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Editorial

WORLD DIABETES DAY

Every year 14th November is celebrated as World Diabetes Day (WDD). International Diabetes Federation and the World Health Organization (WHO) created World Diabetes Day in 1991 in response to growing health threat of diabetes.

On December 20, 2006 United Nation (UN) passed a resolution to designate Nov 14 as World Diabetes Day. In 2007 according to United Nation resolution 61/225 World Diabetes Day became an official United Nation Day. World Diabetes Day was first commemorated on November 14, 2007, and is observed annually. The WDD aimed to raise awareness of diabetes, its prevention and complication and the care diabetic people needed. Government, NGO and private sectors are encouraged to increase the awareness of the disease. The WDD campaign draws attention to issues of paramount importance to diabetes world and focused the issue for the public. International Diabetes Federation chooses a new theme every year based on issues faced by World Diabetes community. Theme campaign is last for whole year but the 14th November is celebrated as the day to mark the birth day of Frederick Banting who, along with Charles Best, first conceived the idea which led to the discovery of insulin in 1922. **"Diabetes Education and Prevention"** is the World Diabetes Day theme for the period 2009-2013. 200 member associations of the International Diabetes Federation in more than 160 countries and territories, all member states of the United Nations, as well as by other associations and organizations, companies, healthcare professionals and people living with diabetes and their families observe WDD.

The World Diabetes Day logo is the blue circle - adopted in 2007 to mark the passage of the United Nations World Diabetes Day Resolution. The circle symbolizes life and health. The colour blue reflects the sky that unites all nations and is the colour of the United Nations flag. The blue circle signifies the unity of the global diabetes community in response to the diabetes pandemic.

Inspired from the life of Banting following researches are going on to transform peoples life and support the current generation of researchers.

- **The artificial pancreas:** a technology that monitors blood glucose levels and adjusts the amount of insulin being administered by an insulin pump to ensure the person is always getting the right amount. For the first time, adults with Type 1 diabetes are using it in the home environment.
- **Type 1 vaccine:** to better understand the role of the immune system in the development of Type 1 diabetes, in the hope that this will help lead towards a vaccine for this type of diabetes.
- **Low-calorie diet:** trying to find out whether a low-calorie diet should be offered as a treatment option to put Type 2 diabetes into remission.

Diabetes is the common name of a range of conditions including diabetes mellitus type one and type two, diabetes insipidus and gestational diabetes. These are all conditions, which affect how the pancreas secretes insulin or how the body reacts to this hormone. Depending on the type and severity, diabetes is controlled by dietary measures, weight loss, oral medication or injected or inhaled insulin. There is a wide range of short and long-term complications of diabetes including foot and eye problems and vascular diseases. It is estimated that one in three residents of the United States will develop diabetes at some point in their life.

In the society the influence of diabetes is enormous. Every day new population are included in diabetic family and surprisingly a good number of patients are children and young adult. Physiatrists are also a responsible member of this society and everyday they are facing the influence of diabetes among the disable patient which makes the problem more complex.Awareness of unaffected people, patient and doctors are the key element of this movement and physiatrist should not left behind to play there vital role to make this world habitable and beautiful for the disabled.

– R. N. Haldar

Case Report

Hand and Foot Deformities in Parkinsonism – A Case Report

Menon Nitin A[1], Kothari S Y[2], Sreekumar V[3]

Abstract

Deformities of the hands and feet in Parkinson's disease (PD) may be mistaken for other more commonly occurring conditions. A case report of a 62 years old lady with Parkinsonism having such deformities is presented here.

Key words: **Parkinsonism, deformities, striatal hands.**

Introduction:

James Parkinson in 1817 reported in his article "An Essay on the Shaking Palsy"[1] the features of a disease that bears his name. Parkinsonism can be due to idiopathic Parkinson's disease (PD) or due to secondary causes like damage to basal ganglia by drugs like neuroleptics and anti-emetics, trauma, viral infections of the nervous system, cerebrovascular disease, toxins and neurodegenerative diseases like progressive supranuclear palsy and multiple system atrophy.[2] The four cardinal features of Parkinsonism are tremors at rest, akinesia (or bradykinesia), rigidity and postural instability. In addition, there are a number of other less recognised symptoms like postural deformities, autonomic dysfunction, cognitive and behavioural abnormalities and sleep and sensory loss. They add to the disfigurement associated with the disease, reduce dexterity, interfere with activities of daily living (ADL), disrupt gait, increase falls, and produce pain and discomfort. These present an additional challenge to physicians involved in the care of these patients.

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Case Report:

A 62-year-old lady presented with chief complaints of tremors in hands and difficulty in moving since the last 3 years. A few months after that, she started noticing deformities of the hands and feet, more on the left side as compared to the right. She consulted the neurology department in our hospital and was started on dopamine agonists without much improvement in symptoms. About a year later, she noticed stooped posture and further slowing of movements. After a few months, she started noticing bilateral weakness and was diagnosed as multiple brain infarcts on MRI. She was referred to PMR department for management of her deformities.

Vitals and general examination was normal. Higher mental function testing showed no abnormality except for slow speech. Neurological examination showed lead pipe type rigidity on the left side along with resting tremors. Power was 3/5 in shoulder, elbow and wrist and 2/5 in hip, knee and ankle on both sides with normal sensory examination for all modalities. Her hand functions were poor and she was not an independent ambulator.

Description of deformities:

Left hand (Fig 1)

- Flexion of all MCP joints
- Hyperextension of PIP joints
- Flexion of DIP joints
- Flexion and adduction of thumb
- Mild ulnar deviation of wrist

Right hand (Fig 1)

- Flexion of thumb at MCP joint and hyperextension at IP joint

Feet (Fig 2)

- Clawing of toes on right side

Trunk

- Stooped posture

All limb deformities were fixed.

Fig 1- *Hand Deformities in Parkinsonism*

Fig 2- *Deformities of the Feet*

Investigations showed haemoglobin count of 13.1 g/dl with a total WBC count of 5500 per cubic mm. ESR in the first hour was 55 mm and C–reactive protein, rheumatoid factor and antineutrophilic antigen were all negative. Plain radiographs of her hands showed subluxation of metacarpophalangeal and proximal interphalangeal joints but preserved anatomy of the wrist joint with no erosions (Fig 3).

She was put on levodopa + carbidopa (100+25) thrice a day, benzhexol (1 mg) twice a day, clopidogrel (75 mg) once a day and atorvastatin (20 mg) at bedtime. She was also started on active assisted range of motion exercises,

Fig 3- *Hand Radiograph showing Deformities with Normal Wrist Joint Anatomy*

strengthening exercises, co-ordination and balance exercises and gait training with walker. For activities of daily living, she was advised a raised toilet seat and a spoon with built-up handle.

Discussion:

The terms “striatal hands and feet” were first used by Charcot in 1877 to report the distal limb deformities associated with Parkinson’s disease[3]. They are present in about 33% of patients with Parkinsonism and are more common in females[4]. The side of the deformity correlates with the side of initial symptoms. They are generally seen in advanced cases, but subtle deformity can be noticed in early disease as well, sometimes even before other manifestations are apparent.

Striatal hand consists of flexion of MCP joint, extension of PIP joints, flexion of DIP joints and ulnar deviation of wrist (not always seen) and striatal foot consists of great toe extension and flexion of other toes. Other deformities like camptocormia (stooped posture with flexion in the thoracic and/or lumbar spine), antecollis (neck drop that is more pronounced than expected when compared to the flexed posture of the trunk) and Pisa syndrome (lateral flexion of the trunk which completely disappears on lying down) may also be seen[4].

The differential diagnosis of the hand deformities may include:

- Dystonia
- Rheumatoid arthritis
- Systemic lupus erythematosus (SLE)
- Dupuytren’s contracture
- Ulnar neuropathy

In primary dystonia, the deformities are mobile (in early cases), present during movement and disappear during sleep. Rheumatoid arthritis presents with warm, swollen and painful joints with erosions, osteopenia and decreased joint space in radiographs and inflammatory markers in serum. Systemic lupus erythematosus (SLE) arthritis is associated with ANA positivity and synovitis[5].

The various theories proposed for the presence of deformities in PD include muscular rigidity, decreased central motor conduction time due to loss of inhibition by the extrapyramidal system leading to overactive muscle contraction, increased ligamentous laxity in women or unknown hormonal influence, sarcomere loss in muscles due to sustained muscle contraction leading to muscle shortening and deformity and use of ergot dopamine agonists like bromocriptine predisposing to fibrosis.

The treatment of the deformities may consist of levodopa, anti-cholinergics like benztropine, baclofen, benzodiazepines, botulinum toxin, tendon transfers or tendon lengthening procedures or neurosurgical procedures like pallidotomy, thalamotomy and deep brain stimulation.

Learning Points:

- Postural abnormalities are grossly overlooked in early Parkinsonism.
- Misdiagnosis of this condition is possible as it may mimic more commonly seen conditions.
- Contractures may be prevented by early recognition and mobilisations.

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Case Report

Gutter Crutches: An Unconventional Walking Aid for Incomplete Tetraplegics – A Case Report

Senthilvelkumar T[1], Raji Thomas[2]

Abstract

The goal of the therapists and patient while selecting an ambulatory aid is to maximise walking ability, manoeuverability and independence, while maintaining safety and stability. Unlike elbow crutches or walker, gutter crutches are not a familiar and well established walking aid in the rehabilitation of persons with incomplete spinal cord injury. In this case report we highlight enhanced ambulation achieved by a 53-year-old man with chronic, incomplete tetraplegia with the use of gutter crutches.

Key words: **Gutter crutch, tetraplegia, walking aid, ambulation.**

Introduction:

The walking outcome of a person with chronic incomplete tetraplegia could be impacted by factors such as potentially poor hand grip, trunk weakness, lower extremity weakness and the consequential effects on balance, to name a few. Inappropriate walking aid prescription and inadequate user training could exacerbate the problem[1-4]. For persons with chronic incomplete tetraplegia, it is hence important to have an aid that fits into the available hand function and ensure weight transmission through the forearm, as hand deformity will be an issue. Selection of an appropriate walking aid can help enhance confidence, feeling of safety and lead to a more meaningful walking outcome, which in turn, can help raise the level of activity and degree of independence.

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Gutter crutches were basically designed for patients with rheumatoid arthritis for whom poor hand grip and difficulty in weight bearing through inflammed joints is a common constraint[5,6]. As persons with incomplete tetraplegia may also have poor hand grip similar to those with rheumatoid arthritis, it was thought that this group of patients may also be benefited from using gutter crutches. In this case study, we report enhanced walking achieved by a patient with chronic incomplete tetraplegia with the use of gutter crutches.

Case Report:

A 53-year-old man, who was employed in a public transport corporation developed C5 incomplete tetraplegia in the C category according to the American Spinal Injury Association (ASIA) impairment scale following an alleged history of fall. Magnetic resonance imaging showed C4-C5 cord changes and central disc herniation which was managed by laminectomy.

He was initially treated elsewhere and was then transferred to our institution for rehabilitation. He was started on conventional programme which included flexibility and strengthening exercises for the key muscles of upper and lower limbs, balance, ADL and functional training. He was tilted and progressed to standing and walking in the parallel bars. His improvement in the self care activities is displayed in Table 1.

Progression in gait training was slow due to difficulty in gripping the walking aid due to poor hand function. At

discharge, he was able to walk 50 metres in 25 minutes with a right knee brace and a walker; he used the hook grasp to progress the walker. This walking aid was chosen as he was incapable of using other conventional options. He was on level 9 in Walking Index for Spinal Cord Injury scale (WISCI II).

During the 19 months at home after the rehabilitation, there was no significant improvement in the ambulatory status. Ambulation was confined to home, as he found it difficult to attain functional mobility outdoors in rough terrains with the walker. Moreover, the walker needs more space for manoeuvering, which is usually not available in the community in rural India and is unsuitable for negotiation of ramps, stairs and obstacles.

He was readmitted with the aim of improving his outdoor mobility. His upper extremity muscle score was 28.50/50 and his lower extremity muscle score was 25.75/50 as measured by manual muscle testing. He had grade 1 spasticity in all four limbs as measured by modified Ashworth scale. He had mass grasp and hook grip in the hands bilaterally. He was independent in bed mobility and was able to come to a sitting position by himself. Without any appliances he was able to walk for 80 metres with the help of a walker.

Due to poor hand grip, wrist flexion contracture and weakness of crutch muscles, he was not able to use elbow crutches, canes or axillary crutches. We considered various options to choose a different walking aid that could overcome the limitations caused by muscle weakness and deformities. This is how gutter crutches came into the radar as a possible option. Gutter crutches could fit his hand function and also allow weight transmission through the forearm (Fig 1).

Initially he found it difficult to adjust to the new walking aid and felt unsafe using it. With proper instruction (Table 2) and reassurance, he started gripping the crutches well enough to lift and place them forward safely. After the end of first week, he was made to walk outside the parallel bars using two gutter crutches with the help of one person, whose principle role was to help maintain balance. His walking endurance was worked on in a gradual manner. At the end of third week he achieved 100 metres with gutter crutches. Advanced walking skills such as negotiating ramps, rough terrain and stairs was introduced into his daily regimen in the later stages. At the end of the training, he was able to walk 150 metres in half an hour under supervision.

A follow-up visit was done after three months to review his ambulatory status in his given environment. He was able to move around better at home as well as in the community than before. He did not report any fall in the first three months of experience at home and in the community.

Fig 1- *Illustration Shows the Gutter Crutches Used in the Study*

Discussion:

The goal of rehabilitation (Table 3) for persons with spinal cord injury is to help them adjust to life by equipping them and their families with the skills and resources required for living in the community[7]. In the selection of an ambulatory aid, the goal of the therapists and patient is to maximise walking ability, manoeuverability and independence, while maintaining safety and stability.

Unlike elbow crutches or walker, gutter crutches are not a familiar and well established walking aid in the rehabilitation of patients with spinal cord injury, especially those with chronic tetraplegia. Even the WISCI II scale does not have a level describing the use of gutter crutches. The absence of literature exploring the potential use of gutter crutches for persons with

incomplete tetraplegia may also have been a factor leading to the non-consideration of this option as a walking aid in the initial rehabilitation.

For the incomplete tetraplegic in this study, progress from home ambulation to community ambulation was a transition that made a major difference in his day-to-

Table 1: *Pros and Cons of Conventional Walking Aids*

Aid	Pros	Cons
Walker	• Provides more stability • Maximises safety aspect • Suitable for severely compromised balance	• Anterior tipping risk more • Requires more space to maneuver • Not suitable for walking in Indian community environment • Stair climbing not possible
Axillary crutches	• Best suited for musculoskeletal problems • Indicated when non-weight bearing on one lower limb needed • More accessible than walker • Stair claiming possible	• Possibility of crutch palsy • Crutch muscle strain possible • Slipping common
Elbow crutches	• Easy to maneuver in small spaces • Stair climbing possible • More accessible than walker • Enables paraplegics to perform swing to or swing through walking pattern	• Not as stable as walker • Crutch muscle strain possible • Not suitable for people with weak crutch muscles
Canes	• More accessible than any other aid • Appearance gives greater sense of psychological comfort • Suitable for minimally compromised balance • Stair claiming possible	• Less stable than crutches • Chances of slipping

Table 2: *Weekwise Training Programme*

Week	Gait training	Support activities
1	• Stepping activities in parallel bar • Identification of gutter crutches as a possible walking aid • Discussion with patient of the pros and cons of the proposed walking aid • Securing his consent after making it clear that this strategy may not work • Customisation of gutter crutches	• Sit to stands • Range of motion exercises for hip and shoulder • Hand function training • Sitting balance over Swiss ball • Reaching activities • Lower limb key muscles strength and endurance training • Easy adoption to this conventional training as the patient had prior experience
2	• Started walking outside the parallel bar with support of one person • Distance gradually increased over the course of the week • Walking endurance improved to 60 metres	• Transfers practice using gutter crutches • Strengthening programme continued • Range of motion exercises for hip and shoulder • Bridging exercise • Swiss ball training
3	• Progressed to training on rough terrain • Ramp practice • Step climbing practice on four inches elevated surface • Walking endurance improved to 100 metres	• Transfer practice using gutter crutches • One leg and tandem standing balance • Strengthening programme and flexibility training
4	• Stair case practice on six inches elevation • Obstacle crossing • Community outing • Walking endurance improved to 150 metres	• Standing balance training continued • Strengthening programme and flexibility training

Table 3: *Strength and Mobility Variables at Different Stages of Rehabilitation Process*

	At the end of initial rehabilitation	At the time of admission for second round	At the time of discharge
UEMS	27.75/50	28.50/50	28.50/50
LEMS	25.25/50	25.75/50	25.75/50
Ambulatory status	Limited household	Limited household	Limited community
Aid	Walker	Walker	Gutter crutches
Appliance	Right knee brace	Nil	Nil

UEMS - Upper extremity muscle score; LEMS - Lower extremity muscle score

day life. The outcome in the initial stages was encouraging enough for the patient and us to go the distance with gutter crutches.

In rural communities in developing countries such as India, the physical environment is a major barrier for people with physical challenges. In this context, any form of walking is a superior option to wheelchair-based mobility and this aspect is emphasised in our rehabilitation process. Our evaluation and interaction with the patient clearly pointed to the need for enhanced ambulation, an opportunity to re-integrate in his community, and, most importantly, a way to resume his occupation to ensure a sustainable livelihood. These aspects forced us to look hard at possible options to explore the maximum potential of this individual with incomplete tetraplegia.

Conclusion:

Gutter crutches must be considered as a possible option for persons with incomplete tetraplegia whose hand function usually does not allow the use of conventional walking aids.

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Learning from the article

- Incomplete tetraplegics may be less capable of using the usual assistive devices that rely largely on upper extremity integrity.
- Gutter crutches fit their hand functions, and hence must be considered as an option for persons with almost similar profiles.

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Original Article

Evaluation of Mirror Therapy for Upper Limb Rehabilitation in Stroke

Muzaffar Tufail[1], Wadhwa RK[2], Borah Diganta[3], Laisram Nonica[4], Kothari SY[5]

Abstract

Trials have shown modest clinical improvement in disabilities after stroke with the use of different techniques; however most of the treatment protocols for the paretic upper extremity are either expensive or labour intensive, which makes the provision of intensive treatment for many patients difficult. It has been suggested that mirror therapy is a simple, inexpensive and, most importantly patient-directed treatment that may improve upper extremity function.

A prospective randomised case control study was done on 60 patients of both the sexes in the age group of 19 to 82 years having stroke for the first time. This study was conducted in the Department of Physical Medicine and Rehabilitation of a tertiary care hospital. All the patients who fulfilled the criteria were enrolled for study; patients were randomly allotted to the study or control group. Study group was given mirror therapy in addition to the conventional stroke rehabilitation programme. Patients were assessed in terms of motor recovery (Brunnstrom stages), spasticity (modified Ashworth Scale), and the self-care items of the Barthel index. These indices were measured at 0 month (pretreatment), 1 month (post-treatment), and 6 months (follow-up).

There was a statistically significant difference in spasticity improvement between the study and control groups; however no significant difference was seen in motor recovery and self care items between the groups. The patients had significant improvements within the groups after the therapy for one month.

Mirror therapy can be a useful intervention supplement in rehabilitation of patients; it provides a simple and cost effective therapy for recovery of hand function.

Key words: **Mirror therapy, stroke, rehabilitation, functional improvement, spasticity.**

Introduction:

Stroke is a global epidemic and an important cause of morbidity and mortality. As defined by WHO stroke is "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin"[1]. It is well known in the world of health care, especially among physiatry, neurology and neurosurgery professionals that stroke patients today have more treatment options than ever before. However, in spite of this, stroke remains the leading cause of disability and the third leading cause of death among adults in the United States of America[2]. In India, stroke is perhaps the second commonest cause of death and probably the most common cause of disability[3]. More than 50% stroke patients remain vocationally impaired and about 30% need full support for activities of daily living[3]. Understanding of stroke evolved from apoplexy of Hippocrates to present definition of stroke that explains all the mechanisms of the event, so does its rehabilitation from complete hopelessness to advanced present day stroke rehabilitation centres.

Small trials have shown modest clinical improvement in disabilities after stroke with the use of different techniques: electrical stimulation over the surface of

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muscles to contract them for simple movements[4], intense practice with electromechanical devices that assist in reaching or stepping[5], non-invasive stimulation of the peripheral nerve or direct stimulation of the motor cortex to augment cortical plasticity and learning during arm therapies[6,7], pharmacotherapy with agonists of dopamine, acetylcholine, and serotonin, which may modulate neurotransmission and learning[8] and the use of mental imagery of an action[9].

However most of the treatment protocols for the paretic upper extremity are either expensive or labour intensive and require manual interaction by the therapists for several weeks, which makes the provision of intensive treatment for many patients difficult. It has been suggested that mirror therapy is a simple, inexpensive and, most importantly, patient-directed treatment that may improve upper extremity function. Since few studies have investigated mirror therapy for patients with stroke, there is no agreement on aspects such as optimal patient selection or duration and intensity of training of this new therapeutic approach. Incorporating mirror therapy into the conventional programme at the early stages of treatment and applying it for a long period might be even more beneficial for improving hand function.

A potential limitation of previous studies was generalisability of the results. Inclusion criteria were based only on the population of subacute stroke inpatients (all within 12 months post stroke) after first stroke without severe cognitive function. In our study patients were taken three months post stroke including subacute stroke (3 to 12 months post stroke) and chronic stroke (>12 months post stroke).

The mirror provides patients with visual input. The mirror reflection of the moving good arm looks like the affected arm moving correctly and perhaps substitutes for the often decreased or absent proprioceptive input. Use of the mirror may also help recruit the premotor cortex to help with motor rehabilitation[10]. The premotor cortex has a number of features suggesting it might possibly be a link from the visual image in the mirror to motor rehabilitation following stroke. Premotor cortex has significant contributions to the descending corticospinal tracts, more bilateral control of movement than the motor cortex itself and intimate connections with visual input. On a number of neurological and psychological levels, mirror therapy may help to reverse elements of learned disuse of the affected limb[11].

Mirror therapy has been seen to provide encouraging results in treatment of hemiparesis[11-14]. It seems likely that this illusion enhances activation of the premotor and motor cortex in a similar way to action observation or motor imagery. This effect can be explained by the activation of so-called mirror-neuron system. Mirror neurons are neurons that fire when the subject performs a movement, but also during observation of the same movement by someone else, and they seem to play a central role in the process of motor (re-)learning by action observation[12].

Materials and Methods:

This study was a prospective randomised case control study. This study was conducted in Department of Physical Medicine and Rehabilitation, VMMC and Safdarjang Hospital, New Delhi. All the patients of stroke with hemiparesis were examined and screened according to the inclusion and exclusion criteria. Seventy patients who fulfilled the criteria were enrolled in the study after taking an informed consent. Patients were randomly allotted to study or control group using numbers generated from research randomiser. Study group was given mirror therapy (Figs 1 & 2) in addition to the conventional stroke rehabilitation programme. The conventional programme was patient-specific and consisted of neuro developmental facilitation techniques, stretching and strengthening exercises, ADL training in occupational therapy and speech therapy (if needed). During the mirror practices (Figs 3-6), patients were seated close to a table on which a mirror (30.5 × 30.5cm) was placed vertically. The involved hand was placed

Fig 1- *Hand at the Beginning of Mirror Therapy*
Fig 2- *Hand One Month after Mirror Therapy*

Fig 3- *Researcher Showing the Mirror Box,* **Fig 4-** *Researcher Showing the Hand Positioning,* **Fig 5-** *Researcher Explaining the Therapy,* **Fig 6-** *Patient Is Doing Mirror Theropy*

behind the mirror and the non-involved hand in front of the mirror. The practice consisted of non-paretic side wrist and finger flexion and extension movements and some purposeful movements. Patient looked into the mirror, watching the mirror image of non-involved hand. Patient's involved hand was hidden from sight. During the session patients were instructed to imagine the reflected image as the involved hand. Patients were also instructed to try to do the same movements with the paretic hand while they watched only the mirror image of the non-paretic hand. The control group only performed the conventional stroke rehabilitation programme and not the mirror therapy. Each patient was evaluated in terms of tools of measurement.

Inclusion criteria: Patient with first episode of unilateral stroke with hemiparesis, after at least 3 months post stroke, proven by computed tomography or magnetic resonance imaging and Brunnstrom score between stages I and IV for the upper extremity. Patient was able to understand and follow simple verbal instructions and has a normal hand function before the stroke. Patient was willing to participate in the study.

The exclusion criteria: Patients with second episode of unilateral stroke with hemiparesis, duration of less than 3 months post stroke, Brunnstrom score >IV or inability to understand and follow simple verbal instructions.

Patients with low vision or had difficulty in attending therapy sessions on daily basis.

Tools of measurement: Patients of both the groups were assessed in terms of motor recovery (Brunnstrom stages), spasticity (modified Ashworth Scale), and the self-care items of the Barthel index. These indices were measured at 0 month (pre-treatment), 1 month (post-treatment), and 6 months (follow-up). All patients were evaluated under same circumstances (time of the day, ambient temperature, testing position).

Results:

Seventy patients qualified for the study and were randomly allocated into either study or control group. Of the total of 70 patients enrolled in the study, 60 patients completed one month of therapy and all of those who completed one month came for the third evaluation at 6 months. Study group (patients with mirror therapy) had more dropout rate during the first month compared to the control group.

Mean age of study group was 47.97±13.99 years and mean age of control group was 49.13±10.69 years, p-value 0.73. Males were more common in both the study (83.3%) and control (76.7%) groups. Educational status of the patients varied from no education to post-graduation level in both study and control groups. Majority of patients were of poor socio-economic status, 53% and 60% in study and control groups respectively. Right and left hemiplegia were almost equally prevalent in both study and control groups. Ischaemic stroke was more common cause of stroke in both study as well as control groups. Ischaemic to haemorrhagic stroke ratio was 6:1 in both the groups.

Patients in both the groups were divided into subacute (3-12 months) or chronic stroke (>12 months). Among the patients seen, subacute duration was more prevalent in both the groups; however in chronic groups some extremes of duration were seen resulting in wide variation. In study group 3 months was the earliest and 156 months was the longest duration of stroke, while in control group duration ranged from 3 to 120 months.

The mean stroke duration was 18.37± 30.88 months among the study group and 22.80 ± 35.96 months among the control group. There was no significant difference between the two groups as the p-value was 0.610.

Brunnstrom score (Table 1 & Fig 7)

At the beginning of the study, Brunnstrom scores of study group and control group were 2.8 ± 0.805 and 2.8 ± 0.847 respectively, p-value 1 on independent t test. After one month of mirror therapy and exercise programme, mean of study group increased to 3.30 ± 1.088 while that of control group increased to 3.23 ± 0.679; however there was no significant difference within 95% confidence interval, p-value 0.777. Mean change increased further in study group as well as in control group, however the p-value 0.281 was still insignificant.

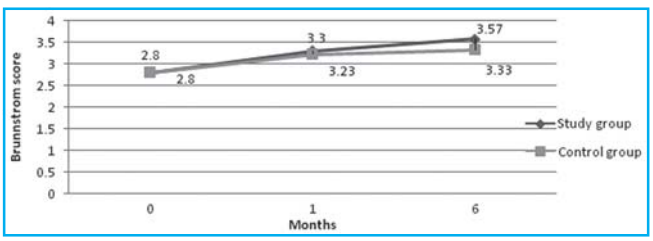

Fig 7- *Time Trend of Brunnstrom Score (n=60)*

Modified Ashworth score (Table 2 & Fig 8)

Mean MAS at the beginning of the study of study group was 2.07 ± 0.983 and control group was 2.00 ± 0.868, with no significant difference, p-value 0.782. One month after the exercise and mirror therapy there was an obvious improvement in spasticity in study group (mean MAS 1.33 ± 0.711) compared to the control group (mean MAS 2.33 ± 0.802). The difference between cases and controls was significant, p-value 0.000. Improvement persisted in six months follow-up in the study group, with only slight improvement of spasticity in control group.

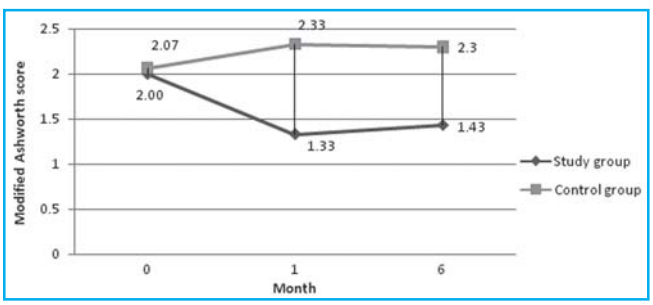

Fig 8- *Time Trend Modified Ashworth Score (n=60)*

Barthel index (Table 2 & Fig 9)

At the beginning of the study mean BI of study group was 27.83 and that of control group was 28.33; there was no significant difference between two groups, p-value of 0.830. At one month post-treatment the mean BI of both study group and control group increased; however there was no significant difference between the two groups, p-value of 0.146. At third assessment the BI had improved further; study group had a mean of 35.67 while the control group had a mean of 32.67 but no significant difference was found between the two groups.

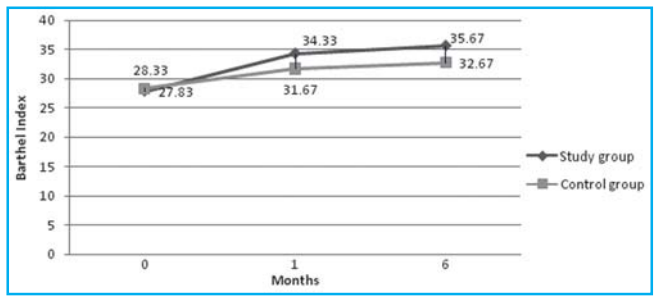

Fig 9- *Time Trend Barthel Index (n=60)*

Discussion:

In our study we found that patients both in study group as well as control group had significant improvement in motor recovery of hand as measured by Brunnstrom stage (BS) one month after treatment, however no significant difference was found between the groups in 95% confidence interval (CI). The difference between the means as seen at the beginning of treatment and after one month of treatment was 0.5; 95% CI, 0.286 to 0.714 (study group) versus 0.433; 95% CI, 0.221 to 0.646 (control group) p-value 0.777. This is in contrast to Yavuzar *et al*[12] where the mean change scores and 95% CI of the Brunnstrom stages for the hand were mean change, 1.5; 95% CI, 1.1 to 1.9 (study group) versus mean change, 0.4; 95% CI, 0.1 to 0.8 (control group); p-value 0.001. This difference could be explained by the fact that in our cohort we had both subacute as well as chronic stroke patients, since there was not much improvement in motor recovery as measured by BS in the chronic stroke patients. Yavuzer *et al*[12] had a smaller group than our study and they had included only the subacute cases.

Modified Ashworth score (MAS) showed marked improvement in the study group compared to the control group. To start with both the groups had almost equal MAS (statistically insignificant difference p-value of 0.728); however after one month of treatment the group difference between the means was -0.667; 95% CI, -0.932 to -0.401(study group) versus 0.267; 95% CI, 0.099 to 0.435 (control group); p-value 0.000. The

Table 1: *Independent T Test Results (n=60)*

	Group	No. of Cases	Mean	Std. deviation	Std. error mean	P-value Independent t-test
Brubbstrom's score 0	Study	30	2.80	0.805	0.147	1.000
	Control	30	2.80	0.847	0.155	
Brubbstrom's score 1	Study	30	3.30	1.088	0.199	0.777
	Control	30	3.23	0.679	0.124	
Brubbstrom's score 6	Study	30	3.57	0.971	0.177	0.281
	Control	30	3.33	0.661	0.121	
MAS 0	Study	30	2.00	0.983	0.179	0.782
	Control	30	2.07	0.868	0.159	
MAS 1	Study	30	1.33	0.711	0.130	0.000
	Control	30	2.33	0.802	0.146	
MAS 6	Study	30	1.43	0.728	0.133	0.000
	Control	30	2.30	0.837	0.153	
BI 0	Study	30	27.83	9.798	1.789	0.830
	Control	30	28.33	8.130	1.484	
BI 1	Study	30	34.33	6.915	1.262	0.146
	Control	30	31.67	7.112	1.298	
BI 6	Study	30	35.67	5.979	1.092	0.087
	Control	30	32.67	7.279	1.329	

difference decreased at follow-up; however there was still a statistically significant difference p=0.000. This is in contrast to Yavuzer *et al*[12] who had (mean change, 0.3; 95% CI, 0.0 to 0.6 versus mean change, 0.3; 95% CI, 0.1 to 0.6; p=0.904). Spasticity is defined as velocity dependent resistance to stretch. In upper motor neuron lesions such as stroke, the stretch reflex is exaggerated due to loss of supraspinal control; however, mirror provides feedback that excites an alternative pathway that suppresses the excessive contraction of the muscles, ultimately leading to reduction of spasticity[11].

Functional status as measured by BI in both the study group and the control group had significant recovery one month post-treatment and continued to have recovery at six months follow-up. However, the two groups did not show statistically significant difference in gains of functional outcome on hand function outcomes of Barthel index. Study group had a mean difference one month post-treatment of 6.500; 95% CI, 4.791 to 8.209 versus control group 3.333; 95% CI, 2.006 to 4.661; p-value 0.146. Yavuzer *et al*[12] had a significant improvement in FIM scores in the study group compared with the control group. FIM self-care score (mean change, 8.3; 95% CI, 6.5 to 10.1 versus mean change, 1.8; 95% CI, 0.3 to 3.2; p-value 0.001) showed significantly more improvement at follow-up in the mirror group compared with the control group. In our study, though patients felt significant improvements subjectively in many subtle activities of daily living while using the affected side (like opening door knob, applying soap, applying oil on hair, decreased time for clothing and unclothing, locking unlocking, better arm swing and transfers), due to lack of these measurements in BI and most other scales, these changes cannot be quantified objectively.

The neural mechanisms underlying the efficacy of mirror therapy are not clear, but the resulting improvement in motor function is an instantiation of use-dependent neural plasticity, which has been demonstrated in the form of expansion of topographic maps in a variety of situations.

It is well known that patients with sensory loss are among the most difficult to rehabilitate. Rehabilitative interventions focus largely on the motor system. Patients with impaired somatic sensation may constitute the most appropriate group for mirror therapy because of their dependence on visual input. Sathian *et al*[14] found patients with predominantly motor deficits did not benefit during testing with the mirror at their initial visit.

Table 2: *Advantages and Disadvantages of Mirror Theropy*

Mirror therapy advantages	Mirror therapy disadvantages
Mirror therapy is cheap and it is easy to make the mirror box.	It is difficult to explain the patients how the mirror therapy is going to work and its mechanism of action.
We can treat many patients at a time.	Optimal dose and set of exercises is not yet established.
It is convenient to do even at home and does not need rehabilitation set up.	Patient needs repeated motivation for compliance and cueing during the sessions to concentrate on the mirror.
During treatment patients get a better feeling to see the mirror image, something like an Avatar hand.	It is sometimes boring for the patient to sit in front of the mirror with limited choice of activities.
Three patients had relief of CRPS symptoms while on mirror therapy.	Mirror therapy gives good visual feedback, however in patients with good hand sensation they do not get as much correction of mismatch as do patients with poor sensory feedback.
All the patients in the mirror group had a drastic change in the hand spasticity after one month of mirror therapy; the tone reduction was maintained at six months follow-up.	It causes cyber sickness like illness in few patients with headache and rise in blood pressure.
It is easily administered even to patients with limited mobility, not able to participate in other exercise programmes and even in patients with no hand function unlike CIMT that requires some preserved hand and wrist movement.	Mirror therapy needs good higher mental function for appreciation and understanding of the method.
When patient is asked to see the mirror image, the patient is exploring the contralateral side of the lesion which is the problem seen in hemispatial neglect, theoretically it should help in hemineglect.	Mirror therapy may theoretically increase learned non-use by seeing the mirror image of hand that is working well.
Mirror therapy does not pose any major risk to the patient and therapy can be terminated as soon as the patient gets fatigued.	Mirror therapy cannot provide increasingly challenging tasks to improve a skill and task performance.

This could be the possible explanation of our findings because only a few patients in our study had somatosensory loss, resulting in lower difference in gains of the functional outcome between the study group and control group.

Mirror neurons are bimodal visuomotor neurons that are active during action observation, mental stimulation (imagery), and action execution. For example, it has been shown that passive observation of an action facilitates M1 excitability of the muscles used in that specific action. Mirror neurons are now generally understood to be the system underlying the learning of new skills by visual inspection of the skill[12].

In addition to previously reported "observation with intent to initiate" or "stimulation through simulation" mechanisms based on increased visual or mental imagery feedback, another possible mechanism for the effectiveness of the mirror therapy might be bilateral arm training. In the study by Yavuzer *et al*[12] they directed the patients to move the paretic hand as much as they could while moving the non-paretic hand and watching the image in the mirror in a bilateral training approach. However in our study when patient tried to do bimanual movement with mirror they had a curiosity to see the paretic arm hidden behind the mirror and needed repeated cueing to direct their attention on the reflected image rather than on the paretic arm.

Conclusion:

In Indian scenario where affording the latest technological aid like robots, computer based virtual realities or functional electrical stimulation is not possible by most of the patients, mirror therapy provides a simple and cost effective addition towards the rehabilitation. Mirror therapy can be a useful intervention supplement in rehabilitation of patients if not a substitute for more advanced equipment and tools.

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Case Report

Myositis Ossificans Circumscripta: A Case Report

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Abstract

Introduction: Myositis ossificans circumscripta (MOC) is a form of heterotopic ossification (HO) that is benign in nature but may appear clinically and radiologically as a malignant neoplasm. A 26 years old male patient of traumatic spastic paraplegia, secondary to compression fracture of D8-D10 vertebra presented with severe LBP, more around right buttock with hip movement. During investigations, the presence of large heterotopic ossification mass was noted on rightside of pelvis. Diagnosis was confirmed by blood investigations, x-rays, MRI. Malignancy was excluded by bone biopsy. Case was managed conservatively, the orthosis was changed. Patient was discharged in early July 2012 with significant improvement in pain (VAS-1) and ROM of hip with proper counselling to patient, care-givers and necessary advice for resettlement.

Keywords: **Myositis ossificans circumscripta, gluteal region, traumatic, changed orthosis.**

Introduction:

Myositis ossificans circumscripta (MOS) is a form of heterotopic ossification that is benign in nature but may appear clinically and radiologically as a malignant neoplasm[1]. There is no sex predilection, however, majority are reported in young adult males[2] and less commonly in children[3]. Heterotopic ossification is most commonly associated with musculoskeletal trauma, central nervous system disorders or injuries, severe burns, and elective surgery[4]. Any part of the body may be involved, but the anterior thigh is the most common site[5]. Many classifications of this condition have been suggested. Noble classification includes three types: 1) *Myositis ossificaiis progressiva.* This is a metabolic disorder occurring in children with widespread metamorphosis of muscle into bone, all of the skeletal muscles becoming involved progressively. It is ultimately fatal. 2) *Traumatic myositis ossificans circumscripta.* This follows local trauma which may be either acute (a single injury), or chronic (repeated slight injuries or an occupational injury, such as strain of the adductor longus tendon in jockeys). 3) *Myositis ossificans circumscripta without history of trauma.* This is usually found in paraplegia, chronic infections, burns and poliomyelitis, but may occur independently in these conditions[6]. We report a case of MOC arising in the right side pelvic region of a young patient without any obvious history of trauma.

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Case Report:

A 26 years old unmarried male patient of traumatic spastic paraplegia since 12-07-2010 was presented due to compression fracture of D8-D10 vertebrae. Admitted on 04-04-2012 with complaints of severe LBP more towards right gluteal region and right hip on movement since last 4 months. Pain was severe aching occasionally shooting and was associated with a sense of tightness of the lower limb muscles, interfering in ADLs. No history of any obvious trauma in recent past was there. In past

he was admitted at NIOH on 09-08-2010 for institutional rehabilitation. At time of discharge on 19-01-2011 he had independence in most of the ADLs, was able to stand in parallel bar with KAFO (with supratrochanteric thigh shell) (Figs 1 & 2).

Patient was taught to do self CIC for bladder evacuation and self manipulation technique for bowel evacuation. There was history of 3-4 incidences of UTI which was controlled by proper antibiotics.

Patient lived in a rural area along with the parents and his only younger brother. There was cemented flooring inside home. There was no ramp for wheelchair access. He had mobility in home on wheelchair. His education is up to Intermediate and was working as an electrician before injury.

On **physical examination**, he has tenderness above the right greater trochanter, **Right hip:** Passive abduction restricted due to pain-up to 30° and also extension, pain intensity with movement on VAS-9. Bilateral gastro-soleous tightness with passive dorsiflexion up to 90°.

Figs 1 & 2- *Patient Standing in a Parallel Bar Wearing KAFO with Supratrochanteric Thigh Shell*

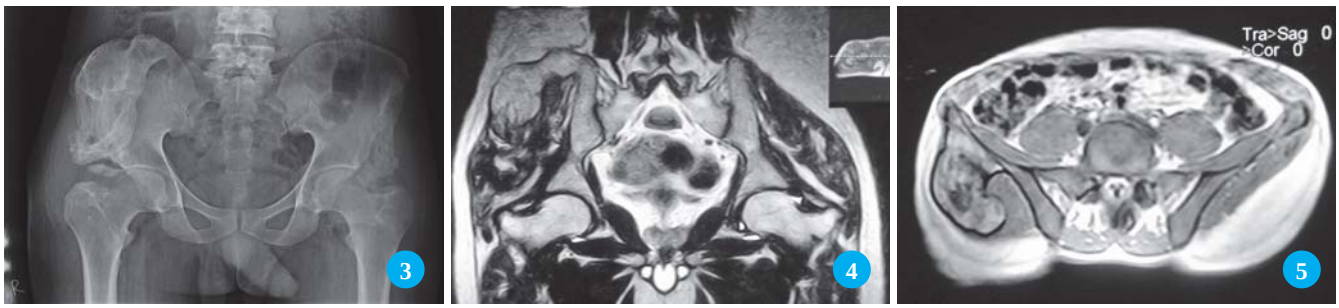

Fig 3- *AP Pelvis Radiograph Revealed Large Irregular Ossified Mass around Right Pelvic Bone*
Figs 4 & 5- *MRI of Pelvis with Both Hips T1 & T2-weighted Images*

No other contractures. Mild wasting in lower limbs, tone-grade 2 spasticity (MAS), voluntary motor control-absent in both lower limbs, B/L patellar and ankle clonus present, neurological level: D7, ASIA score-A.

Lab findings: Haemoglobin-13.0 g/dl, serum alkaline phosphatase-382 micron/l, CRP-24 mg/l (1:4 dil), serum CPK-280 micron/l, serum calcium-8.9 mg/dl, serum phosphorus-5.3 mg/dl.

To confirm the diagnosis x-ray and MRI pelvis with both hips was done which shows bilateral gluteal compartment ossified mass of heterogeneous signal intensity marked on right side (Figs 3 - 6). The mass is in the space between gluteus maximus and medius and is extending superiorly. It is adherent to superior part of the iliac bone. The lesion is lobulated in appearance and well defined. Hip joint normal. Was it post-traumatic ossification?

Figs 6 & 7- *Patient Standing in Parallel Bar with New KAFO*

To exclude the possibility of primary bone tumour/ secondary metastasis, a bone biopsy was done which showed trabeculae of lamellar bone lying in a dense hyalinised fibrocollagenous tissue. There was no evidence of malignancy.

Patient was treated with indomethacin 75 SR mg OD for 6 weeks, residronate 35 mg weekly 6 weeks, calcium 500 mg OD 6 weeks, vitamin D-0.25 mg OD 6 weeks, gentle passive ROM exercises. The KAFO was changed (Figs 6 & 7).

Re-evaluation (Tables 1 & 2)

Table 1: *Re-evaluation*

On admission	After 6 weeks
Pain intensity on VAS-9	Pain Intensity on VAS-1
Not able to do most of ADLs independently	Able to do most of ADL activities independently
Not able to don & doff KAFO	Able to don & doff KAFO
Not able to stand with KAFO	Able to stand with KAFO in parallel bar.
Tone B/L lower limb spasticity was 2 (MAS)	Tone B/L lower limb spasticity decrease to 1+

Table 2: *Re-evaluation*

On admission	After 6 weeks
ESR-30 mm	ESR-22 mm
S. Alkaline Phosphatase -382 micron/l	S. Alkaline Phosphatase -330 micron/l
S. CRP-24 mg/l (1:4 dil)	S. CRP-negative
S. CPK-280 micron/l	S. CPK-39 micron/l
S. phosphorus-5.3 mg/dl	S. phosphorus-3.6 mg/dl

Discussion:

Although there is no obvious history of any trauma in recent past in our patient but previously given KAFO(with supratrochantric thigh shell) for better standing balance as seen in Figs 1 & 2, which might be a potential source of repeated microtrauma around the pelvic region so the supratrochantric portion of KAFO was removed and a standard KAFO was given (Figs 6 & 7). To exclude possibility of primary bone tumour or secondary metastasis, a bone biopsy was done. The patient was treated conservatively with NSAIDs, bisphosphonate and passive ROM exercises. As per literature etidronate is mentioned for treatment of HO but due to unavailability of this drug we talked with pharmacologist and he advised a new and more potent drug residronate that is a bisphosphonate. Some home modification is done by patient himself in consultation with us for approach to different area in house including toilet. Mobility outside home is not possible because road to community is uneven and sandy. He has got some land in nearest district's market area so he was advised to make two rooms on the ground floor there, one for shop and other as a residence so that he can earn his livelihood.

Conclusion:

Patient was discharged in early July 2012 with significant improvement in pain (VAS-1) and ROM of hip with proper orthosis, counselling to patient and care-givers. Necessary advice for resettlement was given.

Take home message:

As per literature standard KAFO is advised, so before doing any enthusiastic modification of a standard prescribed orthosis one must consider the possibility of micro trauma leading to HO which in turn makes the case difficult for rehabilitation.

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Medical Philately

Aimed at enhancing the well-being of the population, with special concern for the weaker elements of the society, Israel has enacted a wide range of social legislation and set up extensive social assistance programmes and community services throughout the country. To signify it Israel released this stamp.

Pes Anserine Bursitis

Manssor Sahibzada Nasir

Seventy-five years old gentleman, known case of osteo-arthritis presented to rehab department with swelling on medial aspect of proximal tibia (Fig 1) adjacent to left knee joint for the past two weeks. There was associated increased pain and difficulty in walking. There was no history of fever. On examination the swelling measured 3cm by 2.1cm and was fluctuant and tender. The knee joint had crepitus mild varus deformity but no effusion or joint tenderness. He was admitted on the suspicion of pes anserine bursitis (Fig 2). His baseline investigations revealed a raised TLC of 12.0 per cmm, blood sugar random was normal and x-ray left knee revealed advanced osteo-arthritis. His musculoskeletal ultrasound revealed synovial swelling with infective element. His bursa was drained and 25ml of turbid fluid was aspirated and fluid sent for RE and C/S. Synovial fluid RE revealed increased neutrophil count. He was given IV antibiotics for 7 days and his swelling and pain improved. He was subsequently discharged.

Fig 1- *Swelling Medical Aspect of Proximal Tibia (Left)*

Fig 2- *Pes Anserine Bursitis*

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PG Forum

REHAB CHALLENGES

A fifty years old male presented in PMR OPD with severe low back pain for last ten days. The pain was non-inflammatory in nature and radiating to right lower limb incapacitating his life. There was significant muscle spasm (Fig 1). He was treated with analgesics, muscle relaxant, heat therapy and TENS. Unfortunately he was still in agony with pain radiating to back of the thigh only. X-ray (Fig 2) of his spine showed facet joint arthropathy. MRI scan (Figs 3 & 4) showed that a cyst possible linked with facet joint. Please opine regarding the next plan of management including interventional pain approach for this particular patient.

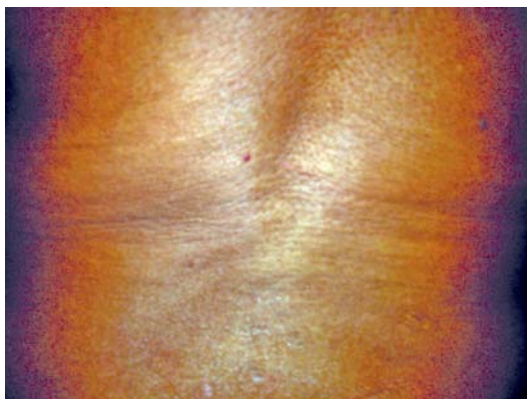

Fig 1- *Muscle Spasm*

Fig 2- *X-ray Spine*

Fig 3- *MRI Scan*

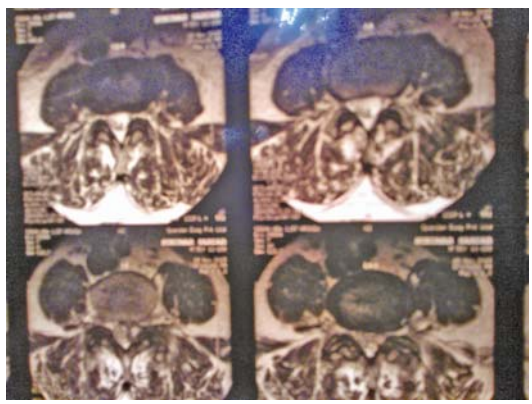

Fig 4- *MRI Scan*

PG Forum

REHAB QUIZ

1. **All are technique of propioceptive facilitation technique except?**
   A) Adding resistive exercise to involuntary activity
   B) Stretching the muscle to increase excitation
   C) Using specific reflex activity to produce specific muscle action
   D) Use of the tonic neck reflex

2. **Hydro collator packs are heated in water up to**
   A) 90-100° F
   B) 110-130° F
   C) 140-160° F
   D) 180-200° F

3. **Preservation of stump length and tissue in congenital and acquired amputations is essential because**
   A) It alleviates parental guilt
   B) Prosthesis are better if shorter
   C) Any tissue with sensation enhances tactile exploration and sensory feedback
   D) Balance and coordination will be better

4. **All are characteristic radiographic changes in Psoriatic arthropathy except**
   A) Erosion of terminal phalangeal tufts
   B) 'Whittling' of phalanges, metacarpals and metatarsals
   C) Ground glass opacity
   D) Pencil in cup deformity

5. **All are component of SAPHO except**
   A) Arthritis
   B) Pustulosis
   C) Hyperostosis
   D) Osteitis

6. **An infant with upper extremity deficiency can be fitted with a passive prosthesis between 3-6 months of age for all except**
   A) Making limb length bilaterally equal
   B) Promoting eye hand control
   C) Encouraging unilateral hand activities
   D) Propping support in sitting and crawling

7. **Intranuclear ophthalmoplegia is most commonly seen in**
   A) CVA
   B) Multiple sclerosis
   C) Brain tumour
   D) Guillain- Barre syndrome

8. **A patient appears to have good strength in the hand and can use it for gross activities automatically but cannot perform skilled movements. This form of disability is called**
   A) Constructional apraxia
   B) Kinetic apraxia (motor apraxia)
   C) Ideational apraxia
   D) Ideomotor apraxia.

9. **Lesion involving the posterior parietal region of the non dominant hemisphere will result in**
   A) Constructional apraxia
   B) Kinetic apraxia (motor apraxia)
   C) Ideational apraxia
   D) Ideomotor apraxia

10. **Fromet sign is seen in injury of the**
    A) Median nerve
    B) Radial nerve
    C) Ulner nerve
    D) Musculocuteneous nerve

ANSWERS

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1-A; **2**-C; **3**-D; **4**-D; **5**-B; **6**-A; **7**-C; **8**-C; **9**-D; **10**-C