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Editorial

Neural Prosthesis – Past, Present and Future

Damage to the central nervous system and its component architecture is a major cause of disability amongst humans. Physiatrists are often dealing with problems associated with acceptance and use of conventional orthoses and prostheses. Most common cause for rejection turns out to be frustration amongst patients for being unable to control the aids as desired by the person. Hence the idea of thought controlled appliances, and other voluntary / involuntary control mechanisms became an important area of development and many advancements have been occurring. Currently, many approaches for restoring the connectivity of neural elements are being explored (e.g., gene therapies, stem cell transplants, tissue engineering). One of the highly promising parallel areas developing is neural prosthesis engineering, which can provide the patients an alternative approach to restore functions through the building of suitable interfaces with the nervous system. Hence it is important that the physiatrists are in tune with the technological developments in the field of neural prosthesis engineering so that such techniques can be implemented for better rehabilitation of the patients.

The design of a neuro-prosthesis emulates the physiology of nervous system integrated with knowledge of microelectronics and computer sciences. The design challenges include signal measurement using electrodes without affecting the body system, signal interpretation with respect to correlation of measured neural signal and intended action, intent interpretation for creating responses to certain problems, performing the desired action, signal generation to achieve a specified goal, signal transmission without causing displacement, overcoming irritation and other problems, and achieving of optimal functionality .

Since 1957 - when the first neural prosthesis i.e. cochlear implant was developed - there has been a vast development in this field. The landmarks include development of internal pacemaker (1958), first motor prosthesis for foot drop in hemiplegics (1961), first auditory brainstem implant (1977), peripheral nerve bridge implanted into spinal cord of adult rat (1981) etc. In the 1980's and 90's there were extensive developments in the field of neural prosthetics wherein the fruits of research were tested with the patients and were successfully prescribed. During 1986-1995, trials proved FES (Functional Electrical Stimulation) allowed paraplegics to walk and in 1988 lumbar anterior root implant was developed for facilitating standing. In 1995 human trials began for foot drop splint, and for bionic glove and visual cortex prosthesis. FDA has by now approved many devices for application on humans after successful trials. Some of these are freehand system for quadriplegics, transcutaneous neurostimulation of 3rd and 4th sacral nerves to treat urinary incontinence, auditory brainstem implant for human use, vagal nerve stimulator. FDA authorized optobionics to begin trials of Artificial Silicon Retina (ASR) in sub-retinal implant, ACTIVA tremor control therapy technology (deep brain stimulation) to treat parkinsonism, implantation of Abio Cor, a permanent self contained total heart replacement, hand master system etc. Presently there is advanced ongoing research in the area of thought controlled prosthesis and more compatible biomaterials for implantation into human body e.g. microelectrode arrays, IST (Implanted Stimulator Telemeters), IJAT (Implanted Joint Angle Transducers), intradural electrodes for walking in paraplegics etc.

Some other newer clinical applications & technologies which hold promise for the future are potential use of electricity to aid in neural regeneration; BION System with RF (Radio-Frequency) link (small injectable single channel stimulator) – used in hemiplegia for shoulder subluxation; biofuel cells (these cells make use of body's own chemistry and structure) with introduction of special components to generate power, control from motor and pre-motor areas of brain for applications in controlling robotic arm etc. Promising areas of future research are improvements in thought controlled motion, biocompatibility and human implantation technology, ways of allowing cortical signals to control functional movement as well as system state (e.g. turning the system on/off, or exercising the states) etc. With the above mentioned technological advances taking place across the developed world, it is important that rehabilitation specialists in developing countries not only be abreast with the advancements, but also initiate collaborative efforts with key technological institutes to further contribute to this field, and prepare to use the increasingly innovative approaches for better rehabilitation and training of persons with disability. The abilities that technological strides can infuse into human functioning through judicious man-machine interaction are set to transcend newer frontiers and rehabilitation medicine is ideally positioned to guide the transformation process.

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Challenges in the Management of Pressure Ulcers

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Abstract

Pressure ulcers primarily affect persons with impairment of sensation, spinal cord injured, diabetic and mobility impaired persons.

Twenty seven patients of spinal cord injury (SCI) with extensive pressure ulcers were studied. All of them had very low serum hemoglobin and serum protein level along with other complications of SCI hampering healing of pressure ulcers. This vicious cycle of paraplegia / quadriplegia → pressure ulcers → low serum hemoglobin and serum protein level → reduced healing capacity and more pressure ulcers, was broken with increase in serum hemoglobin and serum protein levels.

All these patients improved in general condition, serum hemoglobin, serum protein levels and were discharged ambulatory.

Key words: **Pressure ulcers, spinal cord injury.**

INTRODUCTION

Despite advances in medicine, surgery, nursing care and self-care education, pressure ulcers remain a major cause of morbidity and mortality, particularly for persons with impaired sensation and prolonged immobility.[1] Persons with spinal cord injury and associated co-morbidity are at an increased risk for the formation of pressure ulcers.[2] The incidence of pressure ulcers in this population ranges from 25% to as high as 66%.[3]

The National Pressure Ulcer Advisory Panel[4] (NPUAP) of USA defines a pressure ulcer as "An area of unrelieved pressure over a defined area, usually over a bony prominence, resulting in ischemia, cell death, and tissue necrosis".

Pressure ulcers are caused by the interaction of multiple and diverse, etio-pathological factors that can be classified as patho-mechanical or patho physiological.[5,6]

Contributing factors to pressure ulcers

Patho-mechanical (Extrinsic or primary)	*Patho-physiological (Intrinsic or secondary)*
Compression	Fever
Maceration	Anemia
Immobility	Injection
Pressure	Ischemia
Friction	Hypoxemia
Shear	Malnutrition
	Spinal cord injury
	Neurological disease
	Decreased lean body mass
	Increased metabolic demands

We admitted patients with extensive pressure ulcers suffering from SCI (Fig.1 and Graph 1), who were neglected by all other medical specialties like Plastic surgery, General Surgery, Orthopedics and Medicine, and treated them with successful outcome.

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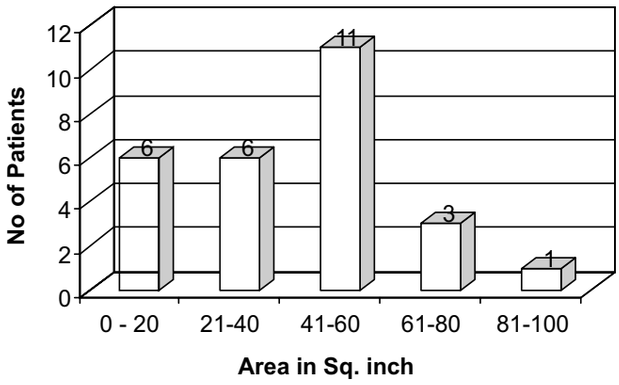
Graph 1 : *Extent of Pressure Sores.*

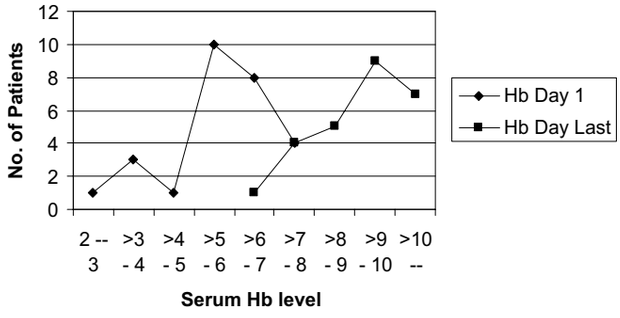


Material and Methods

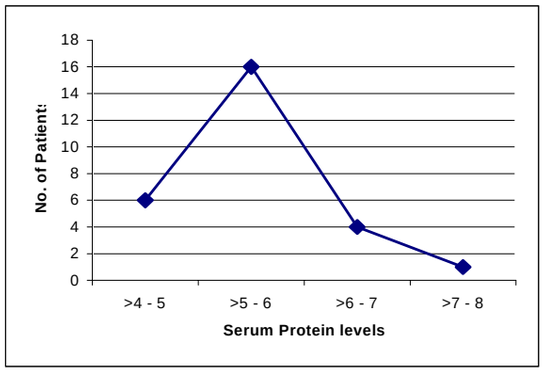
The retrospective study was done on twenty seven patients of spinal cord injury with extensive pressure ulcers who were admitted in spinal injury ward of the department of Rehabilitation Medicine, Safdarjang Hospital and VMMC, New Delhi, from the years 1998-2005. An explicit informed consent was taken from all the patients explaining possible untoward reaction and prognosis of the existing disease.

The patients' age ranged from 10 years to 40 years. They were of both sexes and belonged to both rural and urban backgrounds. The cause of SCI was both trauma and disease.

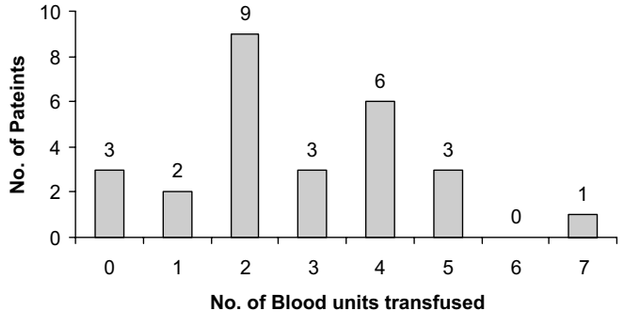
Graph 2 : *Improvement in Hemoglobin (Hb) Levels.*



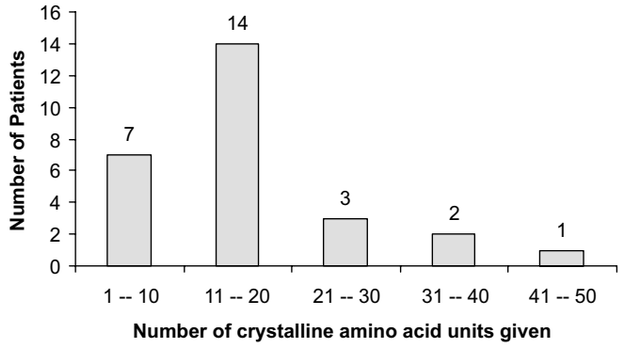
Graph 3 : *Serum Protein Levels at Beginning*



Graph 4 : *Serum Protein Levels at Beginning*



Graph 5 : *Number of Crystalline Amino Acid Infusions Given.*



Inclusion criteria

1. SCI patients with more than 2 weeks of injury
2. SCI patients with extensive pressure ulcers and with low serum hemoglobin levels.

Exclusion criteria

1. Patients with acute spinal cord injury (less than 2 weeks).
2. Patients having any psychiatric disorder.

The study included patients having both quadriplegia and paraplegia. ASIA impairment scale[7] was used for classification of spinal cord injury.

The level of serum hemoglobin in all these patients varied from 2.3-8.0gm/dl (Graph 2) and the serum protein levels ranged from 4-7gm/dl. (Graph 3).

The staging of pressure ulcers was done as per NPUAP classification.[4] Our study included patients with pressure ulcers having stage II to stage IV.

The pressure ulcers were measured initially and during healing, clinically. (Graph 1).

All other relevant investigations were also done. All the patients had other complications also, which too contributed to poor general condition and slow healing of ulcers. (Table 6)

Patients were given both general care by providing proper nutrition in the form of high protein diet, tablets of Iron and Folic acid, Vitamin C and 'B' complex.

Patients were given blood transfusion depending on the level of Serum hemoglobin and availability of donors. Intravenous nutritive infusion of pure crystalline amino acids containing essential and non essential amino acids in a balanced ratio (Hermin™, Alamin™) was also given to raise the serum protein levels, assuming that improvement in serum protein and serum hemoglobin level would break the vicious cycle as mentioned earlier and lead to faster healing of pressure ulcers.

The local care of pressure ulcer was given by providing daily Eusol dressing along with antibiotic ointment wherever required. Periodic shifting of patients on bed and wheel-chair was done 2 hourly. Water mattress was discouraged as it obstructs in proper turning of patients, in effect leading to slow healing of pressure ulcers.

Observation and Results

Age, sex, background of patients, cause of SCI, level of injury and co-morbid conditions are shown in Tables 1-6.

Table 1 : *Age Distribution*

0-10	11-20	21-30	31-40
1	4	11	11*

*1 died (36 years)

Table 2 : *Sex Distribution*

Male	Female
22*	5

*1 died

Table 3 : *Background*

Urban	Rural
10	17*

*1 died

Table 4 : *Cause*

Trauma	Disease (TB)
25*	2

*1 died

Table 5: *Level of injury*

	C_{1-7}	D_{1-6}	D_{7-12}	L_1 - >
Vertebral	9*	6	10	2
Neurological	9*	6	7	5
Classification	Quadri	High para	Low para	

*1 died (C_7)

Table 6: *Co-morbid conditions*

Head injury	1
Major fracture (Extremities)	1 (Tibia)
Abdominal injury	1 (Colostomy done)
Depression	1
Hematuria	1
Urinary tract infection	22
Septicemia, ARF, DIC	1 (died)

Maximum number of patients were in the age groups 21-30 yrs (Table 1).. The male to female ratio being 4.2:1 (Table 2), ratio of rural to urban background was found to be 1.7:1 (Table 3).

Trauma was the most common cause of SCI (Table 4). Ratio between trauma and disease was 12.5:1, whereas the paraplegia to quadriplegia ratio was 2:1 (Table 5).

The hospital stay of patients varied from 5 wks to 20 wks with most patients staying for 5 wks.

The area of pressure ulcers in the given study in sq.cms. is shown in Graph 1, with most patients having pressure ulcers with an area of 261-390 sq. cms. Maximum no. of patients had serum hemoglobin level in the range of 5-6gm/dl (from 2.7 to 7.4 gms/dl.)(Graph 2) and Serum Protein level in the range of 5-6 gm/dl (Graph 3) at the time of admission. No. of units of whole blood transfusion to patients varied from 0-7 units with most of the patients receiving 2 units of whole blood (Graph 4).

The level of serum hemoglobin was shown to improve in all these patients with average hemoglobin rising up to 9 gm/dl. at the time of discharge. (Graph 2). Intravenous infusion of crystalline amino acids received by the patients is shown in Graph 5, with most of the patients receiving 11-20 units (Unit of 200 ml).

Maximum number of patients had urinary tract infection as the most common associated complication at the time of admission which contributed to poor general condition of these patients.

At the end of the study we found that most patients had improved serum hemoglobin (Graph 2) and serum protein level along with improvement in their general condition.

All the pressure ulcers were healing in respect to their size, number and depth. The pressure ulcers were clean, granulating and contracting in size to be fit for plastic surgery, except in case of one patient who died as a result of septicemia.

All the patients were ambulatory with maximum number of patients on wheel-chair and one patient being able to walk with bilateral Ankle Foot Orthoses (AFO) and elbow crutches. Two patients left against medical advice, when their hemoglobin levels had improved but final ambulatory status was not attained.

Discussion

Maximum number of patients in the given study were in age group 21-40 years with a mean age of 30.5 years. This correlates with studies by Marc D Basson, Richard E Burney et.al. who also had patients with SCI having decubitus ulcers with mean age of 31 years.[2]

Male to female ratio of 4.2:1 is in correlation with studies by Stover S L et. al. who found a male to female ratio of 4:1 in their study.[8]

Trauma being the common cause of SCI in our study is similar to a study by Gary M. Yarkony[9] who mention trauma to be the most common cause of SCI.

All the patients in our study were anemic as it was our selection criteria and was a natural result of extensive pressures ulcer (cause and effect). According to a study by Hirsch GH et al[10], on patients with SCI, anemia is fairly common in chronic spinal cord injury persons with an incidence ranging from 30% to 56%.

The type of anemia in our patients was normocytic normochromic and microcytic hypochromic. Anemia is an intrinsic risk factor for the development of pressure ulcers and persons who have a serum hemoglobin level below 10gm/dl have difficulty in healing of pressure ulcers[11]. Therefore we took special care in improving serum hemoglobin levels by multiple blood transfusions as and when available together with multiple transfusions of amino acids and oral iron and vitamin supplements.

Most of the patients in our study had urinary tract infection (UTI) as a co -morbid condition. According to a study by Hirsch G H et al, it is reported, that the increased risk and frequent recurrence of UTI is the most common cause of anemia in persons with SCI.[11]

One patient died in our study due to septicemia. Allman R M[5] reported that infection is the major complication associated with pressure ulcers. Systemic sepsis and wound related bacteremia are life threatening complications and can increase the risk of mortality to 55%.

At Discharge

1. Most of the patients had serum hemoglobin level of 9gm%.
2. The ulcers were clean, granulating, healing and contracting in size, and fit for plastic surgery.
3. The general condition of all the patients was stable.
4. All the patients were ambulatory. (Except one that died for other reasons)

Conclusion

It can be concluded that pressure ulcers in spinal cord injured persons can be successfully treated by improving the serum hemoglobin and serum protein levels. Proper attention if required for associated complication and care of ulcers locally, breaking the vicious cycle of low serum hemoglobin/ serum protein and pressure ulceration.

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Significance of Grip Strength in Geriatric Rehabilitation: A Pilot Study

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Abstract

Background: Grip strength has been proposed to be an indicator as well as a predictor of old age disability. Indian studies confirming this are lacking. Moreover, multi-center data for comparison is also deficient in our setting.

Objectives: To determine the significance if any, of grip strength measurement in Geriatric Rehabilitation practice in assessing and predicting physical disability.

Subjects and Methods: In this cross-sectional, single blinded, single center study, patients 60 years or older of both sexes were included. Functional impairment and cognitive impairment were measured using the FIM Score and MMSE respectively. Grip strength was measured with Tracker™ computerized hand function evaluation system, at the second and third handle settings by a second examiner who was blinded to the patient's diagnosis or the functional status.

Results & Conclusion: Data obtained from 20 persons revealed that all of them were independent in ADL and 75% physically active. Self-perceived health correlated positively with peak grip strength. The study is ongoing and the role of grip strength assessment, a safe, simple, fast, cost-effective and portable test may prove useful in the rehabilitation of our elderly.

Key Words: **grip strength, geriatric rehabilitation**

Introduction

Geriatric rehabilitation research can be divided into three categories – (1) disablement process, (2) organizational structure, and (3) rehabilitation intervention[1]. It is important to have adequate data on the disablement process to plan and execute effective interventions.

Grip strength, a simple measure, has been used by many researchers as an indicator as well as a predictor of old age disability[2]. It is also an indicator of nutritional status[3] and physical function and muscular strength[4]. Frederiksen et al[5] identified hand grip strength as a suitable phenotype for genetic variants of mid- and late- life physical functioning.

Though there are many western studies stressing the importance of grip strength as a predictor of disability, Indian studies are lacking. Moreover, a normative database comprising of data from multiple centers is unavailable in the Indian context.

Objectives

The study was aimed at determining the significance, if any, of grip strength measurement in Geriatric Rehabilitation practice in assessing and predicting physical disability.

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Materials and Methods

Type of study**:** Cross-sectional, single blinded, single centre study

Subjects**:** Patients of either sex, attending PMR OPD were included in the study if they were 60 years or older irrespective of the diagnosis. They were excluded from the study if they had a diastolic BP recording above 120 mm Hg. Inability to understand the test procedure, difficulty in test performance or unwillingness to take part in the study were considered as exclusion criteria. Consent was obtained from all participants before commencing the procedure.

Methodology**:** Demographic data and self-reported disability were obtained using a structured questionnaire. The Edinburgh Handedness Inventory was used to determine the hand dominance. Functional impairment was assessed using the Functional Independence Measure (FIM) and cognitive impairment using the Mini Mental State Examination (MMSE) Scale. Grip strength was tested using Tracker™ computerized hand function evaluation system. A comparison was also made to the

grip strength value obtained using a locally available spring loaded hand held dynamometer.

***Procedure*:** Interviews to determine demographic data and functional status were done by one investigator. Second investigator, blinded to the diagnosis and functional status of the patients tested grip strength.

Standard patient positioning (recommended by American Society of Hand Therapists – ASHT) was followed. The procedure was demonstrated to the patients prior to testing and verbal enhancement was given during the procedure. The side to be tested first was chosen by the patients. Each test was performed three times.

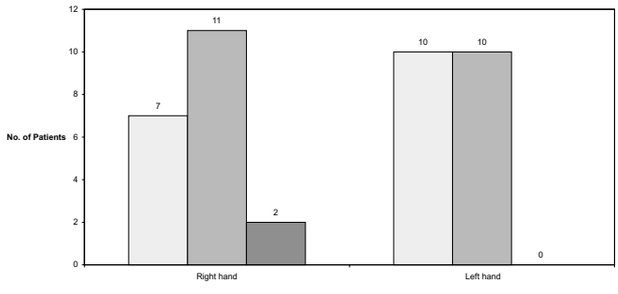
Dynamometer handles of Tracker™ were placed both at the second and third handle settings and peak grip strength (PGS) and average grip strength (AGS) were noted for either side.

Results

Preliminary results of 20 patients (11 males and 9 females) are published in this article. The age of the participants varied from 60 to 81 years. There was only one patient who was left-hand dominant (male).

The average grip strength (AGS) measurements obtained for both hands of all patients are shown in figure 1. Grip strength power of right hand was shown to be in the normal range for 7 patients, 11 had mild deficit and 2 had

Figure 1. Grip Strength of Patients



moderate power deficit. Ten patients had normal power and 10 had mild power deficit in the left hand. The power deficit shown in the Tracker™ system was in comparison to the western data (Mathiowetz et al[6]).

Right sided hand grip strength measured with locally available hand held dynamometer correlated significantly with peak grip strength (PGS) and AGS measured with Tracker™ system.

Self-perceived health reported by patients (obtained from questionnaire) correlated significantly with both peak grip strength (PGS) and average grip strength (AGS) measured by Tracker™ system (Table 1). This finding may suggest that grip strength could be an indicator of health status of elderly patients. Out of twenty, 15 patients were physically active and 18 were often engaging in manual activities (Table 2).

TABLE : 1

	Self-perceived health	***Self-reported physical activity***	***Frequency of manual activities in daily life***
Significant correlation of PGS	YES (P = 0.038)	NO	NO
Significant correlation of AGS	YES (p = 0.016)	NO	NO

TABLE : 2

Self-perceived health		***Self-reported physical activity***		***Frequency of manual activities in daily life***	
Category	No. of patients	Category	No. Patients	Category	No. of Patients
Excellent	1	Very active	4	Very often	12
Good	14	Active	11	Often	6
Fair	4	Slightly active	5	Sometimes	2
Poor	1	Sedentary	0	Never	0

No statistically significant correlation of peak or average grip strengths were found with self-reported physical activity level, frequency of manual activities in daily life, FIM, difficulty in self-care, MMSE, demispan or weight.

Discussion

Tracker™ system uses the norms published by Mathiowetz et al[6]. Vaz et al[7] developed predictive equations for normal grip strength of Indians (Bangalore, 2002).

Giampaoli et al[8] said that only reduced handgrip strength predicted incident disability in men 77 years or older. According to a study conducted by Rantanen et al[4], the number of chronic conditions correlated positively with motor disability and negatively with physical activity and muscle strength in older women. In our study, the initial data suggests that handgrip strength can indicate self-perceived health in elderly.

Although more than half participants in this study were 'physically active' (15 no.) and 'very often' engaging in manual activities (12 no.), statistical significance to grip strength was not attained. This could probably be due to small sample size. A comparison to normative data of similar age group was not done (other than the readings given by instrument), as only western norms were available for this age group.

The right sided hand grip strength obtained with hand dynamometer was comparable to that of Tracker™ system. Hence hand dynamometer can be used in OPD to determine the strength of patients in this age group.

Conclusions

- Self-perceived health correlated positively with peak grip strength.
- All participants were independent in ADL and 75% of study population were physically active.
- Present norms of grip strength are not satisfactory for our population, attempts should be made to collect data for Indians.
- Grip strength testing is a simple, relatively safe, easy and fast method of assessing health and disability in elderly.

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Post Stroke Psychiatric Morbidity Among Hemiplegics in Manipur

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Abstract

A study was conducted in 50 hemiplegic patients with a minimum of 3 months duration to find out any association of psychiatric morbidity in hemiplegics by using the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and Present State Examination (PSE). Depression was found in 24%, anxiety disorders in 26%, adjustment disorders in 12% and sexual dysfunction in 50% of the cases. Twenty-eight percent of the patients also had other psychiatric comorbidity. Early recognition and treatment of such problems in stroke patients will certainly help in the early recovery.

Introduction

World Health Organisation (WHO) defined stroke as a "rapidly developing clinical signs of local (at times focal) disturbance of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin[1]. In developed countries, stroke is the third commonest cause of death after heart disease and cancer[2]. The annual incidence of stroke is 2 per 1000 population, and the prevalence rate is about 5 per 1000 population[1]. In India, epidemiological information on annual incidence or prevalence rates and morbidity trends in defined populations are not available[3]. A community survey from different regions of India showed a crude prevalence rate for stroke in the range of 200 per 100000 persons[4]. Eighty percent of the strokes are due to cerebral infarction, 10% to primary intracerebral haemorrhage, and 10% to subarachnoid haemorrhage[5]. In Asia, the proportion due to primary intracranial haemorrhage is rather higher; about 25 to 35% [1].

Stroke is an important cause of impairment and disability. It often results in major changes in a person's life: stroke survivor can suffer loss of health, occupation, social role and independence. Major depression is a common occurrence[6]. The recognition and treatment of depression is important as depression is associated with increased disability[7,8,9], increased cognitive impairment[10,11], increased suicidal tendency and mortality[12,13,14] and poor rehabilitation outcomes[15].

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Hemiplegics, over and above their physical inabilities, also suffer from psychological, cognitive and social changes, which are more painful and injurious to the patient and family[16]. Mood disorders are common but often unrecognised companion of stroke. The reported prevalence of post stroke depression (PSD) varies from 20% to 65%[17, 18]. Studies on the neuropsychological correlates, persistence of PSD and psychological evaluation of these patients are very few[19,20].

We also feel that studies on the neuropsychiatric and emotional aspect of hemiplegics, which play a vital role in recovery, are scarce, particularly in our set up. This study is planned to examine the prevalence of psychiatric morbidity in hemiplegic patients after 3 months of onset of hemiplegia in Manipur.

Material and Methods

A study was conducted in 50 post stroke hemiplegic patients, who attended the department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal during the period July 2004 to January 2005. Diagnosis was clinically established and confirmed by CT scan. Patients with acute physical complications and having gross impairment in comprehension and expression of speech, uncooperative patients, and patients with past history of psychiatric illness were excluded from the study.

Assessment tools consisted of a) a semi structured proforma, b) Diagnostic and Statistical Manual of mental disorders, fourth edition (DSM-IV)[22] and c) Present State Examination (PSE), 9th edition [23].The first interview was performed when the patient was readmitted in the Physical

Medicine and Rehabilitation ward after 3 months of the onset of hemiplegia. Patients were first evaluated for the symptoms by using PSE and if psychiatric disorder was present, then diagnosis of psychiatric morbid condition was made by using DSM-IV guidelines.

Statistical analysis was performed by using Chi-square test wherever suitable.

Results

Out of the 50 patients, 12 were females and 38 were males. Twenty two patients had left sided involvement. Seventy percent of patients (n=30) belonged to the age group 46 to 65 years with only 4% (n=2) patients in the age group 26-35 years. Associated medical problems like hypertension in 56% (n=28), diabetes mellitus in 12 %(n=6), alcoholic liver diseases in 10% (n=5) and ischaemic heart diseases in 8% (n=4) cases were noted. Fifty-six percent of them were smokers and 28% of them were found hyperlipidemic.

Psychiatric morbidity was seen in 84% (n=42) of cases which was statistically significant ($p<0.001$). Table I shows distribution of patients with respect to psychiatric morbidities. Sexual dysfunction was the commonest disorder and 14 patients (28%) had sexual dysfunction associated with either depression or anxiety.

Table I: Distribution of Psychiatric Morbidity in Hemiplegic patients

Psychiatric Morbidity	***At 3 months***	
	Number	***Percentage (%)***
Depression	12	24
Anxiety Disorder	13	26
Adjustment disorder	6	12
Sexual Dysfunction	25	50

(14 patients had more than one diagnosis)

Discussion

In the initial 2 months, the symptoms, signs and behavioural problems of psychiatric disorders overlapped with normal grief reaction towards physical disorders and also cognitive impairment in memory, orientation, language, attention and visuospatial functions present in majority of patients[23,24,25]. Such disorders may still persist in about 35% to 60% of cases until 3 months, which may create a bias in a prevalence study. Also the peak prevalence of mood disorders appears to be around 3 to 6 months after the attack of stroke; although the prevalence remains high even after 1 to 3 years of the stroke attack[26]. Hence, the first assessment was done only at 3 months of onset of hemiplegia.

Our study consists of 28 males and 12 females. Kotila M[25] and Numminen et al[27] also reported higher incidence in males below 65 years of age, thereafter it equalizes with increasing age. Seventy percent of patients in the present study belonged to age group 36 to 65 years. Kotila M[25], Dobkin B[27], and Numminen et al[26] also reported increase in the incidence with increasing age.

In the present study, 42 out of 50 patients had at least one type of psychiatric morbidity. Many had more than one disorder co-existing together. The disorders found in the present study were depression (24%), anxiety disorders (26%), adjustment disorder with depressed mood (12%), and sexual dysfunction (50%). There was additional psychopathology found in the present study; post traumatic stress disorders like symptomatology in 8% of subjects and suicidal thoughts and plan in 4% of cases with depression. We have not come across cases with post-stroke mania, post stroke psychosis, anosognosia with denial of illness, catastrophic reaction with violence though there are reports in the literature. Percentage of depression in the present study (24%) is comparable with different authors (22% to 27%) who studied at 3 months from stroke[24,29,19,30]. Astrom[19] reported 28% occurrence of anxiety disorders and Castillo et al[31], 23% and 28% when co-morbid with major depression in post stroke patients. These findings are similar with the present study (26%). However, post traumatic stress disorder like anxiety was found in 8% of subjects, which did not fulfil the criteria as a separate disorder entity. Tang et al[32]reported association of adjustment disorder in 8.2% of patients against 12% in the present study.

Fifty percent of the subjects were having sexual dysfunction. The problems were mainly due to lack or loss of sexual desire and erectile disorders, reduced and loss of vaginal lubrication, reduced or cessation of coitus and loss of sexual satisfaction. Sjogren et al[33] found sexual dysfunction in 75% females and 64% males, although there were no endocrinological deficits or medications including antihypertensive treatment explainable to cause sexual dysfunction. Hawton[34] reported that 50% of subjects had recovered from sexual dysfunction at 6 months.

Conclusion

Hemiplegic patients are often having complications with psychiatric morbidity such as depression, anxiety disorders, adjustment problems and sexual dysfunction, etc. These complications hinder in the physical recovery of the patients. Therefore, such association of psychiatric morbidity in hemiplegic patients should be recognised in time and appropriate treatment should be done along with management of hemiplegia to improve their neuro-motor function.

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Associated Handicaps in Cerebral Palsy

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Abstract

Cerebral palsy (CP) is one of the most common disabilities affecting children. Most of the children suffering from cerebral palsy have associated abnormalities, which have a direct effect upon rehabilitation management, functional outcome and prognosis.

Two hundred diagnosed cases of CP in the age group of two years and above were assessed and various associated handicaps were identified.

In the given study Mental retardation was found to be the most common handicap.

Key words: **Cerebral palsy, associated handicaps.**

Introduction

Cerebral palsy is a symptom complex rather than a specific disease. It covers a group of non-progressive, but often changing motor impairment syndromes secondary to lesion or anomalies of the brain arising in the early stages of its development [1].

The reported incidence is approximately 2-3/1000 live births [2].

Cerebral palsy presents with multiple associated abnormalities, which have a direct effect on rehabilitation management, on functional outcome and prognosis of the child.

The present study was conducted to identify various types of handicaps associated with cerebral palsy.

Material And Methods

The study was conducted in the department of Physical Medicine And Rehabilitation Safdarjang Hospital and VMMC, New Delhi.

The study included two hundred diagnosed children of cerebral palsy between age groups 2 to 12 years of both sexes who attended the Department of P.M.R. during the years 2000-2002. Only those CP children having prenatal and natal causes were included. The diagnosis of CP was as per definition of American Academy of Cerebral Palsy[3].

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The classification of Cerebral palsy was based on major groupings as described by Minear WL[4].

Identification of various associated handicaps was done. These included:

1) Mental retardation.
2) Speech impairment.
3) Visual impairment.
4) Seizure disorder.
5) Hearing impairment.
6) Miscellaneous, dental dysmorphogenesis.

These were identified and diagnosis confirmed after examination by respective specialists. Mental retardation was graded based on the criteria of American Academy of Mental Deficiency.

Observations

Out of two hundred cases of Cerebral palsy, 142 (70%) were males and 58 (29%) were females. The age group ranged from 2 to 12 years. Maximum number of cases were in age groups between 2 to 3 years. Male to female ratio was 2.4:1. The most common type of Cerebral Palsy was spastic, constituting 165 (82.5%) out of 200 cases followed by Dyskinetic 15 (7.5%) and Hypotonic 15 (7.5%). The least common was Ataxic numbering only 3 (1.5%) and mixed in 2 (1%).

In the spastic group, spastic diplegia in 80 (48.5%) was the commonest followed by spastic quadriplegia in 50 (30.3%) and spastic hemiparesis in 35 (21.2%). (Table

1).

Table 1: The distribution of different types of cerebral palsy (n=200)

	Types	*Total no. (n=200)*	*Percentage*
1.	Spastic	165	82.5
	i. Diplegia	80	48.5
	ii. Quadriplegia	50	30.3
	iii. Hemiplegia	35	21.2
2.	Dyskinetic	15	7.5
3.	Hypotonic	15	7.5
4.	Ataxic	3	1.5
5.	Mixed	2	1

Among the various associated handicaps (Table 2) mental retardation of varying degrees was observed to be the most common handicap in 151 (75.5%) cases. Mild, moderate and severe MR was observed in 73 (48.3%), 53 (35.5%), and 25 (16.5%) cases respectively. Of the 151 cases of mental retardation, 20 (13.24%) cases had microcephaly.

Speech impairment was seen in 63 (31.5%) cases.

Seizure disorder, visual defect, and hearing impairment were present in 60 (30%), 50 (25%), and 28 (14%) cases respectively. Incidence of dental dysmorphogenesis was least, being present in only 16 (8%) cases (Table 2).

Table 2: Associated handicaps in CP children (n=200)

Types of Handicap	*Total no. (n=200)*	*Percentage*
1. Mental ratardation	151	75.5
2. Speech	63	31.5
3. Seizures	60	30
4. Visual impairment	50	25
5. Hearing impairment	28	14
6. Dental dysmorphogenesis	16	8

The visual defects present were strabismus in 35 (70%) cases followed by nystagmus in 9 (18 %) cases and optic atrophy in 6 (12%) cases.

Discussion

A male preponderance was observed in our study with a male to female ratio being 2.4:1, this is consistent with other studies[5,6]. Age group varied between 2 years and above; the maximum number being in the age group 2 to 3 years. This may have been probably because the developmental delay was first noticed by parents at this age. In the study of all the different types of cerebral palsy, the spastic type constituted the largest group in (82.5%) cases. Our finding is consistent with those of other workers who have also reported spastic cerebral palsy to be the most common variety [7]. Amongst the spastic group spastic diplegia was the most common type constituting 48.55% followed by quadriplegia in 30.30% and hemiplegia in 21.20%. Our findings agree with those reported by Kudrajaceve, Schoenberg et al and Michael Msall [7,8].

In the present study mental retardation presented as the commonest handicap constituting 75.5% and matches with the figures given by Vining et al [9]. All the cases with severe mental retardation had microcephaly. Our observation regarding seizure disorders being present in 30% of the cases agree with the study by Hagberg et al[10] and the highest incidence was observed in children with associated severe mental retardation reflecting the greater extent of brain injury in these cases.

The commonest visual defect comprised of strabismus whereas the least common was optic atrophy. The incidence of hearing impairment though rare[11], was higher than dental dysmorphogenesis which in turn constituted the least associated handicap in the study group.

Conclusion

Present study shows the common handicaps in CP are mental retardation, speech impairment, seizure disorder, visual defect, hearing impairment and dental dysmorphogenesis. Maximum number of children with cerebral palsy have mental retardation as associated handicap.

The success of treatment programme and the prognosis of the child with cerebral palsy depends on the degree and extent of associated handicaps. Early identification and management of these associated conditions causing handicaps are essential for optimum rehabilitation of the children with cerebral palsy.

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Comparison of Static Weight-Bearing and Static Sway in Below Knee Amputees Trained by Conventional Verses Visual Biofeedback Techniques Using Dynamic Posturography

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Abstract

The purpose of this investigation was to compare the results in weight distribution between the two lower extremities of a group of unilateral below-knee (BK) amputee adults trained by conventional methods and another group trained by using visual feedback techniques through dynamic posturography imparted using a dual force plate system. Two sets of BK amputees were taken. One set of fifteen old BK amputees (>1 yr) using the PTB prosthesis and trained conventionally with parallel bars and mirror. Second set of fifteen recent amputees (3 months to 1 year) fitted with prostheses recently and they were given weight bearing training for equalized weight distribution by dynamic posturography using force plate systems. They were further sent to the parallel bar system for gait training. The results of our study indicated that weight bearing was more on the normal foot. The discrepancy was to the order of 65:35 percentage of Total Body Weight (%TBW). This data was then compared with normal individuals for the dominant and non-dominant phenomenon where the difference was 52:48%TBW. The difference in the second test group after training was much less, to the order of 55:45%TBW. This difference is believed to significantly improve the gait, reduce the static sway of the patient and thereby increase the overall acceptability of the prosthesis.

Keywords: **Amputees; Artificial limbs; Weight bearing; Posturography; Sway**

Introduction

Ambulation is a very basic activity required for all functions of normal life – ADL and vocational. Humans are ambulant on two lower limbs, which provide for the normal gait. Equal weight bearing is a prerequisite for proper stance and swing. In patients with unilateral below knee amputations, retraining for weight bearing thus becomes very important. To this end we tried to study the methodology and results for the significance of our training.

In addition to mobility, standing in upright posture is also a feature that is unique to humans. This happens to be an unstable position requiring dynamic control and constant muscular activity. Thus enters the concept of sway in the 3-D cone of stability. In order to maintain a stable position it is very important to keep the sway of the body in the cone of stability[1,2]. It was also thought that proper weight distribution on bilateral lower limbs should be an important prerequisite for reducing the sway.

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To these two effects we thought it was significant to study the weight distribution in below knee amputees on prosthetic limbs and to see if better training can achieve better results. It is also appreciated that any rehabilitation program should also focus on dynamic weight bearing but there are countable numbers of gait labs in our country and not every patient can be trained on such expensive equipment. We therefore focused on static weight bearing and the ease of training patients for such activity. Very cheap equipment can be designed to give feedback training in static weight bearing. There is also extensive literature that says that static weight bearing is also an important indicator for gait training[3,4,5] and we wish to focus on these findings.

This study aimed to compare symmetrical weight distribution and static sway in two groups of fifteen, unilateral, below-knee amputees using conventional (Exo-skeletal) prosthesis. It was observed that even after regular training of the below-knee amputees, these patients continued to have poorer balance than normal individuals.

Material and Methods

Subjects: We enrolled thirty below-knee amputees in our study with proper consent. Five, old, follow up patients were included who served as part of the control group. The criteria for the control group were those patients who were using the prosthesis for more than six months, thus the follow up patients could be included in this group. The average age of the patients in the control group was 42 years and the male to female ratio was 4:1. The patients included in the study group were those who were recently amputated (3 months to 1 year) and were being imparted training for the prosthesis for the first time. The average age in this group was 37 years and the male to female ratio was 11:4. The exclusion criterion included all patients with complicated stumps, patients above the age of 60 years, patient with other known co-morbidities likely to affect the balance and stability.

Equipment: For the training of the conventional group a routine parallel bar system with level ground and full length plane mirror on one side is used. For the training of the visual feedback group, dynamic posturography was used. This was imparted using a system consisting of two force plates for each foot. The load taken on each limb is displayed on the screen as a bar graph that is easily comprehensible by most patients. All patients were using the conventional exoskeletal PTB prosthesis with SACH foot.

Method: These patients were divided in two groups – study and control. The control group included five old and ten new patients. These were given below knee prosthesis and were trained for gait and weight bearing using the standard departmental protocol. This was based on using the parallel bars with a full length plane mirror on one side in which the patient sees his gait and posture and given intermittent feedback by the therapist. This training was given five days in a week for five weeks and each session lasted about half an hour.

The study group was also consisted of fifteen patients, which were amputated during the past six months to one year. They were given definitive prosthesis after proper care of the stump. They were trained using dynamic posturography. They were trained to achieve as equal a weight distribution as possible in five days a week for five weeks with each session lasting about twenty minutes. They were then sent to the parallel bars for the usual gait training.

At the end of five weeks training period all these patients were assessed for static weight bearing with eyes closed and also their sway parameters were recorded using a dynamic posturography unit. Three sets of readings were taken and averaged. The findings are reported in this paper.

Results

The observations made in the two groups in our study have been tabulated. Table 1 gives the averages of the percentage of total body weight borne by each limb in the group trained by conventional methods. It may be seen from Table 1 that the mean weight borne on the amputated limb (AL) was 36% TBW and that on the normal limb (NL) was 64% TBW. The range of variation on the AL was from 22-45% TBW with the median as 37% TBW and the mode as 37% TBW. The range on the NL was from 78-55% TBW with the median and mode as 63% TBW.

Table 1 : *Percentage Body Weight borne on each limb in the conventionally trained control group*

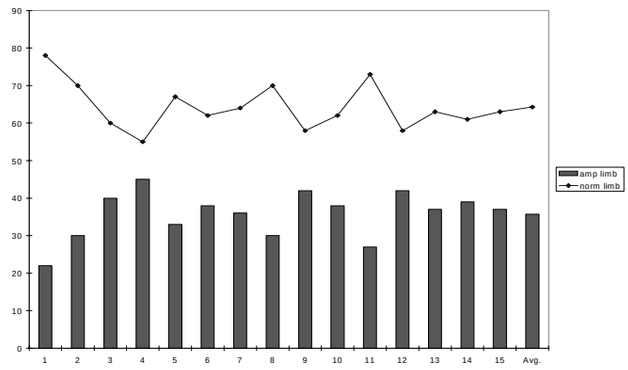
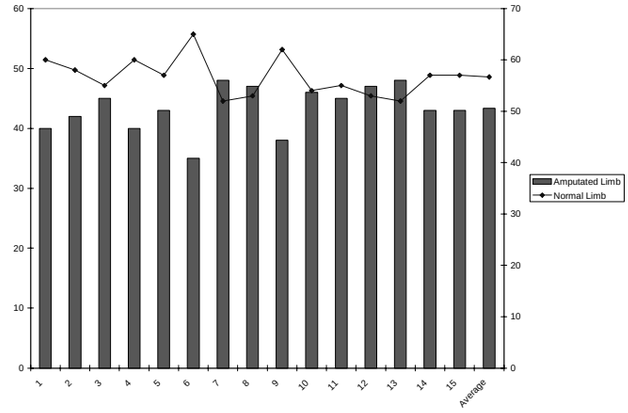


Table 2 shows the percentage of total body weight borne by the normal and amputated limb in the test group (i.e. the group trained by visual biofeedback). It gives the recordings of the individual group members and the group mean. The maximum load taken on the AL in this group was as high as 48% TBW while the minimum was 35% TBW. The mean, median and the mode on the AL in this group was 43% TBW while that on the NL was 57% TBW

Table 2 : *Percentage Body Weight bome on each limb in the test group trained by visual biofeedback method.*



The overall study group average has been compared with the test group average in table 3. There is a 21% increase in weight bearing in the visual biofeedback trained group.

Table 3 : *Comparison of average percentage body weight borne by each limb in the control and the study group.*

Group	***Av. % TBW on AL***	***Av. % TBW on NL***
Conventional	35.5	64.5
Visual feedback	43.1	56.9

The static sway parameters were also recorded for both the groups at the end of the training period before discharge from the study. The purpose was only to observe the difference in static sway if any. The observations have been presented in Tables 4&5 for the control and the study group respectively. These values for the individual members of the group have then been averaged and compared. The average static sway has been shown as the percentage of the limits of stability (% LOS) transcribed by the person standing during the test period of twenty seconds.

Table 4 : *Static Sway as observed after training in the conventional control group.*

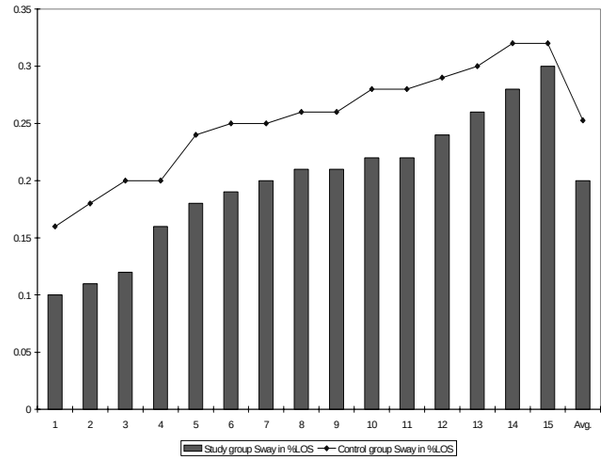
S.No.	Sway in % LOS	S.No.	Sway in % LOS
1	0.26	9.	0.32
2	0.28	10	0.16
3	0.20	11	0.25
4	0.30	12	0.25
5	0.32	13	0.26
6	0.24	14	0.28
7	0.20	15	0.29
8	0.18	**Avg**	**0.253**

Table 5 : *Static Sway as observed after training in the visual feedback study grouip.*

S.No.	Sway in % LOS	S.No.	Sway in % LOS
1	0.12	9.	0.19
2	0.30	10	0.24
3	0.20	11	0.16
4	0.22	12	0.26
5	0.18	13	0.11
6	0.28	14	0.21
7	0.10	15	0.22
8	0.21	**Avg**	**0.216**

The data in these tables has been diagrammatically shown in Figure 1. For the purpose of clarity the data shown in Figure 1 has been rearranged in ascending order for comparison and the serial numbers have been arbitrarily assigned. It may be seen that value to value each reading has a higher static sway in the control group as compared to the study group.

Figure 1 : *Static Sway in study group compared with the control group after re-arranging it in an ascending order.*



Discussion

In our study it was found that weight bearing on each limb was more towards equal after visual feedback training as compared to conventional training, and the difference was significant. The static sway observed in the two groups was not significantly different yet the average stability was apparently more in the visual feedback trained group.

The above findings suggest the importance of appropriate biofeedback. The main difference in our study group was that the feedback was in a mathematical and quantifiable form. In the conventional group also feedback was there in the form of the mirror and the therapist but that was only a subjective feedback

Tiberwala et al[6] have done a study and shown that even in normal individuals there was some difference in the weight borne by each limb. They also correlated that more weight was borne by the dominant side extremity and this gave the concept of dominant lower limb. Keeping this in mind it would be impractical to achieve absolute symmetry but the results obtained by us were very close to it. Hence any further training was unlikely to cause much improvement.

It has been shown that prosthetic foot takes more weight on the forefoot as compared to the normal foot[7] . This is an important reason for increased sway in amputated patients. Another important reason is that in SACH foot the ankle is fixed. This results in the loss of ankle strategy for posture and balance[2]. Ankle and hip are the major joints involved in the maintenance of erect posture and stability. The increased instability leads to loss of confidence and fear of falling which is a major impediment

to successful rehabilitation of amputated patients.

Fernie and Holling[8] have shown that postural sway in people with below knee amputations is increased while Vittas et al[9] showed that it was comparable to the control group. Thus we considered it appropriate to evaluate the static sway in our group of patients.

Eli Isakov et al[10] in 1992 studied the standing sway and weight bearing distribution in below knee amputees and concluded that these subjects were significantly less stable than able bodied persons during standing and the major contribution was due to loss of proprioceptive inputs from the amputated limb.

Standing is an unstable position which requires the constant use of muscular activity and joint mobility especially at the ankle and hip to maintain stability[11,12]. These functions are significantly expected to be compromised in below knee amputees with a SACH foot as the ankle strategy of balance is lost. This was confirmed in our findings indirectly as the extent of sway reduced in those patients trained to achieve better weight distribution.

Engsberg JR[13] et al pointed out in their study done on BK amputee children that the weight bearing pattern in children was more towards the normal children with the normal limb behaving as the dominant foot and taking a greater share of the total body weight. The significant difference was in the forefoot predominance in the prosthetic limb perhaps due to the basic design of the prosthetic foot piece (i.e. the keel of the foot-piece).

Conclusion

It can be concluded that better weight bearing leads to less static sway and is a positive factor for successful rehabilitation of amputees. For achieving better weight distribution over the amputated limb it is helpful to use some form of visual feedback training. Force plates are one of the options for feedback and it should be possible to device a system without much cost. The difference though not statistically significant yet is a fair indicator that better training is essential. It will thus be prudent, to extend this study to a wider group with stratified patient characteristics.

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IJPMR April 2006; 17 (1): 18-20 *Case Report*

Symphalangism in an Indian Family

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Abstract

Symphalangism is an uncommon congenital abnormality characterized by fusion of interphalangeal joints of fingers and toes. It exhibits autosomal dominant inheritance pattern. Involvement of both proximal and distal interphalangeal joints can occur. But proximal interphalangeal joint involvement is more common. It may be associated with other skeletal or non-skeletal abnormalities. Compensatory hyperflexibility of the joints proximal and distal to the fused joints may be present. Here we are presenting two brothers with proximal symphalangism in bilateral hands and feet. Involvement of index finger and thumb was also present in these patients. They did not complain of any functional impairment in daily activities and hence did not seek any intervention to regain movement in the involved joints.

Introduction

Symphalangism is an uncommon syndrome characterized by ankylosis of interphalangeal joints of fingers and toes. It was first described by Harvey Cushing in the first issue of Genetics (1916).[1] He interviewed three affected members of a family and presented a family record of seven generations, where he found 84 affected members among 312 descendants of an affected person.

The fusion can occur in any finger. Little finger is the most frequently involved finger followed by ring, middle and index finger.[2,3] Index finger is generally involved only when other fingers are also involved. Involvement of thumb has also been reported.[5] The fusion can occur in proximal interphalangeal (PIP) or distal interphalangeal (DIP) joints; however, involvement of proximal interphalangeal joints is more common.[3,4,5] Accordingly it can be classified into proximal and distal symphalangism. Proximal as well as distal symphalangism have an autosomal dominant inheritance pattern.[1,2,3,4,5,7,8] It has been reported to be associated with additional skeletal and non-skeletal abnormalities [3,4,7,9], however, expression of these abnormalities is variable and depends on the type of symphalangism. Commonly seen skeletal abnormalities include brachydactyly, camptodactyly, clinodactyly, syndactyly, radio-humeral fusion, carpal and metacarpal anomalies, pes planus, bilateral hip dislocation, tarsal coalition, congenital fusion of cervical or thoracic spine, compensatory hyperflexibility of unaffected joints of same digit. Conductive hearing loss and absence of cutaneous creases over the affected joints are the associated non-skeletal abnormalities. Symphalangism may be found in association with some syndromes such as Poland syndrome, Apert syndrome, Herrmann's syndrome etc. According to Flatt and Wood symphalangism can be divided into three main groups- true symphalangism without additional skeletal abnormality, symphalangism associated with symbrachydactyly, and symphalangism with syndactyly.[3]

In India symphalangism have been reported earlier by Gemma Savarinathan and Willard R. Centerwall.[10] They reported a south Indian family of which twelve members spanning over four generations were affected. They found fibrous symphalangism of thumb associated with variable syndactyly and polydactyly in nine out of twelve affected members. Osteoarthritis of joints proximal and distal to the fused joints has been observed as a long term complication. This may be partly because of increased mechanical stress in these adjacent joints.[11]

Case History

Two cases of symphalangism in a family are presented. The affected patients were two brothers out of five siblings. The family pedigree is shown in the Figure 1. Both the brothers were interviewed and examined. They confirmed the involvement of four generations of their family tree of which they represent the third generation. They could not provide details of extent of involvement in the first and second generations except for their father.

Case 1: The younger brother aged 40 years presented in our department with absence of movements in some of the joints of the fingers and toes since birth. His physical examination revealed slightly short fingers and normal

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length toes except short great toes. No active or passive movements could be elicited in the PIP joints of all fingers and lateral four toes and in the interphalangeal joints of thumb and big toe of both sides. All the nails were normally developed. The DIP and metacarpophalangeal joints of the affected finger were having increased flexibility. Rest of the joints of the extremities including bilateral wrist, elbow, shoulder, ankle, knee and hip joints showed no abnormality in movement. There was absence of skin creases on the dorsal and volar aspects of the affected joints (Figure 2, 3); although single poorly developed skin crease was present in the volar aspect of PIP joints of bilateral little and middle fingers. Examination of the rest of the body did not reveal any other abnormality. Radiographic examination showed complete fusion of PIP joints of medial four digits of both the hands (Figure 4, 5). Fusion of IP joints of thumbs was incomplete. Radiographs of the feet showed complete fusion of the PIP joints of lateral four toes (Figure 6). There was incomplete fusion of IP joints of both the great toes. On the left side 1st metatarsal and proximal phalanx was markedly shorter in comparison to normal, whereas on the right side it was slightly shorter.

Case 2: The elder brother aged 48 years accompanied case 1. During history taking of case 1 he also exposed his deformities. His physical examination showed normal length fingers and toes. No active or passive movement was present in PIP joints of middle, ring and little fingers of both the hands. In the PIP joints of index fingers and IP joints of thumbs some flexion was possible. In PIP joints of lateral four toes and IP joints of great toe of both feet there was no passive or active movement. Joints just proximal and distal to the affected joints were having more flexibility in comparison to normal range. Rest of the joints in the extremities were found to have normal mobility. There was no skin crease on the dorsal aspect of the affected joints and on volar aspect of ring and little finger of both hands (Figure 7, 8). But poorly developed skin crease was present on the volar aspect of the little and index finger and thumb. No other abnormality was detected in the rest of the body.

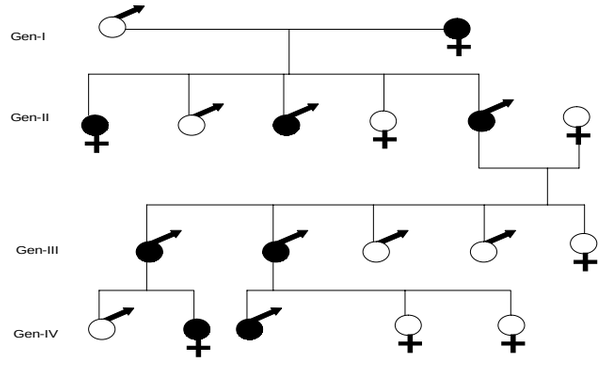

Fig. 1: *Pedigree pattern of symphalangism involving four generations*

Fig. 2: *Dorsal aspect of hands of case 1*

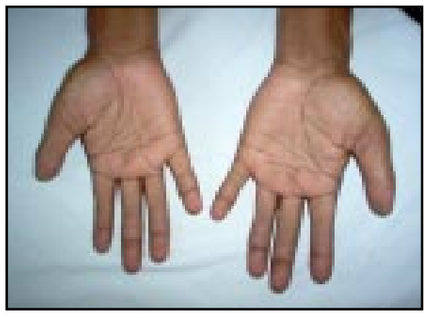

Fig. 3: *Volar aspect of hands of case 1*

Fig. 4: *Radiograph of left hand of case 1*

Fig. 5: *Radiograph of right hand of case 1*

Fig. 6: *Radiograph of feet of case 1*

Fig. 7: *Dorsal aspect of hands of case 2*

Fig. 8: *Volar aspect of hands of case 2*

Discussion

Symphalangism is an autosomal dominant disorder. [1,2,3,4,5,7,8] The pedigree pattern of our cases also reflects the same. As evident from the literature available, proximal symphalangism is more common than the distal variety. [3, 4, 5] In a review of literature Flatt and Wood documented only 34 DIP fusions out of 649 affected fingers. The two cases discussed here fall under the category of proximal symphalngism. Occurrence of the abnormality in the index finger and thumb is less common, but in our cases involvement of these digits were also noticed. In the Indian family reported by Gemma Savarinathan and Willard R. Centerwall affection of thumb was described and the ankylosis was fibrous whereas in our cases it was bony. [10] Their cases were associated with syndactyly and polydactyly but in our cases these findings were not present. It is known to be associated with additional skeletal abnormalities and in our case 1, short 5th metacarpal and short proximal phalanx of great toes of both sides were the only such findings. The only non-skeletal association found in our cases was the absence of skin creases over the affected joints. Occurrence of osteoarthritis in the joints proximal and distal to the fused joints has been reported.[11] Our patients were aged 40 years and above but they did not show signs of osteoarthritis as per ACR criteria. Probably because the condition manifests since birth in most of the instances, persons with symphalangism learn to perform tasks without movement of the affected joints and do not have functional impairment.[3, 6, 12] Both the cases we are presenting did not have any functional impairment and did not want any intervention for restoration of movement in the affected joints or to increase functional ability. These cases are unique in another respect that involvement of thumb and index finger being rare, was present in these cases.

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