duration of intervention was three months of intervention with the treatment duration of forty five minutes daily. In order to find utmost significance of Physiotherapy interventions the researcher randomly selected 10% of the functionally recovered patients (on the basis of Modified Barthel index) referred for advanced radiological investigations such as Functional MRI using DTI technique to find white matter

II. Literature Review

Rick M. Dijkhuizen, Kajo van der Marel, Maurits P. A van Meer in their Experimental study on Functional MRI and Diffusion Tensor Imaging of Brain Reorganization studied the potential of the adult brain to reorganize after ischemic injury is critical for functional recovery and provides a significant target for therapeutic strategies to promote brain repair. Despite the accumulating evidence of brain plasticity, the interaction and significance of morphological and physiological modifications in post-stroke brain tissue remain mostly unclear. Neuro imaging technique such as functional MRI (fMRI) and diffusion tensor imaging (DTI) enable in vivo assessment of the spatial and temporal pattern of functional and structural changes inside and outside ischemic lesion areas. This can contribute to the elucidation of critical aspects in post stroke brain remodelling. Task/stimulus –related fMRI, resting state fMRI, or pharmacological MRI enables direct or indirect measurement of neuronal activation, functional connectivity, or neurotransmitter system responses, respectively. DTI allows estimation of the structural integrity and connectivity of white matter tracts. Together, these MRI methods provide an unprecedented means to (a) measure longitudinal change in tissue structure and function close by and remote from ischemic lesion areas, (b) evaluate the organizational profile of neural networks after stroke, and (c) identify degenerative and restorative processes that affect post-stroke functional outcome. Besides the availability of MRI in clinical institutions as well as research laboratories provides an optimal basis for transitional research on stroke recovery. This review gives an overview of the current status and perspective of fMRI and DTI applications to study brain reorganization in experimental stroke models.

1. **Amir H Bakhtiyari and Elham Fatemy** in their randomized controlled study titled “Does electrical stimulation reduces spasticity after stroke? In which they investigated the therapeutic effect of electrical stimulation on plantar flexor spasticity in stroke patients. They studied forty stroke patients (aged from 42 to 65 years) with ankle plantar flexor spasticity. Fifteen minutes of inhibitory Bobath techniques were

applied to one experimental group and a combination of 9 minutes of electrical stimulation on the dorsiflexor muscles and inhibitory Bobath techniques was applied to another group for 20 sessions daily. Outcome measure were passive ankle joint dorsiflexion range of motion, dorsiflexion strength test, plantar flexor muscle tone by Modified Ashworth Scale and soleus muscle H-reflex. The mean change of passive ankle joint dorsiflexion in the combination therapy group was 11.4 (SD 4.79) degrees versus 6.1 (SD 3.09) degrees, which was significantly higher ($P=0.001$). The mean change of plantar flexor muscle tonicity measured by the Modified Ashworth Scale in the combination therapy group was 1.6 (SD 0.5) versus 1.1 (SD 0.31) in the Bobath group ($P=0.001$). Dorsiflexor muscle strength was also increased significantly ($P=0.04$) in the combination therapy group (0.7-0.37) compared with the Bobath group (0.4-0.23). However, no significant change in the amplitude of H-reflex was found between combination therapy (0.41-0.29) and Bobath (0.3-0.28) groups. This study concluded that therapy combining Bobath inhibitory technique and electrical stimulation may help to reduce spasticity effectively in stroke patients.

2. **Nouredin** nakhosin, Soofia Naghdi in a clinical study to evaluate the efficacy of the Bobath approach on the excitability of the spinal alpha motor neurons in patients with post stroke spasticity. Ten subjects ranging in age from 37 through 76 years (average 60 years) with ankle plantar flexor spasticity secondary to a stroke were recruited and completed the trial. They had physiotherapy according to Bobath concept for ten treatment sessions, three days per week. Two repeated measures, one before and another after treatment were taken to quantify clinical efficacy. The effect of this type of therapy on the excitability of alpha motor neurones (α MN) was assessed by measuring the latency of the Hoffmann reflex (H-reflex) and the Hmax/Mmax ratio. The original Ashworth scale and ankle range of motion were also measured. The mean Hmax/Mmax ratio on the affected side at baseline was high in the study patients. However, there were no statistically significant differences in the Hmax/Mmax ratio or in the H-reflex latency between the baseline values and those recorded after therapy intervention. Before treatment, the Hmax/Mmax ratio was significantly higher in the affected side than in the unaffected side. However, it was similar at both sides after treatment. Following treatment, the significant reduction in spasticity was clinically detected as measured with the original Ashworth scale.
3. **Wang RY, Hsiu I Chen, Chen Yin Chen, Yea Ru Yang**, in a randomized controlled study on Efficacy of Bobath versus orthopaedic approach on impairment and function at different motor recovery stages after stroke, to investigate the effectiveness of Bobath on stroke patients at different motor stages by comparing their treatment with orthopaedic treatment. On Twenty-one patients with stroke with spasticity and 23 patients with stroke at relative recovery stages, found that participants with spasticity showed greater improvement in tone control (change score: 1.20 +/- 1.03 versus 0.08 +/- 0.67, $p = 0.006$), MAS (change score: 7.64 +/- 4.03 versus 4.00 +/- 1.95, $p = 0.011$), and SIS (change score: 7.30 +/- 6.24 versus 1.25 +/- 5.33, $p = 0.023$) after 20 sessions of Bobath treatment than with orthopaedic treatment. Participants with relative recovery receiving Bobath treatment showed greater improvement in MAS (change score: 6.14 +/- 5.55 versus 2.77 +/- 9.89, $p = 0.007$), BBS (change score: 19.18 +/- 15.94 versus 6.85 +/- 5.23, $p = 0.015$), and SIS scores (change score: 8.50 +/- 3.41 versus 3.62 +/- 4.07, $p = 0.006$) than those with orthopaedic treatment. They concluded that Bobath or orthopaedic treatment paired with spontaneous recovery resulted in improvements in impairment and functional levels for patient with stroke. Patients benefit more from the Bobath treatment in MAS and SIS scores than from the orthopaedic treatment program regardless of their motor recovery stages.
Bobath inhibitory techniques and Bobath exercises to upper limb and lower limb for 45 to 60 min.

4. **Annette Sterr, Dean P J, Szameitat AJ, Conforto AB, She S** conducted a study on Corticospinal tract integrity and lesion volume play different roles in chronic hemiparesis and its improvement through motor practice. The examined the association of motor status and treatment benefit by testing patients
5. **with a wide range of severity of hemiparesis of the left and right upper extremity.** Diffusion tensor imaging was performed in 22 patients beyond 12 months after onset of stroke with severe to moderate hemiparesis. Motor function was tested before and after 2 weeks of modified constraint-induced movement therapy. CST integrity, but not lesion volume, correlated with the motor ability measures of the Wolf Motor Function Test and the Motor Activity Log. No differences were found between left and right hemiparesis. Motor performance improved significantly with the treatment regime, and did so equally for patients with left and right arm paresis. However, treatment benefit was not associated with either CST integrity or lesion volume. CST integrity correlated best in this small trial with chronic long-term status but not treatment-induced improvements. The CST may play a different role in the mechanisms mediating long-term outcome compared to those underlying practice-induced gains after a chronic plateau in motor function.
6. **Harold P. Adams Jr, Edward C. Jauch, Bart M Demaerschalk, Paul W McMullan, Kenneth Rosenfield, Debbie R Summers** et al stated a scientific statement from the stroke council of ASA. The management of patients with acute ischemic stroke is multifaceted, and indications for specific therapies vary among patients. There is strong evidence that outcomes after stroke can be improved and that death or disability from stroke can be reduced with appropriate treatment. This statement aims to provide guidance to physicians for the early treatment of patients.
 - a. Patients with acute ischemic stroke should be evaluated and treated immediately. Stroke should be approached as the life-threatening emergency it is. A regional or local organized program to expedite stroke care is recommended. This organized approach can increase the number of patients who can be treated.
 - b. Urgent evaluation is aimed primarily at determining that ischemic stroke is the likely cause of the patient's symptoms and whether the patient can be treated with intravenous rtPA.
 - c. Urgent treatment should include measures that protect the airway, breathing, and circulation (life support), especially among seriously ill or comatose patients. An elevated blood pressure should be lowered cautiously.
 - d. Intravenous administration of rtPA (0.9 mg/kg; maximum 90 mg) is strongly recommended for treatment of carefully selected patients who can receive the medication within 3 hours of onset of stroke. Safe use of rtPA requires adherence to NINDS selection criteria, close observation, and careful ancillary care. Intravenous administration of streptokinase or other thrombolytic agents cannot be substituted safely for rtPA.
 - e. The intra-arterial administration of thrombolytic agents is being given to an increasing number of patients. While intra-arterial thrombolysis holds promise for treating patients at time periods longer than 3 hours after the onset of stroke, the patient selection criteria and effectiveness of this form of therapy have not been fully established.
 - f. Urgent administration of anticoagulants has not yet been associated with lessening of the risk of early recurrent stroke or improving outcomes after stroke. Because urgent anticoagulation can increase the risk of brain hemorrhage, especially among patients with moderately severe strokes, the routine use of this therapy cannot be recommended. Aspirin can be administered within the first 48 hours because of reasonable safety and a small benefit.
 - g. No medication with putative neuroprotective effects has yet been shown to be useful for treatment of patients with acute ischemic stroke.
 - h. Comprehensive stroke unit care, including comprehensive rehabilitation, can be given to a broad spectrum of patients.
 - i. Subsequent treatment in the hospital should include measures to prevent or treat medical or neurological complications of stroke. An evaluation to determine the most likely cause of the patient's stroke should lead to institution of medical or surgical therapies to lessen the risk of recurrent stroke. Rehabilitation and plans for care after hospitalization also are important components of acute management of patients with stroke.
7. **Leeanne M. Carey, Rudiger J Seitz, Mark Parsons, Christopher Levi, Shawna Farquharson, Jacques Donald Tournier** et al studied Neuroimaging foundations for post stroke recovery. The results were A shift is emerging in the way in which we view post-stroke recovery. This shift, supported by evidence from neuroimaging studies, encourages us to look beyond the lesion and to identify viable brain networks with

capacity for plasticity. In this article, the authors review current advances in neuroimaging techniques and the new insights that they have contributed. The ability to quantify salvageable tissue, evidence of changes in remote networks, changes of functional and structural connectivity, and alterations in cortical thickness are reviewed in the context of their impact on post-stroke recovery. The value of monitoring spared structural connections and functional connectivity of brain networks within and across hemispheres is highlighted.

8. **Matteo Paci**, conducted a study on physiotherapy based on the bobath concept for adults with post-stroke hemiplegia: a review of effectiveness studies. The purpose of this paper was to determine whether there is evidence regarding the Bobath concept for adults with hemiplegia following a cerebrovascular accident. For this goal an extensive review with critical appraisal of studies was conducted. Selected trials show no evidence proving the effectiveness of NDT or supporting NDT as the optimal type of treatment, but neither do they show evidence of non-efficacy, because of methodological limitations. The Bobath concept must be defined, and standardized guidelines for treatment must be identified and described. Further investigations are necessary to develop outcome measures concerning goals of the Bobath approach, such as quality of motor performance, determine which patient benefits from NDT and which does not, pointing out its indications and contra-indications and determine the real effectiveness of NDT in treatment of post-stroke hemiplegia. The cost/benefit ratio should also be considered
9. **Birgitta Langhammer** , **Johan K Stanghelle**, carried a study on Bobath or Motor Relearning Programme? A comparison of two different approaches of physiotherapy in stroke rehabilitation: a randomized controlled study. Patients treated according to MRP stayed fewer days in hospital than those treated according to Bobath (mean 21 days versus 34 days, $p = 0.008$). Both groups improved in MAS and SMES, but the improvement in motor function was significantly better in the MRP group. The two groups improved in Barthel ADL Index without significant differences between the groups. However, women treated by MRP improved more in ADL than women treated by Bobath. There were no differences between the groups in the life quality test (NHP), use of assistive devices or accommodation after discharge from the hospital. The present study indicates that physiotherapy treatment using the MRP is preferable to that using the Bobath programme in the acute rehabilitation of stroke patients.
10. **Kopp, Bruno** **Kunkel A**, **Mühlnickel W**, **Villringer K**, **Taub E**, **Flor H**. In their study Plasticity in the motor system related to therapy- induced improvement of movement after stroke stated Neuroplasticity might play a beneficial role in the recovery of function after stroke but empirical evidence for this is lacking thus far. Constraint-induced (CI) therapy was used to increase the use of a paretic upper extremity in four hemiparetic stroke patients. Dipole modelling of steady-state movement-related cortical potentials was applied before and after training and 3 months later. The source locations associated with affected hand movement were unusual at follow-up because activation of the ipsilateral hemisphere was found in the absence of mirror movements of the unaffected hand. This long-term change may be considered as an initial demonstration of large-scale neuroplasticity associated with increased use of the paretic limb after application of CI therapy.
12. **T. J. Quinn**, **J. Dawson**, **M. R. Walters**, **K. R. Lees** carried out study on Functional outcome measures in contemporary stroke trials. They used various instruments are used to describe poststroke functional outcome, with limited consensus as to optimal end-point for clinical trial use. Many of the popular assessment tools are administered with little formal guidance on best practice. Thus there is potential for substantial heterogeneity in functional outcome assessment poststroke, with consequent effects on trial quality. We examined functional assessment methodology in recent stroke trials. We reviewed six journals representing high-impact international publications in the fields of: stroke (*Stroke*); neurology (*Neurology*, *Lancet Neurology*) and internal medicine (*Lancet*, *New England Journal Medicine*; *Journal of the American Medical Association*). Journals were hand searched for all interventional studies in stroke patients between 2001 and 2006 inclusive. Chosen manuscripts were then analyzed for outcome assessment methodology. We identified 126 trials, comprising a mix of early hypothesis generating studies through to multi-centre trials (phase I: four trials; phase II: 46 trials; phase III: 20 trials; noninvestigational medicinal product studies: 56 trials). The median number of patients assessed per trial was 100. Across the trials, 47 different outcome measures were used. One hundred trials had functional outcome assessment as the primary study end-point. The median number of outcome measures was two per trial (range 1–9). The modified Rankin scale was the most prevalent outcome assessment (64.3%); followed by Barthel index

(40.5%). A minority of trials (33.3%) provided full details on outcome assessment methodology. Among these trials there was substantial heterogeneity in data collection procedures. There is heterogeneity in the use of functional outcome measures in stroke trials. This compromises comparison and meta-analysis. Trialists continue to use poorly validated approaches to outcome assessment. Given the potential effects on data quality, explicit description of methodology should be mandatory for all trials and rigour is desirable.

- 13. Surya Shah, Frank Vanclay And Betty Cooper Occupational Therapy**, University of Queensland, St Lucia, Qld 4067, Australia (Received in revised form 1 February 1989) Improving the sensitivity of the barthel index for stroke rehabilitation. Abstract-The Barthel Index is considered to be the best of the ADL measurement scales. However, there are some scales that are more sensitive to small changes in functional independence than the Barthel Index. The sensitivity of the Barthel Index can be improved by expanding the number of categories used to record improvement in each ADL function. Suggested changes to the scoring of the Barthel Index, and guidelines for determining the level of independence are presented. These modifications and guidelines were applied in the assessment of 258 first stroke patients referred for inpatient comprehensive rehabilitation in Brisbane, Australia during 1984 calendar year. The modified scoring of the Barthel Index achieved greater sensitivity and improved reliability than the original version, without causing additional difficulty or affecting the implementation time. The internal consistency reliability coefficient for the modified scoring of the Barthel Index was 0.90, compared to 0.87 for the original scoring. Functional independence ADL Barthel Index Stroke outcome measure Adaptive recovery scale Stroke rehabilitation
- 14. Geert Sulter, MD; Christel Steen, MS; Jacques De Keyser, MD, PhD** .Use of the Barthel Index and Modified Rankin Scale in Acute Stroke Trials Background and Purpose—The Barthel Index (BI) and the Modified Rankin Scale (MRS) are commonly used scales that measure disability or dependence in activities of daily living in stroke victims. The objective of this study was to investigate how these scales were used and interpreted in acute stroke trials. Methods—We identified from MEDLINE the major efficacy trials with neuroprotective drugs, thrombolytic drugs, and anticoagulants in acute ischemic stroke published between January 1995 and December 1998. We selected those trials that used the BI and/or MRS as outcome parameters. Results—Fifteen trials fulfilling the inclusion criteria were identified. The BI was used in 13 and the MRS in 8. In 4 trials mean and median scores of the BI were used, and in 1 trial median scores of the MRS were compared. Primary end points included the BI in 7, the MRS in 6, and both the BI and MRS in 3. With regard to the BI, a variety of sum scores between 50 and 95 were used as cutoff scores to define favorable outcome. Favorable outcome on the MRS was defined as either #1 or #2. Conclusions—Among the efficacy trials in acute stroke, we found remarkable differences in the choice of primary end points and in the definition of favorable outcome on both the BI and MRS. This lack of consensus strongly hinders the design, interpretation, and comparison of acute stroke trials. In general, it may be easier to define poor outcome instead of favorable outcome. Poor outcome could be defined if any of the following end points are reached: death, institutionalization due to stroke, MRS .3, or BI .60. (Stroke recovery and neural connectivity in these subjects).

III. Need For Study

In recent past decades the quality of life in stroke survivors has been found very much satisfactory for which the credit goes to neurophysiotherapists and their skills being used for their functional independence but the significant role played by physiotherapists in most of the times it was masked and the actual credit goes to other measures of interventions in stroke patients. So there is scarcity in the existing literature which evidences a specific physiotherapy skill made significant changes with his/her patient in the aspect of functional outcome and actual morphological changes in relation to the recovery was not found yet .so this study may be one of such kind witnessing the significant role played by physiotherapists.

IV. Aim

To study the white matter recovery and related neural connectivity in a functionally recovered stroke survivors undergone continuous Physiotherapy interventions.

V. Objectives

1. To find out the extent of lesion by using conventional MRI
2. To analyse morphological changes (white matter recovery and related neural connectivity) that occurred as resultant to regular physiotherapy interventions with the given form of physiotherapy skills

3. To compare affected part of one half of the brain with unaffected part of other half of the brain by using advanced radiological investigation technique called DTI

VI. Methodology

- Type of study : Interventional
- Study design : Pre -post Analytical
- Sample size : 06
- Sampling method : Random sampling
- Study duration : 3 months
- Place of study : Dpt. Radio diagnostics Krishna hospital,karad

VII. Criteria For The Study

Inclusion criteria:

1. The subjects who have undergone continuous physiotherapy intervention with the selected approaches of functional outcome in post stroke individuals.
2. Subjects with MBI score showing independent grade

Exclusion criteria:

1. A patient who doesn't want to go for advanced radiological investigations.

VIII. Materials For The Study

- a. Conventional CT and MRI
- b. Functional MRI with DTI

IX. Procedure

From the group of patients who were undergone continuous physiotherapy intervention in the hands of researcher, recovered fully functional only 10% of study population were selected randomly after their written and informed consent referred for functional MRI with DTI technique. The reports given by the radiologist has been analysed well for deriving the final conclusions. Diffusion tensor magnetic resonance imaging (DTI) is a relatively new technology that is popular for imaging the white matter of the brain. The popularity of DTI has been enormous. It has been applied to a tremendous variety of Neuro-scientist studies including schizophrenia, traumatic brain injury, multiple sclerosis, autism and aging. DTI is a sensitive probe of cellular structure that works by measuring the diffusion of water molecules. The measured quantity is the diffusivity or diffusion coefficient, a proportionality constant that relates diffusive flux to a concentration gradient. In the white matter of the brain, diffusion anisotropy is primarily caused by cellular membranes, with some contribution from myelination and the packing of the axons. Anisotropic diffusion can indicate the underlying tissue orientation. To measure diffusion using MRI, magnetic field gradients are employed to create an image that is sensitized to diffusion in a particular direction. By repeating this process of diffusion weighting in multiple directions, a three dimensional diffusion model (the tensor) can be estimated. In simplified terms, diffusion imaging works by introducing extra gradient pulses whose effect "cancels out" for stationary water molecules, and causes a random phase shift for molecules that diffuse. Due to their random phase, signal from diffusing molecules is lost. This loss of signal creates darker voxels (volumetric pixels). This means that white matter fiber tracts parallel to the gradient direction will appear dark in the diffusion weighted image for that direction. DTI is usually displayed by either considering the information contained in the tensor into one number (a scalar), or into 4 numbers (to give an R,G,B color and a brightness value). The color scheme most commonly used to represent the orientation of the major eigenvector works as follows: blue is superior-inferior, red is left-right, and green is anterior-posterior. To enhance visualization of the white matter and suppress information outside of it, the brightness of the color is usually controlled by tensor anisotropy (FA). DTI is an increasingly prevalent and popular imaging modality that has been applied to numerous scientific studies and clinical problems since its invention just over 15 years ago. We expect that the field will benefit from many future advances in diffusion imaging and analysis. Keeping all the basic physics and effects of DTI there are about 4 patients (around 10% of study population) were undergone DTI procedure in the department of radiology, Krishna Hospital, Karad. Make and model of MRI machine- Technique-

X. Data Presentation, Analysis And Interpretation

Data Presentation

Patient number	Age/sex	Clinical Diagnosis	MRI number
1	55/M	Ischemic stroke	998,474
2	70/F	Ischemic stroke	6546
3	80/F	Ischemic stroke	5352
4	65/M	Ischemic stroke	5353

XI. Analysis

DTI findings of various subjects-

1. 998

Basic MRI reveals – Area of gliosis in the right basal ganglia & corona radiate.

DTI reveals-

- (i) Complete loss of anisotropic signal in superior longitudinal fasciculus & corona radiate on the right. Corresponding areas on the left show normal signal intensity & anisotropy.
- (ii) External capsule & frontopontine and thalamocortical projections appear normal
- (iii) Optic radiations and corpus callosal fibers show normal anisotropy.
- (iv) Cingulum and corpus callosal fibers appear normal.

2. 474

Basic MRI sequences reveals- Area of gliosis in the right basal ganglia and corona radiate

DTI reveals-

- i) Atrophy of right cerebral peduncle indicating wallerian degeneration
- ii) Assymetry noted in the superior longitudinal fascicule, part of SLF on the right shows complete loss of fractional anisotropy and the remainder of it appears atrophic as compared to the left and shows change in fractional anisotropy.
- iii) Bilateral inferior longitudinal fasciculus appear normal and symmetric
- iv) Corona radiate on the right shows reduced signal as compared to that on the left.
- v) External capsule and frontopontine and thalamic radiations appear normal bilaterally
- vi) Optic radiations and corpus callosal fibers show normal anisotropy
- vii) Cingulum and corpus callosal fibers appear normal.

2. 6546

DTI reveals-

- i) Loss of anisotropic signal involving part of corona radiate on the right. Corresponding part of corona radiate on the left appears normal
- ii) Reduced signal with or without changes in anisotropy involving external capsule on the right. Internal capsule appears normal. Contralateral external capsule appears normal in signal intensity and anisotropy.
- iii) Cingulum and internal capsule appear normal
- iv) Optic radiations and corpus callosal fibers show normal anisotropy. Fornix shows altered anisotropic signal normal variant.
- v) Brain stem nuclei and cerebellar peduncles appear normal

3. 5352

Basic MRI sequences reveal- Acute infarct involving temporal lobe, insular cortex, external capsule, head of caudate nucleus and corona radiate.

DTI reveals-

- i) Loss of anisotropic signal in middle 1/3rd of inferior occipito-frontal fasciculus on the right (analogous to posterior limb of external capsule)
- ii) Reduced signal with change in anisotropy in inferior longitudinal fasciculus on the right.
- iii) Cingulum and internal capsule appear normal.
- iv) Optic radiations and corpus callosal fibers show normal anisotropy
- v) Brain stem nuclei and cerebellar peduncles appear normal.

XII. Interpretation

On the basis of basic CT scan and MRI reports on various types of stroke.

1. Analysis of functional recovery of patients in both conventional and bobath group of stroke individuals in relation with acute effect of an insult to the brain may be due to ischemic or haemorrhagic lesion. There were total 60 patients were been analysed. In that 30 for conventional group and 30 for bobath group. In both the groups only the ischemic and hemorrhagic type of stroke patients were included. This analysis has been done grossly on the basis of findings from conventional CT scan and MRI, because to know the acute effect of stroke at the site of lesion due to any cause conventional CT and MRI may be highly significant.

The findings are as follows,

Sr No.	Ischemic	Haemorrhagic
1.	The area involved in Pnumbera is very much larger and the functional activity of the neurons involved largely affected.	Area involved in the Pnumbera is very much localised until and unless it is multifocal lesions so the neuronal connections involved was very much minimally affected.
2.	The secondary effect of lesion such as localised oedema and necrosis are minimal at the site of lesion.	Whereas in haemorrhagic the damage occurred was based on the extent of haematoma the compression of underlying neurons, the inflammations and etc generally the damage is larger
3.	The intracranial pressure was raised gradually depending on the size of emboli and other ill effects of stroke.	Whereas in haemorrhagic intracranial pressure was found abruptly increased with the sign of intense headache.
4.	The activation of Penumbera regions slower in these patients.	It was found rapid when the haematoma was removed by conservatively or surgically.
5.	The good prognosis in these patients where highly depended on good medical measures like anticoagulants, antioedematous, vasodilators and etc.	The surgical measure like craniotomy followed by haematoma removal has gained its importance in these patients.
6.	The recurrence of stroke was seen very minimal.	The secondary complications of craniotomy and other vulnerable procedures and uncontrolled hypertension was threatening the strokes survivors very highly.
7.	The therapeutic recovery secondary to any kind of intervention was slower in pace.	Faster recovery was found once the haematoma was removed and hypertension was under control.
8.	Functional recovery was found good with bobath group as compared to conventional group.	Same findings were there with these patients.
9.	All the patients required medical supervision continuously.	Same findings were there with these patients.

Note:

- A. The details of the medical follow up had been obtained from respective physicians.
- B. The therapeutic recovery was assessed with the help of voluntary control gradings, functional mobility assessment, modified ashwarth scale, berg balance scale and etc.
- C. The functional outcome was assessed with the help of modified barthal index.

Interpretations on the basis of DTI findings

1. There is a change in the anisotropic signals in the affected part of the brain; specially the ischemic areas but when we compare normality of white matter recovery between the affected side of brain with the normal side, the diminished signals seen are also significant evidence of recovery at the affected side.
2. The consecutive DTI report of patient no 1 MRI no 998 and 474 reveals that there is a difference in the prognosis of white matter recovery which signifies that the given intervention to the subjects made some significant contribution the prognosis.
3. The complete loss of anisotropic signal represents the permanent damage at the site of lesion emphasising there is less recovery of white matter.
4. The positive anisotropic signals at the subcortical structure reveals that the connectivity which was transiently blocked were restarted functions.

XIII. Discussion

This study is being conducted with the aim of finding out the effect of two different methods of physiotherapy primarily at the functional aspect (ADL) followed by structural changes at the site of lesion. So, for all the (60) patients have shown significant improvement in their activities of daily living .Any permanent changes in the attitude of affected parts of the body always due to definite positive changes at the site

of lesion (basic physiocare phenomena of motor control & motor learning of normal and affected part of the brain.)

Most of the stroke survivors in this study gained 60 to 70% of motor control and recovered all the motor skills. This supports the normal phenomena of motor control and motor learning.

To execute any kind of motor activity in the affected part of the body, the regaining of control at the higher centres for the specific motor function will follow primarily learning the skill at the various phases:

1. Cognitive phase.
2. Associative phase.
3. Autonomous phase.

Functional characteristics of affected parts of brain:

1. The affected part of brain will not be generating any kind of action potential in order to facilitate the motor recruitment of upper CNS and lower CNS.
2. The sub cortical structures will not be participating in the motor control and motor learning program of the brain.
3. The involuntary function of brain may be facilitated due to lack of initiating control of the cortex.
4. The DTR & primitive reflex will be exaggerated.

Evidence based characteristics features of recovered motor activity in CNS lesions:

1. Regaining of motor control
2. Learning the motor skill
3. Executing the functional tasks
4. Performing the isolated movements

The above mentioned characteristic features are followed in a phase wise manner as a result of specific interventions for the same. So in this study the approaches being given for the recovery are Bobath Concept of Stroke Rehabilitation and Conventional Physiotherapy for the same. In both the approaches subjects shown recovery in the above mentioned manner. But in the group belongs to Bobath Concept of Stroke Rehabilitation the time duration taken for the recovery has been comparatively less than that of Conventional Approach. The only strongest reason is the exercises which are framed on the basis of Bobath Concept are primarily based on preventing the preventable clinical manifestations, the design of exercises are in functional pattern aiming of functional mobility and activities of daily living. Whereas in conventional approach the exercises are generally on the basis of symptomatic approach.

XIV. Summary and Conclusion

Summary

An experimental study was undertaken with the aim of finding the functional recovery and subsequent white matter recovery in the post stroke individuals who were undergone universally accepted stroke rehabilitation protocols. There are about 60 subjects were included who were grouped into group A and B with two different stroke rehabilitation approaches shown significant functional outcome assessed by using modified Barthel index. Out of which 10% of study population were taken for advanced MRI using DTI for finding the white matter recovery.

Conclusion

As per DTI there are evidences showing the white matter recovery.

Limitations

1. Only 10% of population were referred for DTI procedure may be because of financial constraints.
2. The follow up of DTI at various stages of recovery not been done.
3. The study conducted generally for all the available type of stroke instead it could have been done concentrating only on one type of stroke.

XV. Suggestions and Recommendations

To generalize the results a study with the more financial freedom for finding out the DTI changes in 100% study population following various stages of recovery for a specific type of stroke. The above suggestion is recommended for further studies.

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