

REHABILITATION OF THE STROKE PATIENT

By Tan Eng Seng

INTRODUCTION

Hemiplegia due to cerebrovascular accident is one of the most common disabilities the general practitioners see today. The incidence of stroke increases with the advancing age of a population. In the United States it is estimated that there are about two million stroke patients still living, a third of whom who were formerly working have been made unemployable because of stroke, and in England there are about half a million stroke patients still alive. In fact stroke ranks third as cause of death in the United States besides heart disease and cancer. In the past physicians considered stroke as an inevitable paralysis with a hopeless future, but with the advent of Physical Medicine and Rehabilitation, the approach to stroke rehabilitation is a positive one. As early as 1964 during the National Stroke Conference held in Chicago, it was estimated that with the help of rehabilitation 90% of patients could be taught to get out of bed, 70% became self-sufficient and 30% of those employable age group could return to some form of gainful employment. In our Republic through the recent establishment of a rehabilitation unit at the Tan Tock Seng Hospital stroke patients referred from the various Government Hospitals are able to enjoy a reasonably comprehensive rehabilitation program set for them.

Aetiology of Stroke

There are three basic pathological processes each of which can lead to stroke:

1. Cerebral Thrombosis. This frequently follows vascular collapse, myocardial infarction and any major surgery.
2. Cerebral Embolism. The emboli usually originate in the heart but can come from peripheral veins. It is common among patients suffering from mitral stenosis, rheumatic heart disease, subacute bacterial endocarditis, myocardial infarction and

auricular fibrillation. Patients suffering from cerebral embolism recover more quickly and leave least neurological deficits on recovery.

3. Cerebral Haemorrhage. The commonest causes are: hypertension, cerebral aneurysm, haemorrhagic diseases, trauma and tumours. Stroke due to cerebral haemorrhage gives the most profound residual functional deficits and takes the longest to recover.

Management

The management of the stroke patient is best carried out in an acute hospital during the acute phase and then in a proper rehabilitation centre later on. In some cases limited rehabilitation may be carried out at the patient's own home though this is not ideal. The medical management includes:

1. A full assessment of each case.
2. The treatment of any disease present, whether associated with the stroke or not.
3. The rehabilitation proper.

1. *Assessment of Patient*

A comprehensive rehabilitation program cannot be organised without a detailed assessment of the patient, the purpose of which is to determine goals for the patient and means to help him achieve them. These goals must be realistic, feasible and within the capabilities and needs of each patient, lest rehabilitation will do more harm than good to him. A proper assessment includes:—

- (a) A knowledge of the patient's premorbid vocation and skill, his age, education and social environment, will help in the planning of his rehabilitation program. Motivation is one of the most important tools in rehabilitation. Rehabilitation may be hampered or even fail if a patient has no motivation to learn from the therapists.
- (b) Neurological Assessment. The doctor must note which side of the body is affected, the muscle tone of the affected side, any visual disturbance, any speech involvement, patient's mental state, especially

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his level of consciousness, his orientation to time, space and place and his memory of recent events. Normally after a stroke the affected side is flaccid with depressed reflexes but after a few days muscle tone returns and the limbs become spastic with hyper-reflexia. Should flaccidity remain for over three months the prognosis is usually poor. In right hemiplegics (i.e. when the left cerebral hemisphere is involved) there is disturbance of symbol functions such as language, numbers, concepts and ideas. The patient usually has poor memory especially of recent events; he is emotionally labile and prone to outbursts of crying, laughing, anger or frustration (this is called "organic affective lability"); he is less critical about his own behaviour (e.g. he may knowingly put on his dress inside-out and yet not bother to correct his mistake). Therefore right hemiplegics find it difficult to understand oral instructions but will follow instructions by gestures or visual demonstrations. In left hemiplegics, however, there is disorder of perceptual function (i.e. he is unable or finds it hard to discriminate and appreciate form, position, movement and distance). Perception in vertical and horizontal planes is also disturbed. This poses a problem in gait and posture training. The left hemiplegic also suffers from memory loss especially of recent events; he is emotionally labile and less critical about his own behaviour. Disturbance in vision will interfere with ability to relearn motor skills and when he walks he has to turn his head in such an awkward position so as to have a better view of the direction he is going. Loss of sensation, especially of position and vibration sense hampers progress in ambulation. The therapist has to keep on reminding him about the position of his affected limbs during ambulation training.

- (c) **General Medical State.** The presence of any medical condition, whether associated with the stroke or not, may restrict, postpone or even preclude a full scale rehabilitation. One must therefore examine thoroughly the cardiovascular, respiratory, renal, gastro-intestinal and musculo skeletal systems to exclude diseases that are commonly associated with stroke.
- (d) **Functional Performance.** The doctor should note patient's ability to perform functions

like sitting up, standing and even walking in order to prognosticate each case. A simple method of testing whether patient will be able to walk soon is to ask patient to lift the affected leg up from the bed, and if he can raise his heel an inch above the mattress whilst lying supine with extended knee, the patient will be able to walk, as this action indicates there is some power in his quadriceps and hip muscles.

- (e) **Emotional and Psychological Assessment.** Stroke is not only a personal catastrophe but a catastrophe to his family. The reaction to loss of control of the body movements usually leads to depression, anxiety, fear, frustration, anger and even hostility; denial pattern if present may prevent patient from having a cooperative, receptive learning in rehabilitation. The doctor must anticipate such emotional and psychological reactions and be prepared to give moral support, advice and reassurance. The patient must be made to feel he is still a worthy human being. During the crisis period following a stroke the doctor is regarded as the pillar of moral support by the patient and his family, and he therefore must show calm and understanding and learn to interpret the needs of his patient especially when his patient is aphasic.

2. *Treatment of any disease present*

Any medical condition present must be treated concurrently with the rehabilitation. Routine investigations like chest X-ray, electromyography, blood for haemoglobin, urine for sugar, blood pressure and carotid angiography should be done for all stroke cases.

3. *Rehabilitation Proper*

This includes treatment of any complications that may follow stroke.

The aims of rehabilitation of the stroke patient are fourfold:—

- (a) To prevent contractures, pressure sores and urinary complications during the initial phase of stroke.
- (b) To teach patient in activities of daily living (e.g. feeding, washing, combing, brushing, dressing and toilet use) with the view to restoring independent self-care.
- (c) To train patient in ambulation.
- (d) To assist patient to return to gainful employment or to home resettlement. In short

the aim is to help patient to lead as fulfilling and self-sufficient a life as his physical, emotional and socio-economic resources permit. Rehabilitation should be started immediately after the patient gets the stroke and it can be divided into two phases, an early phase and a late phase.

Early Phase

During the early phase the patient may be in coma and shock, and whether he is in hospital or at home, treatment is directed towards maintaining life and preventing complications. One must ensure a clear airway and no cardiac embarrassment at all times. Correct POSITIONING of the patient in bed is important to prevent contractures. In hemiplegics the tone of the affected limbs is initially flaccid and the lower limb tends to go into lateral rotation at the hip with the foot plantar flexed. When the tone returns after a few days, the position of the limbs assumes a different pattern—the upper limb will tend to be adducted and slightly internally rotated at the shoulder joint, flexed at the elbow, pronated at the forearm and flexed at the wrist and finger joints. When the leg is contracted it tends to go into the pattern of hip adduction with slight internal rotation, knee flexion and equinovarus. A low bed with a firm mattress is essential so that early training for sitting and standing posture is possible. The upper limb should be positioned such that the arm is abducted at least 60 degrees, the elbow flexed at 90 degrees with the forearm pronated, the wrist slightly dorsiflexed and the fingers and thumb are prevented from being clenched by using a roll of towel placed in the hand. Small pillows are used for this purpose so that distal joints are placed at a higher level than proximal ones. For the lower limb, sandbags or even folded blankets are placed against the lateral side, and the foot is prevented from plantar flexion by using a footboard placed about four inches from the edge of the mattress so that the ankles hang comfortably over the edge of the mattress. To avoid pressure sores and hypostatic pneumonia developing, the patient must be TURNED every two hours, making sure every time he is turned he does not lie on the affected limbs, and the uppermost limbs rest comfortably on pillows. Proper FLUID INTAKE is maintained to prevent urinary tract infection (for our climate about 200 mls. per hour during the day is more than adequate in the initial phase). CATHETERISATION should be avoided as far as

possible unless there is acute retention of urine which may occur during the coma stage when the tone of the bladder is flaccid. If catheterisation is indicated, intermittent catheterisation four hourly is the choice. PASSIVE EXERCISE to the paralysed side can be started as early as two to three days after the onset of stroke caused by transient ischaemic attacks or thrombosis, and about one week after for those due to cerebral haemorrhage. The technique can be taught to responsible members of the family or even to the patient himself if he is conscious and rational. Each joint on the affected side is given a full range of passive movement at least three times a day and each motion is repeated five to ten times. If the patient can sit up he is taught to use the normal hand to clasp the affected one and raise it slowly forwards and upwards as far as he can go and then to lower it and whilst doing so to pronate the affected forearm and flex the elbow to its maximum. This exercise is to prevent joint stiffness and limb contractures. At the same time the normal limb should be strengthened by doing active resistive exercise in a graduated manner using either dumb-bells, sand-bags or chest-expander springs. The normal upper limb is trained to do the dominant role as early as possible and this will be described later on.

Late Phase

As patient improves he is taught to get out of bed, and the following diagrams will illustrate the different stages through which the patient learns to sit up, roll, bridge, transfer himself from bed to chair and chair to toilet, walk, climb stairs and go down stairs. Usually uncomplicated cases can be taught to get out of bed and even to stand 24 hours after the onset of stroke whereas complicated ones may take up to two weeks. The upright posture is encouraged as soon as possible so as to boost morale and start an increase flow of sensory input to the central nervous system. Prolonged bed rest may lead to muscle atrophy, thrombophlebitis, pulmonary embolism and "atrophy of spirit" and patient may develop dependence instead of independence later on. Tilt table may have to be used for those who have stayed too long in bed to prevent postural hypotension as well as to improve standing tolerance and increase flow of proprioceptive sensory input to the central nervous system. In ambulation training the patient initially needs help, and this help is given on the affected side of the patient. The

helper supports the patient with one hand under the armpit and the other behind the knee to assist the weak leg to swing forward. Then he transfers the hand to the front of the knee to steady it while the weak leg is bearing the weight. The sequence of movement in walking is: put stick forward with the good hand first; then swing the weak leg forward; and finally putting body weight on the stick the good leg is swung forward. Stages 1-7 shown in the diagrams can be carried out in the patient's own home. Walking sticks used for ambulation training are of three types: four-point (quadruped) stick, three-point (tripod) stick and one-point stick. The height of the stick handle should be at the level of the upper border of the greater trochanter of the femur or of the tip of the styloid process of the ulnar. Initially a four-point stick should be used, mainly for stability, and this has to be graduated to a one-point walking stick.

When the patient is able to ambulate, the question of using leg BRACES should be looked into. If he has an unsteady, flail knee due to weakness of his quadriceps then he should be fitted with a long leg brace with double side bars and a hinge joint at the level of the knee with a sliding box-lock along the inside bar. The upper end of the brace ends as a ring round the upper end of the thigh, and below, the iron bars are fixed to the sides of the heel of the shoe by means of square ferroles which fix the ankle at right angle. Long leg brace is not comfortable to wear and patients would prefer to go without it. The short leg brace is used for those with a flail ankle where the foot tends to go into the pattern of equinovarus. Short leg braces are below knee braces, and each brace may have double or single iron side bars with either a 90 degree posterior stop or a toe raising spring attached to the sole of the shoe to prevent plantar flexion whilst the affected foot is off the ground during walking. For those who prefer less cumbersome braces a single inside iron bar brace with an outside T-strap will be used.

UPPER LIMB TRAINING should take place as early as possible so that the good hand can take over the dominant role from the affected limb in Activities of Daily Living. Normally the upper limb is more severely affected than the lower one and in about 90% of cases the hand functions do not return to normal. The good hand is taught to comb hair, brush teeth, wash face, do dressing, bathe, use toilet and put on shoes as well as to write. To facilitate this training, shirts should have buttons and trou-

sers should have elastic strings instead of belts. The toilet should have sitting instead of squatting commode and bath-seat in the form of a stool (1' x 2' and 1½' high) may have to be used in the bathroom where the tap should be fixed within reach of the patient. Hand rails may have to be fixed to the walls of the toilet and bathroom within reach of the patient to enable him to get on and off the bath-seat or commode. Female patients should be taught kitchen work. Whilst this program is on the therapist starts to train the affected upper limb to its maximum function by strengthening the recovering muscles, maintaining full range of motion of all the joints and improving coordination. Overhead pulleys are used for improving the reciprocal action of the limbs by using the good hand to help to pull and lower the bad one up and down the pulley. To improve coordination and muscle power the bad hand is made to move in a circular motion on a board placed on the table, and at first friction between the hand and the board surfaces is reduced by sprinkling talcum powder on the board, and gravity may be eliminated by suspending the forearm on a spring attached to an overhead beam. Friction is gradually increased by asking patient to plane on a piece of plank with a wooden plane with sand-paper fixed to its under surface. The plane is moved to and fro by the good hand with the affected hand attached to one of the handles. As patient improves, he then learns to pick up objects of different textures and shapes, like blocks of wood and then stack them. This exercise helps to improve hand function and increase range of motion of the affected shoulder against gravity. Assistive devices like the palmer positioning splints may be needed for those with persisted spasticity of the wrist and finger flexors. If the upper limb shows no improvement in muscle power and remains flaccid or spastic after a period of 5-6 months from the onset of the stroke, the prognosis is usually poor.

SPEECH AND LANGUAGE DISTURBANCE normally occurs in right-handed patients with a right hemiplegia (i.e. when the left dominant hemisphere is involved). The commonest types of speech and language disturbance are aphasia (expressive and receptive) and dysarthria, though the rarer types like agnosia, apraxia, agraphia, and alexia may occur. As aphasia is the commonest type of language disturbance, and as proper treatment involves the service of a speech therapist, the following

DIAGRAMS OF A LEFT HEMIPLEGIC PATIENT TO ILLUSTRATE THE FOLLOWING:

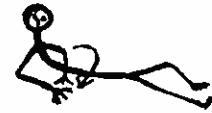
1. SITTING UP:



A. Person lying flat on back.



B. Affected arm across tummy & affected leg slightly bent.



C. Roll towards stronger elbow. Push up on elbow.



D. Straighten elbow to push on palm.



E. Move unaffected arm back behind body line.

2. ROLLING:



A. Person lying flat on back.



B. Put normal leg over affected leg, & affected arm in towards body (elbow to waist) & normal arm across chest to bed on opposite side.



C. Bring body weight to midline & roll onto tummy.

3. BRIDGING:



A. Person lying flat.



B. Bend 2 legs up. Arms by side slightly bent & push knees together. Buttocks squeezed together.

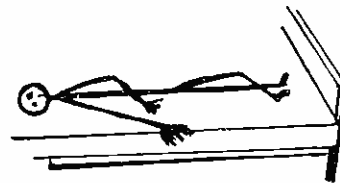


C. Lift tail high pressing on shoulders, elbows, & soles of feet. (For using bed-pans or putting on pants).

4. TRANSFER: BED TO CHAIR.



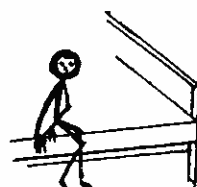
A. Patient lying in bed.



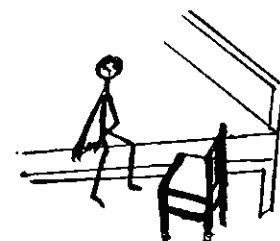
B. Bad arm across chest towards good side. Good leg under bad leg & move both towards side of bed using good leg to assist bad one.



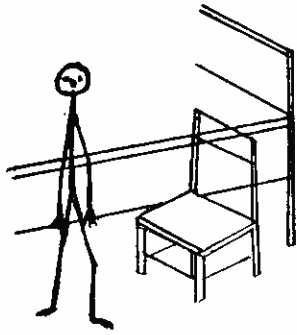
C. Either push up on good elbow or grip mattress to sit up & swing legs - over edge of bed.



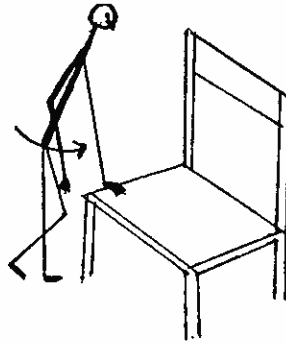
D. Uncross legs.



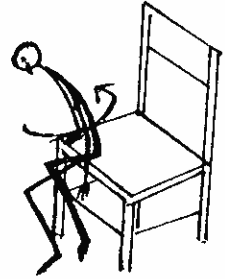
E. Chair put near bad side. Feet under bed. Bad arm across thigh. Good arm on edge of bed.



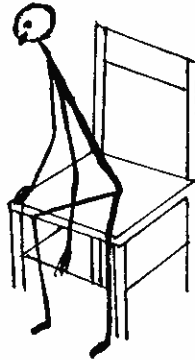
F. Push up good arm & leg to stand up.



G. Place good arm on left side of chair (side of chair nearest bad side of body).

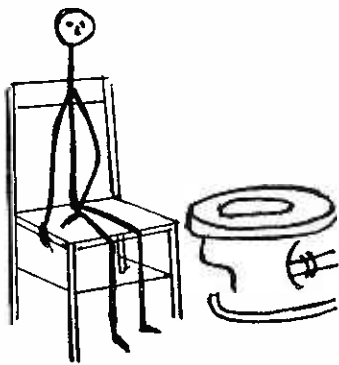


H. Twist, moving feet & body together.

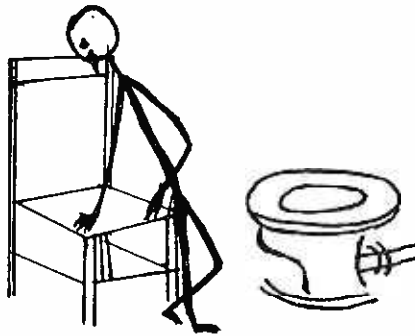


I. Sit down.

4. TRANSFER: CHAIR TO TOILET



A. Bad arm across body. Good arm on chair facing toilet.



B. Push on good arm & leg to stand up.

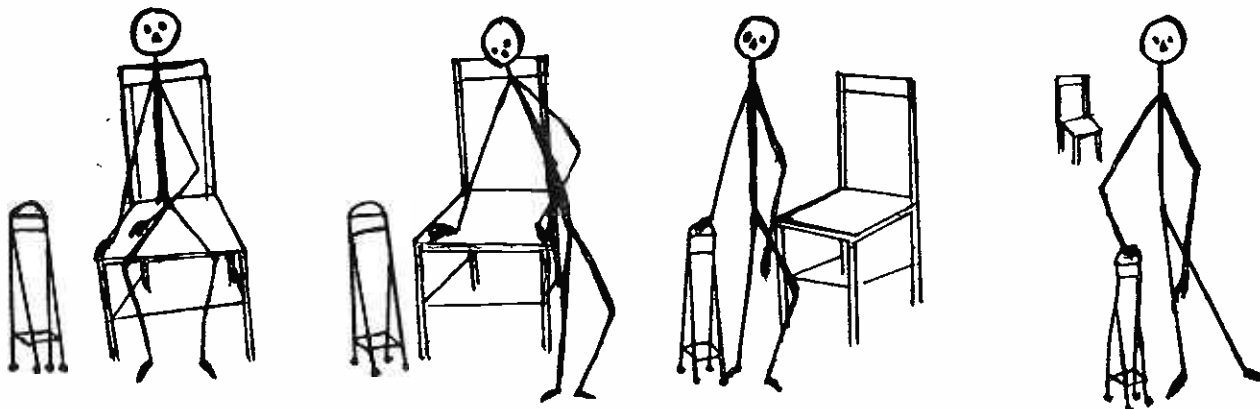


C. Good arm to left-side of toilet seat. Turn feet & body together.



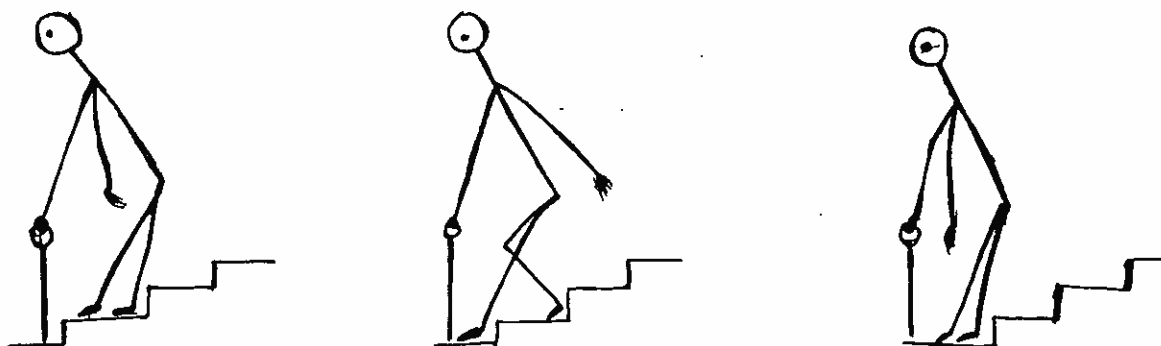
D. Bend and sit down.

5. STANDING TO WALK:



- A. Whilst sitting on chair put bad arm across body. Stick on good side. Put both feet close together.
- B. Push on good arm & leg to stand up. Assistant helps from bad side.
- C. Take stick with good arm. Stick forward, & lean on it.
- D. First place stick forward, bad leg, then good leg. Later put stick & bad leg forward together then good leg.

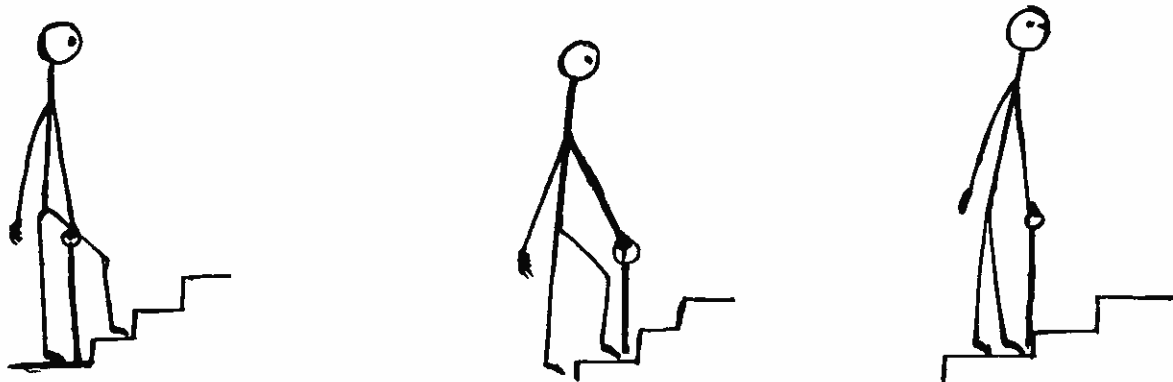
6. DESCENDING STAIRS:



- A. Stick down first.
- B. Then weaker leg down.
- C. Then strong leg down.

(Note: If assistance is being given, it should be given on the affected side, on the step below the patient, when ascending stairs, and on the step above the patient when descending the stairs).

7. ASCENDING STAIRS:



- A. Place feet close to step. Strong leg up first.
- B. Then stick up. A side-ways movement may be necessary.
- C. Then weak leg up.

suggestions are designed to help the patient overcome his anxiety state, and prevent personality deterioration: Be patient when dealing with aphasic patients and always anticipate such behaviour like lack of cooperation, misunderstanding instructions and sudden mood changes, as these are often the result of their language difficulties. Encourage patient to talk by first phrasing questions that he may answer with 'yes' or 'no' or appropriate head movements. If he can read encourage him to read newspapers and if he can write encourage him to write this name, etc. When handling objects to him like fork, repeat the word "fork" several times to him in a clear and confident manner so as not to confuse him. Use monosyllable names first, starting with names of parts of the body he can see such as arms, hand, leg, toe and objects of daily use like cup, pen, book, chair and bed. When he shows progress, go on with two syllable words, and so on. Normally the patient recovers the elements of language in the following order: nouns, verbs, adjectives, and adverbs, then articles, prepositions and conjunctions.

If the patient is treated in a rehabilitation centre a PSYCHOLOGICAL ASSESSMENT should be done before his discharge in order to determine his I.Q. level, his concentration span and how extensive cerebral damage has occurred through the cerebrovascular accident. This is important when deciding his future vocation.

COMPLICATIONS AND THEIR TREATMENT

These are some of the more common complications that may follow stroke:—

1. Swelling of affected limbs, especially at the extremities. This is mainly due to lack of muscular tone which is needed to pump the blood back to the heart. Treatment is by elevation of the affected limbs, restriction of fluid intake, and if too severe by use of oral diuretics.
2. Contractures. The regime of full range joint movement in the initial stage of rehabilitation helps to prevent contractures. If contracture is too severe, tendon release may have to be resorted to.
3. Excessive spasticity of the affected limbs. This usually occurs when the motor cortex or the internal capsule is affected. The

antigravity muscles are more severely affected and spasticity is aggravated by anger, excitement, pain and cold. Treatment is by avoiding these precipitating factors or by local blocks with alcohol or lignocaine (2%). Ice packs or hot packs and sometimes muscle relaxant drugs like valium may be used with advantage.

4. Shoulder-hand-syndrome. This condition starts as swelling of the first and second phalangeal joints with pain on passive flexion of the fingers and on moving the shoulder joints. Demineralisation of the bones of the hand and arm occurs quite early. Treatment is by supporting the hand in a sling, full range mobility of the affected joints, and by using analgesic drugs.
5. Heterotropic ossification where bony deposits are found around joints especially the hip joints. The cause is unknown and treatment is by operative removal.
6. Root or nerve compression lesions involving either the cervical roots, brachial plexus or even peripheral nerves. This occurs when the patient is in coma with the body lying on the affected limb for a long period of time. Subluxation of the shoulder joint may also cause it. Erb's palsy (C5,C6) is an example.

CONCLUSION

The success of active rehabilitation demands adequate motivation, sensory appreciation, awareness of body image, comprehension and communication. At the Tan Tock Seng Rehabilitation Unit it has been found that uncomplicated cases showed marked improvement during their first month of stay and are able to go home in a reasonably independant state within the first eight weeks. Most of these cases were admitted within the first two weeks after the onset of stroke. This proves a point that for maximum recovery to take place early rehabilitation is essential, preferably in a rehabilitation hospital. This applies not only to hemiplegic cases but also to all types of physical disabilities.

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