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Bobath Concept to Improve Gross Motor Function (Sitting, Standing and Walking) and Fine Motor Activity (Grasping and Gripping) for the Patient with Left Side Hemiplegia; A Case Study**Md. Saifur Rahman¹, Md Monoarul Haque^{2*}**¹Neuro-Physiotherapy specialist, Anaet Healthcare, Barguna, Bangladesh²Associate Professor, Department of Public Health, German University Bangladesh***Correspondence Author:**

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The case study is about whether the activation of the hemiplegic foot in order to achieve efficient gait has an impact on the both the upper and lower limb. This is a case study of Abbas Hossain who is 50 years old who worked as a tailor abroad, diagnosed with left hemiparesis following stroke. The clinical interventions are based on the movement dysfunction which lasted for 7 sessions in two weeks of time which includes 60 minutes for each session. The treatment approach is inspired by the Bobath concept. The outcome measures were quantitative that includes Berg balance scale and 10 meter walk test along with photographs. The study concludes that activating the hemiplegic foot including sensory integration does affect to improve one's gait. It does not exclude the importance of treating the less affected foot and its impact on achieving efficient gait.

Introduction

There are a several number of neurological approaches used in the management of the patient following a neurological deficit. The Bobath concept is one of the most commonly used of these approaches. Physiotherapists use the Bobath concept in there every day practice. Bobath concept focused the treatment on the affected side basing the interventions on knowledge of human movement and relaxation. The Bobath concept is an approach to neurological rehabilitation that is applied in patient assessment and treatment (such as with adults after stroke, or children with cerebral palsy). The goal of applying the Bobath concept is to promote motor learning for efficient motor control in various environments, thereby improving participation and function. This is done through specific patient handling skills to guide patients through initiation and completion of intended tasks. This approach to neurological rehabilitation is multidisciplinary, primarily involving physiotherapists, but may also include occupational therapists and speech and language therapists (Bobath concept, 2008). The theoretical basis of Bobath concept is redefined based on contemporary neuroscience and rehabilitation science. The framework utilized in the Bobath concept for the analysis of movement and movement dysfunction is described. This framework focuses on

postural control for task performance, the ability to move selectively, the ability to produce coordinated sequences of movement and vary movement patterns to fit a task, and the role of sensory input in motor behavior and learning. (Graham, 2009). Neural plastic changes are experience and learning dependent yet exploiting this knowledge to enhance clinical outcomes after stroke is in its infancy. Our aim was to search the available evidence for the core concepts of neuroplasticity, stroke recovery and learning identify links between these concepts and identify and review the themes that best characterize the intersection of these three concepts. Our novel approach developed for this review allowed the identification of the common themes/topics that intersect the concepts of neuroplasticity, stroke recovery and learning. These may be synthesized to advance a neuroscience-informed approach to stroke rehabilitation (Westwater-Wood et al, 2010).

Patient Details**Personal Factors**

The case study is about Abbas Hossain who is 50 years of old. He worked as a tailor at a shop in Saudi Arabia. His job responsibilities force him to work more than 12 hours a day. His working position is mainly long time sitting position.

Dominant in left hand. Patient hobby is gardening.

Health Condition

Patient had his cardio vascular attack on 28 September, 2024. Prior to that condition he was suffering from high blood pressure for a while. Along with stroke he was also diagnosed with diabetes mellitus. Now he has difficulty in activating key muscles of both the upper limb and lower limb on the right side. He also faces difficulty in other ADL's such as dressing, eating, toileting etc.

Environmental Factors

He had stroke while he was working abroad, then he goes to the Mostaska, Malik-Tahar Hospital, Saudi Arabia. Now that he has sent back home which is a rural area called Barguna that do not near to Dhaka. He doesn't have access to adequate transportation. In order to enter into his house he must cross 3 steps. He does have access to Asian toilet which is apparently 15 meters away from his room. He could not participate in the social activities for instance visiting his nearby relative's houses. Sometimes he need walking aid. His current medication protocol made of anti-hypertensive and anti-diabetic drugs.

Assessment

Functional movement analysis

Stability task

Standing: His foot contact asymmetry more contact by RT. foot and less contract on LT. foot, ankle slightly everted and lateral rotated Lt. knee slightly flex, hip abducted and external rotated, asymmetrical weight bearing by Right>Left pelvis. Trunk slight slouch and Lt of shoulder downward. elbow and slightly pronated arm, neck slight shorter on right side and head goes slightly forward from midline.



Mobility task: stand to sit and sit to stand

Stand to sit: patient's trunk and head keep straight asymmetrical weight bearing on foot left side, Left foot does not contact on floor well and inverted, hip abducted and external rotated. Left shoulder depressed with protracted and pronated arm with a flexed elbow. Asymmetrical weight bearing was found on ischial tuberosity less contact on bed by left side of gluteus.

Sit to standing: patient's trunk keep straight can transfer his body weight forward need instructions to stand his left foot does not properly keep on floor, hip abducted and externally rotated, push on bed by his right hand, more BOS, asymmetrical weight bearing left>right feet and asymmetrical pelvic level.

Walking: Mobility Task

Left Toes goes claw, ankle inverted, most weight bearing on lateral part of the sole, foot flat, heel strike absence, hip abducted and external rotated, short stance phase and large swing phase that means patient can't equal weight bear by the Left lower limb and knee extended, decreased hip flexion and absence pelvic rotation. Right leg leading and short step length but wide BOS with absence Left arm swing, shoulder asymmetric, protracted and adducted shoulder, pronated arm and flexed elbow. He compensates Left hand arm, shoulder, trunk, pelvic.

Sensorimotor performance: His vision & vestibular sensation is normal but his tactile skin is impaired, absent 2 point discriminations, impaired joint proprioception. Ability to move hand & finger is reduced for soft tissue stiffness may be due to associated reaction in U/L, trunk & pelvic. Sit-to- stand and active standing abilities are modified independent due to poor core muscles activity, asymmetrical weight bearing on foot, less efficiency of both affected & non-affected lower limb.

Postural Control

Sitting: Wide BOS, COM goes forward, Left foot abducted & more weight bear in laterally on Right foot. External rotation of left hip, pelvic posteriorly tilted, trunk slouch & shifted in left side, inferior angle of left scapula goes more laterally& upward with protracted shoulder joint.



Standing: wide BOS, COM shifted backward and towards left shoulder and hip area. Associated reaction increased both foot, hyperextension of both knees, inversion of left ankle, less foot contact at medial side. Pelvic posteriorly tilted and left side less contact on bed, left scapula is winging,

medial border upward & more laterally from spine, Neck slightly protracted & shorter to left side shoulder and it seems forward and depressed, trapezius & latissimus dorsi shorter/eccentric contracted.

Sit to Standing: Due to having not good foot (left) contact on ground gives unstable, lack of core activity gives him less pelvic & trunk control. More associated reaction in left side. Lack of eccentric control hip & pelvic muscle make his COM goes laterally downward. Loss of dorsi flexion on left L/L, less selective hip & knee flexion, extension on right knee. Extensor thrust makes more compensation in upper trunk and right upper limb.

Skilled Facilitation

Mobilization of multifidus muscle in sitting to regain more eccentric activity from the multifidus muscle so that patient can have more trunk opening along with better extension of spine in sitting. Realignment of scapula through scapular setting along with release of pectoralis muscle were done to prepare an active upper limb for functional activities. Mobilization of pelvis to regain more selective movements in sitting which will help to activate the core muscles for an active trunk. Eccentric mobilization of forearm and wrist musculature were done to reduce structural stiffness as well as to improve sensorimotor performance. Facilitation of foot in supine along calf muscle mobilization were conducted to prepare an active foot in order to gain more extensor activity in lower limb. Facilitating sit to stand with stop standing to gain core activation also improved postural control.

Manual Facilitation

Manual facilitation is key to correcting the biomechanical abnormalities which a patient represents, Scapular setting along with mobilizing the pectoralis helped patient to have an active upper trunk; eccentric mobilization of forearm and wrist muscle helped patient to have an active upper limb which is important for regain functional activities.

Verbal facilitation

The patient's comprehension is quite good considering the fact that he has aphasia. Verbal facilitation works hand in hand with manual facilitation. Verbal facilitation increases the efficiency of manual facilitation while working on the patient.

Environmental facilitation

Environmental modification improves postural orientation and also helps to reduce associated reaction. Environmental modifications help patient to maintain hand contact with support which helps patient to have an active trunk; be more stable while doing functional activities.

Critical Cues

In sitting the patient maintains the upright position by shifting his bodyweight onto the Right side to maintain his equilibrium which leads to right upper trunk flexion; but he can manage to get some extension of spine upon verbal

facilitation. During standing patient tend to rely on his right side considering the lack of extensor activity on the left side in addition to that hyperextension of the left knee causing his left pelvis to drop a little shorter. Due to poor core control patient tend to use his right hand to get up from sit to stand. The deficit in the hip extensor and knee extensors on the left side resulting in lack of swing phase during walking; poor activation of left lower limb also suggests that lack of sensorimotor information received by the CNS from that area. But the responds pretty well upon facilitation improved postural control upon manual facilitation. He has made communication severely difficult than usual and yet the patient is quite efficient to while communicating with others. The patient is highly motivated towards his treatment approach; there is no lack of concentration while receiving the treatment and always tries to respond accordingly upon verbal commands.

Patient's Goal

The goal of the patient is to walk more efficiently and for prolong period of time so that he can go back to his work environment again. He is also the only earning member of his family so he wants carry out some outdoor activities such as shopping, Tailoring, monitoring his family business, so it's important for walk efficiently.

Activation of core stability and APAs with the purpose of increasing the postural tone were necessary. Inhibit associated reactions in the upper limb and trunks by minimizing higher postural tone.

Activation of scapula-thoracic setting, Humero-scapulo and shoulder girdle muscle group for more scapular setting and upper trunk activation

Activation of the extensors and abductors of the hip, including the activation of the foot

Activation of right foot for more selective movement like as heel strike, knee flexion and hip flexion for better walking pattern

Another goal is activation of intrinsic muscle group for grasping, gripping, Coordination and releasing smaller objects considering his ADLs activity

Activation of intrinsic muscle group for grasping, griping and releasing smaller objects considering his job

Outcome Measurements

The measurement which is used in this study is a quantitative measuring tools. The patient goal is to walk for prolong period of time so the measuring tools that I've used is Barg balance scale. There is another quantitative tools which is 10 meter walk test. And also there are some photographs before and after the treatment which will also help to measure the quality of the functional movement.

Presentation of movement diagnosis, working hypothesis and identification of potential

Movement Diagnosis

Patient maintain his standing balance with oscillation mainly by hip strategy but sometime his mixed both ankle and hip strategy. The oscillation may come from gluteus medius muscle. It did not work properly in standing. In test movement with both U/L supported he was instructed to one leg stand. He did it almost normal at right leg but huge oscillation showed in left single leg stand. It may be due lack of proprioception in left hip and knee. In sit to stand he shifted towards left side it may mean he push too little from left L/L or push too much with his right L/L. He may also have altered understanding of midline orientation. His upper trunk got slouched it may be due to poor upper trunk and scapular control. It seems to me he had good gross motor control but fine motor control was not good. He may have problem in cutaneous receptor of foot proprioceptors of foot and ankle. He has difficulty to coordinate movement may be due to feed forward postural control adjustment lack of proper sensory feedback that's why he cannot coordinate his APA's it got delay. It got worse by poor activity of core muscle makes the stability poor both in standing, sitting & selective sit to stand movement. In the MBCP: Weakness of the hip and knee extensors which makes it difficult to move his COM during the stance phase. Weakness of the plantar flexors and dorsiflexors during gait causing patient to rely on the visual input which leads to inefficient gait comprised of small steps and reduced speed. The poor activation of the core leading to instable trunk which forces patient to perform compensatory action from the less affected side which contributes even more to poor postural control.

Working hypothesis

According to MBCP

To give afferent input by foot to stimulate the ascending system (spino-cerebellum and cerebro-cerebellum) to improve foot contact & good alignment will maintain kinetic chain of Lt side and control oscillation during movement

More active core, active gravireceptor & linier extension both pelvis and trunk give him more stability & eventually more active selective movement by activating reticulospinal system and vestibulospinal system

Light touch contact with hand both in sitting and standing could provide spatial information about body orientation used to enhance their postural stability

Mobilization of the forearm muscle to get more length out of those muscles also to reduce stiffness; scapular setting to elevate COM to get antigravity muscle activity

Sit to stand practice with stop to get core control during functional activities

Preparation of the foot in supine to get sensory input from that area also lengthening the gastrocnemius and soleus to

get more extensor activity to achieve better stance phase

Potentiality of patient

Despite all those movement dysfunctions that are mentioned above Mr. Abbas Hossain does have some potential which came forward during the treatment session

In treatment session he shows good & symmetrical core activity with controlled pelvic tilting in 'stop standing' maneuver. That means his neuroplasticity occurs fast.

In treatment session he shows good foot sensation & proprioception, good spatial understanding with light finger touch gives him less oscillation in standing.

He has ability to move sit to stand task better if he tries to control his psychological anxiety. In treatment session he receives motivation.

In sitting posture, he can control his stability longer if he keeps focus on the stability task.

In post evaluation after every treatment session he has shown signs of improvement which involves lesser compensatory actions, lesser effort to perform task moreover improved postural.

In spite of having all those abnormalities in terms of motor control, sensory feedback he seems quite motivated regarding his well-being which makes him sincere about his home exercise program.

Responds to manual facilitation quite well. Shown sign of reduced compensatory actions from the left side. Shows a lot of willpower to carry out verbal command. Mentioned about feeling less difficult to move his leg after the facilitation

Clinical Interventions

The selection of clinical interventions based upon the hypothesis, movement diagnosis also related to the goal of the patient which was efficient gait. In order to achieve efficient gait one must have better foot activation along with extensor activity in the lower limb also improved trunk control to have postural stability. In this time I facilitating his different area and go to the postural transition in lying position that is active lying. So I started off in lying position because it was initially difficult working on his right lower limb because stiffness around that area also inadequate length of the hip and knee extensor, gastrocnemius and soleus muscle. In lying I started off with foot preparation also worked on the calf muscle to get more length out of that muscle also facilitated abductor digiti minimi to get more intrinsic muscle activity; more sensory feedback. Then the patient transferring from lying to sitting position my facilitating core and others position that he needs. Then In sitting position I started off with some sit to stand activity in order to prepare an active trunk; then I did some stop standing in order to activate the core which will help to improve postural stability. I also applied lateral pelvic shifting to get more selective movement out

of the pelvis which will help to gain a stable stance phase. I mentioned in the movement diagnosis that there is lack of activation of muscles in the right upper trunk also in the right arm along with abnormal setting of the scapula. In order to overcome that I applied scapular setting to place the scapula more medially as well as to get some activation of the muscles around the scapula which eventually help the patient achieve an active sitting. It was mentioned in the movement diagnosis section that the patient had weakness in his trunk musculature so in order to prepare more active trunk I applied linear extension both in cervical and lumbar area to prepare an active trunk for functional activities. I applied in upper limb reaching practice and also activation of triceps muscle. Here are some pictures of the clinical interventions which were applied to the patient.

Intervention time: 90 minute per session treatment and total treatment session is seven

Foot preparation/ foot mobilization

In prior to active standing foot preparation is needed. Patient was in sitting position with both U/L was supported side way with a chair. I came close to his left foot. Take a slow, gentle grasp to his heel, facilitate to rise heel with activation of gastrocnemius muscle GTO activation. Then try to facilitate dorsi-flexion with my hand below his foot afferent sensory stimulation given toward great toe extensor tendon to normalize hyper-activity of great toe extension. Afferent sensory stimulation given to the palmar side of the foot. Facilitate abductor digiti-minimi muscle of little finger with my lumbrical grip. Then I facilitate intrinsic muscle of foot by mobilizing it. Facilitate the heel to touch the ground from my lap and vice-versa. It moves along with the hip & knee.



Figure: Foot preparation / Mobilization

Active Standing with Hand Support

At first I reduce BOS of foot with my hand gently to make sure foot intrinsic muscles were more active. Give light pressure with my foot to his foot that he tries to manage his foot stay there. Then I put a light pressure quadriceps tendon's GTO to keep his knees in proper extended position not make hyperextended. I then corrected his hip with more extended position as it was mild flexed. As it corrected his pelvic went better anterior tilt position. I tried to activate his gravireceptors with my hand then and make him more upright posture. All that time of correction his both U/L was

supported at my shoulder some external support gave his touch sensory support to keep his trunk upright. After give 5-6 min time to have him stimulation to maintain activity in abdominal and pelvis. I released my hand from pelvis in order to give him chance to do it actively. I then put my hand on his both triceps to be relaxed not to push hard.

Stop Standing

From his active standing position with all environmental support that I mentioned earlier. I facilitate him with stop standing maneuver. At first day it was difficult to him to grasp

but day after day he showed good performance in there. He needs lots of verbal cues to do this movement. I did it 15-20 times per day with some rest.

Stand to sit and sit to stand

At the ending point of his stop standing activity. I facilitate him to go control descending up to sitting on the bed. I hand was around the pelvis & hip to ensure make proper posterior tilt just before standing. His feet and knee was supported by my feet and knee. His U/L was supported at my shoulder. His trunk was supported by my assistant. He needed lots of verbal cues to do this move. He did it for 10-15 times with

some rest.

Linier Extension

I facilitate the patient in liner extension of pelvis in sitting. In that time his hand was supported by chair and pillow. First I activate multifidus for movement preparation then I do the maneuver. Patient tried to cope with the movement though he needed lots of verbal cues. At linier extension at trunk it needed more effort by the patient. It may because of he has poor scapular setting at right side. I gave him lots of repetition of this activity also gave him scapular setting in order to correct upright trunk posture.



Lateral pelvic shift

I starting position was opposite to the side I want to facilitate lateral pelvic shift. At first I started to facilitate to the right side pelvis. I stabilize left hip with a rolled towel in order gain more selective movement to right side. Then I placed my one hand to his belly to activate his gravireceptors another hand to his right hip near IT. My shoulder placed against his trunk in order to prevent trunk left shift. I just facilitate it he did the moves. I did the same procedure to left side pelvic

lateral shift. He gradually did the move more efficiently.

Scapular setting

The patient had less activation of the musculature around the scapula which causes asymmetry of the shoulder also upper trunk flexion on the right side so I tried wake up the muscles around the scapula through scapular setting which thereby helped him to get more trunk control.



Triceps activation

I applied triceps activation with weight bearing activity of left hand to help patient achieve an active elbow extension

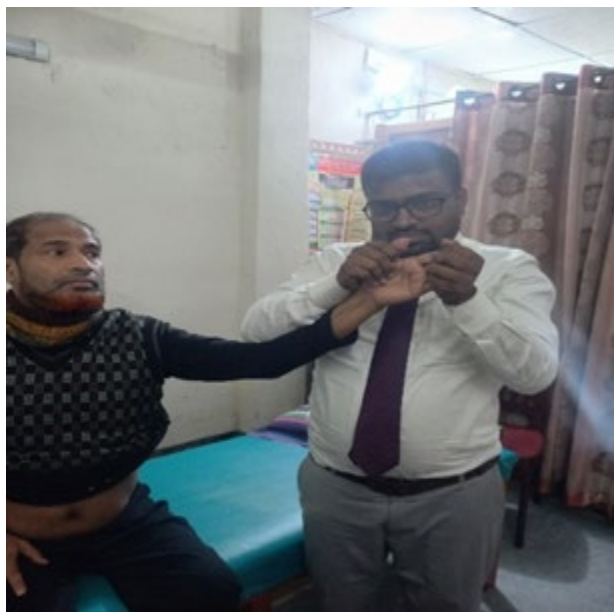
which is important for most of the functional activities and upper limb motor control.



Reaching practice

The patient had less activation of the musculature around the scapula, arm and fore arm muscle which causes asymmetry of the shoulder also upper limb reaching activity on the left

side. so I tried wake up the muscles around the scapula, arm and forearm muscle through reaching in upper limb which thereby helped him to get more upper limb motor control.



Re-evaluation



Sitting: Pre



Sitting: post/ after intervention



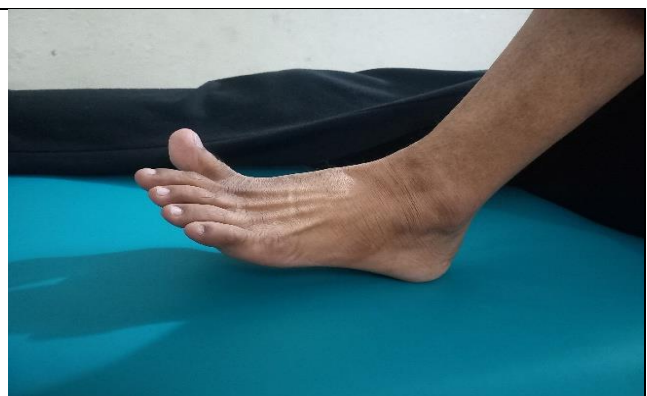
Standing: Pre



Standing: post



Ankle: Pre



Ankle: post. (Dorsi flexion)

Outcome measurement (Re-evaluation)
Compare Berg Balance Scale

SL. No.	Item Description	Initial Score	Discharge Score
1	Sitting to standing	2	3
2	Standing unsupported	3	4
3	Sitting unsupported feet on floor	3	4
4	Standing to sitting	2	3
5	Transfers	2	3
6	Standing unsupported with eyes closed	2	3
7	Standing unsupported with feet together	0	1
8	Reaching forward with outstretched arms	1	2
9	Pick up object from the floor	1	3
10	Turning to look behind/over left and right shoulders	2	4
11	Turn 360 degrees	2	3
12	Count number of times step touch measured stool	1	2
13	Standing unsupported, one foot in front	2	3
14	Standing on one leg	1	2
Total score		24	37

Maximum score would be =56

Interpretation: (0-20) = Wheelchair bound; (21-40) = walking with assistance,
(41-56) = Independent

According to this scale he is now able to walk

10m Walk test

	Baseline	After treatment
10m walk test	35 seconds	24 seconds

Discussion and Conclusion

This study has demonstrated that the different component of the Bobath concept can be described by experts in the Bobath concept, and also has aspects in common with the views of clinicians that are not expert in the Bobath concept. The aim of the study is to achieve efficiency in the patient's gait and the treatment approach in order to achieve that is based on the movement dysfunction presented by the patient. The treatment mostly focused on activation of the left foot which is more affected along with sensory integration, core activation which helped patient to achieve efficient walking in terms of effort: took less effort to walk post treatment explained by the patient himself. After the treatment during the re-evaluation there is evidence of improvement of patients gait also in standing there was improved trunk activation which helped patient to activate the antigravity muscle in order to elevate the COM. In this study most of the clinical interventions were applied to let lower limb which is the more affected but I also treat the less affected side but less attention were given to right side compared to the left side which is more affected. Moreover it is difficult to measure the contribution of the left foot (less affected) in relation to the improvement of the gait that was mentioned.

In my study suggest that identifiable feature of the clinical practice in the Bobath concept and is used to support the individual motor learning of patients with a neurological disorder. Key aspects of the Interactive-Dialogue have been identified and can be used to evaluate and reflect on clinical practice. Further research is needed to describe and clarify the components of the Interactive Dialogue and investigate inter-rater reliability of the evaluation forms developed in this study.

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