

Indian Journal of Physical Medicine and Rehabilitation

IJPMR Archives IJPMR 2012 June; 23 (2) IJPMR 2012 June; Volume 23 (Number 2) HPMR Contents Editorial Undergraduate Medical Education in Physical Medicine and Rehabilitation. RN Haldar. Original Articles 1. Functional Outcome of Stroke Patients, Correlation with Scandinavian Stroke Scale, Keshav Dev, Mrinal Joshi. 2. Functional Outcome after Rehabilitation among Different Diagnostic Groups of Childhood Print Edition Meningoencephalitis. P.P.Pan, G.Santra, D.K.Khatua, R.Pramanik. 3. Study of Factors Affecting Progress of Locomotor Disability in a Slum in Mumbai. Manasi S Padhyegurjar, Shekhar B Padhyegurjar. Editor: Prof RN Haldar Our Experience with Correction of Angular Deformities of Knee by Flexible Figure of 8-plate Hemiepiphysiodesis. Sakti Prasad Das, S Pradhan, PK Sahoo, RN Mohanty, SK Das. 5. Effectiveness of Tolperisone Hydrochloride with Aceclofenac as Combined Therapy in Acute Low Back ISSN Pain. B Bhattacharjya, S Mohammad Naser, A Biswas, F Kamal, K Banerjee. 0973-2209 Case Report Hypokalaemic Periodic Paralysis Associated with Hypothyroidism. Th Khelendro Singh. Ngampa Sangme, L Nilachandra Singh, AK Joy Singh. Special Article 7. Prosthetic Fittings Limitations and Its Present Scenario in India and Abroad. MK Mathur. Pictorial CME A Rare Clinical Sign - Saviour During a Diagnostic Dilemma. R Pramanik, P P Pan. PG Forum A) <u>Rehab Challenges</u> B) Book News C) Article News D) Rehab Quiz Obituary Obituary of Prof R Chinnathurai by Dr P Thirunavukkarasu. Miscellaneous Medical Philately Authors' Guidelines Editorial Board and IAPMR Executive Council

Disclaimer: The contents of this journal are not for the consumption of general population and are also not intended to help the public use this information to treat any medical condition or indulge in practice of rehabilitation of the persons with disability, themselves. The public in its own interest is advised to consult their doctor for advice on the management of their medical conditions.

Web administration and designing: Dr U Singh. First built: April 15, 2004. Last updated: September 10, 2012

Original Article

Functional Outcome of Stroke Patients, Correlation with Scandinavian Stroke Scale

Keshav Dev¹, Mrinal Joshi²

Abstract

Present hospital based prospective study was conducted in Sawai Man Singh Hospital in Jaipur district of Rajasthan state (west part of India) during the year 2008-2009 to know functional outcome of stroke correlation with Scandinavian stroke scale score. Assessment severity of stroke on Scandinavian stroke scale (SSS) score and functional disability on Barthel Index (BI) were neasured. Out of 200 included cases 11 were dropped out and it was found that incidence of stroke in young individual is significantly less than older individual. Hypertension was most important risk factor. Ratio of R: U=1.38: 1, M: F=1.74: 1 and infarction: hemorrhage= 1.32: 1. Metabolic syndrome was a nonsignificant risk factor for women as well as men (p>0.005). The correlation between the SSS and on functionally outcome was significant (p<0.005).

Key words : Stroke, Scandinavian stroke scale score, metabolic syndrome.

Introduction:

S troke is a major cause of long term disability. Every year a significant number of stroke survivors are left with residual disabilities which interfere in their daily routine and social integration, as it affect not only family but also society as majority of patients are only earning member of family and requiring medical and rehabilitative treatment for better outcome. Rehabilitation after stroke is a continuum, starting within days of stroke onset and ending only when it no longer produces any positive effect. Effective rehabilitation relies on a coordinated,

- ¹ MBBS, MD (PMR), Assistant Professor, Department of Physical Medicine and Rehabilitation.
- ² MBBS, MD (PMR), DNB, Associate Professor, Head of Department, Department of Physical Medicine and Rehabilitation.

Cite as :

Department of Physical Medicine and Rehabilitation, Rehabilitation Research Centre, Sawai Man Singh Medical College and attach Hospital, Jaipur, Rajasthan

Email ID: kdgupta092@yahoo.in, Mobile No.-9828141092

Received on 29/01/2012 Revised on 08/03/2012, Accepted on 21/03/2012 multidisciplinary team approach. Regular team meetings, as well as meeting with the patients, his or her family and cares are essential.

Materials and Methods:

This prospective study includes two hundred patients admitted to an inpatient stroke rehabilitation programme in department of physical medicine and rehabilitation in Sawai Man Singh Hospital between september 2008 and august 2009. The Sawai Man Singh Hospital is the tertiary care centre in the Jaipur district of Rajasthan state in the west part of India. The diagnosis of stroke was based on clinical assessment supported by CT scanning or MRI. Neurorehabilitation programme was started as early as possible after admission. The usual daily treatment consists of 2 to 3 hours of therapy, based on individual needs and tolerance. Along with neurological examination patients were also evaluated on Scandinavian stroke scale Score (SSSS) for assessment of severity of stroke in initial stage. The SSS evaluates level of consciousness, eye movement, power in arm, hand and leg, orientation, aphasia, fascial paresis, and gait on a total score from 0 to 58. Functional outcome of stroke was measured by Barthel Index (BI). Activity of daily living (ADL) was assessed on admission, weekly until death or ends of rehabilitation and again at the 6- month poststroke examination using the BI. The BI evaluates 10 different

Author's affiliations:

Sawai Man Singh Medical College and attach Hospital, Jaipur, Rajasthan.

Dev K, Joshi M. Functional outcome of stroke patients correlation with scandinavian stroke scale. IJPMR 2012 Jun; 23(2): 53-6.

Correspondence :

Dr. Keshav Dev

abilities on a score from 0 to 100. According to the BI score functional disabilities was classified into five categories: Very severe disability (0 to 20 points); severe disability (25 to 45 points); moderates disability (50 to 70 points); mild disability (75 to 95 points); no disability (100 points). In our study very severe, severe, moderate disability patients (0 to 70 points) categorise into total and partial dependent (functional deficit) and mild, no disability patients (75 to 100 points) into independent (functional non-deficit) category.

Results:

Eleven patients dropped out due to various reasons, one hundred eighty-nine patients were followed for six months.Sociodemographic Profiles is shown in Table 1. The study showed an increasing frequency of stroke with advancing age excepting after 70 years when there was a decline of cases. Mean age of patients was 58.26 yrs \pm 2 SD. Ratio of rural to urban background was 1.38: 1.Ratio of male to female was 1.74: 1.

Table 1: Sociodemographic Parameter of StrokePatients

Parameter	Specific Examples	No. of Patients
Sex	Male Female	127 73
Marital status	Married Unmarried	192 8
Residence	Rural Urban	116 84
Age group	<40yrs 41-55 yrs 56-70 yrs >71 yrs	27 (13.5%) 60 (30%) 83 (41.5%) 30 (15%)
Occupation	Student Housewife Farmer/labourer Retired Service/businessmen	4 (2%) 68 (34%) 64 (32%) 33 (16.5%) 31 (15.5%)
Hand dominance	Right Left	184 16
Occurrence	First Recurrent	177 23

Stroke risk factors, type, motor impairment is shown in Table 2.Ratio of infarction: hacmorrhage = 1.32: 1. With reference to ATP III criteria twenty patients (10%) had metabolic syndrome. In our study population metabolic syndrome was a non-significant risk factor for women

IJPMR 2012 Jun; 23(2) : 53-6

	No. of patients	%
Stroke type		
Infarction	108	54%
Hacmorrhage	82	41%
Other	10	5%
Stroke risk factors		
Hypertension	112	56%
Diabetes	18	9%
Smoking	70	35%
Metabolic syndrome	20	10%
Stroke motor impairment		
Left body	80	40%
Right body	116	58%
Both sides	4	2%
Associated symptom at admission		
Dysphasia	164	84%

 Table 2: Descriptive Characteristics of the Stroke

Rehabilitation Patients

as well as in men (p>0.005). Even though the occurrence of metabolic syndrome had non-significant correlation with overall stroke but had significant correlation to ischacmic stroke. Fourteen patients (12.90%) out of one hundred eight ischacmic strokes had metabolic syndrome indirectly a significant correlation.On SSS a score of twenty-two and more direct a good prognosis had all the recruited patients were found on this scale during the initial stage of admission. Tables-3 and 4 show the relation between neurological severity and functionally outcome of stroke patients at initial and six months post-stroke stage. One hundred one had a score of less than twenty -two (53.43%) and eighty-eight had score of more than twenty-two (46.56%); 47 patients out of 189 patients had reached their best possible independent function according to the BI score. However, it cannot be excluded that further improvement may have occurred in some patients after rehabilitation was ended. The correlation between the SSS and rehabilitation functionally was significant (p<0.005). End of this study forty-seven patients recovered to a functional level (24.86%), one hundred two patients were deficit (53.96%), and forty patients were expired (21.16%) (Chart1).

Table 3: Number of Stroke Patients havingNeurological Severity (SSS Score) and FunctionalDisability (BI Score) at the Time of Admission

SSS score (0 to 58 points)	BI score (0 to 70 points)	BI score (75 to 100 points)	Total
<22	101	0	101
≥22	74	14	88

Eleven patients drop out from study.

Table 4: At Six Month Poststroke FunctionalOutcome of Stroke Patients, Correlation with InitialScandinavian Stroke Scale Score

SSS score	Functional deficit BI score (0-70)	Functional non deficit BI score (75-100)	Expired	Total
<22	64 (63.36%)	5 (4.95%)	32 (31.68%)	101
≥22	38 (43.18%)	42 (47.72%)	8 (9.09%)	88

Eleven patients drop out from study.

Chart 1: At Six Month Poststroke Outcome of Stroke Patient's, Correlation with Initial Scandinavian Stroke Scale Score



Chi -Square-49.495 with two degree of freedom p=0.000 (p<.005)

Discussion:

In this study incidence of stroke in young individuals is significantly less than in older individuals; 13.5% patients were <40 years of age and remaining 86.5% patients were above forty. Similar finding were observed by Bharucha *et al*¹ Saha *et al*² study that prevalence of stroke increases with age. Our rural and urban background findings were similar to observed by Gourie et al^3 study stroke where was higher in rural area compared with urban area.Secondary/ repetitive stroke was present in 11.5% patients, which is near to the figure observed by Razdan *et al*⁴ where such cases were 6.6%. As regard to the job working group 49.5%, house hold job done by 34% and retired 16.5%. Liet at al⁵ in China saw the distribution as working group 80.7%, house hold 15.45% and other 3.7%. We cannot be conclusive regarding the relationship between occupation and stroke as the sample size is to small but it does indicate that most of the patients are from working group and that makes rehabilitation to be the most important component in stroke management. Ischacmia was the most pattern of stroke in our study when is using in the various western studies^{1,6.} Hypertension was the most important risk factor which was present in 56% of cases with almost no sexual predominance. Most epidemiological studies^{2,4,6-} ⁸ have confirmed that blood pressure is among most important single risk factors of stroke. Along with that 9% (eighteen patients) had diabetes^{2,7}. We screened our patients on ATP III criteria9 validated for metabolic syndrome. Twenty patients (10%) had metabolic syndrome which was a non-significant risk factor either for men or women¹⁰. Ratio between infarction and hacmorrhage was 1.31. Banerjee and Das⁶ found the ratio between infarction and hacmorrhage 2.2:1. SSS score which is valid to regarding prediction of recovery and relation to severity of stroke^{11,12}, functional recovery was strongly related to initial stroke severity (SSS score). Best ADL function was reached in patients with initial mild stroke or higher SSS score and poor ADL functional in initial severe stroke or low SSS score ¹². At six months post-stroke the risk of death and dependency was higher in patients with SSS score less than twenty two compare with SSS Score more than twenty-two¹¹. In Indian scenario the health system is not linked with community social services and also there is no government funded medicare system. It thus becomes more imperative that stroke survivor is taken in to rehabilitation and should be made as independent functionally as possible with short intensive programme. As soon as the patients enter the community he loses touches with health system and has no community reintegration programmes. This increase the burden of disability on society and community.

Conclusion:

SSS predicts death and dependency in stroke patients. Higher scorer patients had better outcome of stroke at the end of study. Stroke rehabilitation should be taken up with a precise formulated programme which should be short and intensive. Metabolic syndrome and survival age is increasing as India is emerging economically. This poses a challenging due to increase in incidence of stroke and their survival too. Intervention rehabilitation programme with appropriate follow-up so that with large patients group can be included. There is need to more multicentric and large population inclusion for modern policy for stroke rehabilitation in India.

Acknowledgement:

The authors express deep appreciation to Dr. Navnendra K. Mathur, who helped us with the design of this study. We mourn his untimely death.

References:

- 1. Bharucha NE, Bharucha EP, Bharchaae, Bhise AV, Schoenberg BS. Prevalence of stroke in the Parsi community of Bombay. *Stroke 1988*; **19**: 60-2.
- Saha SP, Bhattacharya S, Das SK, Maity B, Roy T, Raut DK. Epidemiology study of neurological disorder in a rural population of eastern India. *J Indian Med Assoc 2003*; 101: 299-304.
- 3. Gourie Devi M, Gururaj G, Satishchandra P, Subbakrishna DK. Prevalence of neurological disorder in Bangalore, India: a community based study with comparison between urban and rural areas. *Neuroepidemiology 2004*; **23**: 26-8.
- 4. Razdan S, Kaul RL, Motta A, Kaul S. Cerebrovascular disease in rural Kashmir, India. *Stroke 1989*; **20**: 1691-3.
- Li SC, Schoenberg BS, Wang CC, Cheng XM, Bolis CL, Wang KJ. Cerebrovascular disease in the peoples republic of china. *Neurology 1985*; 35: 1708-13.

- 6. Banerjee TK, Das SK.Epidemiology of stroke in India. *Neurol* Asia 2006; **11:** 1-4
- Lavy S.Melamed E, Cahane E, Carmon A. Hypertension and diabetes as risk factor in stroke patient. *Stroke 1973*; 4: 751-9.
- 8. Salonen JT, Puska P, Yuomilehto J, et al. Relation of blood pressure, serum lipid and smoking to risk of cerebral stroke- a longitudinal study in eastern Finland. *Stroke 1982*; **13**: 327-33.
- Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: An AHA/NHLBI Scientific statement. *Circulation* 2005; **112**: 2735-52.
- Boden-Albala B, Lee HS, Grahame-Clarke C, Rundek T, Elkind MV, Wright C, et al. Metabolic syndrome and ischemic stroke risk : Northern Manhattan Study. *Stroke 2008*; **39:** 30-5.
- Christensen H, Boysen G, Truelsen T. The Scandinavian stroke scale predicts outcome in patients with mild ischemic stroke. *Cerebrovasc Dis 2005*; 20: 46-8.
- 12. Jorgensen HS, Nakayama H, Raaschou HO, Vive-Larsen J, Stovier M, Oslen TS. Outcome and time source of recovery in stroke. Part-2: Time course of recovery. The Copenhagen stroke study. *Arch Phys Med Rehabil 1995*; **76**: 406-12.
- Christensen H, Boysen G, Truelsen T. The Scandinavian stroke scale predicts outcome in patients with mild ischemic stroke. *Cerebrovasc Dis 2005*; 20: 46-8.

Original Article

Functional Outcome after Rehabilitation among Different Diagnostic Groups of Childhood Meningoencephalitis

P P Pan¹, G Santra², D K Khatua³, R Pramanik⁴

Abstract

Objective: To study the functional outcomes in different groups of meningoencephalitis patients after rehabilitation approach in addition to standard medical therapy.

Study period: From January 2007 to January 2009.

Study Design: Prospective longitudinal analytical study.

Study Area: Departmentof Physical Medicine & Rehabilitation, Department of Paediatric Medicine in North Bengal Medical College, Sushrutanagar, Darjeeling, India.

Study population: 108 patients.

Material and methods: After taking consent and institutional ethical committee clearance the sample size were assessed. After stabilisation of the affected children with medical therapies, rehabilitation regimen was added.

Outcome measures: Percentage of total Wee FIM score.

Follow up: 0, 2weeks, 6 weeks.

Results: Data analysed by McNamara's chi Square test showed disability rate is much higher than other aetiology. Best prognosis is seen in patients with viral infections.

Discussion: In developing countries children in lower socioeconomic group from rural areas are the most victim of tuberculous meningoencephalitis who responded reasonably with rehabilitation regimen.

Conclusion: Rehabilitation regimen is best helpful in viral infection. Tuberculous infection, relatively commoner in India does not respond very well.

Key words : Meningoencephalitis, Wee FIM score, disability.

Author's affiliations:

- ¹ MD, Associate Professor, Department of Physical Medicine and Rehabilitation. North Bengal Medical College, West Bengal
- ² MD, Assistant Professor, Department of Medicine, Calcutta Medical College. Kolkata
- ³ MD, Associate Professor, Department of Physical Medicine and Rehabilitation, BankuraSammilani Medical College, Bankura
- ⁴ MD, MRCP(UK)Assistant Professor, Department of Physical Medicine and Rehabilitation, IPGMER & SSKM Hospital, Kolkata

Cite as :

Pan P P, Santra G, Khatua D K, Pramanik R. Functional Outcome after Rehabilitation among Different Diagnostic Groups of Childhood Meningoencephelitis. IJPMR June 2012; Vol. 23(2): 57-61.

Correspondence :

Partha Pratim Pan, Associate Professor, Department of Physical Medicine and Rehabilitation, North Bengal Medical College, Sushrutanagar, West Bengal, Darjeeling, India.

E-Mail ID: drpan@rediffmail.com

Received on 06/07/2011, Revised on 25/102011, Accepted on 23/05.2012

Introduction:

Meningoencephalitis ie, inflammation of both the meninges and brain parenchyma, is real challenge in the field of neurorehabilitation. Disability rate is much higher in case of childhood meningoencephalitis because the insult on an immature developing cerebral cortex leads to wide range of neurodeficit. The impact is much higher in developing countries like India due to lower socioeconomic condition and paucity of rehabilitation services available for every affected child.

According to world literature causative organism of meningoencephalitis is mostly the virus followed by bacteria and less likely the parasites, fungi etc.^{1,2.} In south East Asia especially in India incidence rate of tuberculous meningoencephalitis is much higher than developed world where immunocompromised children are the most victims³. Streptococcus Pneumoniae, Haemophilus

influenzae and *Neisseria meningitides* are common causes of acute bacterial meningitis (ABM) in children during post-neonatal period.⁴⁻⁸ ABM in early childhood may lead to several potential disabilities including hemiparesis, quadriparesis, visual field defect, cortical blindness, sensoryneural hearing loss, cranial nerve palsies, cerebral palsy, ataxia, complex seizure disorders, learning disabilities, obstructive hydrocephalus, behaviour disorder, neuropsychiatric dysfunction, brain atrophy and so on.⁸⁻¹¹

Viruses account for most cases of acute meningoencephalitis and enteroviruses (non-polio enteroviruses) are most common among them. Enteroviruses like echoviruses, coxackie virus A and B commonly cause meningitis. Arboviruses cause meningoencephalitis rather than pure meningitis. Japanese B virus is the biggest offender of this group worldwide. Other causes of viral meningitis are HSV-1, HSV-2, mumps, measles, varicella zoster virus etc. Long-term neurological sequel in children from viral meningoencephalitis include quadriparesis, hemiparesis, and neurogenic bladder, loss of speech, blindness, sensorineural hearing loss, seizure disorders, hydrocephalus, parkinsonian features, cranial nerve palsy, learning disabilities, and behaviour disorders and so on. Herpes simplex and arbovirus infections, including Japanese B encephalitis, can cause in severe neurological disorders.¹²⁻¹⁴ A study¹⁵ conducted in UK on children with meningitis during first year of life revealed that 42 per cent of children with echovirus meningitis had mild or moderate neurological disabilities till five years of age.

Survivors of TBM may have permanent neurological sequelae. In TBM, dense exudate envelops the arteries and cranial nerves and causes blockade in the flow of CSF, which in turn leads to hydrocephalus. Development of arteritis and infarctions of brain lead to hemiplegia, quadriplegia and other neurodeficits.Due to the variably of disease distribution in India and wide range of neurodeficit and functional impairment, disability spectrum is really different. This project is a humble attempt to find out the efficacy of rehabilitation regimen in meningoencephalitis in a developing country.

Materials and Methods:

The present prospective longitudinal analytical study was conducted in the Department of Physical Medicine & Rehabilitation and Department of Pacdiatric Medicine in North Bengal Medical College, Sushrutanagar, Darjeeling, India during the period from January 2007 to January 2009. The patients admitted in the department of Paediatric Medicine in North Bengal Medical College in their age group of 3 to 12 years with meningoencephalitis confirmed clinically, radiologically by CT scan, biochemically by CSF picture with Glasgow coma scale of 15 were included in this study with following exclusion criteria:

- 1. Neurological and haemodynamic instability
- 2. Glasgow coma scale <15
- 3. Past history of neurodeficit like cerebral palsy, Down's syndrome etc.
- 4. Hypothyroidism
- 5. Congenital cyanotic heart disease.

Informed consent was obtained from parents of all children and the study was carried out in accordance with the Institutional Ethical Committee. After stabilisation of the patients with appropriate medical treatment like anticonvulsant, antiviral, antibiotic, antituberculous medications etc, a detailed history was taken and clinical examination was done. The relevant clinical findings and history were recorded in the proforma.

Non-pharmacological management protocol

The following rehabilitation protocol was adopted in each case of meningoencephalitis depending on the involvement.

- A. *Posture and positioning:* Patients were advised care of the back with frequent change of posture. Proper positioning of all affected limbs was maintained to avoid contractures. Upper limb were kept with shoulder in 90 degree abduction, elbow in 90 degree flexion, wrist in full 30 degrees dorsiflexion and fingers in hand in the form of a grip of a cylindrical object. The lower limb was kept with hip in 30 degree abduction, knee in full extension and ankle in neutral position.
- B. *Exercises:* Passive exercise of all affected joints was demonstrated to the parents of each case. They were advised to perform full range of movement at each affected joint, 10 times each and 5 to 6 times a day. Stretching exercise and PNF were also advised in appropriate situation. Sitting balance with or without support followed by standing balance and gait training recommended gradually.
- C. *Orthotic management:* Like AFO (ankle foot orthosis), WHO (wrist hand orthosis) was advised in selected cases.

- D. *Training of ADL activities:* Each child was given training of activities of daily life so that they can develop self confidence and independence in their day to day life. They were also advised speech therapy and counselling by psychotherapist for their abnormal behaviour as needed.
- E. *Nutritional Supplement:* Nutritional supplemention the diet like plenty of milk and its products, sunlight exposure every day for half an hour in the morning, fruits, calcium, iron, vitamin B complex and vitamin D etc.

After initial visit all the patients were followed up at 2 weeks, 6 weeks and detail follow - up results were recorded at 3 months.

Functional assessment:

For assessment of activities of daily living (ADL), we used the Wee FIM (functional independence measures) instrument. (Annexure 1).

Because total normal Wee FIM score varies with age up to the age of seven years, we calculated the percentage of total Wee FIM score of a patient with respect to normal total Wee FIM score of the particular age group of that patient for easy comparison.Functional disability had been described in the study in five grades including:

Disability grade	% of Wee FIM score
Normal or no disability	100%
Mild	90-99%
Moderate	60-89%
Severe	30-59%
Very severe/profound	<30%

Results :

At the end of the study period a thorough statistical analysis by McNamara's Chi-square test was done. In this study population boys were dominating with a male: female ratio of 62:46. Most of the studied patients belonged to rural areas (rural: urban = 8:1). In this whole study group the children from lower socio economic strata of society clearly outnumbered the patient from higher socioeconomic group with a ratio of 8:1. Interestingly it was noted that 27 out of 108 patients were affected by tuberculous infection (61 viral and 20 bacterial infections documented).

Clinical status at the end of 6 weeks:

Clinical status	Ν	o of cases
Loss of speech	_	5
Hemiparesis	_	9
Quadriparesis	_	5
Inability to stand	_	6
History of seizures	_	8
Spasticity	_	18
Rigidity	_	3
Bladder involvement	_	9
Abnormal behaviour	_	14

Table 1: Assessment of Tuberculous MeningitisPatients (n=27)

Parameters: Functional ability (Wee FIM scale)	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	1	5
Mild	2	5	7
Moderate	7	8	6
Severe	8	6	5
Very severe /profound	10	7	4

 Table 2: Assessment of Viral Meningitis Patients

 (n=61)

Parameters: Functional ability (Wee FIM scale)	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	19	52
Mild	6	21	5
Moderate	11	10	2
Severe	19	7	1
Very severe /profound	25	4	1

Table 3: Assessment of Bacterial Meningitis Patients (n=20)

Parameters: Functional ability (Wee FIM scale)	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	2	10
Mild	2	5	5
Moderate	5	7	2
Severe	7	4	2
Very severe /profound	6	2	1

Parameters: Functional ability (Wee FIM scale)	Tuberculous meningitis, n -27 (% of patients)	Viral meningities, n=61 (% of patients)	Bacterial meningitis, n=20 (% of patients)	P value
A. Normal	5 (18%)	52 (85%)	10 (50%)	<.05
B. Disabled	22 (82%)	9 (15%)	10 (50%)	<.05
Mild	7(26%)	5 (8.2%)	5(25%)	—
Moderate	6(22%)	2(3.3%)	2(20%)	
Severe	5(19%)	1(1.6%)	2(20%)	—
Very severe/profound	4(15%)	1 (1.6%)	1 (5%)	

Table 4: Comparison of Functional Outcome of Three Groups of Meningoencephalitis Patients at the end of Study

Annexure 1:

Wee FIM levels:

	Score	
No helper:	7.	Complete independence (timely safely)
	6.	Modified independence (device)
Helper- modified dependence:	5.	Supervision (subject =100%)
	4.	Minimal assistance (subject = 75% or more)
	3.	Moderate assistance (subject = 50% or more)
Helper complete dependence:	2.	Maximal assistance (subject = 25 % or more)
	1.	Total assistance or not testable (subject < 25 %)

Disability status was variable according to the aetiology of disease.Prognosis was much better in patients with viral infection. It was not so good in patients with bacterial and tuberculour aetiology.

DISCUSSION

Although 130 patients were recruited initially 108 (61 viral, 27 tuberculous, 20 bacterial etiology) completed this prospective study. Unfortunately we lost 8 patients (6 tuberculous and 2 bacterial cases died during the study period) and 14 cases (5 bacterial, 8 viral, 1 tuberculous) dropped out from the study.

The children with male preponderance (male to female ratio was 31:23) mainly from lower socioeconomic group of rural population (ratio of lower: higher income group and rural: urban population were 8:1) were the main victims of this dreadful condition. This observation is corroborative with the other Indian studies of Chinchankar *et al* from Pune, India was reported that out of 31 children of ABM, 55 per cent had long term sequel with significant neurodevelopment handicaps ranging from isolated hearing loss to severe mental retardation with multiple disabilities.⁸

Grimwood *et al* reported that children after ABM suffer from persistent disturbances in learning and memory, behavioural problems and poor academic performance. They also discovered that neuropsychological deficits were frequently aggravated by hearing impairment.¹² in a study by Madagame *et al*,¹⁷ functional outcome of 22 paediatric patients with severe ABM requiring mechanical ventilation was assessed in areas of locomotion, self-care, and communication. Sixty-eight per cent of children showed functional disabilities at the time of discharge and 41 per cent continued to suffer from functional disabilities in different areas of function during followup.¹⁷ In our study also significant number of patients suffered from loss of speech, hemiparesis, quadriparesis etc.

Paganini *et al*¹⁸ in a study of 40 cases of TBM reported that 45 per cent of children had completely recovered but mild, moderate and severe neurological sequel were noticed in 18 per cent, 8 per cent and 22 per cent of patients respectively, along with three fatal cases (7 per cent).¹⁸ Schoeman *et al* determined the long-term outcome of TBM in 76 children, who were diagnosed with the disease and treated with ant tuberculosis drugs.¹⁹ Only 20 per cent of children were found to be completely functionally normal during follow-up. Main areas of functional deficits were cognitive impairment (80 per cent), poor scholastic progress (43 per cent), emotional disturbance (40 per cent) and motor impairment (25 per cent). One child was blind but no child reported sensorineural deafness. In the present study group lots of children suffered from behavioural abnormality and loco motor disability.

Numerical comparison of their functional abilities by percentage of total Wee FIM score clearly demonstrate that disabilities were maximum with TBM cases, followed by ABM and minimum in viral meningitisduring and at the end of the study. An interesting observation is that all three groups recovered at the most during the first two weeks of rehabilitation process, after which the rate of recovery slowed down. The best results were noticed in patients with viral meningitis because 85 per cent of these cases displayed normal functional abilities at six weeks in contrast with 82 per cent of tubercular cases showed residual disabilities at six weeks. Almost half of the patients with bacterial infections landed up with residual disabilities at the end of study.

CONCLUSION:

Disability in tuberculous meningoencephalitis which is predominant in developing country is much higher even after proper rehabilitation programmes. Although viral meningoencephalitis is most common, children became mostly independent with appropriate pharmacological and non-pharmacological measures.

References:

- Attia J, Hatala R, Cook DJ, Wong JG. The rational clinical examination. Does this adult patient have acute meningitis? *JAMA 1999*; 282: 175-81.
- Ginsberg L. Difficult and recurrent meningitis. J Neurol Neurosurg Psychiatry 2004; 75 (Suppl 1): i 16-21.
- 3. Thwaites G, Chau TT, Mai NT, et al. Tuberculous meningitis. *J Neurol Neurosurg Psychiatry 2000*; **68**: 289-99.

- Mani R, Pradhan S, Nagarathna S, *et al.* Bacteriological profile of community acquired acute bacterial meningitis: a ten-year retrospective study in a tertiary neurocare center in South India. *Indian J Med Microbiol 2007*; 25: 108-14.
- Schiech WF. Bacterial meningitis in the United States. JAMA 1985; 253: 1749-54.
- Kabra SK, Praveen Kumar, Verma IC, et al. Bacterial meningitis in India: an IJP survey. *Indian J Pediatr 1991*; 58: 505-11.
- Sahai S, Mahadevan S, Srinivasan S, Kanungo R. Childhood bacterial meningitis in Pondicherry, South India. *Indian J Pediatr 2001*; 68: 839-41.
- Chinchankar N, Mane M, Bhave S, *et al.* Diagnosis and outcome of acute bacterial meningitis in early childhood. *Indian Pediatr* 2002; **39**: 914-21.
- 9. Saez-Liorens X, McCracken GH. Bacterial meningitis in children. *Lancet 2003*; **361**: 2139-48.
- Richardson MP, Reid A, Tarlow MJ, Rudd PT. Hearing loss during bacterial meningitis. Arch Dis Child 1997; 76: 134-8.
- Schmidt H, Heimann B, Djukic M, *et al.* Neuropsychological sequelae of bacterial and viral meningitis. *Brain 2006*; **129**: 333-45.
- Agarwal AK. Post viral encephalitis sequel and their rehabilitation. *Indian J Physi Med Rehabil 2006*; 17: 39-40.
- Baruah HC, Biswas D, Patgiri D, Mahanta J. Clinical outcome and neurological sequelae in serologically confirmed cases of JE in Assam, India. *Indian Pediatr* 2002; 39: 1143-8.
- Bergstrom T, Vahlne A, Alestig K *et al.* Primary and recurrent herpes simplex virus type 2- induced meningitis. *J Infect Dis* 1990; 162: 322-30.
- Bedford H, de Louvais J, Halket S, *et al*. Meningitis ininfancy inEngland and Wales: follow up at age 5 years. *BMJ 2001*; 323: 1-5.
- Grimwood K, Anderson P, Anderson V, *et al*. Twelve year outcome following bacterial meningitis: further evidence for persisting effects. *Arch Dis Child 2000*; 83: 111-6.
- Madagame ET, Havens PL, Bresnahan JM, *et al*. Survival and functional outcome of children requiring mechanical ventilation during therapy for acute bacterial meningitis. *Crit Care Med* 1995; 23: 1279-83.
- Paganini H, Gonzalez F, Santander C, *et al*. Tuberculous meningitis in children: clinical features and outcome in 40 cases. *Scand J Infect Dis 2000*; **32:** 41-5.
- Schoeman J, Wait J, Burger M, *et al.* Long-term follow up of childhood tuberculosis meningitis. *Dev Med & Child Neurol*. 2002, 44: 522-6.

Original Article

Study of Factors Affecting Progress of Locomotor Disability in a Slum in Mumbai

Manasi S Padhyegurjar¹, Shekhar B Padhyegurjar²

Abstract

Locomotor disability is one of the most commonly prevailing type of disability in India. This study was conducted with the aim of assessing the severity and to study the factors affecting progress of locomotor disability.

A community based cross-sectional observation study was conducted in an urban slum of Mumbai. Total sample of 3665 individuals were screened; 205 were identified with locomotor disabilities who were subjected to a structured questionnaire and physical examination.

The prevalence of locomotor disabilities is found to be 5.59 %. Females are affected more than the males and unemployment was observed to be very high. Awareness about rehabilitative services was found to be very low and very few individuals had ever taken any treatment. Majority of the individuals detected with locomotor disability were ambulatory, showed good IADL score and muscle power as well as single joint involvement. Advancing age and longer duration of disability have been associated with low scores of IADL, low muscular power, multiple joint involvement and increased duration of disability. Treatment started at young age, on immediate diagnosis will halt the progress of the disease. Availability and awareness of rehabilitation facilities will go a long way in improving the quality of life of individuals with locomotor disabilities.

Key words : Locomotor disability, IADL score, muscle power, number of joints, duration of disability.

Introduction:

Musculoskeletal conditions are frequently cited as among the most common and disabling of the chronic diseases. Unlike other medical conditions, such

Author's affiliations:

² MD (PSM), Professor, Department of Community Medicine

Karpaga Vinayaga Institute of Medical Sciences (KIMS), Chinna Kolambakkam, Palayanoor (P.O.), Madhuranthagam Taluk, Kancheepuram District, PIN : 603308.

Cite as :

Padhyegurjar Manashi S, Padhyegurjar Shekhar B. Study of Factors Affecting Progress of Locomotor Disability in a Slum in Mumbai. IJPMR Jun 2012; 23(2): 62-7.

Correspondence :

Dr Manasi Shekhar Padhyegurjar c/o Dr B. K. Padhyegurjar, 9, Narmada Niwas, TopiwalaWadi, Station Road, Goregaon (West), Mumbai 400 062. Phone: 08015129473, 08122695816 E-mail address: manasipg@gmail.com

Received on 24/02/2012, Revised on 30/04/2012 Accepted on 16/05/2012 as cardiovascular disease and cancer, musculoskeletal conditions are rarely the cause of death. Instead, musculoskeletal diseases are noted for causing deterioration in the quality of life. These conditions affect the quality of life through increased disability, limited activity, physical pain, and impairment. These disorders also result in serious economic consequences for society.¹ Census 2001 has revealed that over 21 million people in India are suffering from one or the other kind of disability. This is equivalent to 2.1% of the population. Among the five types of disabilities 27.9% were observed having disability in movement.² The NASSO study³ showed that, among the different types of disabilities, the prevalence of locomotor disability was highest in the country-it was 1046 in the rural and 901 in the urban per 100000 persons. Current demographic trends show that the number of older people is rapidly increasing. Accordingly, the prevalence of disability in basic, self-care activities of daily living is also rising, posing a great challenge to the health care and social systems that are already experiencing financial constraints.^{4,5} In this scenario we need to absorb people with disability in the mainstream socially as well

¹ MD (PSM), Associate Professor, Department of Community Medicine

as financially. To make the disabled people self sufficient and improve their quality of life, we need to understand factors which affect the progress of their disease. With this aim in mind, this study was conducted among people detected with locomotor disability, to assess the severity of their disability and to study the factors affecting progress of disability in them in a slum area of Mumbai.

Materials and Methods:

The study was carried out in an urban slum which is the field practice area of a teaching hospital in Mumbai. The study is cross-sectional and observation based. A pilot study was conducted which showed a prevalence of 10% of locomotor disability among the screened population. Based on this minimum sample of 3600 was estimated. A household was taken as a single unit by stratified systematic random sampling in two demarcated areas of the slum. All members of the household were included in the study. A sample of 3665 individuals was taken. The interns posted in the department of community medicine were involved in data collection. They were trained in identification of disabled individuals as per the NSSO criteria³, administration of the questionnaire, measurement of IADL score and gradation of muscle power by the authors. The medical social workers and Health Assistants guided the interns in the community.

Criteria used in 58th Round National Sample Survey Organisation (NSSO) was used to identify individuals with locomotor disability. Persons having locomotor disability included in the study were those with (a) loss or absence or inactivity of whole or part of hand or leg or both due to amputation, paralysis, deformity or dysfunction of joints which affected his/her "normal ability to move self or objects" and (b) those with physical deformities in the body (other than limbs), such as, hunch back, deformed spine, etc. Dwarfs and persons with stiff neck of permanent nature who generally did not have difficulty in the normal movement of body and limbs was also treated as disabled.³

Those identified with locomotor disability, were subjected to the questionnaire and Index of Activity of Daily Living score (IADL) to assess the ability to perform day to day activities. The IADL is a scale whose grades reflect profiles of behavioural levels of six sociobiological functions, namely, bathing, dressing, toileting, transfer, continence, and feeding. The IADL score is as follows ⁶:

Activity

А	totally independent	6
В	totally independent except for one	5
С	dependent in bathing + another	4
D	dependent in bathing + dressing up + another	3
E	dependent in bathing + dressing up + toileting + another	2
F	dependent in bathing + dressing up + toileting + transferring + another	1
G	totally dependent	0
Η	dependent in at least two activities, but not classified as C, D, E or F	4

Its hierarchical nature makes it possible to rank the overall functional status of people in an ordered manner. The index has been used to produce predictive information about chronic conditions and to evaluate the benefits of long-term services. It has been used in profiled measures of severity of illness.⁷

Muscle power was graded by applying external resistance to movements of various parts of the body. For upper limb arm, forearm and hand were considered and for lower limb thigh, leg and foot of both sides were considered. Scale used for measuring muscle power 0 to 5^{18}

Grades Muscular Activity (Range)

0 100 contraction
110 contraction

- 1 Flicker on contraction (very weak contraction)
- 2 Contraction when gravity is eliminated
- 3 Visible contraction against gravity but absent after applying resistance
- 4 Visible contraction against gravity and added resistance
- 5 Visible contraction against gravity and maximum resistance

Total maximum score is $12 \times 5 = 60$. Cumulative muscle power ie, percentage of total maximum score was also calculated.

The data collection was done over a period of 3 months. The data was analysed using SPSS software (version 17). 95% confidence limits for prevalence was calculated to estimate the prevalence in the general population,

Score

Chi-square test was applied to identify the association between two variables. Age, duration of disability and sex were predictor variables and IADL score, cumulative muscle power were response variables.

Table 1: Distribution of Individuals Affected with Locomotor Disability (n=205)

Variables	No. of Cases (%)
Age (years)	
<45 years	134 (65.4)
>45 years	71 (34.6)
Sex	
Males	59 (28.8)
Females	146 (71.2)
Employment status	
Unemployed	154 (75.1)
Employed/Self employed	51 (24.9)
Per capita income (Rs)	
<500	128 (62.5)
>500	77 (37.5)
Duration of disability	
<1 year	55 (26.8)
1-5 Years	97 (47.3)
>5 years	53 (25.9)
Ambulatory status	
Walk without support	197 (96.1)
Walk with support	7 (3.4)
Bedridden	1 (0.5)
IADL score	
А	192 (93.7)
В	10 (4.8)
C	2 (1)
D	(
E	(
F	(
G	1 (0.5)
П Marcele merror (9/)	(
Muscle power (%)	64 (31.2)
96.00	70(34.1)
81-95	34 (16.6)
< = 80	37 (18.1)
No. of joints involved	57 (10.1)
No. of joints involved Nil	2 (1
1	118 (57 5)
>1	85(41.5)
Awareness of rehabilitation services in vic	inity
Yes	42 (20.5)
No	163 (79.5)
Treatment taken for present condition	
Yes	73 (35.6)
No	132 (64.4
	· · ·

Results:

Total sample of 3665 individuals were screened for locomotor disabilities. Among 3665 individuals 205 were identified with locomotor disabilities. Thus, the prevalence of locomotor disabilities is 5.59% (95% C.L. 4.85% to 6.33%). The study was further carried out on these 205 disabled individuals. Mean age of the affected sample was 38.89 years with standard deviation 15.1 years. Out of the total sample, 49.3% were illiterate and 69.3% were married.

As observed in Table 1, 65.4% of affected individuals were less than 45 years of age; 71.2% of the total sample were females, 75.1% were unemployed with 62.5% having families with per capita income less than Rs 500. Majority of the sample (74.1%) had duration of disability of less than 5 years. Only 25.9% were suffering from disability for more than 5 years; 96.1% of the individuals with disability could walk without support, 93.7% of affected individuals had IADL score A which indicates that they are totally independent; 81.9% had more than 80% muscle power retained in extremities; 31.2% had normal muscle power in all limbs; 57.5% affected individuals had single joint involvement. 79.5% of the sample were not aware of any rehabilitative services in the area of their residence. Only 35.6% of their population had ever received treatment for their locomotor disability.

Table 2 shows association of various factors affecting progress of locomotor disability. It is observed that disabled individuals more than 45 years of age and those having disability for more than 5 years, had significantly low score of IADL (p<0.005 and p<0.001 respectively). This indicates that advancing age and longer duration of disability are associated with low IADL scores indicating poor daily activities in disabled persons. Advancing age as well as longer duration of disability is observed to be significantly associated with (p<0.001 for both) low muscular power.More number of disabled persons in higher age group was observed to have involvement of multiple joints (p<0.001). More number of females was seen to have multiple joint involvements than males (p < 0.05). Individuals with age more than 45 years showed more than 5 years of duration of disability. This association was statistically significant (p<0.01).

Discussion:

The prevalence of locomotor disabilities in the current study is 5.59%. Census of India 2001, estimated 28% of

Variables		1	No. of cases (%)		
IADL score	Α	B-G		Total	Test of significance
Age (years)					
<45	117 (98.3)	2 (1.7)		119 (100)	X ² =8.61
>=45	75 (87.2)	11 (12.8)		86 (100)	DF=1 P<0.005
Duration of disability					
<=5 years	148 (97.4)	4 (2.6)		152 (100)	$X^2 = 11.06$
>5 years	44 (83)	9 (17)		53 (100)	DF=1 P<0.001
Muscle power	<= 80	81-95	>95	Total	Test of significance
Age (years)					
<45	7 (5.2)	14 (10.5)	113 (84.3)	134 (100)	$X^2 = 65.32$
>=45	30 (42.3)	20 (28.2)	21 (29.5)	71 (100)	DF=2 P<0.001
Duration of disability					
<=5 years	17 (11.2)	26 (17.1)	109 (71.7)	152 (100)	$X^2 = 19.05$
>5 years	20 (37.7)	8 (15.1)	25 (47.2)	53 (100)	DF=2 P<0.001
No of joints involved	<=2	>2		Total	Test of significance
Age (years)					
<45	101 (84.9)	18 (15.1)		119 (100)	$X^2 = 12$
>=45	55 (64)	31 (36)		86 (100)	DF=1 P<0.001
Sex					
Male	51 (86.4)	8 (13.6)		59 (100)	$X^2 = 4.87$
Female	105 (71.9)	41 (28.1)		146 (100)	DF=1 P<0.05
Duration of disability	<1 yr	1-5 years	>5 years	Total	Test of significance
Age (years)					
<45	34 (28.6)	64 (53.8)	21 (17.6)	119 (100)	$X^2 = 10.21$
>=45	21 (24.4)	33 (38.4)	32 (37.2)	86 (100)	DF=2 P<0.01

Table 2: Association	of various	factors	affecting	progress of	of	locomotor	disabil	itv
				p. 0 . 000 .				

total disabled population with movement disabled where as NSS (National Sample Survey, 58th round, 2002) estimates them at 51%.⁵ Study conducted by Borker S. etal⁹ in rural Goa found a prevalence of 0.9%. Out of the total sample, 49.3% were illiterate and 69.3% were married; 65.4% of the study population were less than 45 years of age. Similar findings were observed in some other research studies.^{10,11} Most (71.2%) of individuals with locomotor disability were females. Similar findings have been observed in Census 2001, where Tamil Nadu was observed to have a higher number of disabled females than males.² However study conducted by Patel observed that males were more susceptible for developing disability than females.¹¹

The present study shows very high rate of unemployment (75.1%) as well as most of the families having per capita income less than Rs 500 (62.5%). Based on National Sample Survey data, Mitra and Sambamoorthi¹² showed that the employment rate of persons with disabilities is only 60% that of the all India working age population.¹² Murt, *et al*¹ conducted a study on disability, utilisation,

and costs associated with musculoskeletal conditions in United States, in which it was observed that, musculoskeletal problems accounted for a total of \$3.9 billion in lost productivity costs during 1980 for employed persons in the work force and for homemakers and thus posed significant economic burden.

About 3/4 the ie 74.1% of population were suffering from disability for less than 5 years. This indicates that most of the cases were of recent origin. There are chances that such cases will be more receptive to rehabilitative services and thus progress of the disability can be halted in them by timely interventions.

Another positive observation in the current study is that majority of the population is ambulatory and showed good level of IADL score. Similar findings were observed in multiple other studies. In NSS round 58, it was observed that, about 60 per cent of the disabled were able to take self-care without any aid or appliances.³ The WHO-ILAR Community Oriented Program for Control of Rheumatic Diseases (COPCORD) states that although rheumatic-musculoskeletal symptoms/disorders is a predominant ailment, it has a modest effect on daily living in most subjects suffering from it.¹³ Milla'n-Calenti *et al*⁶. conducted a study using the IADL score. It was observed that, in relation to the categorization of subjects according to the ADLscore 34.6% of the total subjects studied presented some kind of dependence on the ADL scale; within them, 1.7% presented dependence for all ADL and 21.9% for at least one (category B).⁶

A sizeable section of the individuals with ie 31.2% locomotor disability had normal muscle power and 81.9% had power more than 80; 57.5% showed single joint involvement and 41.5% had more than 1 joint affected. Peat *et al*¹⁴. observed that, a total of 1226 (50%) had more than one joint involved. The current study show that only 20.5% of the affected individuals were aware of rehabilitative services in the nearby area and only 35.6% individuals had received any treatment for their disability. Swaddiwudhipong *et al*¹⁵. observed that there are many persons with untreated disabling conditions in rural communities, and that a significant number of them can benefit from medical treatment and rehabilitation. Chopra *et al*¹³. observed that, 21% of patients had never visited a doctor and were only identified by the COPCORD study. In the report on disability, Walia⁵ mentions that although the overall burden of diseases was 20.9% in India the proportion of health expenditure was less 1%. Thus, there is a need of systematic and organised community based rehabilitation facilities to identify and take care of persons with disability wherein they can be managed and treated.⁵

As observed in Table 2, individuals above 45 years of age had significantly low IADL scores.In a systematic review conducted by Rodrigues *et al* ¹⁶. it was observed that increasing age was the most frequent risk factor for functional disability. The Rotterdam Study ¹⁷, stated that disability in the activities of daily living is a major problem in people aged 55 years and over. Milla' n-Calenti *et al*⁶. observed that there is a negative correlation between age and the score obtained with the IADL scale (r = -0.527; p <0.001) which is indicative of the association between age and the low IADL scores which would imply the tendency towards dependence; i.e., the older, the more dependent in IADL.

Advancing age has also found to be associated with low muscle power in the current study. Similary Runge *et al*⁴ observed that all parameters of muscle performance were negatively correlated with age.

Puthoff and Nielsen ¹⁸ stated that all measures of strength and power were indirectly related to the LLFD I disability component and suggested that older adults should focus on increasing and maintaining lower extremity strength and power across a range of intensities in order to decrease functional limitations and disability. Age more than 45 years was also found to be associated with multiple joint involvement and longer duration of disability. Similarly, in the Rotterdam study¹⁷ it was observed that, the prevalence of locomotor disability increased linearly with the number of joint sites that were painful.¹⁷

The current study states that as duration of disability increases IADL score as well as the muscle power significantly decrease. Conversely individuals with recently diagnosed disability showed significantly higher IADL scores as well as muscle power. Thus management of disability as soon as diagnosed will reflect positively on the progress of the disease. Similarly Ormel *et al*¹⁹. concluded that to improve quality of life in elderly adults, treatment should target disability when it is new.

Females have found to be significantly associated with multiple joints involvement in the current study. Similarly, the study conducted by Peat G *et al*¹⁴. it was observed that, multiple joint pain and pain across more than one region were more common in women than in men.

Conclusion:

The study shows that locomotor disability in the community is not of severe nature as majority of the individuals detected with locomotor disability were ambulatory, showed good IADL score and muscle power as well as single joint involvement. Advancing age and longer duration of disability have been associated with low scores of IADL, low muscular power, multiple joint involvement and increased duration of disability. Thus advancing age and longer duration of disability will make rehabilitation difficult. However, the positive finding is that majority of affected individuals in the study are less than 45 years of age and with disability of less than 5 years. Thus if rehabilitative services are targeted to these groups, their deterioration can be effectively prevented by early diagnosis and prompt treatment. Females were found to be affected more than males. They should be specially targeted through existing programmes for women. Lastly, rehabilitative services need to be developed at grassroot level and awareness needs to be created regarding their availability. This will increase the number of people seeking treatment, limit the disability, and will eventually improve the employment rate and financial status of people with locomotor disability. Thus timely diagnosis and effective rehabilitation services will go a long way to restrict the deterioration of individuals with locomotor disability.

References:

- MurtHA, Parsons PE, Harlan WR, et al. Disability, utilization, and costs associated with musculoskeletal conditions, United States, 1980. National Medical Care Utilization and Expenditure Survey. Series C. Analytical Report No. 5. Washington: DHHS Pub. No. 86-20405. National Center for Health Statistics, Public Health Service. Washington. U.S. Government Printing Office, Sept. 1986.[cited 2011March 7]. Available from: URL: http:// www.cdc.gov/nchs/data/natmedcare/nmc_c_05acc.pdf
- Government of India. Census and You Disabled Population [cited 2011 Feb10]. Available from: URL: http://censusindia.gov.in/Census_And_You/ disabled_population.aspx -
- Government of India. Disabled Persons in India, 58th Round National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Report No.485 (58/26/1), 2003.[cited 2011 Jan 7]. Available from: URL: http:// mospi.nic.in/rept%20_%20pubn/485_final.pdf
- Runge M, Rittweger J,Russo CR et al. Is muscle power output a key factor in the age-related decline in physical performance? A comparison of muscle cross section, chair-rising test and jumping power. *Clin Physiol Funct Imaging* 2004; 24: 335-340
- Walia GK .Disability. South Asia Network for Chronic Disease [online] [cited 2011 June 7]. Available from: URL: http:// sancd.org/uploads/pdf/disability.pdf
- Milla'n-Calenti JC, Tubý'o J, Pita-Ferna'ndez S et al. Prevalence of functional disability in activities of daily living (ADL), instrumental activities of daily living (IADL) and associated factors, as predictors of morbidity and mortality. *Archi Gerontol Geriatr* 2010; 50: 306-10.
- Katz S, Akpom CA. A measure of primary sociobiological functions. *Int J Health Serv* 1976; 6: 493-508.
- McAuley J, Swash M. Nervous System. In: Swash M, Glynn M, eds. Hutchison's Clinical Methods. An Integrated Approach to Clinical Practice.International Edition: Saunders Elsevier, 2007: 208

- Borker S, Motghare DD, Venugopalan PP, et al. Study of prevalence and types of disabilities at rural health centre mandur – a community based cross sectional house to house study in Rural oa. JPMR 2008;19:56-60.
- Fernandes A. Problems of women with locomotor disabilities, CIF International Conference, Goa 2003. [online] [Cited 2011 September 21]. Available from: URL: http:// www.karmayog.org/LIBRARY/libartdis.asp?r=152&libid=192
- Patel SK. An Empirical Study of Causes of Disability in India. The Internet Journal of Epidemiology, 2009; 6 (2) [online] [Cited 2011 August 21]. Available from: URL: http:// www.ispub.com/journal/the-internet-journal-of-epidemiology/ volume-6-number-2/an-empirical-study-of-causes-ofdisability-in-india.html
- Mitra S, Sambamoorthi U. Disability and the Rural Labor Market in India: Evidence for Males in Tamil Nadu, 2006 [Cited 2011 November 1]. Available from: URL: http://web.up.ac.za/ UserFiles/MitraxSambamoorthi_Village_TN_July06.pdf
- 13. Chopra A, Saluja M, Patil J et al. Pain and disability, perceptions and beliefs of a rural Indian population: A WHO-ILAR COPCORD study. WHO-International League of Associations for Rheumatology. Community Oriented Program for Control of Rheumatic Diseases. J Rheumatol 2002; 29: 614-21.
- Peat G, Thomas E, Wilkie R et al. Multiple joint pain and lower extremity disability in middle and old age.*Disability Rehabil* 2006; 28: 1543-9.
- Swaddiwudhipong W, Amaritchavarn V, Boonyabuncha S. Prevalence of disabling conditions in a rural northern Thai community: a survey conducted by village health communicators. *Southeast Asian J Trop Med Public Health*. 1994; 25: 45-9.
- Rodrigues MAP, Facchini LA, Thumé E et al. Gender and incidence of functional disabilityin the elderly: a systematic review. *Cad. SaúdePública, Rio de Janeiro* 2009; 25: 464-76.
- Odding E, Valkenburg HA, Algra D et al. Association of locomotor complaints and disability in the Rotterdam study. *Ann Rheum Dis.* 1995; 54: 721-5.
- Puthoff ML, Nielsen DH. Relationships among impairments in lower-extremity strength and power, functional limitations, and disability in older adults. *Phys Ther* 2007; 87: 1334-47.
- Ormel J,Rijsdijk FV,Sullivan M et al. Temporal and reciprocal relationship betweenIADL/ADL disability and depressive smptoms in late life. *Gerontology: Psycholo sci* 2002; 57B: 338-47.

Original Article

Our Experience with Correction of Angular Deformities of Knee by Flexible Figure of 8-plate Hemiepiphysiodesis

Sakti Prasad Das¹, S Pradhan², PK Sahoo³, RN Mohanty⁴, SK Das⁵

Abstract

Background: Genu valgum and genu varum deformity in the lower limb in children results in cosmetic problem, gait disturbance, pain and early joint degeneration. Most of them are physiological and improve to the normal adult femorotibial angle before the age of eight years. Persistent deformities are corrected by osteotomy and internal fixation or gradual correction by external fixation. Osteotomy has got its complications. Gradual correction also can be achieved by stapling, percutaneous drill technique and transphysial screw. Stapling has drawbacks related to implant failure including migration and breakage of implants. Drilling and screwing carries risk of permanent growth arrest. The timing of epiphysiodesis has to be perfect otherwise there may be under correction or overcorrection. 8-plate temporary hemi-epiphysiodesis is a new concept and producing good results with less complication. The objective of this study is to reduplicate the results of 8-plate hemiephiphysiodesis on angular deformities of knee joint.

Methods: We attempted gradual correction through 8-plate in 31 patients with 54 angular deformities around knee. Cases were followed for 38months (range, 24 to 52months) after removal of implants. Measurements were compared pre and postoperatively.

Results: There was statistically significant improvement in all the outcome measures measured. There was gross reduction of intermalleolar distance and reduction in angular deformity.

Conclusions: 8-plate hemiepiphysiodesis is an effective means for correcting angular deformity around the knee in skeletally immatured patients.

Key words : Hemiepiphysiodesis, angular deformity, 8-plate.

Introduction:

ost children are bow legged at birth, become knock-kneed by age 2. This knock-knee alignment usually peaks by age 4, and then improves by age 9.

Author's affiliations:

- ¹ Assistant Professor
- ² Lecturer
- ³ Assistant Professor
- ⁴ Associate Professor
- ⁵ Ex-Director

Swami Vivekanand National Institute of Rehabilitation Training and Research, Olatpur, Bairoi, Cuttack, Orissa

Cite as :

Das Sakti Prasad, Pradhan S, Sahoo PK, Mohanty RN, Das SK. Our Experience with Correction of Angular Deformities of Knee by Flexible Figure of 8-Plate Hemiepiphysiodesis. IJPMR Jun 2012; Vol 23(2): 68-73.

Correspondence : Sakti Prasad Das, Asst. Professor, Svnirtar, Olatpur, Bairoi, Cuttack-754010, Orissa E-Mail: sakti2663@yahoo.com Tel: (O671) 2526220. (M) 9437016874

Received on 11/11/2011, Revised on 16/02/2012, Accepted on 28/03/2012

Most improve spontaneously to the normal adult femorotibial angle before the age of eight years.¹ In normal skeletal growth, limbs are equal in length and are properly aligned from the hips to the ankles. Sometimes, due to reason that may be idiopathic in origin or growth plate or bone forming disorders can cause long bones of the leg (e.g., tibia, femur) to grow out of alignment.Pain and limitation of activity may occur in a significant number of children who do not spontaneously grow out of "bowed legs" or "knock knees."Abnormal or injured physes, with or without pathologic loading, may result in a wide variety of problems that require orthopaedic reconstruction to correct angular problems and equalise limb lengths. For neglected cases, or upon reaching skeletal maturity, osteotomies may be required for correction.

However, in the skeletally immatured patient with angular deformity, reversible hemi-epiphysiodesis, or guided growth, may be used to correct the mechanical axis, limb length, and restore function. Correction using hemiepiphysiodesis is a much less invasive surgical method for correcting pathological angular deformities by restricting the growth on one side of the physis, while permitting continued growth on the opposite, noninstrumented side. The goal is to permit realignment through growth. Gradually, the bone realigns and the deformity is corrected. Since the bone is not cut (as with an osteotomy), there is no neurovascular risk, instability from the cut, or significant period of healing. Gradual correction by hemi-epiphyseal arrest is possible using techniques such as stapling,² percutaneous drill hemiepiphysiodesis³ or transphyseal screws.⁴But all these techniques carry a risk of permanent growth arrest if timing of surgery and available remaining growth is not calculated precisely.

8-plate hemi-epiphysodesis is a well accepted method of correction for many deformities in children due to its tension band technique and less complications in comparison to staples.⁵⁻⁸ The observed rate of correction was more rapid than stapling without any permanent growth arrest. This technique has rapidly gained popularity and studies, show encouraging results.⁵⁻⁸ The eight-plate gently guides growth while allowing natural, safe and gradual correction of limb alignment.

The purpose of this study is to discuss the role 8-plate hemi-epiphysiodesis to correct angular deformities of the knee joint and to compare our results with Wiemann *et al*,⁸ Ballal *et al*⁵ in a prospective trial.

Materials and Methods:

A decision to offer surgical correction was based on symptoms and absence of spontaneous improvement after observation for at least 12 months. All the children with sufficient bone age⁹ remaining were included in the study. Those children within six months of skeletal maturity (14 years of bone age for females and 16 years for males), were excluded from the study¹⁰.

Thirtyone children, 20 boys and 11 girls (mean age of 11.6, range 5.5 - 14.9) with 54 symptomatic genu varum and valgum were included in this prospective trial. Bilateral deformity was noted in 8 cases. There were 14 valgus, 36 varus and 4 wind-swept deformity knees. Average follow-up was 38 months. Average operation time and hospital stay were similar for all subjects with an average correction time of 11 months. All the patients were reviewed as outpatients at 4 months interval till correction was complete (Fig. 1-8).

Informed consent was obtained from the primary caregiver of children and the procedure was approved by institutional ethical committee. **Outcome Measures:** Full limb radiographs were obtained using a dedicated 51 by 14 inch graduated grid cassette, which included the full limb of tall subjects. The subject stood without footwear, with tibial tubercles facing forward with the x-ray beam centred at the knee at a distance of 8 ft. A setting of 100–300 mA-s and a kilo voltage of 80–90 were used depending on limb size and tissue characteristics.

The AP, weight-bearing, short knee x-ray was obtained with the patient standing with the back of their knees in contact with the vertical cassette, and the central beam centred 2.5 cm below the apex of the patella with a film to focus distance of 100 cm. Both knees were radiographed together. All radiographs were obtained with the same technique for each subject.

Tibio-femoral angle: Full-limb radiographs were obtained. Both knees were radiographed together. Angles were measured using a standard plastic 30 cm goniometer, and recorded in degrees. Angles greater than 180° represent a valgus alignment, and angles lesser than 180° a varus alignment.

Anatomical alignment is measured from the AP knee radiographs. A dot is placed at the midpoint of the tibial spines. The femoral anatomical axis is then found by drawing a line from the midpoint of the tibial spines to a point 10 cm above the tibial spines, midway between the medial and lateral femoral cortical bone surfaces. The tibial anatomical axis is found by drawing a line from the midpoint of the tibial spines to a point 10 cm below the tibial spines, midway between the medial and lateral cortical bone surfaces.

The angle of the intersection of the axes is then measured by goniometer.

Mechanical Axis: Stevens pm et al. believed that the knee can be divided into four radiographic quadrants, designating varus as negative and valgus as positive. Plus or minus zone I, the central quadrants, represent physiologic deformities. Plus or minus zone II often correlates with symptomatic deformities that may warrant surgical intervention. Plus or minus zone III is outside the confines of the knee and usually warrant surgical intervention. The mechanical axis measured on a full-length film can be readily correlated to any of these zones. The mechanical axis was deûned as a line drawn between the centre of the femoral head and the centre of the tibial plafond. Zones of the mechanical axis have previously been described, and identiûcation of these

zones has been reported to be reproducible with negligible interobserver error.¹¹ 'We considered the mechanical axis of the limb to be abnormal if it crossed the knee joint outside the centre of knee,¹² This outcome measure was not statistically computed but to ascertain the success of the surgery after follow-up.

Intermalleolar and intercondylar distance: The intermalleolar and condylar distance was measured using a measuring tape and calculated as the distance between the 2 malleoli with the medial condyles touching or both the malleoli touching for intercondylar distance.

For the 4 patients with wind swept deformity only tibio femoral angle was measured.

All the measurements were made twice: once before surgery and at the time of final follow-up.

Procedure: The level of the physis on the relevant side and segment (distal femur or proximal tibia) was identified using fluoroscopy. The centre of the physis was estimated by palpating the anterior and posterior margins of the femur or tibia and placing a 2 cm skin incision over this position. The fascia lata was divided longitudinally. The periosteal surface was exposed by blunt dissection, taking care not to injure this layer and the perichondrial ring. The plate was placed over the physis and provisionally secured with a hypodermic needle through a small central hole in the plate. Satisfactory positioning was confirmed by fluoroscopy. Threaded guide wires were then driven through the centres of the two main holes of the plate, aiming to keep the direction of these wires parallel to the physis. The cortex was broached using a cannulated drill and a self-tapping 4.5 mm titanium screw was passed over the guide wire. These wires were extracted before each screw was finally secured on to the plate and its position checked. A compression bandage was applied after wound closure.

Patients were discharged after three days of surgery. They were also safely mobilised partially weight-bearing on crutches. The compression bandage was reduced after three or four days and knee motion encouraged. Full weight-bearing was usually achieved in the second week. Patients were monitored clinically and radiologically at three monthly intervals. When clinical correction of the deformity was deemed satisfactory, a standing scanogram was obtained to confirm the clinical impression. The desired correction was restoration of the mechanical axis to within the inner two zones of a six-zone division of an anteroposterior radiograph of the knee; when this occurs, there is improvement¹³ in the position of the ground reaction forces. Plate removal was undertaken as day surgery and the patients followed up until skeletal maturity to check for rebound deformity, limb-length discrepancy or premature physeal closure.

Data collection and analysis: All data were collected and statistically analysed by paired t test. Pairwise all comparisons were set at 95% confidence interval.

Results:

The pre-operative deformity ranged from 53° of genu varum to 17° of genu valgum. The mean deformity for genu varum was 32° (11° to 53°) and 14° (11° to 23°) for genu valgum. Post operatively all patients showed improvement in parameters measured and all these parameters were found to be statistically significant. The mean varus angled improved from 32.47 to 5.39 degrees whereas the valgus improved from 17 to 9.56 degrees (Table-I & Chart I). Similarly the intercondylar distance and intermalleolar distance improved from 10.8 cm to 3.69 cm and 11.31cm to 2.5 cm respectively (Chart - II). Statistically all measurements were significant p<0.05 as calculated by paired 't' test.

 Table -1: Showing Pre and Postoperative outcome

Outcome measure	Pre- operative (mean)	Post- operative (mean)	t value	p value
Intercondylar distance	10.8 cm	3.6 cm	14.16	0.00
Intermalleolar distance	11.31 cm	2.5cm	13.48	0.00
Genu valgum	17.00	9.56	15.68	0.00
Genu varum	32.47	5.39	22.66	0.00

Chart -I:	Outcome	Pre and	Posto	peratily
-----------	---------	---------	-------	----------





There were complications in two patients, namely radiological evidence of plate and screw migration. The plate and screws were removed and replaced.

Discussion:

The eight-plate holds one side of the growth plate. As the opposite side of the physis continues to expand and grow, the screws diverge within the plate, effectively serving as a hinge. This hinge action also avoids compressing the growth plate that is being guided. And because of its flexibility, the chances of the plate or screws bending or breaking under the forces of bone growth are considered very low.Bony deformity may be treated by osteotomy, for which careful analysis of the deformity and detailed operative planning are essential. Analysis of the deformity has been formalised and clarified by the centre of rotation angulation method.¹⁴ However, in deformities around a joint, an open physis can make correction a technically difficult problem. Furthermore, osteotomy and acute correction of deformities carry a risk of complications such as compartment syndrome and non-union.^{15,16}

Bony deformity may also be corrected by manipulating the growth behaviour of an open physis.^{16,17} In experimental and clinical work, Haas^{17,18} demonstrated the resilience of the physis following surgical instrumentation. He documented growth inhibition by placing a wire loop around a canine distal femoral physis and noted that growth resumed when the wire broke. Based on this work and others,^{18,19} procedures have been introduced to manipulate the growth from a physis. The technique of hemi-epiphysiodesis is well established in children, in particular the use of staples and transphyseal screws. Both methods exert compression on the physis and, when placed eccentrically, can retard development on the side of application and thereby produce asymmetrical growth.^{2,4,19} Some concerns have been raised over the use of staples in younger children; the prolonged presence of rigid implants bracketing the physis has prompted worries over excessive compression leading to permanent physeal closure.^{20,21} Aykut et al²² demonstrated clinically and experimentally that transgression of the periosteum during staple insertion or removal poses a risk of producing a physeal bar. In contrast, a recent study²³ demonstrated that percutaneous epiphysiodesis using transphyseal screws in the correction of lower limb deformities in younger children can be a reversible method.

The flexible plate concept developed by Stevens differs from staple or screw compression across the physis⁵. The placement of this non-rigid tension band device at the perimeter of the physis produces the effect of a focal hinge. While some compression is applied across the physis, it is not constant owing to the propensity of the screws to diverge as correction proceeds. Once the

C + 1/42 cm 2 + 1/42 cm 2 + 1/32 cm 4 + 1/41 cm

Fig-1: Pre operative genuvalgum X-ray



Fig-2: Post operative genu valgum X-ray after correction



Fig 3: Pre operative clinical

Fig 4: Post operative follow up one year after correction



Fig-5: Pre operative X-ray Genu valgum

Fig 6: Post operative follow up X-ray after 16 months



Fig 7: Pre operative Clinical photograph genu varum

Fig 8: Post operative clinical after correction of genu varum

screws reach their maximum divergence, there is also the facility within the flexible plate to bend. Both of these features reduce the risk of creating a permanent physeal tether through excessive and prolonged compression across the physis. Also, only one plate per physis is needed to produce correction, whereas three staples per physis are usually needed for the same effect. This clinical study also confirms the reversible nature of growth inhibition produced by the device. The speed of correction in hemiepiphysiodesis is determined by the nature of the growth modulation (staple, transphyseal screw or flexible plate), the age of the child and the physis treated. Burghardt et al^{24} described the rate of correction using the flexible plate method in terms of mechanical axis deviation. In this case, the rate of improvement in the mechanical axis derived from the tibial segment was slower than from the femoral segment. Conversely, we can report on rates of correction as derived from each physis in terms of angular improvement per month, but also describe the influence of age on the process. The measurement of the rates of correction per month allows the surgeon to estimate the overall treatment time and provide parents with relevant information. Visual appreciation of the effect of gradual correction usually occurs towards the end of the treatment period. Providing counselling about the estimated time needed will allay any parental anxiety over what may appear initially to be a lack of progress. Implant migration was noted in two patients and this has also been documented with the use of staples.^{20,25} There were no instances of screw or implant back-out as can occur with staples.^{26,27}

The average age of the children in this study was 11.6 years with a 25% to 75% interquartile range of 10 to 13

years. Therefore, the majority were adolescents. This is similar to the study by Stevens.⁵ The ability to harness this technique for younger children, as in some of the cases in this study, is a major advantage and reduces the need for osteotomy for deformities around the knee joint. The only problem is that the physis itself must be normal and respond to growth guidance through the flexible plate. Finally, the ability to perform the implantation and removal of the device within a short span of time is an added advantage over correction by osteotomy. Most children were walking confidently without aids by the second postoperative week.

Conclusion:

This study has confirmed the reversible nature of growth inhibition on the physis produced by a bridging flexible titanium plate and has demonstrated its value in correcting deformities around the knee. The procedure is technically simple and has significant potential for treating genu varum and valgum for many children without the need for osteotomy.

References:

- 1. Salenius P, Vankka E. The development of the tibiofemoral angle in children. *J Bone Joint Surg Am* 1975; **57:** 259-61.
- 2. Blount W. A mature look at epiphyseal stapling. *Clin Orthop* 1971; **77:** 158-63.
- 3. Bowen JR, Torres R, Forlin E. Partial epiphysiodesis to address genu varum or genu calgum. *J Pediatr Orthop*1992; **12:** 359-64.
- Metaizeau J-P, Wong-Chung J, Bertrand H, Pasquier P. Percutaneous epiphysiodesis using transphyseal screws (PETS). J Pediatr Orthop 1998; 18: 363-9.

- MS Ballal, CE Bruces Nayagram.Correcting genu varum and genu valgum in children by guided growth-temporary hemiepiphysiodesis using tension band plates. *J Bone Joint* Surg 2010; 92: 273-6.
- 6. PM. Stevens-Guided growth for angular correction: a preliminary series using a tension band plate. *J Pediatr Orthop:* 2007; **27:** 253-9.
- Goyeneche RA,CE, Primomo,N Lambert Miscione.Correction of bone angular deformities:Experimental analysis of staples versus 8-plate. *J Pediatr Orthop.* 2009; 29: 736-40
- Wiemann JM, Tryon C, Szalay EA. Physeal stapling versus 8 plate hemiephysiodesis for guided correction of angular deformity about the knee. J Pediatr Orthop 2009; 29: 481-5.
- 9. Blair V, Walker S, Sheridan J, Schoenecker PL. Epiphysiodesis: a problem of timing. *J Pediatr Orthop*1982; **2:** 281-4.
- Anderson M, Green WT, Messner MB. Growth and predictions of growth in the lower extremities. *J Bone Joint Surg Am* 1963;45:1-14.
- Stevens PM, Maguire M, Dales MD, Robins AJ. Physeal stapling for idiopathic genu valgum. *J Pediatr Orthop* 1999; 19: 645-9.
- 12. Stevens PM, Pease F. Hemiepiphysiodesis for posttraumatic tibial valgus. *J Pediatr Orthop* 2006; **26**: 385-92.
- Stevens PM, Mac Williams B, Mohr RA. Gait analysis for genu valgum. J Pediatr Orthop 2004; 24: 70-4.
- Paley D. Principles of deformity correction. Berlin: Springer, 2002.
- 15. Mycoskie PJ. Complications of osteotomies about the knee in children. *Orthopaedics* 1981; **4:** 1005-15.
- Steel HH, Sandrow RE, Sullivan PD. Complications of tibial osteotomy in children for genu varum or valgum: evidence that neurological changes are due to ischemia. *J.Bone Joint Surg* [*Am*] 1971; **53**: 1629-35.
- 17. Haas SL. Retardation of bone growth by a wire loop. *J Bone Joint Surg Am* 1945; **27**: 25-36.

- Haas SL. Mechanical retardation of bone growth. J Bone Joint Surg Am 1948; 30: 506-12.
- Blount WP, Clarke GR. Control of bone growth by epiphyseal stapling: a preliminary report. *J Bone Joint Surg Am* 1949; **31**: 464-78.
- Bylski-Austrow DI, Wall EJ, Rupert MP, Roy DR, Crawford AH. Growth plate forces in the adolescent human knee: a radiographic and mechanical study of epiphyseal staples. J Pediatr Orthop 2001; 21: 817-23.
- Farnum CE, Nixon A, Lee AO, et al. Quantitative threedimensional analysis of chondrocytic kinetic responses to shortterm stapling of the rat proximal tibial growth plate. *Cells Tissues Organs* 2000; **167:** 247-58.
- Aykut US, Yazici M, Kandemir U, et al. The effect of temporary hemiepiphyseal stapling on the growth plate: a radiologic and immunohistochemical study in rabbits. *J Pediatr Orthop* 2005; 25: 336-41.
- 23. Khoury J, Tavares J, McConnell S, Zeiders G, Sanders J. Results of screw epiphysiodesis for the treatment of limb length discrepancy and angular deformity. *J Pediatr Orthop* 2007; **27**: 623-8.
- Burghardt RDE, Herzenberg JE, Standard SC, Paley D. Temporary hemiepiphyseal arrest using a screw and plate device to treat knee and ankle deformities in children: a preliminary report. *J Child Orthop* 2008; 2: 187-97.
- Zuege RC, Kempken TG, Blount WP. Epiphyseal stapling for angular deformity at the knee. *J Bone Joint Surg Am* 1979; 61: 320-9.
- Brockway A, Craig WA, Cockreli BR Jr. End-result study of sixty-two stapling operations. *J Bone Joint Surg Am* 1954; 36: 1063-70.
- Fraser RK, Dickens DR, Cole WG. Medial physeal stapling for primary and secondary genu valgum in late childhood and adolescence. *J Bone Joint Surg Br* 1995; 77: 733-5.

Original Article

Effectiveness of Tolperisone Hydrochloride with Aceclofenac as Combined Therapy in Acute Low Back Pain.

B Bhattacharjya¹, S Mohammad Naser², A Biswas³, F Kamal⁴, K Banerjee⁵

Abstract

Objective: An open label, non-randomised, prospective study was conducted to evaluate the effectiveness of tolperisone hydrochloride 150mg thrice daily with aceclofenac 100mg twice daily compared to aceclofenac 100mg twice daily alone for the treatment of acute low back pain (LBP) for 14 days. total (n=242) patients recruited for the study were divided into two treatment groups. One of the group (n=124) received oral tolperisone plus aceclofenac and the other (n=118) Aceclofenac alone. The pain intensity was assessed by visual analogue scale. Patients were informed to report any adverse effect encountered during the study period. The overall effect of the drug (global assessment of the study medication) on pain and adverse effects were assessed by the patients at the end of the trial on a categorical scale. There was significant reduction in pain score in the tolperisone group than aceclofenac group with insignificant adverse effects which didn't require discontinuation of the study. Tolperisone when added with aceclofenac can be more effective than aceclofenac alone for relief of acute LBP with minimum adverse effects.

Key Words: Low back pain, tolperisone, aceclofenac, visual analogue scale

Introduction:

L ow back pain (LBP) is one of the common causes of disability in patients under 45 years of age. Sustained muscle spasms associated with LBP due to involuntary contraction are usually very painful and cannot be completely relieved by voluntary effort¹. LBP is the most common cause of disability for work population leading to increased sickness absenteeism². Some common causes of LBP are bad sitting

Author's affiliations:

- ¹ MS (Orthopedics) Associate Professor, Dept. of Orthopedics
- ² MD (Pharmacology) Assistant Professor, Dept. of Pharmacology

 3 MD (Pharmacology) Assistant Professor, Dept. of Pharmacology 4 MD(PMR) Assistant Professor, Dept. of Physical Medicine &

Rehabilitation

⁵ MS (Orthopedics) Assistant Professor, Dept. of Orthopedics

Calcutta National Medical College, Kolkata -14

Cite as:

B.Bhattacharjya, S.Mohammad Naser, A.Biswas, F. Kamal, K. Banerjee. Effectiveness of Tolperisone Hydrochloride with Aceclofenac as Combined Therapy in Acute Low Back Pain.JJPMR Jun 2012; Vol 23(2): 74-8.

Correspondence:

Dr. Syed Mohammad Naser Flat 401, Panthaneer 3/1 Picnic Garden 2nd Lane,Kolkata -700039 Mob: 9433349332

Email: smnaser2000@hotmail.com Received on 16/07/2011,Revised on 28.03.2012, Accepted on 16/05/2012 posture, lumbar spine arthritis, spondylolisthesis, herniated disc etc. Compression fracture from osteoporosis is common cause of LBP among women.

Non-steroidal anti-inflammatory drugs (NSAIDs), opioids, analgesics and muscle relaxants are commonly used for the treatment of this disorder. Most of the centrally acting muscle relaxants have considerable side-effects such as sedation, dizziness, impairment of coordination, mental confusion, weakness, withdrawal phenomenon or anti-cholinergic adverse events.³ Traditional NSAIDs are associated with several adverse effects like gastritis, gastrointestinal bleeding, nausea, constipation with long term effects like renal dysfunction. On the other hand natural opioids and their synthetic congeners are the alternative ways of managing LBP, though it has its own drawbacks in the form of nausea, vomiting, ileus and respiratory depression etc.

Aceclofenac is a non-steroidal anti-inflammatory agent which acts by blocking cyclooxygenase enzyme thereby inhibiting PGE₂ synthesis. It also inhibits interleukin-1âinduced prostaglandin E_2 production by human rheumatoid synovial cells ^{4, 5}. Aceclofenac is also converted into diclofenac and 42 -hydroxy diclofenac by human polymorphonuclear leuk ocytes and monocytes. 42 -hydroxy diclofenac suppressed prostaglandin E_2 production specifically by blocking cyclooxygenase-2 activity⁶. Tolperisone is a centrally-acting muscle relaxant that has been in therapeutic use for more than three decades in the western world for the symptomatic treatment of spasticity and muscle spasm^{7, 8}. It differs from other myotonolytic agents in its pharmacological properties, which mediate muscle relaxation without concomitant sedation or withdrawal phenomena ⁹. It also blocks mono and polysynaptic reflexes by inhibiting presynaptic neurotransmitters from the primary afferent endings in a dose dependent manner at the spinal level via a combined action on voltage-gated sodium and calcium channels ^{9, 10}.

Tolperisone increases the blood supply to skeletal muscles; this action is noteworthy since muscle contracture may compress the small blood vessels and induce ischaemia leading to release of pain stimulating compounds¹¹. It causes preferential antinociceptive activity against thermal stimulation that is likely to be attributed to its local anesthetic action ¹². Besides being an effective antispastic agent, tolperisone also has analgesic activity in rodents and human by the inhibition of the action potential propagation on both the A and C fibres ¹³, ¹⁴.

Earlier studies ^{7,9} done abroad concluded a better efficacy and safety of tolperisone when compared with placebo or pridinol mesylate.

Therefore it was felt necessary to conduct this study in our institute for understanding the effect of tolperisone with the following objectives: i)To compare the oral analgesic and antispastic effect of tolperisone hydrochloride with aceclofenac for treatment of acute low back pain ii) Safety evaluation: Incidences of adverse effects during the study period.

Materials and Methods:

An open label, non-randomised, prospective study was conducted at Calcutta National Medical College and Hospital, Kolkata in collaborations with the Department of Orthopaedic Surgery, Physical Medicine & Rehabilitation and Pharmacology. The total duration of the study was one year (July 2010 to June 2011). After prior approval from Institutional Ethics Committee, patient aged 20 to 60 years of both genders suffering from acute or acute exacerbation of chronic LBP were included according to inclusion/ exclusion criteria. Patient with history of major trauma or fracture, associated with other medical conditions like uncontrolled diabetes mellitus, hypertension, hepatic or renal disease etc. as well as pregnant and lactating women were excluded from the study. A sample size of (n=255) patients

were calculated on the basis of Raosoft[®] software (www.raosoft.com © 1996-2011 by Raosoft, Inc.) with 90% confidence interval and 5% margin of error.

Patients included in the study were thoroughly counselled and explained about visual analogue scale (VAS) for pain where 0 cm denoted no/minimum imaginable pain and 10cm denoted maximum imaginable pain.

The patients were divided into two groups receiving either Tab Myotop® (tolperisone Hydrochloride -150mg, Zuventus) thrice daily plus tab. Hifenac® (aceclofenac -100mg, Intas) twice daily (n=124) or Tab. Hifenac® (Aceclofenac -100mg) alone twice daily (n=118) for 14 days. On initial visit the patients were examined clinically and the intensity of pain was assessed by visual analogue scale (VAS) as follows: 0 - no pain, 1 to 3 - mild pains, 4 to 6 - moderate pain, 7 to 8 - severe pain, 9 to 10 - very severe pain. Further changes in the intensity of pain were noted by VAS score of patients on 8th (2nd visit) and 14th day (3rd visit) of the study. The adverse effects of study drugs were also noted during these visits. Biochemical tests (Hb%, TC, DC, ESR, uric acid, creatinine, sugar, bilirubin, SGPT, SGOT and urine for routine examination were done during screening and at the end of the trial (day 14) to assess any change in parameters.

Global assessment for effectiveness and tolerability was assessed separately by the patient at the end of therapy on day 15 on a 5-point scale of excellent, good, satisfactory, poor and very poor ¹⁵. A Student's unpaired 't' test was used to compare the pain intensity (VAS) between the two treatment groups. Serial changes within the two study groups were assessed by repeated measure ANOVA. The p values below 0.05 were considered to be statistically significant.

Results:

Out of 255 patients enrolled, 242 patients completed the study. Total 13 patients of which (n=5) belonging to tolperisone group and (n =8) of aceclofenac group were dropped from the study due to discontinuation of the trial. Patients who have been dropped from the study had similar age (mean= 45.72 yrs) and weight (mean = 62.43 kg) as compared to those completed the study. There was a predominance of male subjects (77.27%) among the dropouts. Since these patients (n=13) were excluded from the study at a very early stage, they were not included in final statistical analysis.



The baseline demographic characteristics were similar between the groups. Overall 59.10% (143/242) of patients were female (Table: 1).

 Table: 1 – Demographic Characteristics of Subjects

Characteristics	Tolperisone Hydrochloride + Aceclofenac (n=124)	Aceclofenac (n=118)
Sex (n) Female	72	71
Male	52	47
Age, Yr (mean \pm SD)	42.53 (4.5)	44.04 (5.2)*
Weight, Kg (mean \pm SD)	63.52(5.8)	64.11(6.4)*

*Difference of age & weight statistically not significant

The primary effectiveness measure was pain intensity. The overall analgesic effect of the study drugs over the period of day 0, day 8 and day 14 were measured by reduction in pain intensity using visual analogue scale.

There was significant reduction in pain score (p < 0.001) [Table: 2] when compared within the Tolperisone plus

Table: 2 – Mean score	of vas	from the	baseline	(n=242)
-----------------------	--------	----------	----------	---------

Assessment	Tolperisone Hydrochloride + Aceclofenac (n=124) (mean ± SD)	Aceclofenac (n=118) (mean ± SD)
Day 0	9.86 ± 0.50	9.73 ± 0.61
Day 8	$1.86 \pm 1.02*$	$4.84 \pm 1.24^{*,a}$
Day 15	$0.18 \pm 0.69*$	$4.11 \pm 1.11^{**,a}$

*p< 0.001 when compared between Day 0 & Day 8, Day 8 & Day 14 of respective group

** p= 0.004 when compared between day 8 & Day 14 of aceclofenac group

^ap<0.001 when compared between Day 8 & Day 14 of both groups

Aceclofenac groups between day 0, day 8 and day 14. The reduction in pain intensity score at day 8 as well as day 14 was significant (p < 0.001) in tolperisone plus aceclofenac group in comparison to Aceclofenac group (p=0.004). Ten patients experienced adverse effects such as nausea, vomiting, dizziness, epigastric pain etc. [Table: 3]. However

Adverse Events	Tolperisone Hydrochloride + Aceclofenac (n=124)	Aceclofenac (n=118)
Nausea, Vomiting	3	2
Dizziness	1	0
Epigastric Pain	2	2
Total No. of Adverse Events	6(4.8%)	4(3.3%)

 Table: 3 – Adverse event profile of study drugs

Total No. of adverse reaction - 10(4.1%)

none of the patients had to discontinue the drugs due to these adverse effects. No serious adverse event was reported among patients in all treatment groups. Patients of both the groups suffered similar kind of adverse effects [tolperisone plus aceclofenac = 4.83% (6/124) aceclofenac 3.38% (4/118)] which was statistically insignificant.

There was no significant change in biochemical parameters both before and after the administration of study drugs.

The overall effect (global assessment of the study medication) of the combined drug therapy on the patients was assessed as 'excellent' (78.14%) of the tolperisone plus aceclofenac group where 66.42% of the patients assessed 'good' for aceclofenac alone regarding control of pain and adverse effects at the end of the trial (day 15) on a categorical scale [Fig 2, 3].

Treatment compliance was comparable in both the treatment groups.

Discussion:

From the result in terms of effectiveness, it was concluded that there was highly significant reduction in pain score in the tolperisone plus aceclofenac group (p < 0.001) when prescribed for 2 weeks in patients of acute or acute

Fig -1: Effect of combined drug therapy



Fig -2: Effect of aceclofenac alone



exacerbation of chronic low back pain due to various degenerative and inflammatory conditions when compared to Aceclofenac alone group [Fig 1]. This finding is comparable with the earlier results of other studies^{9, 16} done abroad . The added advantage of combination group may be due to tolperisone induced increase in flow of blood which prevents the release of pain producing compounds due to ischaemia precipitated by contracture of skeletal muscles. The local anaesthetic action of tolperisone might have also contributed for better effectiveness. The other conclusion drawn from this study was fewer side-effects of the study drugs.

Fig -3: Drug effect on categorical scale.



In the present study tolperisone was well tolerated with no sedation reported by any patient during the study period. The lack of sedative side-effects in the present study also correlates well with the results of another study done earlier which has concluded that tolperisone has no sedative action and does not impair reaction time ¹⁷.

Thus it appears that addition of tolperisone with aceclofenac does not aggravate the chances of any extra adverse effects.

On the contrary the combination therapy proved to be more effective than the comparator group. The present study however limited by the fact that, it was neither truly randomised nor blinded and conducted on patients of similar ethnic group. It is proposed that further multicentric studies will be helpful to generate more data.

Conclusion:

Tolperisone hydrochloride is a muscle relaxant that can be safely prescribed along with analgesics for getting additive effect for the symptomatic treatment of acute LBP.

References:

- 1. Fischer A A, Chang C H. Electromyographic evidence of paraspinal muscle spasm during sleep in patients with low back pain. *Clin J Pain1985*: 147-54.
- Martin J, Meltzer H, Elliot D.The prevalence of disability among adults. OPCS surveys of disability in Great Britain, Report 1. London: Her Majesty's Stationery Office, 1988.
- Kocsis P,Tarnawa I, Kovács G, Szombathelyi Z, Farkas S. Mydeton. A centrally acting muscle relaxant drug from Gedeon Richter Ltd. *Acta Pharm Hung 2002*; 72: 49-61.
- Hulkower KI, Wertheimer SJ, Levin W, Coffey JW, Anderson CM, Chen T *etal*. Interleukin -1â induces cytosolic phospholipase A₂ and prostaglandin H synthase in rheumatoid synovial fibroblasts: evidence for their roles in the production of prostaglandin E₂. Arthritis Rheum 1994; 37: 653-61.
- Yamazaki R, Kawai S, Matsuzaki T, Kaneda N, Hashimoto S, Yokokura T *et al.* Aceclofenac blocks prostaglandin E₂ production following its intracellular conversion into cyclooxygenase inhibitors. *Eur J Pharmacol 1997*; **329**:181-7.
- Ryuta Y, Shinichi K, Takeshi M, Norimasa K, Shusuke H, Teruo Y *et al.* Aceclofenac blocks prostaglandin E₂ production following its intracellular conversion into cyclooxygenase inhibitors. *Eur J Pharmacol1997*;**329**: 181-18.

- Quasthoff S, Möckel C, Zieglgänsberger W, Schreibmayer W. Tolperisone. A typical representative of a class of centrally acting muscle relaxants with less sedative side effects. *CNS Neurosci Ther* 2008;14(2): 107-19.
- Sweetman SC, editor. Tolperisone: Martindale The Complete Drug Reference. 36th ed. London: *Pharmaceutical Press, 2009*: 1899.
- 9. Pratzel HG, Alken RG, Ramm S. Efficacy and tolerance of repeated oral doses of tolperisone hydrochloride in the treatment of painful reflex muscle spasm: results of a prospective placebocontrolled double-blind trial. *Pain 1996*; **67**: 417-25.
- Girish MB, Bhuvana K, Sarala N, Kumar TN. Tolperisone. J Anaesth Clin Pharmacol 2010; 26: 363-4.
- 11. Furuta Y, Yoshikawa A. Reversible adrenergic alpha-receptor blocking action of 2, 4'- Dimethy l-3-piperidino- propiophenone (tolperisone). *Jpn J Pharmacol1976 Oct*; **26** : 543-50.
- Akiko S, Motoko H, Mitsuo T. Antinociceptive effects of sodium channel-blocking agents on acute pain in mice. J Pharmacol Sci 2004; 95:181–8.
- Kocsis P, Farkas S, Fodor L, Bielik N, Thán M, Kolok S, et al. Tolperisone-type drugs inhibit spinal reflexes via blockade of voltage gated sodium and calcium channels. *J Pharmacol Exp Ther 2005*; **315**: 1237-46.
- Vora A. Tolperisone drug review. J Assoc Physicions India 2010; 58: 127-28.
- Ram P, Swapnil K, Tanay P, Amarinder S, Rajiv R. A hase IV observational multi-Centre, open-label study on efficacy and safety of tolperisone 150 mg in patients with painful muscle spasm associated with degenerative or inflammatory diseases of the musculoskeletal system. *J Assoc Physicions India 2011*; 59:33-37.
- 16. Cabitza P, Randelli P. Efficacy and safety of Tolperisone in patient with low back pain: A double blind randomised study. *European Review for Medical and Pharmacological Sciences* 2008;**12**: 229-35.
- J Dulin, Kovacs L, Ramm S. Evaluation of Sedative effects of single and repeated doses of 50 mg and 150 mg Tolperisone hydrochloride: results of prospective, randomized doubleblind, placebo controlled trial. *Pharmacopsychiatray 1998*; 31:137-42.

IAPMR National Mid-Term CME 2012

Theme : New Horizons in PMR

September 8-9, 2012

Kamineni Hospitals, Hyderabad, India

Organizing Chairperson: Dr T Sreedhar (M: 09490294946) **Organizing Secretary:** Dr Rajendra Kumar (M: 09247342832)



Hypokalaemic Periodic Paralysis Associated with Hypothyroidism

*Th Khelendro Singh*¹, *Ngampa Sangme*², *L Nilachandra Singh*³, *AK Joy Singh*⁴

Abstract

Periodic paralysis is also seen as one of the uncommon cause of quadriplegia in the physical and rehabilitation medicine practice.

There have been anecdotal reports of periodic paralysis associated with hypothyroidism. However, there is no clear cut evidence of hypothyroidism causing hypokalaemia leading to periodic paralysis or vice versa.

This case report highlights the importance of keeping periodic paralysis as an important cause of the recurrent paralytic attack, importance of serum potassium and thyroid function tests and recovery pattern without active physical therapy intervention which may actually aggravate the disease process. Its occurrence in a young male patient is also a rare phenomenon.

Key words : Hypothyroidism, Hypokalaemia, periodic paralysis.

Case Report:

A 21- year- old male was admitted in the Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal because of recurrent paralytic attacks involving all the four limbs with two similar attacks in the past in which, the symptom resolved without any interventions. There were no clinical features of hypothyroidism. There was no goitre and his mental status was normal. Motor power was 2- 3/5 in all the key muscles of both upper and lower limbs without

Author's affiliations:

- ² MBBS, Postgraduate student
- ³ MD, Assistant Professor
- ⁴ MD, DNB, PhD, Professor
- Department of Physical Medicine & Rehabilitation, Regional Institute of Medical Sciences, Imphal -795004

Cite as :

Singh Th. Khelendro Singh, Sangme Ngampa, Singh L. Nilachandra, Singh AK Joy. Hypokalemic periodic paralysis associated with hypothyroidism. IJPMR Jun 2012; 23(2): 79-81.

Correspondence :

Dr AK Joy Singh, Professor Department of Physical Medicine & Rehabilitation, Regional Institute of Medical Sciences, Imphal-795004 Email: joyakoijam2@yahoo.com

Received on 12/12/2011, Revised on 26/02/2012, Accepted on 10/03/2012 any sensory deficit when examined within 24 hours of the attack. Serum creatine phosphokinase (CPK) was 306 U. Serum K⁺ was consistently low (2.7 and 3 mEq/ L) in two consecutive readings with high TSH level (15 nmol/L) and thyroid related antibodies in the serum. Serum level of antithyroid peroxidase antibodies was 30.12 IU/mL (normal 0-18 IU/mL) and antithyroglobulin antibodies was 180.32 IU/ml (0-70 IU/mL). Urine pH and serum chloride was within normal limits. Nerve conduction velocities for both sensory and motor nerves were normal. He was treated with potassium and thyroxine supplements and was able to walk and perform his duties within 72 hours of the attack. Except for the range of motion exercises, no strenuous exercises were given to prevent aggravation of symptoms and to help in early recovery.

Discussion:

Hypokalaemic periodic paralysis is an episodic neuromuscular disorder and may be of primary or secondary origin. The paralysis may last from an hour to several days and weakness may be of localised or generalised with disorders including myopathy, wasting of muscles, reduced power and reflexes and may even involve the respiratory muscles^{1,2}.

¹ MBBS, Postgraduate student

The primary hypokalaemic periodic paralysis is an inherited autosomal dominant and precipitated by strenous work, high carbohydrate diet and cold², which was not found in our case. The secondary hypokalaemic periodic paralysis has been associated with diuretic abuse, gastroenteritis, renal tubular acidosis, hyperaldosteronism, Bartter syndrome and hyperthyroidism³. The possibility of renal tubular acidosis was excluded as he had normal urine pH and no hyperchloraemia.

Periodic paralysis has been known to be associated with thyroid disorder. But, it is mostly linked with the hyperthyroid state and its association with hypothyroidism is very rare and so far only a few cases have been reported. Clinical examination and investigations rule out the evidence of hyperthyroidism.

Chaudhury *et al*⁴ reported hypokalaemia leading to periodic paralysis in a child who was undergoing treatment for hypothyroidism. The explanation was that thyroxine in pharmacological doses can cause increased potassium excretion and water dieresis in patients with myxoedema during the initial part of the therapy⁵. This may result in hypokalaemia, especially in a child with severe malnutrition and low stores of total body potassium¹.

Hypokalaemic paralysis is a common manifestation of renal tubular acidosis due to inappropriately high potassium excretion leading to symptomatic hypokalaemia. Hypokalaemic weakness is one of the manifestations of distal renal tubular acidosis and it typically presents as hyporeflexive limb weakness, although involvement of the extraocular muscles, sphincters and cranial nerves has been reported⁶. Renal tubular acidosis is defined as an inability of the renal tubule to acidify urine, which is out of proportion to any reduction in the glomerular filtration rate. The acidification defect has been described to be mild and presumably related to thyroxine defiency^{7,8}. An autoimmune mechanism has also been suggested to cause renal tubular acidosis in hypothyroid disorder ^{9,10}. Koul Pand Wahid¹¹ supported association of an autoimmune cause that influences the renal acidification mechanisms through dysfunctions of various transporters and co transporters involved in the acidification in the renal tubular system. However, there has been report where renal tubular acidosis was associated with non-autoimmune hypothyroidism¹². Our patient didn't show any feature of renal tubular acidosis

There are controversies regarding hypothyroidism causing hypokalaemia or vice versa. Even in this reported case,

we were also unable to find out the cause and effect relationship. However, in one of case report on hypokalaemic myopathy accompanied by transient hypothyroidism in a patient with autoimmune thyroiditis, the authors suggested that this transient hypothyroidism might be induced by hypokalaemia during the course of autoimmune thyroiditis¹³.

This case report is unique because the association between hypothyroidism and hypokalaemic periodic paralysis occurred in a young male patient when all the case reports available in the literature showed occurrence only in female patients.

This case report highlights the importance of keeping periodic paralysis as an important cause of the recurrent paralytic attack presenting as tetraplegia, importance of serum potassium and thyroid function tests and recovery pattern without active physical therapy intervention which may actually aggravate the disease process.

By keeping this possibility over and above the detail history and proper clinical examination, we should be able to avoid costly radio-imaging techniques.

References:

- Subbarao SD, Rekha S, Chandrashekhra MK. Hypokalemic paralysis. *Indian Pediatr* 1991; 28: 425-7.
- Smith AS, Swaiman KF, Manning S, Congenital and metabolic myopathies. In:Pediatric Neurology – Principles and Practice. 2nd ed. St Louis: Mosby, 1994.Vol 2: 613.
- 3. Bagga A, Dutta S. Hypokalemic muscle paralysis. *Indian Pediatr* 1994; **31**: 1297-8.
- 4. Chaudhary SP, Gupta K, Gupta RK, Tahilarami H. Hypokalemic paralysis during management of hypothyroidism. *Indian pedialr* 2000; **37:** 1261-3.
- 5. Keelie AC Neil E, Joels N. 'The Thyroid'. Endocrine Glands. *In:* Samson Wright's Applied Physiology. 13th ed. New Delhi: *Oxford Medical Publications*, 1982: 541.
- Nilwarangkur S, Nimmannit S, Chaovakul V. Endemic primary distal renal tubular acidosis in Thailand. *Q J Med* 1990; 74: 289-301.
- Michael UF, Chavez R, Cookson SL, Vaamonde CA. Impaired urinary acidification in the hypothyroid rat. *Pflugers Arch* 1976; 24; 361: 215- 20.
- Drukker A, Dolberg M, Landau H. Renal tubular acidosis in a patient with hypothyroidism due to autoimmune thyroiditis improvement with hormone replacement therapy. *Int J Pediatr Nephrol* 1982; 3: 205-9.
- 9. Mason AM, Golding PL. Renal tubular acidosis and autoimmune thyroid disease. *Lancet* 1970; **2:** 1104-7.
- Maeng M, Pedersen KM. A young woman with metabolic acidosis and recently detected IDDM without ketonuria: a rare

81

autoimmune (?) combination of hypothyroidism, diabetes mellitus and distal renal tubular acidosis. *Ugeskr Laeger* 1998; **160:** 5663- 4.

- 11. Koul PA, Wahid A. Renal tubular acidosis and hypokalemic paralysis in a patient with hypothyroidism. *Saudi J Kidney Dis Transpl* 2011; **22:** 1014-6.
- Fang JT, Huang CC. Distal renal tubular acidosis associated with non- autoimmune hypothyroidism. *Nephrol Dial Transplant* 1996; 11: 1146-7.
- 13. Kanemaru Y, Aizawa K, Kagami T, Haraguchi K, Onaya T. A case of hypokalemic myopathy associated with transient hypothyroidism. *Endocrinol Jpn* 1984; **31**: 809-14.

IAPMRCON 2013

The 41st annual national conference of Indian Association of Physical Medicine & Rehabilitation

from 31st January- 3rd February 2013

Venue: NIMHANS Convention Centre, Bangalore

Organising Committee

Chief Patron: Dr. P. Satishchandra (Director & Vice-Chancellor: NIMHANS) Organising Chairman: Dr. Arun B. Taly Organising Co-Chairman: Dr. Kurian Zachariah Organising Secretary: Dr. Anupam Gupta Joint Organising Secretaries: Dr.RajalakshmiHariharan, Dr. B.M. Maheshwarappa. Treasurer: Dr.Rashmi Krishnan Web Site : www.iapmrcon2013nimhans.com

Special Article

1.4PMR Bengal Oration 2012

Prosthetic Fittings Limitations and Its Present Scenario in India and Abroad

M K Mathur



Dr. Mahendra Kishore Mathur currently working as Chief Consultant Research Development & Training, Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS), Jaipur. After finishing his MS (Orthopaedics) from S.M.S Medical College Jaipur under guidence of Dr. P.K. Shethy on 1983 he worked as a teacher of PMR in same institute for two decades. He has several National and International level of publications. He also contributed chapters in Manuals of Fabrication of Jaipur Below Knee Systems, Fabrication of Jaipur Above Knee Systems, Fabrication of Jaipur Foot, "Jaipur Artificial Limbs" - First comprehensive Text Book on Jaipur Limb Technology. He is the first orator of Bengal oration of IAPMR on 2012 introduced by West Bengal Chapter of IAPMR.

There is no perfect prosthetic fitting available today in the world. What makes prosthetic systems so interesting is the myriad widely divergent approaches designers are now experimenting – hydraulic, mechanical and computerised.

LOWER LIMB PROSTHETICS

For above knee amputees the prosthetic knee system is among the most complex of all components in prosthesis. This is because knee must give support when people stand, allow smooth motion when people walk and permit movements when people sit bend or kneel. Even in normal gait cycle the knee has to be in full extension at the time of heel strike, goes into flexion just prior to foot flat and toe off and goes through different angles of flexion and extension in swing phase.

Different types of prosthetic knee :

Prosthetic knees range from single axis knee to computerised intelligent knee systems. They can be considered in following groups :

- 1. Single axis knee joint
- 2. Polycentric knee joint
- 3. Hydraulic and Pneumatic knee joint
- 4. Micro-processor knee joint

Correspondence :

K-23, Malviya Marg,C- Scheme, Jaipur-302 001 Phone Numbers :0141-2366111, 98290-63739 E-mail ID:drmk1@yahoo.com Every type of joint has some merits and demerits (mentioned below)

1. Single axis knee joint :

Advantages-

- Durable
- Light weight
- Costs less than other knee systems

Disadvantages -

- It has no stance control which means that the amputee must use their own muscle to remain stable while standing.
- Often uses a manual lock to compensate for lack of stance control. This will lead to very poor gait and increase energy consumption.
- Often uses friction system to keep from swinging forward too quickly when moving to next step. This again increases energy consumption.
- It allows for walking with one speed only

2. Polycentric knee joint :

Human knee is polycentric during normal knee flexion and extension, the knee axis moves about a changing centre of rotation (centrode)

Advantages -

- More natural gait.
- Very stable during early stance.

- Can be provided with weight activated knee brake system which will prevent stumbling and falling of amputee in entire stance ways.
- Reduces the leg length in the beginning of the step again lowering the risk of stumbling.
- Has a simple swing control that allows for an ideal knee control.

Disadvantages -

• May need to be repaired or replaced more often



then other type of prosthetic knees.

- May restrict some knee motion but not enough to be a problem.
- Will have to be provided with a fluid or pneumatic control system to allow variable speed walking.



Polycentric knee joints



Here a new knee joint needs special mention. This polycentric knee has been developed by joint research of Bhagman Mahaveer Viklang Sahayata Samiti (BMVSS), Jaipur with Stanford University – USA. This joint has been appreciated so much by the prosthetic world that TIME Magazine in its issue of 23rd Nov 2009 hailed it as one of the 50-Best Inventions of the world in the year 2009.



Polycentric Knee Joint TIME Magazine Issue 2009

3. Hydraulic and Pneumatic knee joint:

Advantages -

- Provide very natural gait.
- Both extension and flexion are independently adjustable.
- Good stance control to prevent the leg from the buckling out from under the amputee.
- The unit can be temporarily disabled, so that the leg swings freely.

Disadvantages -

- Needs frequent adjustments.
- Frequent replacement of moving parts.



Hydraulic and Pneumatic Knee Joints

4. Microprocessor (Electronic) knee joint :

These are very functional, but the most expensive type, and the maintenance cost is very high. They may be single axis, polycentric, hydraulic and pneumatic etc.

Advantages -

- Usually smaller and lighter weight than mechanical knees.
- Initially programmed to learn user walking characteristic.
- It has timing force and swing sensors that take reading 50 times and instantly control the fluid control

system accordingly. Two strain gauge measure pressure on the leg and notes how often the heel strikes.

• It takes fewer efforts to control timing providing amputee with a more natural gait longer walking endurance and better control on uneven surface even while going down the stairs.

Disadvantages -

- Very costly.
- High maintenance and frequent charging is required Electronic knee joints



Different types of prosthetic foot :

Generic class	Basic function	Primary indications	Major advantages	Chief limitations
Single axis	Simplicity	Single speed walking	Inexpensive and durable	Fixed cadence and low stability
Stance control	Increase weight bearing stability	General debility, poor hip control	Improved knee stability	Delayed swing phase
Manual lock	Knee of last resort	Ultimate knee stability knee	Eliminate flexion	Abnormal gait awkward sitting
Polycentric	Positive stability and ease of fixion in swing phase	To enhance knee stability	Stable without distrupting swing phase	Increase weight maintenance
Fluid control	Permit cadence change	Able to vary walking speed	Variable cadence	Increase weight maintenance

Summaries of the qualities of different knee systems

This can be considered in following groups -

- 1. SACH foot (solid ankle cushioned heel)
- 2. Single axis foot
- 3. Multi-axial foot
- 4. Dynamic response/ Energy storing foot
- 1. SACH foot

Advantage -

- Several heel heights, weight categories, manufacturers
- Syme's option
- Durable- low maintenance
- Good choice for padiatrics
- Easy to replace
- Endo or Exoskeleton

Disadvantage -

- Useful for amputees with low activity level only.
- Not for use if active keel is needed.
- Poor multi-axial abilities.
- Poor choice if knee stability is questionable.
- Poor shock attenuation.

2. Single axis foot



Two bumpers limit and control ankle dorsi- and plantar flexion. The PF bumper permits the foot to contact the floor more rapidly during loading response than the SACH foot. The more rapid "foot flat" allows the ground reaction force line to move anteriorly, so that it falls in front of the knee and promotes early knee extension and stance stability

Advantage -

- Adjusts joint angle to accommodate uneven terrain (sagittal only).
- Plantar and dorsiflexion bumpers are replaceable with more or less compliant bumpers.
- Relatively inexpensive.



• Indicated when knee stability is an issue.

Disadvantage -

- Increased maintenance associated with moving parts.
- Difficulty cosmetically finishing due to moving parts.
- Contraindicated if knee is stable.
- Contraindicated if multi-axial function is needed.
- Contraindicated if dynamic response is needed.

3.Multiaxis foot:

Advantage -

• Because the multiaxial foot permits movement in three planes, it accommodates uneven terrain and absorbs torques which would otherwise produce shearing forces on the residual limb.

Disadvantage -

- Its moving parts are heavy and require maintenance.
- Offers little energy for toe off.
- Increased maintenance, accommodation period and training.



4.Dynamic response/Energy storing foot:

Advantage -

- Returns stored energy, which aids in propelling foot forward at toe off.
- For active ambulators.
- Choice of foot designs is available.

Disadvantage -

- Typically expensive except Jaipur foot.
- Varied cosmetic finishing procedures.
- Moving parts may mean increased maintenance except Jaipur Foot.
- Accommodation period.





Recent Develpment of prosthetic foot :

a) iWalk ankle

Advantages -

They replace the action of foot Achilles tendon and calf muscles to provide a near normal gait to amputee. These foot pieces use combination of processors, sensors, motors and springs which provide the user with a powered push-off and increase range of motion and excellent adaptation to uneven terrain.

Disadvantages -

- Very high cost.
- High maintenance.



b) Bionic foot

Advantage –

- Powered ankle motion.
- Intelligent terrain adaptation.
- Natural function.

Disadvantage -

- High maintenance.
- Very costly.
- Needs frequent recharging.



It can be considered under five categories -

- 1 Cosmetic prosthesis.
- 2 Body powered prosthesis (cable controlled).
- 3 Electrically powered prosthesis (Myoelectric, switch control prosthesis).
- 4 Hybrid prosthesis.
- 5 Bionics prosthesis.

1. Cosmetic Prosthesis :

Where the priority is on the restoration of appearance, the design emphasis is on creating a simple, lightweight prosthesis. However, primarily cosmetic solutions are not completely without function:

- The limb may provide passive or opposing functions, such as stabilizing a sheet of paper when writing.
- There is psychological benefit to those patients who are either self-conscious or who face societal pressures.
- There are postural benefits provided by the restoration of body symmetry, these add to the overall

cosmetic benefit and may play a role in preventing associated muscular or skeletal problems emerging over time.

• For very young amputees, bilateral development and increases the likelihood of a successful outcome with functional prostheses in later life.

2. Body powered prosthesis (cable controlled):

Body powered devices are operated using cable and harness systems that require patient to use body movements (moving shoulder or arms) to pull the cable and make the terminal device (a hand, hook or prehensor) open or close much in way a bicycle hand brake system works.

Advantages-

- Lower initial cost.
- Lighter, easier to repair.
- Offer better tension feedback to the body.



Disadvantage -

- Mechanical appearance.
- Difficult to use for some people because they depend on user physical ability.

3. Electrically powered prosthesis (Myoelectric and switch control prosthesis) :

Muscles that are intact after the amputation surgery are used to control limb function. Surface electrodes are carefully position within the prosthesis structure in such a way that when the limb is worn these electrodes lie on the respective muscle bellies and can detect electrical activity within them. The electrodes amplify, filter and process the electrical signals – which arethan passed on to micro-processor within the prosthesis where they act as switching singles to deliver power from to batteries to functional device.

Advantages -

• Do not require a harness or cable and can therefore be built to look more like a real arm.

- Battery powered, so body strength and body movements are not as important for their operation.
- Providing strong grip.

Disadvantages –

- Higher initial cost.
- Heavier.
- High repair cost.
- Dependents on battery life.

4. Hybrid prosthesis:

In these prosthetic systems some functions are controlled myo-electrically and some functions mechanically. For example hand functions may control myo-electrically, elbow flexion mechanically and elbow locking by an electrical pull switch. There are so many permutations and combinations available in such designs

5. Bionics Prosthesis:

Advancement in microprocessors used in myo-electric systems has allowed artificial limbs too many gains in fine tune control of prosthesis, the iLimb hand. It has four independent motorised fingers and motorised thumb, which is manually rotatable all operating from myoelectrically detected nerve ending in the stump. This hand opens a range of grip and fine motor abilities that prosthetic hands have never had before, like using a key in lock, or one finger typing on a key board. Another important advance is simple yet very effective feedback sensors in the fingers which controls grip pressure to hold fragile items like styrofoam.



WHO World Bank Report 2011

According to WHO World Bank Report 2011 on disability less than 15% of disabled persons could obtain aids and appliances. In India there are more than 70 lac amputees and to this figure about 30,000 new amputees are added every year. By a rough estimate less than 45,000 artificial limbs are fitted in India every year. If we keep on fitting artificial limbs at this rate it may take several decades before artificial limbs can be provided to all disabled persons in India.

World Design Impact Award

Recently, the world society of designers have selected seven designs from all over world which have improved or likely to improve quality of life of world population. This is called "World Design Impact Award", you will be happy to know that one of the finalists from out of seven designs chosen from all over world is Polycentric knee joint developed by BMVSS of Jaipur.



Medical Philately



The African Nations are so indebted to Jaipur limb Technology that Kenya Government issued a stamp in their country with an amputee fitted with Jaipur foot.

Pictorial CME

A Rare Clinical Sign - Saviour During a Diagnostic Dilemma

R Pramanik¹, P P Pan²

A twenty years college girl presented to PMR OPD with significant proximal muscle weakness of both upper and lower limb. She was really struggling to manage stairs and to perform overhead activities. She was absolutely fine three months back. Gradually she was suffering from pain in different large joints, fatigability and cold intolerance. At that time her Hb%- 12 gm. /dl, TC- normal range, ESR-45, TSH- 12.4 with low free T4 and free T3. She was on levothyroxine 62.5 microgram since then and her thyroid profile was normalized.

But the arthralgia and myalgia was worsening day by day. Due to moderately high CPK and suggestive electromyographic picture inflammatory proximal myositis was thought of. Prior to visit in PMR department she did not fulfil the diagnostic criteria of rheumatoid arthritis or systemic lupus erythromatoses. Her other biochemical profile like calcium, phosphate, alkaline phosphatase, vitamin D level, sodium, potassium level were within normal range.

When she has been referred to PMR OPD due to rehabilitation of proximal muscle weakness, an interesting skin manifestation noted. Several discrete nonpruritic papular lesions were noted over the knuckle of both hands (as pictured below).

These classical Gottron's papule (infrequently seen) cleanched out the diagnoses of Dermatomyositis and Polymyosytis. Interestingly there was no Heliotrope rash present on her face. Now she is on steroid and nonpharmacological therapies of proximal muscle weakness. At this moment she is enjoying a completely independent and painfree life.





Author's affiliations: ¹ MD, MRCP (UK), Assistant Professor, Dept. of PMR, IPGMER & SSKM Hospital, Kolkata.

² MD, Associate Professor, Dept. of PMR, NBMC, West Bengal

REHAB CHALLENGES

A forty years old male right handed businessman had a road traffic accident two months back in a hilly area of Kashmir. Unfortunately he had a forearm accidental traumatic amputation in his right hand. After initial management he has been treated in one of the apical hospital of West Bengal. At the beginning internal fixation was done for both bone fracture of his forearm. Stump care was also given by a dedicated team. Then he has been transferred to Department of PMR for rehabilitation



He has a decent conical stump with little wound and phantom pain with a metal nail at the end point. He was desperate for final prosthetic fitting as soon as possible. At the most he consented to wait for the wound healing. The orthopaedic team planned for repeat surgery for removal of nail after 18 months. The patient was not willing to go for any further intervention. He wants to be fully independent within a short period of time.

Please opine regarding the rehabilitative management (particularly prosthetic management) of this patient.

BOOK NEWS

- 1. Orthotics and Prosthetics in Rehabilitation, Michelle M. Lusardi PhD PT , Caroline C. Nielsen PhD. Butterworth-Heinemann; 2 edition (June 30, 2006).ISBN-10:0750674792
- 2. Prosthetics & Orthotics in Clinical Practice: A Case Study Approach .Bella May , Margery A. Lockard. F.A. Davis Company; 1 edition (March 8, 2011) ISBN-10: 0803622570
- 3. Fundamentals of Musculoskeletal Imaging (Contemporary Perspectives in Rehabilitation) .Lynn McKinnis.F.A. Davis Company; 3 edition (February 4, 2010)ISBN-10: 0803619464
- 4. Pharmacology in Rehabilitation (Contemporary Perspectives in Rehabilitation). Charles Ciccone. F.A. Davis Company; 4 edition (March 27, 2007)ISBN-10: 0803613776
- Modalities for Therapeutic Intervention (Contemporary Perspectives in Rehabilitation) Susan L. Michlovitz, James Bellew, Thomas P Nolan JrF.A. Davis Company; 5 edition (June 21, 2011)ISBN-10: 0803623917

ARTICLE NEWS

- Scott Telfer, Kellie S. Gibson, Kym Hennessy, Martijn P. Steultjens, Jim Woodburn et al.Computer-Aided Design of Customized Foot Orthoses: Reproducibility and Effect of Method Used to Obtain Foot Shape. Archives of Physical Medicine and Rehabilitation, May 2012;93(5):863-870
- An-Fu Hsiao, Robyn York, Ian Hsiao, Ed Hansen, Ron D. Hays, John Ives, Ian D. Coulter et al.A Randomized Controlled Study to Evaluate the Efficacy of Noninvasive Limb Cover for Chronic Phantom Limb Pain Among Veteran Amputees. *Archives of Physical Medicine and Rehabilitation*, April 2012;93(4):617-622,
- 3. Linda Resnik, Marissa R. Meucci, Shana Lieberman-Klinger, Christopher Fantini, Debra L. Kelty, Roxanne Disla, Nicole Sasson et al. Advanced Upper Limb Prosthetic Devices: Implications for Upper Limb Prosthetic Rehabilitation. *Archives of Physical Medicine and Rehabilitation*, April 2012;93(4):710-717
- 4. Bernhardt, Kathie A.; Beck, Lisa A.; Lamb, Jeffry L.; Kaufman, Kenton R.; Amin, Shreyasee; Wuermser,Lisa-Ann. Weight Bearing Through Lower Limbs in a Standing Frame with and Without Arm Support and Low-Magnitude Whole-Body Vibration in Men and Women with Complete Motor Paraplegia. *American Journal of Physical Medicine & Rehabilitation*, April 2012;91(4):300-308.
- Worobey, Lynn; Oyster, Michelle; Nemunaitis, Gregory; Cooper, Rory; Boninger, Michael L.Increases in Wheelchair Breakdowns, Repairs, and Adverse Consequences for People with Traumatic Spinal Cord Injury. *American Journal of Physical Medicine & Rehabilitation*, June 2012. **91(6):**463-469.

BOOK NEWS

- 1. Orthotics and Prosthetics in Rehabilitation, Michelle M. Lusardi PhD PT , Caroline C. Nielsen PhD. Butterworth-Heinemann; 2 edition (June 30, 2006).ISBN-10:0750674792
- 2. Prosthetics & Orthotics in Clinical Practice: A Case Study Approach .Bella May , Margery A. Lockard. F.A. Davis Company; 1 edition (March 8, 2011) ISBN-10: 0803622570
- 3. Fundamentals of Musculoskeletal Imaging (Contemporary Perspectives in Rehabilitation) .Lynn McKinnis.F.A. Davis Company; 3 edition (February 4, 2010)ISBN-10: 0803619464
- 4. Pharmacology in Rehabilitation (Contemporary Perspectives in Rehabilitation). Charles Ciccone. F.A. Davis Company; 4 edition (March 27, 2007)ISBN-10: 0803613776
- Modalities for Therapeutic Intervention (Contemporary Perspectives in Rehabilitation) Susan L. Michlovitz, James Bellew, Thomas P Nolan JrF.A. Davis Company; 5 edition (June 21, 2011)ISBN-10: 0803623917

ARTICLE NEWS

- Scott Telfer, Kellie S. Gibson, Kym Hennessy, Martijn P. Steultjens, Jim Woodburn et al.Computer-Aided Design of Customized Foot Orthoses: Reproducibility and Effect of Method Used to Obtain Foot Shape. Archives of Physical Medicine and Rehabilitation, May 2012;93(5):863-870
- An-Fu Hsiao, Robyn York, Ian Hsiao, Ed Hansen, Ron D. Hays, John Ives, Ian D. Coulter et al.A Randomized Controlled Study to Evaluate the Efficacy of Noninvasive Limb Cover for Chronic Phantom Limb Pain Among Veteran Amputees. *Archives of Physical Medicine and Rehabilitation*, April 2012;93(4):617-622,
- 3. Linda Resnik, Marissa R. Meucci, Shana Lieberman-Klinger, Christopher Fantini, Debra L. Kelty, Roxanne Disla, Nicole Sasson et al. Advanced Upper Limb Prosthetic Devices: Implications for Upper Limb Prosthetic Rehabilitation. *Archives of Physical Medicine and Rehabilitation*, April 2012;93(4):710-717
- 4. Bernhardt, Kathie A.; Beck, Lisa A.; Lamb, Jeffry L.; Kaufman, Kenton R.; Amin, Shreyasee; Wuermser,Lisa-Ann. Weight Bearing Through Lower Limbs in a Standing Frame with and Without Arm Support and Low-Magnitude Whole-Body Vibration in Men and Women with Complete Motor Paraplegia. *American Journal of Physical Medicine & Rehabilitation*, April 2012;91(4):300-308.
- Worobey, Lynn; Oyster, Michelle; Nemunaitis, Gregory; Cooper, Rory; Boninger, Michael L.Increases in Wheelchair Breakdowns, Repairs, and Adverse Consequences for People with Traumatic Spinal Cord Injury. *American Journal of Physical Medicine & Rehabilitation*, June 2012. **91(6):**463-469.

REHAB QUIZ

1. All are true regarding PTB supracondylar- supra patellar socket except

- A. Suspension is an inherent part of socket
- B. Less restriction to circulation
- C. Kneeling is compatible
- D. Reduces pistoning

2. Which are most tear resistant

- A. Low density polyethylene (LDPE)
- B. Ultra high molecular weight polyethylene (UHMW)
- C. Silicone elastomers (SE)
- D. High density polyethylene (HDPE)

3. Which one does not belong to urethane group

- A. Flexible foam
- B. Rigid foam
- C. Plastisol
- D. elastomer

4. A superior fatigue resistant material is

- A. Steel
- B. Fibre glass
- C. Aluminium
- D. Carbon Fibre

5. Greatest cosmesis is found in gloves for terminal device

- A. Leather made gloves
- B. Custom-sculptured gloves
- C. Stock gloves
- D. Custom production gloves

6. Sierra Wrist flexion unit has all the locking position except

- A. 0 degree
- B. 30 degree
- C. 50 degree
- D. 60 degr.ee

7. Areas requiring socket relief in PTB socket are all except

- A. Head of fibula and peroneal nerve
- B. Medial tibial flare
- C. Lateral tibial flare
- D. Hamstring tendon

- 8. The function of Swanson post arthroplasty orthoses are to facilitate controlled motion of all the joints except
 - A. Wrist
 - B. MCP
 - C. PIP
 - D. DIP

9. False statement regarding Hosmer hip action and adjustable abduction orthoses is

- A. Two position lock at full extension and 95 degree hip flexion
- B. Two position lock at full flexion and 15 degree hip extension
- C. Adjustable adduction stop
- D. Distal extension of thigh cuff to medial condyle of femur

10. With quardra lateral brim the Silesian belt attached laterally

- A. ¹/₂ inch superior and ¹/₂ inch posterior of apex of greater trochanter
- B. ¹/₂ inch inferior and ¹/₂ inch posterior of apex of greater trochanter
- C. $\frac{1}{4}$ inch superior and $\frac{1}{4}$ inch posterior of apex of greater trochanter
- D. $\frac{1}{4}$ inch inferior and $\frac{1}{4}$ inch posterior of apex of greater trochanter

ANSWERS

March Issue Vol. 23(1) :

1.B, 2.A, 3.D, 4.B, 5.A, 6.C, 7.A, 8.D, 9.B, 10.B

Obituary



Prof R.Chinnathurai, active, enthusiastic, dynamic leader, who worked tirelessly from the day he took over the reins of Head of the Institution of the Government Institute of Rehabilitation Medicine, KK Nagar, Chennai has left us to heaven on August 11th, 2012.

He was born on November 15th 1954, completed his undergraduate in Tanjavur Medical College and joined the Government Service on 06.09.1981. He completed his 3 year Diploma in Physical Medicine from the prestigious Madras Medical College from the same GIRM where he became the Head of Institution before his sudden demise. He had a short stint at Kingdom of Saudi Arabia as Specialist in Physical Medicine for 4 years.

He took the charge of Director, GIRM on 20.12.2002 and continued for 2 year and again occupied the post from 1.2.2006 until his death. He is the longest serving Head of the Institution. During his tenure, the Physical Medicine blossomed in other Medical Colleges particularly the newly established medical colleges in government sector. He reorganized the services in GIRM, and brought new clinics like Pain clinic, Cerebral Palsy Clinic etc. He published a new book on Prosthetics and Orthotics for the post graduates and other medical professionals.

World Disability Day on December 3rd, every year turned out to be 3 day function in GIRM with CMEs, Sports activities for disabled people, and it brought the Ministers, Secretaries at Government level to GIRM. Government acknowledged the event and now sanctioned officially Rs 75,000 annually to conduct the event.

The memories of his untiring work and efforts to bring MD PMR post graduate course in Madras Medical College will be remembered by us forever which remains still an unfinished task. His approach to make people in the administration to understand the difficulties faced by the specialty will be a guiding pathway to the people who succeed him in realizing his vision. We pledge to complete his unfinished task and that alone will be right way to pay homage to him.

We pay our sincere condolences his wife and son a B.Tech Graduate in Biotechnology who are grieving his sudden demise. It's a great loss to them.

It was a great loss the Physical Medicine and Rehabilitation specialty also especially for the Physiatrists of Tamilnadu where he has made, irrevocable imprint both in the lives of physiatrists and also in the functioning of the department.

We sincerely pray to God Almighty for his soul to rest in Peace.

Dr. P.Thirunavukkarasu

IJPMR EDITORIAL BOARD

Editorial Board : 2011 – 2013

Editor : Prof. R. N. Haldar

EMERITUS EDITORS	-	Prof. A.K. Agarwal, Prof. Suranjan Bhattacharji, Prof. U. Singh
EDITOR	_	Prof. R.N. Haldar
ASSOCIATE EDITORS	_	Prof. U.N. Nair, Prof. Sanjay Wadhwa, Prof. A.K. Joy Singh
ASSISTANT EDITORS	_	Dr. Mrinal Joshi, Dr. Rajesh Pramanik, Dr. Anil Gaur
MEMBERS	_	Dr. S. L. Yadav, Dr. Anupam Gupta, Dr. Asim Palit, Dr. S. Sunder, Dr. P. Thirunavukkarasu, Dr. Rajendra Sharma, Dr. Ajay Gupta, Dr. George Zachariah, Dr. E. Rajendra Kumar, Dr. P. Ray
EX-OFFICIO	_	Prof. N. George Joseph, Dr. B. Ramachandran

ADVISORY BOARD

- Prof. B.K. Choudhury
- Prof. Ajit Kumar Varma
- Dr. Ratnesh Kumar
- Dr. B.D. Athani
- Dr. S.Y. Kothari
- Prof. P. K. Mandal
- Dr. Arun Kumar Sipani
- Dr. Ali Mohammad Buhroo
- Dr. K.K. Menon
- Prof. V.K. Sreekala
- Dr. S.K. Jain
- Prof. George Tharion
- Dr. M. Feroz Khan
- Dr. Asim Kumar Biswas
- Dr. T. Sreedhar
- Dr. H.C. Goyal

- Prof. Ambar Ballav
- Prof. K.B. Wangjam
- Dr. Sanjay Das
- Dr. F.E. Menezes
- Dr. R.K. Srivastava
- Dr. P. Hanumantha Rao
- Dr. A.K. Mukherjee
- Prof. A.B. Taly
- Dr. S. Hariharan
- Dr. Nirmal Surya
- Dr. Ganesh Arun Joshi
- Prof. R.K. Ghatak
- Dr. T.J. Renganathan
- Dr. B.G. Dharmanand
- Dr. Dharmendra Kumar
- Dr. K. Sunder S.

INDIAN ASSOCIATION OF PHYSICAL MEDICINE & REHABILITATION EXECUTIVE COUNCIL 2011 - 2013

President	: Dr. N. George Joseph	
Vice President	: Dr. K. B. Wangjam	
Hony Secretary	: Dr. B. Ramachandran	
Joint Secretary	: Dr. P. Thirunavukkarasu	
Treasurer	: Dr. S. L. Yadav	
Members	: Dr. Ajay Kumar Gupta	Dr. C. Ramesh
	Dr. M. M. Biswas	Dr. E. Rajendra Kumar
	Dr. N. Romi Singh	Dr. Anil Gaur
	Dr. K. Rajendran	Dr. M. C. Jayaram
Editor IJPMR	: Dr. R. N. Haldar	·
Editor IAPMR Bulletin	: Dr. Sanjay Wadhwa	
Immediate Past President	: Dr. Ajit Kumar Varma	
Immediate Past Secretary	: Dr. R. N. Haldar	
Co opted member	: Dr. Mrinal Joshi	Dr. Anupam Gupta
Regional Member	: Dr. Ashesh Roychoudhur	y – –
Chairman Academic Committee	: Dr. U. Singh	•
Chairman Membership Committee	: Dr. R. Sharma	
Organising Sec., IAPMRCON, 2013	: Dr. Anupam Gupta	

Frequency : Quarterly

ISSN0973-2209

Full text of the Journal and Guidelines to the contributors are available on website.

Subscription :

Annual subscription is Rs 2000/- (India) and US \$ 200 (other countries). Kindly send your request for subscription to the editor along with DD/ Cheque at par in favour of "Indian Journal of PMR" payable at Kolkata. Overseas per hardcopy 50\$.

The journal is despatched in India by surface mail and abroad by sea mail.

Disclaimer :

Indian Association of Physical Medicine & Rehabilitation and Editors can not be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinion expressed do not necessarily those of the IAPMR and Editorial Board, neither does the publication of advertisements constitute any endorsement by IAPMR and Editor.

Correspondence :

Editorial Office :

Prof (Dr) Rathindranath Haldar

Department of Physical Medicine & Rehabilitation, Institute of Post Graduate Medical Education & Research & SSKM Hospital, 244, AJC Bose Road, Kolkata - 700020. E-mail:indianjournalofpmr@gmail.com Phone no : 00 91 9830152173

Visit us : www.ijpmr.com and www.iapmr.org/ijpmr

Editorial

Undergraduate Medical Education in Physical Medicine and Rehabilitation

The goal of undergraduate education is to develop attitudes that will enable the student to see the patient holistically and to teach skills for diagnosis and treatment. Currently over specialization is one of the greatest dangers of an integrated medical curriculum because it leads to a tendency to teach medicine as collection of separate, disconnected subjects. It should be remembered, however, that just as the branches of a tree will die if they are cut off from the trunk, so too will the



individual medical disciplines if they are not viewed in relation to the holistic needs of the patients. Those instructing undergraduate students should relate their portion of the curriculum to the total needs of patients. Integration of all specialties will enable the student to see the patient as a human being rather than as a summation of systems. Interdepartmental education is sine qua non for good medical education at all levels. To much emphasis on teaching in traditional education system may be detrimental for the learning process. Ideally, the learning process should lead to a modification of the student's manner of thinking and feeling as well as acting. Student's assessment on formative and summative aspects should judge the student's competency and identify strength and weakness. Student feedback should include positive and negative learning experiences.

Physical Medicine and Rehabilitation during undergraduate education is important because it is neither necessary nor desirable that all patients who need rehabilitation services be treated by specialists in the field. Patients treated by virtually all of the specialities may need rehabilitation services. Thus undergraduate medical education regarding basic knowledge of rehabilitation will benefit the patients. Ideally the objectives of undergraduate education should be both prevention of disability and rehabilitation.

Every human being should be viewed as an entity connected with his or her environment. This patient and care centered approach used the existing handicap as the starting point and guide for preventive, diagnostic and therapeutic measures. In many medical institutions there is no central focus for rehabilitation medicine and thus there is no guarantee that sufficient attention is paid to the rehabilitative aspects of medicine. Even the evaluation of knowledge and skills in medical rehabilitation is not compulsory in some institute; therefore, this specialty receives insufficient attention during the students' academic programme. Some of the students may have lectures related to rehabilitation medicine but receive insufficient clinical experiences to demonstrate the benefits which patients can achieve from rehabilitation medicine.

Students are already acquainted with history taking, clinical examination and management of patients in the core subject. Only few things are to be added to deal with the disabled patients like functional history, assessment and management. There is definite guideline available for OPD, indoor rehabilitation and theoretical classes in MCI curriculum for PM&R department of this regulation. The MCI has made specific recommendation that PM&R should be taught to medical undergraduates and should be part of the core curriculum.

An undergraduate teaching programme in PMR should allow the student to -

- 1. Learn about the wider impact of long-term conditions on leisure and work.
- 2. Become competent at taking a history and performing a relevant clinical examination of disabled people.
- 3. Understand the principles of treating and managing the disabling effects of long-term conditions, in particular recognizing the role of interdisciplinary team work with other professions (nursing and therapy) and agencies.
- 4. Develop mature attitudes and behavior towards people with disability and their families.
- 5. Engender a life-long learning attitude in relation to disabling effects of long-term conditions.

Mandatory internship guideline by MCI should be followed by a universal curriculum. Last but not the least more and more Physiatrists are needed to establish independent PM&R department and teach PMR as mandatory subject in undergraduate curriculum.

Guidelines for Contributors - REVISED January 2010

Request: Please study these carefully before sending any article for publication to prevent rejections and facilitating the editorial team.

The Indian Journal of Physical Medicine and Rehabilitation (IJPMR) publishes original contributions concerning basic clinical and experimental aspects of Physical Medicine and Rehabilitation. The contributions may be in the form of research articles, short reports, case reports, letters to editors, preliminary communications and technical notes. Editorials, review articles, orations, book reviews, drug reviews, historical articles are welcome with prior information to/invitation from the Editor. The article submitted should neither have been published previously (except proceedings of a conference, congress or seminar), nor they should have been submitted for publication elsewhere simultaneously.

Peer Review: All the articles submitted to the journal, except for the invited review articles, are subjected to be reviewed by experts. The reviewers are chosen from India or abroad according to their expertise. The names of the reviewers are published in each issue of the journal.

All contributors must read the following guidelines and these should be adhered to strictly in preparing the manuscript.

Type format: Please DO NOT TYPE ANYTHING (including Titles, Names etc) IN ALL CAPITALS (UPPER CASE). Use the regular upper and lower case for typing. Exceptions only for acronyms or initials of names accepted.

Hard Copy: Please DO NOT send any hard copies in the beginning. It shall be asked for only in case needed by the editor. Send only electronic copy by email initially. We would like to save paper and save trees besides saving on postage and the space needed to store all these.

Soft Copy: Please send the articles attached with an email (preferably) in Microsoft word document (doc) format. The article can also be sent on a CD/DVD. The document should be editable. Please do not use scanned pages in place of text. Please send your files to the editor on the email address: **indianjournalofpmr@gmail.com**

Photographs and Illustrations should be separate from the text (not inserted in the text even if digitised version is used). Only digital photographs should be submitted. The names of the photographs attached should be numbered along with the name of the first author. Legends to these should be written in the text manuscript where the photograph is to be inserted with a mark in the manuscript [Please insert Figure x here]. The photographs should be taken with a good quality digital camera and not with the low resolution cameras attached with most mobile phones. The resolution should not be less than 3 mega pixels. Magnification data should invariably accompany the photomicrographs. The digital photographs should preferably be in TIFF format or JPEG format. The photograph file should be uncompressed. If printed photos are used, please scan them in not less than 300 dpi resolution and send the uncompressed JPEG or TIFF format file of the scanned image. The photographs should not be embedded or pasted in the text or document file.

Contents' Format: The article manuscript submitted should be in the following format:

Title of the article

Full Names of the Authors, including Qualifications, Designations, Institutional Affiliation, Complete address of the Institution. Email address of each author should also be given.

Account of contributions done by each author should be mentioned after the above. In general total number of authors should not be more than 6 (six). If the number of contributors is more than 6, reasons should be given invariably regarding their contributions. Care should be taken to include only those authors who have actually contributed significantly to the study and preparation of the manuscript. Those who have provided some help should be included in the list of acknowledgements. 'Guest' or 'gift' authorship should be avoided.

Name of Institution where study was done. Complete details of the department, institution, postal address and website address (if any) of the institute should be mentioned.

Name and Address for Correspondence. Full Name, address, email address of the author for correspondence is a must. Phone number or FAX (if any) are optional. Abstract should be not more than 200 words.

Key Words should preferably be those used in Index Medicus as Medical Subject Headings.

Manuscript should normally have Introduction, Material and Methods, Observations, Results, Discussion, Conclusions, Acknowledgements (if any), What we already knew and what we learn from this article and References.

What we already knew and what we learn from this article should be summarised in two-three lines after the conclusions. In other words, the carry home message/ learning from this article.

References should be quoted in the text by way of a number in superscript. The sequence should be in the order as they are quoted in the text. Only those references quoted in the text should be included. These should be referred to in superscripted Arabic numerals in the sequence of their appearance in the text in Vancouver Style, e.g., reference one and four is to be quoted in the text of the manuscript as superscript^{1, 4} Responsibility of accuracy of information given in references/bibliography rests with the contributors. Any errors on this account may render the article liable for rejection. References should be from authentic sources, e.g., journals, books, monographs etc. Online references should be restricted to web-sites of reputed scientific/medical institutions, associations, journals, libraries or universities. Thesis or dissertation should not be quoted unless published.

Examples of correct form of References: Journal Articles: Author(s) of article (surname initials). Title of article. Journal title abbreviated Year of publication; volume number (issue number): page numbers (first-last). [e.g. Barry MA, Purser J, Hazleman R, et al. Effect of energy conservation and joint protection education in rheumatoid arthritis. Br J Rheumatol 1994 Dec; **33(12)**: 1171-4.] **Chapter or article in a Books:** Author(s) of chapter (surname initials). Title of chapter. In: Editor(s) name, editors. Title of book. Place of publication: Publisher; Year of publication: page numbers (first-last). [e.g. Gascon-Barré M. Antiepileptic drugs and bone health. In : Dawson-Hughes B, Holick MF, eds. Nutrition and bone health. Totowa-New Jersey-USA :Humana Press; 2004: 647-66.]

World Wide Web: Author/editor (surname initials). Title [online]. Year [cited year month day]. Available from: URL: [Full address of the URL] [e.g. McCook A. Pre-diabetic Condition Linked to Memory Loss [online]. 2003 [cited 2003 Feb 7]. Available from: URL: http:// www.nlm.nih.gov/medlineplus/newsfullstory_11531.html]

Tables should be sent in original spreadsheet/table format in the document. Please do not scan tables after printing. These should be in editable mode. These should be appended at the end of the manuscript or in a separate file attached with the email. Tables should not contain more than 6 columns. Metric system should be used throughout. These should be numbered and referred to (where they should be placed, in the text. These should be suitably captioned. Any table that is not found to be enhancing the understanding of the article, in the opinion of the editorial board, is liable to be omitted.

Charts should be patterned and not coloured (since these are printed in black and white). These should be sent in the editable mode. These should be appended after the tables or should be attached as a separate file.

Any deviation from this sequence must be explained in the covering letter.

Legends to figures, illustrations and photographs etc. should be neatly given in a separate sheet.

Copyrighted Material: Responsibility of obtaining due permission for any copyright material included in the article rests with the authors. In the case of any lapse, the entire legal responsibility would be borne by the contributors themselves.

Right of alterations in the article: The editorial board reserves the right to make any number of alterations and corrections, if required.

Ownership and copyright of the article will stand transferred to IJPMR on the acceptance of article for publication and the same is not allowed to be published in any other journal in the same form in whole or in part without the written permission from the Editor.

Undertaking: All authors should sign the following undertaking (in the same order as their names appear in the list of authors): If undertaking is sent by email, each author should send a separate email to the editor.

I/We certify that the article titled [Title of the article], authored by [Names of all authors] is my/our original work and I/We have not sent it for publication elsewhere nor it has been accepted for publication any where else. I/We agree with the order of the authors as given in the paper and also mentioned below. I/We hereby transfer the copyright of the article to the Indian Journal of Physical Medicine and Rehabilitation. I also certify that I have read the latest guidelines for submission of the articles in the IJPMR and the manuscript has been prepared accordingly.

Sl. No. Name of author Signatures

1.

2. (If sending this by email, the author can just write his name, digital signatures are not needed)

The undertaking must accompany the manuscript, otherwise the manuscript will not be processed further. The signed undertaking may also be sent after scanning as an attachment with the email.

Reprints: The authors shall not be provided with the hard copies of the reprints. Since at present the journal has free access on the net, the authors are advised to make use of this facility. They can download, save and print their articles once published on the net as desired by the authors. If the authors wish to have hard copies of the reprints, the reprints can be ordered on payment at the time of submitting the articles, in advance. A demand draft for an amount of Rs 500/- (Rupees Five Hundred only) may be made in favor "Indian Journal of Physical Medicine and Rehabilitation" payable in "New Delhi" against advance payment for 10 reprints. If more reprints are needed, these can be ordered @ Rs 500/- per set of 10 reprints. For addresses outside India, in order to cover the postal charges, the rates for reprints shall be double, i.e. Rs 1000/- for 10 reprints. The rate may vary depending on the size of the article. The decision of the editor would be final in fixing the rate of reprints. If the payment for reprints has been made and the articles is subsequently rejected for publication, the amount shall be refunded. Request for reprints made after submission of the articles may not be entertained.

Disclaimer: Statements and opinions expressed in any material published in the Journal are those of authors, contributors and advertisers. The Editor, the Editorial Board, the office bearers of the Indian Association of Physical Medicine and Rehabilitation, the printer and the publisher of the Journal are in no way responsible for any liability arising out of the same.

In case of Rejection: The Editor or any member of the Editorial Board will not entertain any inquiry or correspondence about a paper that has been found unsuitable for publication. The editor reserves the right not to disclose the reason why a paper has been rejected for publication. In this regard the decision of the Editor will be final and binding to all concerned.

Checklist: Please go through the instructions once again on the website of the journal: www.ijpmr.com before submission of your article.

Thank you for your time and attention to read the above. Your reading this would help us a great deal in making the journal better.

Manuscript should be addressed to: Postal Address:

Prof (Dr) Rathindranath Haldar, Editor

Department of Physical Medicine & Rehabilitation, Institute of Post Graduate Medical Education & Research & SSKM Hospital, 244, AJC Bose Road, Kolkata- 700020. E-mail : indianjournalofpmr@gmail.com Phone no : 00 91 9830152173 Visit us : www.ijpmr.com and www.iapmr.org/ijpmr



The African Nations are so indebted to Jaipur limb Technology that Kenya Government issued a stamp in their country with an amputee fitted with Jaipur foot.