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# Short Term Rehabilitative Outcome and its Predictors in Guillain Barré Syndrome

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## Abstract

Clinical and electrophysiological data of 34 patients suffering from Guillain Barré Syndrome (GBS) were analyzed. Functional disability and predictors of outcome was determined using Hugh's scale and Medical Research Council (MRC) scale at 0, 2 and at 4 weeks. Good outcome was defined as the ability to ambulate without assistance. 56% patients were males with mean age of 18.41 years (SD ±13.88). Preceding illness was seen in 76.5%. Mean days to disease nadir was 4.6 days. Weakness (50%) was the predominant chief complaint. Mechanical ventilation was required in 41.2 % patients with a mortality of 7.1%. Independent ambulation was achieved by 61.8% and 17.6% with support at the end of study period. Increasing age ($p<0.01$), days to nadir ($p=0.00$), duration of ventilation ($p<0.001$), severity of motor deficit at disease nadir ($p<0.001$) and high Hugh's score ($p=0.00$) affected outcome. Mechanically ventilated patients had poorer outcome. Although the recovery from severe GBS was prolonged, most survivors regained independent ambulation.

**Key words**: Guillain Barré Syndrome, prognostic factors, rehabilitative outcome.

## Introduction

The Guillain Barré Syndrome (GBS) is a post infectious severe evolution of demyelinating polyradiculoneuropathy with a postulated autoimmune pathogenesis.[1, 2] With poliomyelitis under control, GBS is now the most important cause of acute flaccid paralysis.[3] GBS has become the most common cause of neuromuscular paralysis in Western countries, with an annual incidence of 0.75 to 2.0 per 100,000 population.[3,4] In China, the reported an annual incidence of 0·66 per 100,000 for all ages.[5]

GBS diagnosis is made primarily by history and clinical findings.[1] The condition is characterized by progressive and often profound weakness with nadir within one month followed by a variable course of recovery over weeks to several months. Even when intensive care facilities are available, up to 10% patients may die in the acute phase of the illness and 20% are left with some disability one year after onset.[6] Approximately 40% of the patients who are hospitalized with GBS will require inpatient rehabilitation.[7,8] 5% may die of complications[9]. Relapses are rare, occur at rates of 3-5%.[10]

GBS is classically a demyelinating neuropathy with ascending weakness. Many clinical variants have been documented. Acute inflammatory demyelinating polyradiculoneuropathy (AIDP) is the most widely recognized form in Western countries,[1, 11] but recently acute motor axonal neuropathy (AMAN) and acute motor-sensory axonal neuropathy (AMSAN) also are well recognized.[12, 13, 14]

GBS is a striking problem in India, a good number of young and old persons being affected either with paralysis or respiratory distress or any residual disability. GBS is a disease that often leads to a functional deficit.

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Approximately 85% of patients with GBS achieve full and functional recovery within 6-12 months.[15] The 7-15% who do not recover completely benefit from long term use of assistive devices and rehabilitation strategies.[10]

Various studies have been done to define the diagnostic criteria, antecedent events treatment and prognostic factors affecting outcome.[3, 8, 16, 17] Both plasma pheresis and IVIG are accepted treatment modalities.[18, 19] IVIG is the chosen method of treatment in our centre. Studies from the rehabilitative spectrum are few. There are multiple medical and psychological factors in GBS that can interfere with rehabilitation.[20]

In this study we aimed to document the demographics, clinical characteristics, and complications and to analyze the rehabilitative outcome and the predictors of outcome in patients of GBS.

## Material and Method

The study was conducted in the Department of Physical Medicine and Rehabilitation in collaboration with Respiratory Care Unit (RCU), IPGMER, Kolkata during March 2007 to August 2008. The institutional ethical clearance was obtained.

Inclusion criteria : Cases were selected from those admitted in RCU and general medical wards. 34 patients diagnosed as Guillain-Barré syndrome (AIDP) as based on National Institutes of Neurological Disorders and Stroke (NINDS) Committee (with modifications proposed by Asbury et all 1990)[21] were selected.

The criteria for case selection was 1) onset of diffuse lower motor neuron paresis-usually rapid in onset, often ascending, usually symmetrical, proximal or distal or both.2) Areflexia or hyporeflexia.3) Sensory involvement if present, less severe than motor impairment.4) Electrophysiological criteria 5) CSF study.

Exclusion criteria: 1) Marked persistent asymmetry of weakness.2) Poliomyelitis 3) Diabetic neuropathy 4) Alcoholic neuropathy 5) Porphyria 6) A sharp sensory level. 6) Drugs and metals exposure.

Detailed history and clinical examination were done. Patients were assessed on admission (0), 2 weeks and 4 weeks by standard neuromuscular evaluations. Clinical recovery was defined as the absence of symptoms and signs that interfered with activities of daily living. Factors that were etiologically significant, medical interventions, relevant investigations, need for ventilation, hospital stay, Hugh's disability scale,[17, 18] and Medical Research Council (MRC) [22] scores were noted .Vital signs were regularly monitored and any signs of respiratory distress were checked apart from regular blood gas analysis. The following features were determined: age, gender, antecedent episodes in the four weeks before onset of weakness, a gastrointestinal or upper respiratory tract infection, time from onset of weakness, distribution of muscle weakness, disability score, MRC sum score, presence of sensory loss, and cranial nerve deficits and requirement of ventilation and factors correlated with it. At study entry and during fourteen weeks of follow up neurological examinations were performed. To assess the distribution of muscle weakness on entry to the study, the strength of some proximal and distal muscles was assessed according to the MRC sum score.Sensory evaluation was performed at each visit in both upper and lower limbs. A good functional outcome was expected on achieving Hugh's disability grade 2 and adequate muscle power of at least grade 3 and above for unassisted gait.

Rehabilitative measures to reduce impairments and disability were started early. Patients went through daily range of motion (ROM) exercises and proper positioning to prevent muscle atrophy and joint contractures. Addressing upright tolerance and endurance was also a significant issue during the early part of rehabilitation. Active muscle strengthening was then introduced slowly. Mobility skills, such as bed mobility, transfers, and ambulation, were targeted. Patients were monitored for hemodynamic instability and cardiac arrhythmias.

Orthoses, assistive devices, modalities like electrical stimulation was given as and when required. In addition pulmonary care, maintaining nutrition, bladder bowel care, skin, eye, mouth care, pain management, deep vein thrombosis prophylaxis and psychological counseling were a part of the rehabilitation program.

Data was analyzed by Statistica version 6 (statsoft incorporation, Tulsa, Oklahoma, 2001), statistical software.Data was summarized by descriptive measures namely mean, standard deviation, median and inter quartile range. Subgroups was made on the basis of age (with 12 years as cut off), gender, and occurrence of enteritis as preceding event and use of ventilation. Numerical variables were compared between relevant subgroups by Mann Whitney U test while categorical variables were compared by Chi Square tests or Fisher's exact test, as appropriate. Friedman's analysis of variance was used to assess change in scores over time followed by Wilcoxons matched pairs signed rank test for assessing difference between any two time points.All analysis was two tailed with $p<0.05$ taken as statistically significant.

## Results

Out of 34 patients there were 56% males with a mean age of 18.4 (SD ±13.88), most being below 30 years.

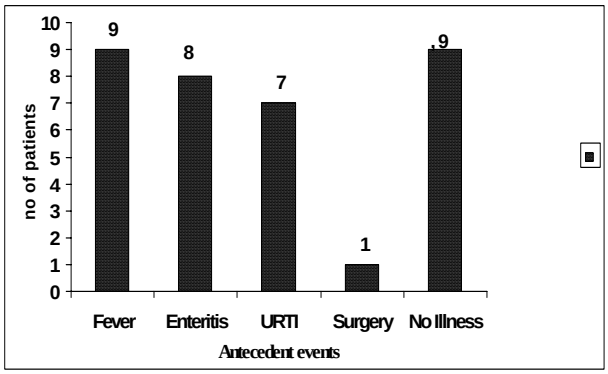


Figure1: Antecedent events prior to onset.

There were 20 patients from urban locality (58.8%) and 14 patients from rural areas (41.1%).

76.4% patients conformed to the classic description of a preceding illness (Figure 1). Maximum latent period was 26 days and the minimum was 1day the average being 5-8 days.

The onset of paralysis was in most cases insidious and progressive in 30 patients and only 4 had an acute onset within hours to 2 days **.**The maximum days to disease nadir being 12 days and minimum is 1 day. The mean days to disease nadir are 4.6 days. (SD± 2.32), median 4.00 days (Q R± 3.00).

Modes of progression of the disease on admission is represented in the table 1.

| ***Modes of progression of Paresis*** | ***No (%)*** |
|---|---|
| BLL to BUL and Cr Nn with resp Support | 14(41) |
| LL no progression | 3 (8.8) |
| BLL and BUL, no progression | 16(47) |
| Cr Nn along with UL with gradual involvement of BLL | 1(2.9) |

Table 1. Modes of Progression. (BLL: both lower limbs, LL: lower limbs, BUL: both upper limbs, Cr Nn: Cranial Nerves.)

The presenting complaint was mostly weakness (50%) and weakness with tingling and numbness (29%). Some patients presented with tingling only (11.8%) and myalgia (8.8%). The pattern of muscle involvement varied in axial distribution but was fairly symmetrical. In the sensory examination, it was seen that subjective feelings of tingling and numbness were most common, followed by pain in lower back and lower extremities seen in 3 patients.

The lower extremities reflexes were involved in all 34 cases and upper extremities reflexes in 31 cases. During recovery, the upper limb reflexes were quick to recover than the lower limbs which remained absent in 13 cases at the end of study, especially the ankle jerk.

Bilateral Facial nerve was involved (26.5%), lower motor neuron type. 15 patients (44.1%) had bulbar weakness ($9^{th}$ and $10^{th}$ nerves) complaining of difficulty in swallowing, pooling of saliva and dysphagia. No other cranial nerve involvement was observed. The facial nerve and the palatal and pharyngeal palsies were transient in all cases.

On admission retention of urine was seen in 8 patients (23.5%). In most cases patients were catheterized and they regained control over the bladder in few days. 5.9% had constipation. Autonomic signs and symptoms were observed in the 35.3%. One patient each had developed hypertension and hypotension. Arrhythmias were uncommon.

Nerve conduction study (NCS) showed low motor unit action potential in all the 31 patients examined for this.

25 patients (73.52%) were treated with standard regime of intravenous immunoglobulin.

The Hugh's disability scoring system showed a progressive improvement over time from a mean value of 4.35 initially to a mean of 1.42 at the end of study (Friedman's ANOVA test had a $p<0.001$).

The Medical Research Council (MRC) score showed a steady improvement over time from a mean value of 15.26(SD±11.66) initially to a mean score of 52.53(SD±9.17). However age and the status of ventilation affected the MRC scores as shown in Figures 2 and 3.

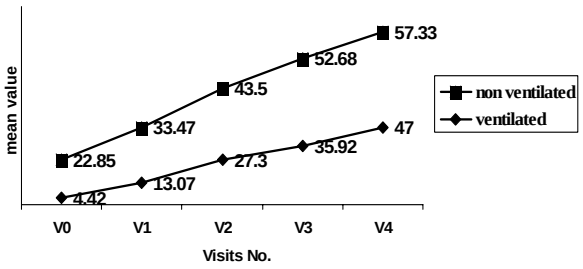


Figure 2: MRC scores across time in ventilated and non ventilated patients.

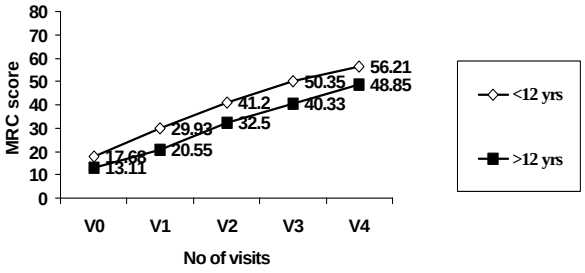


Figure 3: MRC scores across time in two age groups.

14 (41.2%) developed respiratory impairment and had to be placed on mechanical ventilation. One patient on ventilation expired.Mean duration of ventilation was 18.7 days and median value was 12 days .There is significant co relation between the ventilation duration and poorer outcome ($p < 0.001$) in both the Hugh's scale and MRC scale at the end of study period. Co relation between Spearman rank test was 0.382 (fair correlation) with Hugh's score at baseline and 0.14(poor correlation) with MRC score at baseline(V0). However at the end of study period (V4), ventilation duration showed a good correlation with Hugh's score (0.476 )and a good inverse correlation with MRC score (-0.602). So longer the duration of ventilation, poorer was the outcome of the patients. Several factors which showed association with respiratory involvement were: Bulbar involvement (p value < 0.001), Cranial nerve involvement (p value 0.017), Sensory involvement (p value 0.035).

Autonomic involvement (p value 0.036). Age had a significant correlation with ventilation ($p = 0.010$) and days to disease nadir ($p=0.001$) However in this present study factors which failed to show any significant association was gender, upper limb involvement, antecedent event, Nerve Conduction Study result and treatment.

The complications during hospital stay were seen in majority (73.52%), table 2. There were no cases of deep vein thrombosis, heterotrophic ossification and severe cardiac arrhythmias.

| *Complications* | *% of patients* |
|---|---|
| Transient urinary retention | 23.5 |
| Constipation | 0.9 |
| Pneumonia | 8.8 |
| Pain | 26.5 |
| Contactures | 14.7 |
| Hypotention and hypertention | 5.9 |
| Dysphagia | 44.1 |
| Pressure sore | 2.9 |
| Death | 2.9 |
| Urinary tract Infection | 2.9 |
| Tracheostomy | 2.9 |

Table 2: Complications during hospital stay.

Out of 34 patients, there were 4 drop outs during follow up and one death during in-patient stay. 61.8% of the study population achieved the ability for independent mobility. Children in this study, showed a better recovery pattern than those above 12 years ($p<0.05$).Around 33.3% of this population was unable to do manual work. A percentage of 17.6% achieved the ability to ambulate with support such as canes, walkers and orthoses. Upper extremity recovery was good in all these cases. Activities of daily living were mostly achieved by the patients apart from those having difficulty during gait. 2.9% (one patient) remained confined in bed. Fatigue was an often complaint. Postural hypotension was another complaint in few patients especially after inpatient discharge. 64.3% had no sensory symptoms while the remaining had pain and paraesthesia.

## Discussion

Despite numerous studies, there is still some uncertainty concerning GBS outcome. This could be due to the fact that most studies are based on small populations that analyzed retrospectively or focus on patients admitted to clinical trials, which usually include more severely affected individuals. Moreover, one reason explaining the discrepancies in the epidemiologic results is the difference in diagnostic criteria used for defining GBS, a problem that can be overcome by considering only the studies based on NINDS [21] criteria.

A higher incidence in males 55% in comparison to 44% in females were seen in this study. A higher incidence of GBS in males has been reported in most studies[3, 5], with a male to female ratio ranging from 1.1:1 to 2:1. This finding is similar to what has been observed in two other autoimmune disorders of the peripheral nervous system: multifocal motor neuropathy with conduction blocks and chronic inflammatory demyelinating. The study population was mostly below the age of 30 years (79%).The youngest being 2 years of age and the oldest 49 years. It supports the view that GBS occurs in younger age group in Asian population.[23]

26 patients (76.47%) had some form of illness preceding the weakness. The examined period is too short to determine the presence of a seasonal trend. The largest proportion had non specific febrile illness followed by enteritis and upper respiratory tract infection which is consistent with other studies.[24, 25] In adults a higher frequency of enteritis was seen .[26, 27] Antecedent event like enteritis did not seem to affect the outcome of the disease ($p>0.05$.) .This was not consistent with other reports,[6] which may be because of small study population and a greater number of patients in the younger age group having a better outcome at the end of study period. It is of note that in one case (2.9%) GBS followed surgery. The incidence of post-surgery GBS is low and its etiology remains uncertain.[2]

The presenting symptom was pure motor weakness in 50% of the population and associated with paraesthesia 29%. Back and thigh pain was seen in 8.82% this was also reported by Italian and Taiwan study group[17, 22.]

The length of time from when the first symptoms appear to the point of maximal neurological dysfunction is

reported as the "disease nadir." The point of disease nadir has frequently been referred to as the point at which outcome and therapeutic intervention has been considered critical but this has never been established. The mean days to disease nadir is 4.6 days (SD±.2.32).The shorter time to disease nadir was predicted to have a poorer prognosis and severity in this study which corroborates with the Italian study group.[17]

The present study showed patients having motor weakness more on lower limbs. Sensory symptoms too were mostly in the lower limbs. Upper limb paralysis was identified in a higher proportion of patients who subsequently received mechanical ventilation, but this did not reach statistical significance.

Electro diagnostic studies revealed that demyelinating pattern was the commonest pattern overall especially in children less than 12 years. The least common was the axonal variety. There is no significant co-relation between age groups and NCS pattern. (Chi square p value test 0.118).

Regarding treatment, IV immunoglobulin was the mainstay of treatment in 25 patients. However there was no significant difference observed in worsening of symptoms and outcome between and those receiving immunoglobulin and those without. Though studies [28] have found no convincing evidence of the benefits of IVIG the authors enumerated several confounding factors that may have affected data..

Respiratory involvement had has been unequivocally associated with worse functional outcome in the literature on GBS.[17, 29, 30] The presence of increasing age, bilateral facial palsy, bulbar involvement, autonomic dysfunction, and rapid disease progression were also associated with an increased likelihood of mechanical ventilation.[31] Patient-dependent factors such as gender, upper limb involvement, antecedent event and the nerve conduction study result did not predict the progression to mechanical ventilation. Patients with GBS in the ICU are prone to develop pneumonia and upper respiratory tract complications.[32] 3 patients in this study developed pneumonia, which is less than previously reported.[29] Measures that may have assisted in the management of patients with GBS include chest physical therapy and intermittent mandatory positive pressure ventilation, elevating the head of the bed and minimizing aspiration, performing serial respiratory function measurements to monitor improving diaphragmatic function, and maintaining a surveillance system of the infectious organisms present in a particular ICU. Ventilation requirement is a significant prognostic factor in functional outcome, as evident in Hugh's score and MRC score of the patients.

Paraesthesia did not affect functional outcome in our study and this is consistent with previous reports.[29]

Micturition disturbances as retention were a common problem. This was consistent with previous reports and detrusor areflexia, non relaxing urethral sphincter, disturbed bladder sensation and detrusor over activity have all been known to occur[33]. None of the patients required prolonged indwelling catheterization which is consistent with the reports that urological dysfunction usually resolves and improves[33] .All patients with retention had paraparesis or tetraparesis.

Tetraparetic patients who required nasogastric feeding had poorer outcomes.The severity of paresis have been correlated with poorer outcomes[34]. The requirement of nasogastric feeding indicates the involvement of bulbar cranial nerves and a more severe illness.

A few patients complained of pain with occasional flares. Pain in GBS has a neuropathic, musculoskeletal and visceral autonomic quality, all of which have been described.[35, 36] Various topical agents, Paracetamol, Tricyclic Antidepressants and NSAIDs had been prescribed with good results**.** Simple physical measures such as gentle massage and cold packs together with reassurance were also helpful.

There were no cases of deep vein thrombosis or heterotrophic ossification identified through routine clinical screening which have been reported previously.[8] Despite preventive rehabilitative measures were advised throughout; there were cases of decubitus ulcers and contractures. Early mobilization from bed with assisted transfer to a chair was encouraged in all patients, whenever possible, as soon as head control was achieved, even whilst ventilation continued. This contributed to the prevention of contractures and limb pain and improvement in patient's morale.

The number of dysautonomic patients was relatively small in this study. This group has been reported to be notorious for fatal arrhythmias [29] but our small study group precludes further analysis.

A relapse rate of 13% and a death rate of 11 to 18% have been reported [17]. There were no relapses in this study although there was one death (7.1%) in the ventilated population.

It is encouraging to note that majority of the patients 61.7% had a good outcome and were able to ambulate without assistance. 33.3% of this population was unable to do manual work. Upper extremity recovery was good in all these cases. 17.6% of the study population achieved the ability to ambulate with support. In the Italian study group [17] 15% of the 108 survivors had disability grade 3

and more 2 years after onset. Activities of daily living were mostly achieved by the patients apart from those having difficulty during gait. 2.9% (one patient) of the study population remained confined in bed. Fatigue was an often complaint. Sensory deficits were few and similar to previous studies [34]**.** Children below 12 years of age showed a better recovery pattern than those above 12 years ($p<0.05$). This was consistent with available literature.[17, 29]

Several studies have shown that the mortality and outcome in terms of residual disability correlate with the severity of motor deficit at the nadir of the disease and that mechanical ventilation is a particularly poor prognostic feature.[6, 17, 29] This study strongly corroborates with these prognostic factors previously identified. Rapidly progressive disease leading to quadriparesis within one week was shown to be a poor prognostic factor in one series, [23] but this could not be confirmed in the present series. Cardiac arrest are also a significant causes of mortality but, as in the present series, sudden death due to cardiac arrhythmias in patients with Dysautonomia is uncommon.The prognostic factors identified in this study were increasing age, days to nadir, requirement of ventilation, duration of ventilation, high Hugh's grade and severity of motor deficit at disease nadir. One of the most important prognostic factors for the outcome of patients with Guillain-Barré syndrome is the severity of muscle weakness[6] Children had a better recovery of power than adults while gender was not found to be significant. Requirement of ventilator and duration of ventilation was strongly associated with poor motor recovery ($p<0.000$).

The Hugh's disability scale is used frequently and is easy to administer. The Hugh's disability score at nadir was an individual predictor functional outcome. However it does not measure cognitive impairments which have been reported in severely affected individuals Functional outcome as measured by the Hugh's score and MRC score did correlate with the requirement for ventilator support and agrees with other epidemiologic studies that generally evaluated outcome by ambulatory function.[15]

Our study had a few limitations. Our sample size was small and did not represent the entire spectrum of GBS.

## Conclusion

The requirement for ventilator support had the most significant impact on outcome.The presence of bilateral facial palsy, bulbar involvement, autonomic dysfunction, and rapid disease progression were also associated with an increased likelihood of mechanical ventilation. Upper limb involvement, considered to be a factor for ventilator dependence in other studies, was not shown to be a statistically correlated factor in this study. Compared to other studies, number of fatal autonomic dysfunctions were found to be few after comprehensive rehabilitation approach was utilized in this study. The prognostic factors identified in this study were increasing age, days to nadir, requirement of ventilation, duration of ventilation, severity of motor deficit at disease nadir and high Hugh's score.

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# Clinical Profile of Patients with Osteoarthritis of the Knee A Study of 162 Cases

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## Abstract

One hundred sixty two patients of osteoarthritis (OA) knee were studied to describe their clinical profile. The patients were included according to the criteria developed by the American College of Rheumatology. Detailed history, clinical examination and X-rays were carried out. The data were analysed statistically and the results were expressed in percentage and frequency. In this study, 96 (59.3%) were male and 66 (40.7%) were female. The mean age of the subject was 53.73 ± 11.35 years. Most of the patients of were in the age group of 50 to 59 years. Maximum number of females in the age group of 35 to 45 years was affected. Most of the males were affected in the later ages, between 55 to 65 years. Most of the patients were middle class (68.5%) and housewives (35.8%). Mean height was 159.99 ± 8.12 cm and mean weight was 63.34 ± 11.60 kg. Mean duration of symptoms was 25.25 ± 38.85 months. Most patients gave the history of gradual onset of the pain (87.7%). Most of the patients had no morning stiffness in the knee (90.1%). Morning stiffness was present in 9.3% but it was for less than one hour. Maximum patients had intermittent pain (53.7%) but 46.3% patients had constant pain. By this study, it can be concluded that OA knee is commoner in males but females develop it earlier in the life than the males.

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## Introduction

Osteoarthritis is the most important of the rheumatic diseases and is responsible for a huge burden of pain and physical disability[1]. Osteoarthritis is characterised by both degeneration of articular cartilage and simultaneous proliferation of new bone, cartilage, and connective tissue[2]. It is the most prevalent form of arthritis and it is the principal cause of disability in the elderly[3-6]. The area of local damage occurs in those parts of the joint subjected to maximal mechanical stretch[7]. This in addition to the epidemiologic associations with trauma and abnormal joint biomechanics makes it clear that OA is a mechanically driven disorder. The process of abnormal tissue turnover with loss of cartilage volume and on increase in bone and capsular tissue, are chemically mediated[7]. Mild OA of the knee is extremely common, mainly affecting middle aged and elderly women[8]. The knee is a complex joint, with three major compartments: the medial and lateral tibio-femoral joints and the patello-femoral joint[9]. Each of these areas can be affected by OA separately, or in any combination. Maximum evidence of cartilage damage is usually found on the lateral facet of the patella in the patello-femoral OA, and on the tibial plateau area least well protected by the meniscus in tibio-femoral disease[9].

Patients presenting with knee OA fall into two major categories; younger people, often men, with isolated knee disease that may be related to a previous injury or operation such as meniscectomy and middle aged and older people, predominantly females, who often have OA of other joint sites, including the hands. Obesity is very strongly associated with knee OA, particularly in the older female group[9]. Pain on walking, stiffness of the joint and difficulty with steps and stairs are the major symptoms. The physical signs depend on the distribution and severity of the OA within the joint. Wasting of the quadriceps muscle, bony swelling, and tenderness on and around the joint line, painful limitation of full flexion and course crepitus are the usual signs. Medial compartment disease often results in a varus deformity, a very common finding in knee OA. In patello-femoral OA, anterior crepitus,

abnormal movement, and tracking of the patella and tenderness on patella compression occur. Predominant lateral compartment OA can cause valgus deformity. These deformities may influence the activities of the patient affected with knee OA. Even the patient may become unable to do normal work.

A wide variety of treatments are available for those who suffer from OA of the knee. They range from simple educational help to highly technical and skilled physical, medical or surgical procedure[8]. Much can be done to relieve symptoms, optimise function and improve the quality of life. To improve quality of life, we should know the problems and condition of the patients of OA knee joints. For this purpose we studied clinical profile of 162 patients of OA knee.

## Material and Method

**Selection of the patients:** The patients having OA-knee were selected from the department of Physical Medicine and Rehabilitation and those referred from various out patient departments of Chittagong Medical College Hospital (CMCH) and also from general practitioners out side the hospital. Detailed history was taken, clinical examination and X-rays were carried out. The patients were selected according to the clinical criteria developed by the American College of Rheumatology (ACR)[10] which is as follows:

1. Knee pain for most days of prior month.
2. Crepitus on active joint motion.
3. Morning stiffness of the knee $\leq$ 30 minutes.
4. Age $\geq$ 30 years.
5. Bony enlargement of the knee on examination.
6. Bony enlargement.

OA knee was considered to be present when: 1, 2, 3, 4, or 1, 2, 5 or 1, 4, 6 were found.

**Recording:** Nature of the study was discussed with the patients and their verbal consent was taken. History, clinical examination and X-rays were done.

**Statistical methods:** The numerical data were analysed statistically with the help of SPSS windows-12 version.

## Results

A total of 190 patients of OA knee were included in the study. But 28 patients dropped out from the study because they could not attend for physical therapy and/ or could not follow the instructions of daily living properly. Hence, 162 patients followed the treatment advised to them. Out of these, 96 (59.3 %) were males and 66 (40.7 %) were females. The male: female ratio was 1: 0.68.

**Age:** The mean age of the patients in study were 53.73 ± 11.35 years. Most of the patients were in the age group of 40 to 59 years. On the other hand, it was found that maximum females were affected in their earlier ages (between 35 to 45 years age); but most of the male persons were affected in their late ages (between 55 to 65 years age).

| **Age group** | **No** | **%age** |
|---|---|---|
| 30-39 years | 15 | 09.3 |
| 40-49 years | 44 | 27.2 |
| 50-59 years | 45 | 27.8 |
| 60-69 years | 37 | 22.9 |
| 70 years and above | 21 | 12.8 |
| *Total* | 162 | 100 |

Table 1: Age distribution of patients.

**Occupation:** A majority of the patients were housewives (35.8%) followed by retired servicemen (19.1%) and those on government service (17.3%). Others were labourers (6.2%), salesmen (0.6%), businessmen (6.8%), field workers (1.2%), cultivators (4.9%), drivers (1.2%), teachers (3.1%), barbers (0.6%), defence servicemen (1.2%), imams (1.2%) and garment workers (0.6%).

**Socio-economic condition:** Most patients were in the middle class group (68.5%), their monthly income was in between Bangladeshi Taka (BDT) 2001 to 6000. Some patients were poor (29.6%), their monthly income was less than BDT 2000 and a very few patients were rich (1.90 %), their monthly income was more than BDT 6000. Most of our study subjects (121 patients, 74.7%) came from the Chittagong metropolitan city and the rest came from the villages nearby.

**Clinical characteristics:** Mean height was 159.99 ± 8.12 cm and mean weight was 63.34 ± 11.60 kg. Median duration of symptoms was 25.25 ± 38.85 months.All patients were married. Most patients gave the history of gradual onset of the pain (87.7%), some gave the history of sudden onset (7.4%) and some gave the history of pain in the knee after trauma (4.9%). Most of the patients had no morning stiffness in the knee (90.1%) and some had the morning stiffness (9.30%) but it was less than one hour. Maximum patients had the pain intermittent in character (53.7%) but 46.3% of patients had the pain constant in character. It was found that most of the study subjects were suffering from both sided knee OA (48.1%), 44 ( 27.2 %) patients were suffering from right sided knee OA and 40 (24.70 %) patients were suffering from left sided knee OA.

## Discussion

One hundred sixty two patients of OA knee were studied. Out of them, 96 (59.30 %) were males and 66 (40.70 %) were females. The male: female ratio was 1: 0.68. In a

study at Chittagong, Bangladesh, it was found that 61 % of the patients were males and 39% were females[11]. In another study it was found that 64.80 % of the study subjects were males and 35.20 % were females[12]. This is in favour of the findings of our study. Although men and women are equally prone to develop knee OA, but more joints are affected in women than men[13]. The male preponderances may be due to more male attendance in the hospital than female because of social and religious belief. In our study, the mean age of the patients in study was 53.73 ± 11.35 years. Out of 162 patients in the study, most of the patients of knee OA were at the age group of 40 to 59 years. In the other two studies, the mean age was found 53.14 ± 7.7 years and 55.44 ± 7.40 years and most of the subjects were of 50 to 59 years age group[11, 12]. This is to some extent same as the result found in the present series. On the other hand, it was found in our study that most of the female patients were affected with OA- knee in their earlier ages (between 35 to 45 years age); but most of the male patients were affected in their late ages (between 55 to 65 years age). This may be due to occupation of the female as they usually works with knee bent position in their house. In a study at Taiwan, MH Jan et al. found the mean age of the OA- knee patients was 62.4 ± 1.3 years [15]. This is to some extent more than that found in our study. On the other hand in a study at New York, America, Fisher NM et al. showed the mean age of their patients was 69.70 ± 5.40 in their study[16]. This is higher than the present study as the life span is more in America and their life style is also different than that of our country. In a study at Chittagong, Bangladesh, it was found that most of the patients of knee-OA were house wives (31.5%). This is in favour of the findings of the present study. In the developing country like Bangladesh, most of the house wives used to do their household works in the bent knee position. There is a significantly increased prevalence of osteoarthritis in knee in road labourers and others engaged in knee-bending occupations [13]. Retired serviceman became the second (19.10 %) in the present series. In two other studies, the same results were found[11, 12]. This may be due to their age because all the retired servicemen have more than 57 years of age because in Bangladesh normal age for retirement is 57 years for the employees. In our series, maximum patients were in the middle class group (68.5%), their monthly income was in between BDT 2001 to 6000. In this study, some patients were poor (29.6%), their monthly income was less than BDT 2000 and a very few patients were rich (1.90 %), their monthly income was found more than BDT 6000. Most of our study subjects (121 patients, 74.7%) came from the Chittagong metropolitan city and only 41 patients (25.30 %) came from the villages nearby the Chittagong district. This result conforms with other studies [11, 12]. This may be due to the poverty situation of the country. Some rich people usually take treatment from the private clinics and the poor people are illiterate and have not got enough money to spend to reach the tertiary level hospital like CMCH. So, they are less in number in this study.

In the present study, mean weight of the patients was 63.34 ± 11.60 kg and mean duration of symptoms of the patients was 25.25 ± 38.85 months, this is in favour of the findings of another two studies done in chittagong[11, 12]. But Fisher NM found that the mean weight of the patients with knee-OA was 85.50 ± 12.50 kg, this is much higher than our finding [16]. This may be to tall structure of the American people than that of Bangladeshi people.

Regarding the sides affected by OA-knee, it was found in this study that most of the study subjects were suffering from both knee OA (48.1%), 44 (27.2%) right sided knee OA and 40 (24.7%) left sided knee OA. In a study in America, it was found that all the subjects were affected by OA- knee on both sides[16]. This was higher than the present study because their sample size was very small, only 9 subjects were included in their study but we included 162 subjects.

## Conclusion

From the present study, it may be concluded that females are more vulnerable to develop OA knee in earlier ages than male. So, precautions should be taken for this group of population to protect the Knee joints.

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# Correlation Between Instrumental Hand Function and Activities of Daily Living in Rheumatoid Arthritis

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## Abstract

**Objective:** To find the correlation of instrumental hand function (grip strength, muscle power and range of motion) and Activities of Daily Living (ADL) in rheumatoid arthritis patients.

**Methods:** 50 patients of either sex were included in the study. Objective evaluation of hand function was done using Hand dynamometer and Electrogoniometer (Tracker system-version 4®). The patients were assessed for their functional limitations using Indian version of HAQ-DI. Spearman rank collision was performed to find out the association among the variables.

**Results:** It was found that most of the disease specific parameters like morning stiffness, number of inflamed joints, duration of the disease and deformities had a strong correlation with the instrumental hand function. Deficits in grip strength, tip pinch, palmar pinch, and range of motion of hand strongly correlated to difficulty in activities of daily living in patient with RA. Instrumental hand functions (grip strength, pinch strength and range of motion of joints) were significantly impaired in patient with RA and they had good correlation with Indian Health Assessment Questionnaire Disability Index (IHAQ-DI).

**Conclusion:** Instrumental hand function assessment along with IHAQ-DI is an effective tool in evaluation and modulation of therapeutic interventions in patients with rheumatoid arthritis. The instrumental hand function assessment can also predict the deficits in ADL.

**Key words**: Rheumatoid Arthritis, Hand function, Activity of Daily Living.

## Introduction

Rheumatoid arthritis (RA) is a chronic symmetrical inflammatory polyarthritis of small and large joints of the extremities. Involved joints show inflammation with swelling, tenderness, warmth, and decreased range of motion (ROM). Joint and tendon destruction may lead to various deformities of the extremities. These patients show different degrees of difficulty in performing activities of daily living (ADL)[1]. As the disease has a considerable impact on the ADL, it was tried to assess and establish the correlation of hand function (grip strength, pinch strength and range of motion) and ADL in RA patients using Indian version of Health Assessment Questionnaire-Disability Index (IHAQ-DI)[2].

## Material and Methods

Fifty consecutive patients of either sex fulfilling the inclusion criteria and agreeing to participate in the study were taken from those attending the outpatient department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences, New Delhi. The inclusion criteria were: (1) age group: 20 – 50 years, (2) sex: both males and females, (3) all old and newly diagnosed cases of RA at any stage of disease, (4) Symptoms present at the time of initial examination (5) Patient's ability to understand and perform the prescribed test for hand function and answer IHAQ-DI questionnaire and (6) Willingness to participate.

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Objective evaluation of hand function was done using Hand dynamometer and Electrogoniometer (Tracker system-version 4®). The patients were made to sit comfortably and their hand function was evaluated using dynamometer for grip strength, pinch strength and by using goniometer for range of motion of wrist and joints of hands. After the testing of hand function, the patients were assessed for their functional limitations using Indian version of HAQ-DI. The result obtained was analyzed statistically and interpreted with a view to comparatively evaluate the instrumental finding and ADL assessment using the IHAQ-DI scale. Spearman rank collision was performed usingh SAS 8.0 statistical package to find out the association among variables and p-value <0.05 was considered as statistically significant level.

## Results

Median age of the 50 patients was 36.50 years (range 23 to 50). Median duration of disease was 4 years (range 0.25 to 30). Pain score on visual analogue scale (VAS) was 0 to 8 with a median of 4. IHAQ-DI in these 50 patients was 0.08 to 2.08 with a median of 0.75.

There were 40 (80%) females and 10 (20%) males in the study. At the time of study there was no active inflammation in any joint in 26 patients. 30 (60%) patients were having anemia.

Morning stiffness of more than 30 minutes was present only in 38% patients. There was no significant correlation between morning stiffness and IHAQ-DI however morning stiffness had correlation of deficit of ROM of right hand.

Duration of RA strongly correlated with diminished ROM of bilateral hand and presence of deformities but not with any other parameters of instrumental hand function or IHAQ-DI. Strong correlation of inflamed joint count with deficit of ROM of both sides was found. There was no correlation between pain score on VAS and IHAQ-DI and instrumental hand function in the study.

Seventy percent of patients were having deformities. Hand deformities strongly correlated with deficit of right side tip pinch, deficit of bilateral hand ROM and with IHAQ-DI. It was found that restriction of ROM was present in 62% patients. Restriction of ROM of bilateral hands strongly correlated with IHAQ-DI.

Most of the patients were having deficits of grip strength affecting the right side more frequently. Grip strength deficits of both sides were strongly correlated with IHAQ-DI.

Tip pinch and palmar pinch strengths were lower in most of the patients (88%) and left hand was more severely involved than the right hand. Bilateral tip and palmar pinch strength deficits strongly correlated with IHAQ-DI. In most of the patients key pinch was impaired, but no significant correlation was found with IHAQ-DI.

## Discussion

Outcome assessment in patients with RA includes measurement of physical function. Physical disability is an important outcome of rheumatoid arthritis[1, 2].

Morning stiffness (lasting more than 30 minutes) was present only in 19 (38%) patients as the patients were in different stages of the disease and treatment. There was no significant correlation between morning stiffness and IHAQ-DI. Morning stiffness strongly correlated with deficits of ROM of right hand in this study. Curkovic[3] found that there was general trend of the rising grip strength since morning to evening without statistical relevance and grip strength negatively correlated with the grade of morning stiffness but in this study no association could be found between morning stiffness and grip strength.

Most of the patients (70%) were having deformities of hand. Hand deformities strongly correlated with deficit of right side tip pinch, deficits of ROM of bilateral hand and with IHAQ-DI. Adams[4] concluded that in this early RA population handgrip strength was an accurate indicator of upper limb ability and ulnar deviation at the MCP joints and had only a weak to moderate association with upper limb functional activity and ability. Agustín[5] found that both the joint inflammation and joint deformity impairments displayed strong direct paths toward functional limitation.

Duration of RA strongly correlated with decrease of ROM of bilateral hand and deformities. It did not have any correlation with any other parameter of instrumental hand function and IHAQ-DI. In contrast, Bodur[6] found that disease duration strongly correlated with special hand disability index of Stanford HAQ.

Inflamed joint count strongly correlated with deficits of ROM of both sides. However, any correlation between inflamed joint count and IHAQ-DI was not found. van Lankveld[7] found that an increase in the number of swollen joints most strongly correlated with a decrease in dexterity, even after controlling for impairment at baseline. But Hakkinen[8] found in their study that number of swollen and tender joints was of lesser importance for function.

No significant correlation was found between pain score on VAS and IHAQ-DI and instrumental hand function. However Hakkinen[9] concluded that in patients with RA, pain and ROM of joints had the greatest impact on individual subdimensions of the HAQ.

| ADL: Are you able to | Without any difficulty | With some difficulty | With much difficulty | Unable to do |
|---|---|---|---|---|
| | No. of Patients (%) | No. of Patients (%) | No. of Patients (%) | No. of Patients (%) |
| Dress yourself, including tying sari/ salwar/ dhoti/ pyjama and doing buttons? | 24(48) | 21(42) | 4(8) | 1(2) |
| Get in and out of bed? | 28(56) | 20(40) | 1(2) | 1(2) |
| Lift a full cup or glass to your mouth? | 25(50) | 22(44) | 2(4) | 1(2) |
| Walk outdoors on flat grounds? | 23(46) | 19(38) | 7(14) | 1(2) |
| Wash and dry your entire body? | 16(32) | 28(56) | 5(10) | 1(2) |
| Squat in the toilet or sit cross-legged on the floor? | 14(28) | 14(28) | 7(14) | 15(30) |
| Bend down to pick up clothing from the floor? | 25(50) | 18(36) | 5(10) | 2(4) |
| Turn a tap on and off? | 27(54) | 17(34) | 6(12) | 0(0) |
| Get in and out of auto rickshaw /manual rickshaw /car? | 15(30) | 24(48) | 9(18) | 2(4) |
| Walk three kilometers? | 7(14) | 23(46) | 9(18) | 11(22) |
| Shop in vegetable market? | 8(16) | 27(54) | 7(14) | 8(16) |
| Climb a flight of stairs? | 15(30) | 21(42) | 10(20) | 4(8) |

Table-1: Indian health assessment questionnaire

| | **Right grip** | **Left grip** | **Right tip pinch** | **Left tip pinch** | **Right key pinch** | **Left key pinch** | **Right palmar pinch** | **Left palmar pinch** | **Right hand ROM** | **Left hand ROM** |
|---|---|---|---|---|---|---|---|---|---|---|
| Deformities | 0.48 | 0.654 | 0.011* | 0.698 | 0.368 | 0.463 | 0.252 | 0.3 | 0 | 0 |
| Duration (years) | 0.46 | 0..375 | 0.764 | 0.583 | 0.117 | 0.24 | 0.782 | 0.651 | 0.013* | 0.005* |
| Morning Stiffness | 0.63 | 0.844 | 0.681 | 0.055 | 0.615 | 0.591 | 0.473 | 0.349 | 0.017* | 0.145 |
| Inflamed joint count | 0.29 | 0.303 | 0.235 | 0.492 | 581 | 1 | 0.252 | 0.3 | 0* | 0* |
| VAS | 0.26 | 0.584 | 0.784 | 0.985 | 0.425 | 0.687 | 0.145 | 0.179 | 0.245 | 0.572 |
| IHAQ-DI | 0.002* | 0.0* | 0.010* | 0.016* | 0.724 | 0.115 | 0.035* | 0.003* | 0.018* | 0.001* |

Table-2: Correlation Between Hand Function Evaluation, IHAQ-DI and Disease Parameters

In this study, most of the patients were having decreased grip strength with right side affected more severely. Both sides of grip strength deficits strongly correlated with IHAQ-DI. Hakkinen[9] also found that grip strength was associated with the total HAQ disability index.

Tip pinch strength was lower in most of the patients (88%) and left hand was more severely involved than the right hand probably becaue of neglect of the non-dominant side. Tip pinch strength deficits of bilateral hands strongly correlated with IHAQ-DI. It was also found that right tip pinch strength was more strongly correlated with IHAQ-DI.

In right hand, key pinch was impaired in almost 100% patients and right hand was also more severely impaired. But there was no significant correlation between IHAQ-DI and key pinch deficit in both hands. Palmar pinch strength was also lower in most of the patients (88%) and left hand was more severely involved. Both sides

palmar pinch strength deficits strongly correlated with IHAQ-DI.

Bodur[6] noted that disease duration, grip strength, pinch measurements, clinical and laboratory activity parameters strongly correlated with hand disability. They concluded that grip strength and pinch measurements seemed to be the most related variables with hand disability and articular damage. So, grip strength and pinch measurement should be included in the evaluation and follow-up of the patients with RA in hand rehabilitation units.

In this study, there was no restriction of ROM in 38% patients. ROM was more severely affected in the left hand probably because of the neglect due to non-dominant side. Decrease in ROM of bilateral hands strongly correlated with IHAQ-DI. Dellhag[10] found that flexion and extension deficits in digits II through V were the strongest predictors of actual hand function. Hakkinen[7] concluded that in patients with rheumatoid arthritis, pain and ROM of joints had the greatest impact on individual sub dimensions of the HAQ.

## Conclusion

In this study, it was found instrumental hand functions (grip strength, pinch strength and range of motion of joints) were significantly impaired in patient with RA and they had good correlation with IHAQ-DI. The instrumental hand functions assessment along with IHAQ-DI are effective tools in evaluation and modulation of therapeutic interventions in patients with RA. The instrumental hand functions assessment can also predict the deficits in ADL.

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*IJPMR 2009; 20 (2): 52-54*

# Immediate Fitment of Prefabricated Orthoses in Corrective Surgery Camps

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## Abstract

In surgical camps, deformity correction and immobilization by Plaster of Paris (POP) cast is a routine method followed in about four weeks by removal of sutures/ plaster and provision of orthosis. A new technique was developed in which after corrective surgery, instead of POP cast pre-fabricated orthosis were fitted in 236 cases with lower limb deformities following post polio residual paralysi and cerebral palsy.

Use of pre-fabricated orthosis, immediately after surgery in these camps reduced the cost markedly besides being convenient to fit the orthosis in one go.

**Key Words**: Surgical Camp, Prefabricated Orthosis, Locomotor disability.

## Introduction

Majority of the population in India live in the villages, remote and backward areas. According to National Sample Survey Organization (NSSO) report 2002, about 1.86% population of our country is suffering from one or the other kind of disability, out of which majority (57%) is of locomotor disability[1]. Since most of them are living in the remote areas, their sufferings are further aggravated due to poverty, ignorance and lack of availability of rehabilitation services. Camp approach is an accepted method to make rehabilitation services reach their door steps.

Camps are usually done for awareness, distribution of aids and appliances or for surgery The surgical camps are being done in three stages[2]: (1) Selection of the patient for corrective surgery, (2) Corrective surgery on selected patients and then immobilization of the corrected limb on POP cast and (3) Follow-up after 4 weeks to remove sutures and POP and fitment of appropriate orthosis for long-term use.

It was felt that application of POP cast for immobilization of limb after corrective surgery was expensive and could be avoided in some cases. Instead the limb could be directly fitted with the modified version of orthosis. it ensured early and definitive provision of orthosis.

## Material and Method

From August 2004 to March 2008, twenty two surgical camps were organized for deformity correction in patients at different places around the country. Camps were held in collaboration with government, public and private sectors. A total of 1026 patients were benefited by surgery, out of which the majority were suffering from Post Polio Residual Paralysis (PPRP) followed by Congenital Talipes Equino Varus (CTEV), Cerebral Palsy (CP), post-traumatic deformity and post burns contractures. These camps were conducted in three stages. We used the new technique (fitment of prefabricated orthosis immediately after surgery) in 236 cases of lower limb deformity in PPRP and CP cases only, where feasible.

In this method, surgical and orthotic teams were required simultaneously. During the selection phase, the patients selected for surgery were prescribed appropriate orthosis by the orthopaedic surgeon. The measurement of the prescribed orthosis was done by the orthotic team pre-operatively.

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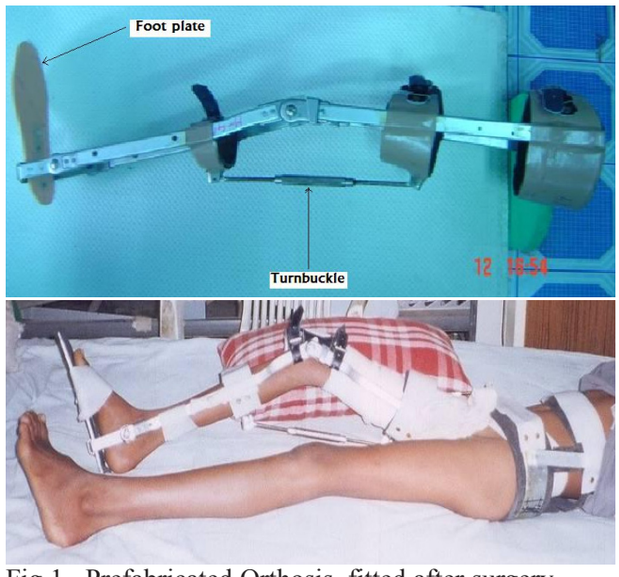


Fig 1. Prefabricated Orthosis, fitted after surgery.

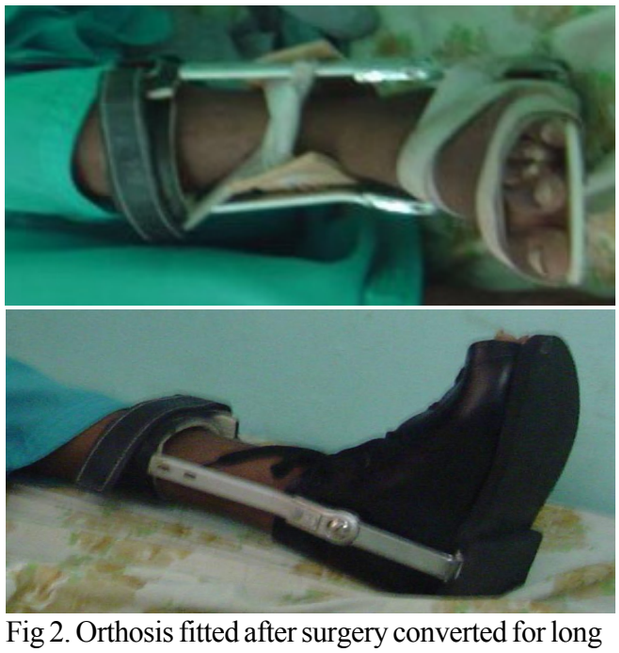

Fig 2. Orthosis fitted after surgery converted for long term use by replacement of foot plate with shoe.

During the surgical phase, surgical team went to the operation theater (OT) for corrective surgery and orthotic team went to the workshop (a nearby room from OT was converted temporarily into a workshop) for fabrication and assembling the orthosis. After surgical correction, the patient was brought to the recovery room without plastering, where fitment of the pre- fabricated orthosis was done. From there the patient was sent to the ward.

Conventional orthotic kit of Artificial Limb Manufacturing Corporation, India (ALIMCO) was modified for the purpose of immediate fitment after surgery. In the orthoses two modifications were done. Foot plate was used instead of fitting a shoe to the orthosis. The foot was secured using Velcro straps. In addition a turnbuckle was fixed to the orthotic joint for the surgically corrected joint to keep the limb under maximal possible corrected position initially to avoid neurovascular complications which was later stretched gradually on daily basis by adjusting the turnbuckle (Fig 1).

Patients were kept in the ward for 2-5 days and then discharged with advise about the use of orthosis. Patients were followed up after four weeks when the sutures were removed and readjustment of orthoses were done by removal of turn-buckle and replacing the foot-plate by shoes. The same orthosis was thus adjusted for long term use for the patient (Fig 2).

Complications like Pressure Sore, Local Swelling and Neurovascular Compromise were also seen in a few cases which were minor and managed by medication and local treatment.

In the camps surgery was done only for those patients who needed minimum surgical procedures with maximum expected results.[3] The procedures were Steindler's, Tendo Achilles lengthening, postero-medial soft tissue release, Yount's, Soutter's, Burn contracture release, Modified Jone's, etc. (mostly soft tissue surgery). Patients requiring bony surgery were neither operated in the camps nor for this new technique of immediate fitment of orthosis.

## Observation and Results

Over 9000 patients were screened through different camps, out of which 1026 patients were operated. Majority of the camps were done in the state of Uttar Pradesh followed by the states of Madhya Pradesh, Chhattisgarh, Orissa, Uttranchal, West Bengal and Rajasthan. Most of the cases were of PPRP followed by CTEV and CP. Majority of them were in the age group of 5-10 years (Table 1).

| **Age** | **Total No.** | **PF Orthosis** |
|---|---|---|
| 0-5 yrs. | 293 | 12 |
| 5-10 yrs. | 508 | 151 |
| 10-15 yrs. | 135 | 73 |
| 15-20 yrs. | 56 | — |
| 20-25 yrs. | 23 | — |
| > 25 yrs. | 11 | — |
| **Total** | **1026** | **236** |

Table 1. Age distribution of patients operated. PF: Prefabricated Orthosis fitted.

| Cause | Total No | PF Orthoses |
|---|---|---|
| Post Polio | 531 | 191 |
| CP | 116 | 45 |
| CTEV | 290 | 00 |
| Post Trauma | 35 | 00 |
| Post Burn | 54 | 00 |
| **Total** | **1026** | **236** |

Table 2. Cause of deformity of patients operated. PF: Prefabricated Orthosis fitted.

Out of the 236 patients where surgical correction was followed by immediate fitment of orthosis, Ankle Foot Orthoses (AFO) was fitted in 120 patients, Knee Ankle Foot Orthosis (KAFO) in 69 patients and Hip Knee Ankle Foot Orthosis (HKAFO) in 47 patients. 191 patients had PPRP and 45 had CP. All those patients who were fitted with immediate prefabricated orthoses came for follow up. Success rate of patients who underwent immediate fitment of prefabricated orthoses was found to be 98%.

## Discussion

Camp approach is considered to be one of the quickest way to reach the needy population in a country where facilities for rehabilitation of the persons with disability are minimal. Most camps are financed by the public or private sectors. POP casts tend to increase the costs keeping in view the large number of patients needing it. The plaster casts have their own disadvantages after surgery since surgeons find it inconvenient to open the cast and defer cutting it to take care of the surgical wounds and their complications. After cast removal, patients go without orthosis unless fitted immediately. To the organizers it adds up to the costs. Fitting the immediate orthosis not only reduced the possible complications like pressure sores, local swelling and neurovascular compromise etc. but also ensured that the orthoses where needed were fitted right in the beginning with minor modifications at the follow up period thereby cutting the costs tremendously as well as ensuring better rehabilitation and possible reduction in the complications of the POP casts.

## Conclusion

After corrective surgery, immobilization of the corrected part by POP is routine method. However in some cases one can immobilize the corrected part by the newly designed prefabricated orthosis with added advantages. It was cost effective and convenient.

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# Neurogenic Heterotopic Ossification within the Temporomandibular Joint in a Stroke Patient

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## Abstract

A 50 year-old male with a history of atrial fibrillation on Coumadin developed an acute infarct of the right Middle Cerebral Artery (MCA) involving the frontal and temporal lobes. The patient developed cerebral edema with a midline shift and hemorrhagic conversion. A ventriculostomy was performed followed by an emergent frontotemporal decompressive craniotomy. The patient developed uncal herniation and underwent a redo frontotemporal craniectomy with right temporal lobectomy and decompression of midbrain with evacuation of the basal ganglia hematoma. On admission to an inpatient rehabilitation unit, approximately 20 months after onset of injury, the patient was found to have diffuse spasticity with multiple severe contractures, limited range of motion, hemifacial spasms, bruxism and cervical muscle dystonia. Patient had limited opening of his mouth both actively and passively, work up revealed mature heterotopic ossification (HO) of the left temporomandibular joint (TMJ) at the condyloid process at the level of the condyloid head and neck of the mandible.

**Key Words:** Heterotopic ossification; Temporomandibular joint; Stroke; Bruxism

## Introduction

Heterotopic ossification has been a well-documented issue for patients with spinal cord injury (SCI), traumatic brain injury (TBI) and burns[1] It is defined as the extra-articular formation of lamellar bone within the soft tissue surrounding a joint but outside the joint capsule.[2] While its etiology remains largely unknown, common sites of development and presenting symptoms have been discovered with associated treatments. Traumatic HO and neurogenic HO have been delineated as two common variants, both with associated patterns of development. HO usually is found in the proximal joints and limbs with a peak occurrence at 2 months from original injury.[3-4] Roentgenographic confirmation usually occurs at 2 months and the usual sites affected are the hips, shoulders and elbows. In this report we are presenting a case of a HO which is unusual in its site of development and its associated condition.

## Case Report

On September 7, 2003, a 50 year-old male with a history of atrial fibrillation on Coumadin developed loss of consciousness and left sided hemiparesis. He was first treated at Whittier hospital where he was diagnosed with stroke and then transferred to UCLA medical center where he was followed by neurology. An MRI of the brain on the same day revealed an acute infarct of the right MCA artery involving the frontal and temporal lobes. The patient began to deteriorate two days later and was diagnosed with cerebral edema and a ventriculostomy was performed, after which the patient began extensor posturing. He was treated with fresh frozen plasma to reverse the anticoagulation effect of Coumadin but CT scan demonstrated MCA infarct with severe edema and a 1cm midline shift with a hemorrhagic component. As a result the patient underwent an emergent frontotemporal decompressive craniotomy. Post-operative CT scan demonstrated marked worsening with more bleeding,

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particularly in the basal ganglia and caudate. He was diagnosed with uncal herniation and underwent a redo frontotemporal craniectomy with right temporal lobectomy and decompression of midbrain with evacuation of the basal ganglia hematoma. Subsequently patient recovered from surgery but remained minimally responsive. He had a PEG tube placed on September 20, 03; percutaneous tracheostomy on the September 22, 03 and was weaned from a ventilator and ultimately discharged on October 3, 03 to Shea Rehabilitation hospital in Whittier in a comatose state.

On October 6, 03, three days after his discharge, the patient was brought to the emergency room at Cedars-Sinai due to a high grade fever. He was in atrial fibrillation with rapid ventricular response and was admitted to the ICU with a fever of 104°F. CT of the brain demonstrated a right to left midline shift of 0.6cm secondary to edematous changes caused by the subacute infarcts seen in the right frontal, temporal and occipital lobes. His rate was controlled and it was discovered that he was growing coagulase negative staphylococcus in his blood. Subsequently a central line from his left subclavian was removed and he was treated with vancomycin, ceftazidime and flagyl. An EEG was performed on October 9, 03 showed diffuse generalized slowing and flattening, consistent with nonspecific generalized encephalopathy or toxic-metabolic encephalopathy. He was discharged in stable condition on October 15, 03 to the Barlow unit of Whittier Presbyterian hospital for long term care.

Subsequently patient had progressed from a comatose state in 2003 to being awake and alert and able to follow one step commands and communicate via hand gestures in 2005. These advances occurred while the patient was being cared for in the nursing facility at Whittier Presbyterian.

On June, 6, 05 the patient was admitted from home to Rancho Los Amigos National Rehabilitation Center (RLANRC) for inpatient rehabilitation. On admission he was found to have multiple severe contractures, limited ROM, hemifacial spasms, bruxism and cervical muscle dystonia/spasticity. The patient had been completely dependent in all activities of daily living with a tracheostomy and G-tube in place. On admission to RLANRC it was noted that the patient has severe bruxism, hemifacial spasm with an inability to open his mouth actively and limited opening of mouth passively by examiner. There was no prior history of trauma or TMJ joint or any prior dysfunction. It was also noted that the patient demonstrated twitching of the periorbital muscles, right platysmal muscle and diffuse twitching on the right side of face.

After careful evaluation and work up, taking in to consideration over all condition of the patient, on 6/7/05 EMG guided chemodenervation with Botox A was performed to the bilateral mentalis, medial pterygoid, temporalis and masseter muscles to treat severe bruxism. Right scalene, sternocleidomastoid and trapezius muscles were also injected with Botox A to treat his torticollis. Also muscles in the upper and lower extremities were injected due to spasticity. Following Botox injection patient had several episodes of oxygen desaturation. Workup to evaluate for possible aspiration pneumonia was conducted, blood culture was positive for gram positive cocci. He was subsequently treated with appropriate antibiotics as per infectious disease recommendations. Post Botox injection the patient continued to have an inability to open his mouth actively and passively by examiner.

The patient was transferred to the intensive care unit on June 27, 05 due to increased secretions and worsening oxygen desaturation. Work up revealed congestive heart failure with bilateral pleural effusions and he was placed on a ventilator and aggressively diuresed. After significant improvement in his condition the patient was transferred to step down unit but in view of earlier aspiration episodes a jejunostomy tube placement via endoscopic guidance was planned. The placement could not be carried out, however, due to extreme difficulty with passive opening of the patient's mouth in order to introduce the endoscopy tube. An X-ray and CT scan of the TMJ (Figures 1) were ordered on July 15, 05 to evaluate for possible causes for this limitation. The studies demonstrated mature heterotopic changes to the left TMJ at the condyloid process at the level of the condyloid head and neck. Triple phase bone scan was unnecessary test to confirm this finding. On August 28, 05 Patient was subsequently transferred to skilled nursing facility in stable condition.

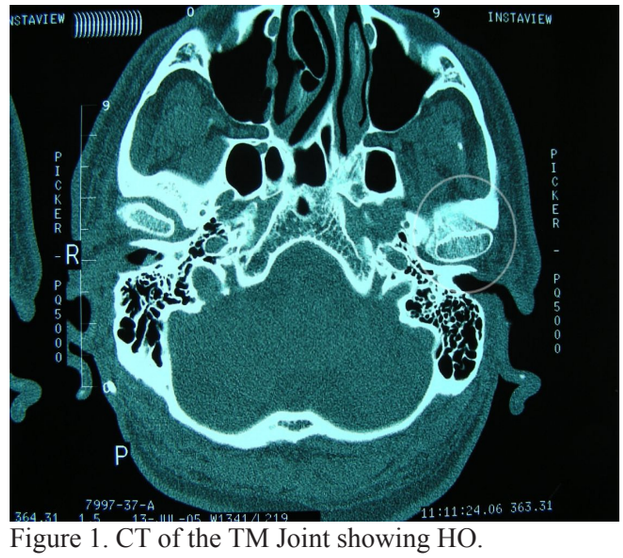

Figure 1. CT of the TM Joint showing HO.

## Discussion

While there are numerous case reports and larger studies that address the issue of HO in the case of SCI and TBI, there are relatively few cases of HO in patients with stroke. Currently there are 3 published case reports documenting HO in patients with stroke, none of which involve the TMJ.[5-6] At the time of this review only one case report directly addressing the issue of HO in the jaw was found and it involved the anterior maxilla of a 13 year-old boy with no history of trauma or complaints of pain.[7] A second case report tackles hyperproliferation of bone in the anterior maxilla of a 2 year old child and hypothesizes that bizarre parosteal osteochondromatous proliferation (BPOP) represents late stage HO.[8] Both cases address the specific histopathology of HO versus osteochondroma in order to better identify and diagnose cases of HO in the maxilla.

In addition, there are several articles reporting on the issue of TMJ ankylosis, the bony or fibrous adhesion of the joint components leading to a loss of function. A review of 204 patients in Egypt who underwent surgical correction of their jaws attributed 98% of its patient's TMJ ankylosis to precipitant trauma but did not specify the type of trauma or age at which it occurred. [9]

The development of HO in the bilateral TMJs has been reported in a patient who had suffered second and third degree burns on 30% of his body (none affecting his head or neck). Over the subsequent 8 years he underwent a bilateral TMJ arthroplasty with two subsequent revisions secondary to reossification, leaving the authors to conclude that surgical resection in the case of HO may be of little value.[10] A second report involving the case of a 10 year old female with second and third degree burns over 40% of her body (including the right side of her face) developed HO of the right TMJ 2 years after her initial injury. She also underwent surgical excision of the joint with subcondylar ostectomy and arthroplasty but this report does not include long-term follow-up.[11]

HO has been found to occur at rates of 10-20% in the closed-head brain injury population with known contributing factors such as spasticity, fracture, infection and DVT. Stroke associated HO is quite rare with very few case reports in the literature.[12] While the etiology of HO is not clearly known, its pathogenesis is distinct from metastatic calcification and theorized to include the transformation of primitive cells of mesenchymal origin into osteogenic cells.[13] HO is most commonly found in the proximal joints and limbs and, in the case of SCI, below the level of lesion. Rarely has HO been demonstrated in the maxillary region and those reported cases are associated with burns or no trauma at all.

Clinically HO usually presents with limited range of motion, patient complaints of pain and localized swelling at the affected area. Lab work may reveal elevated alkaline phosphatase and by two months post injury most patients with HO will have evidence on roentgenography. Treatment and prevention of HO ranges from bisphosphonates, NSAIDs (indomethacin and ibuprofen), radiation therapy to surgical resection in certain cases.[14],[15] The lack of post-stroke HO reported might indicate difficulty associated with diagnosis due to issues such as multiple pain sources and additional impairments both of which frequently affect stroke patients. This study reports a presentation of HO which is unusual in its location (TMJ) and associated comorbidity (stroke).

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# Neuromyelitis Optica

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## Abstract

Neuromyelitis optica (NMO) is a rare, idiopathic, inflammatory disease affecting the spine and characteristically sparing the brain. It mimics multiple sclerosis (MS) in many aspects. A case report of 55 year old house-maker, with recurrent attacks of flaccid weakness with visual and bladder disturbances who was admitted in the Physical Medicine and Rehabilitation (PMR) ward for neuro-rehabilitation is presented. Her serological studies and magnetic resonance imaging of the spine and brain revealed a diagnosis of idiopathic demyelinating disease affecting the spine – Devic's disease.

**Key words** : Neuromyelitis Optica, Multiple Sclerosis, Functional Independence Measure, Optic neuritis.

## Case report

A 55 year old home maker from Trivandrum was admitted in the PMR department with two days' history of gradual onset of weakness of right lower extremity. Later her weakness spread to the left lower extremity. She had decreased vision in both eyes. She also complained of tonic muscle spasms involving both lower extremities and increased frequency of micturition. However her bowel was continent. Ten days back she had backache with radiation to both lower extremities. She had similar weakness last year with weakness of all four limbs and bladder disturbance. She had recovered fully with medication and rehabilitation. History of bilateral optic neuritis was noted. There was no history suggestive of trauma, primary malignancy, collagen vascular disorders or any sexually transmitted diseases in the past.

On examination she had a Functional Independence Measure (FIM) score of 90 out of 126, with complete dependence in bladder and locomotion skills with partial dependence in toileting, bathing, lower body dressing and transfers. Her higher mental functions were normal. Cranial nerves other than the Optic Nerves were uninvolved. She could only count fingers at one meter with her right eye and had no perception of light in the left. Muscle bulk was normal in all four limbs. She had flaccid paraparesis with a power of grade 2 (Medical Research Council Grading) in the lower limbs. Deep tendon reflexes were diminished in both lower limbs with extensor plantar response bilaterally. She had decreased sensation to pinprick, vibration and light touch from the second lumbar segment downwards in both lower limbs. Power, sensations and reflexes were intact in both upper limbs. Superficial and deep anal sensations were preserved. She also had voluntary anal contraction with preserved anal wink.

Her investigations showed that rheumatoid factor, antinuclear antibody and C - reactive protein were positive. Cerebrospinal fluid analysis showed no pleocytosis or protein derangement. Cystometrogram revealed a safe capacity of 250 ml with sustained elevation of detrussor pressure to 22 cm of water. Spine radiographs were normal. Her MRI of the cervico dorsal spine revealed scattered areas of linear hyperintense signals at the fourth cervical to second thoracic levels involving the posterolateral cord and mainly centred in the white matter, suggestive of demyelination. MRI of the brain was normal, so were her electromyogram and nerve conduction studies. In view of non availability of test her NMO IgG auto antibody [1,2,3] was not done. Putting all the investigations and clinical findings, she was diagnosed to have neuromyelitis optica or Devic's disease[3,4]

**Differential diagnosis[1]** :

1 . Multiple sclerosis
2. Vasculitis due to autoimmune disease
3. Paraneoplastic syndrome
4. Vitamin b12 deficiency

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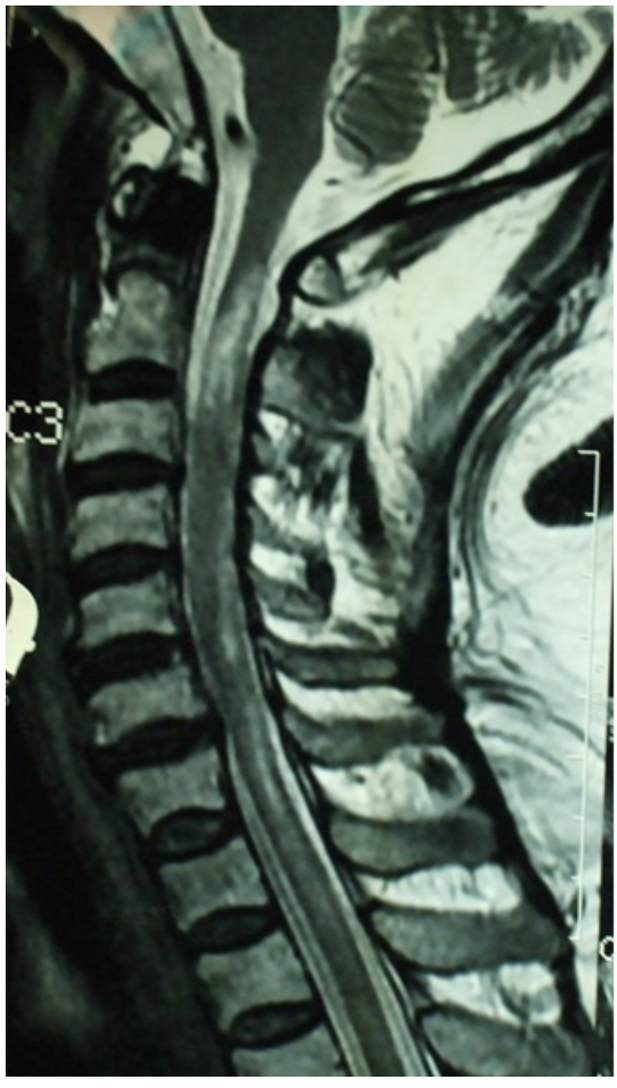


Fig 1. Cervico dorsal MRI showing hyperintense focus.

Diagnostic criteria for NMO have been proposed by Wingerchuck[4]. Diagnosis requires all absolute criteria and one major supportive criterion or two minor supportive criteria

**Absolute criteria:**

1. Optic neuritis
2. Acute myelitis and
3. No evidence of clinical disease outside the optic nerve or spinal cord.

**Major Supportive Criteria:**

1. Negative brain MRI at onset
2. Spinal cord MRI with signal abnormality extending over vertebral segments
3. CSF pleocytosis of > 50 WBC/ $mm^3$ or > 5 neutrophils/ $mm^3$,

**Minor Supportive criteria:**

1. Bilateral optic neuritis
2. Severe optic neuritis
3. Severe, fixed, attack-related weakness in one or more limbs.

**Management:** She was started on parentral steroids (methylprednisolone 1 gm i/v)[1,2,3] for 5 days and later changed to oral steroids which was gradually tapered over 3 months.Immunosuppresion with azathioprine[1,2,3] 50 mg was started and continued with fortnightly screening of routine blood examination and platelet count. Gabapentin was given for neuropathic pain. Neurovitamins were also given.

She was started on therapeutic exercise[7] with active range of motion to both lower limbs and reconditioning exercise to bilateral upper limbs. She was counseled about positioning and daily range of motion exercises at bedside to prevent complications of immobilization. She was put on tilt table for benefits of upright posture. On manual post voidal residual examination[5,6] significant residual urine of 100 ml was detected. She was catheterized and put on strict drinking schedule

**Course in hospital** : She responded to treatment. Her motor power improved and with further training for locomotor skills in parallel bars she was discharged with walker. Vision did not show any improvement. Intermittent clean catheterization was advised to her attendant as she was unable to do so due to decreased vision.

**Follow up**: She was followed monthly after discharge and on first follow up visit she was prescribed tripod cane for ambulation. On the next follow up she was ambulant without support with grade 4 power in bilateral lower limbs. FIM score was 113/126.

## Discussion

Devic's NMO[1,2,3] is characterized by a unilateral or bilateral optic neutiis and transverse myelitis with variable interval between the two events. It is usual for the optic neuritis to precede the myelitis but in our patient myelitis preceded ophthalmic features of optic neuritis.In NMO[3] a positive antibody nuclear status can be positive without evidence of systemic connective tissue disease as seen in this case. It was also unusual to have normal CSF findings. NMO differs from multiple sclerosis by being restricted to spine and optic nerves only, more severe in attacks and in 30% cases associated with auto immune disease. On investigatory grounds CSF oligoclonal[1,2,3,4] bands are usually absent in NMO. MRI brain is non specific or normal in NMO whereas it shows multiple periventicular white matter lesions in multiple sclerosis. This diagnosis was made as this case fulfilled all absolute criteria, two major and two minor ones. It is important that the distinct signs and symtoms of NMO are recognized in order to permit early and

proper diagnosis, followed by appropriate rehabilitation and pharmacologic management.

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*Editor, IJPMR*

# Congenital Generalised Hypertrophy of Feet

**AK Agarwal, PK Srivastava, D Kumar**

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## Introduction

Local hypertrophy, gigantism or overgrowth of hand, foot, part of it (Macrodactyly) or of full extremity are commonly seen in Klippel Trenaunay Parkes Weber Syndrome. However congenital generalized hypertrophy of feet is a rare presentation and a search of the literature revealed one case report in a 25 year old female, a similar case is being presented here.

## Case Report

A12 year old boy presented to our Department of Physical Medicine and Rehabilitation, Chhatrapati Shauji Maharaj (CSM) Medical University, Lucknow, with generalized hypertrophy of feet since birth. There was no history of any systemic complaints. The antenatal history was not significant. There was no history of radiation, drug abuse, tobacco and alcohol intake or any other addiction which is known to be injurious in the antenatal period. This boy was the second son of his non-consanguinous parents with no family history of similar complaints. At the time of birth his feet were of abnormally large size and disproportionate to his body.

According to his father, the overall size of his feet slowly increased. They were able to find a suitable footwear for his son. His main concern was to have a comfortable and proper footwear for him.

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The physical examination revealed that he was having generalized hypertrophy of his feet as compared to size of his both upper limbs and trunk along with undescended testis on right side. He was otherwise active and regularly going to school but unable to take part in the field games. His activities of daily living were within normal limits. His feet were having generalized hypertrophy with large size of all the toes which were apparently proportionate to the feet. On palpation there was well defined diffuse softness in plantar and dorsal surface of feet. There was no neurological deficit. The range of movements of hip, knee, ankles were within normal limits.

Digital skiagram of both feet showed marked thickening of third metatarsal of left foot alongwith proportionately smaller middle phalanx in all the toes. Dense soft- tissue shadow all around foot was seen. The bony trabeculae and density were within normal limits and generalized hypertrophy was seen in all bones of both feet.

High resolution sonography and colour doppler imaging of peripheral arterial tree of both lower extremities was done with direct contact scanning technique, which revealed normal thickness in the walls and no calcification. On colour flow imaging, there was evidence of marked increased flow in the arterial tree, more so on the left side. The venous tree was normal on both sides and there was no evidence of arterio-venus malformation in the feet. The inference of this study was that there was high arterial flow in the left lower limb arterial tree as compared to the right side. CT scan of the head showed no abnormality in the piruitary fossa and adjoining areas.

**Technique of special footwear fabrication:** In this case normal shoe could not be used. The conventional shoelast was also not possible to be used to make a shoe due to abnormal size of his feet, therefore we took plaster of Paris (POP) cast of his feet and made plaster replicas of the feet , modified them to make lasts.

Seasoned chrome leather was mounted on the POP shoelast for the upper. Similarily seasoned leather for sole was stitched with the upper using Goodyear belted process. Thus modified orthopaedic boot was prepared with closed toebox so as to protect the abnormal sized toes from injury. The boy was comfortable and happy with the newly designed orthopaedic boot. With the shoes he could even walk long distances and perform cycling as well.

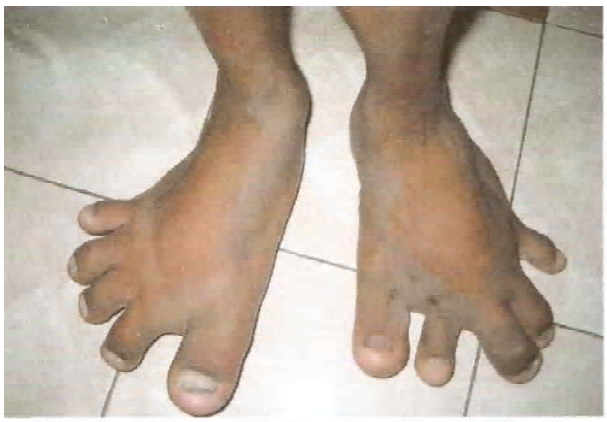

Fig. No. -1A Clinical Photograph of Feet : In Standing

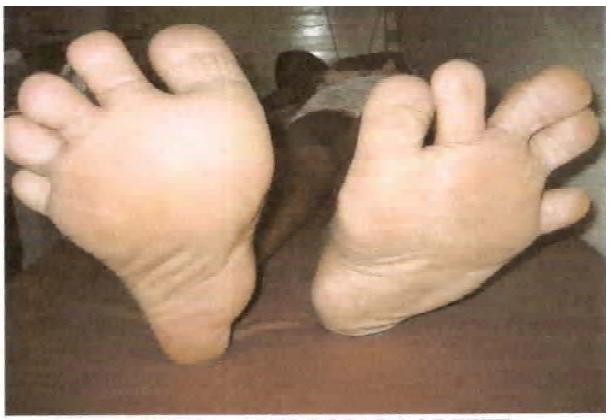

Fig. -1B CLINICAL PHOTOGRAPH OF FEET

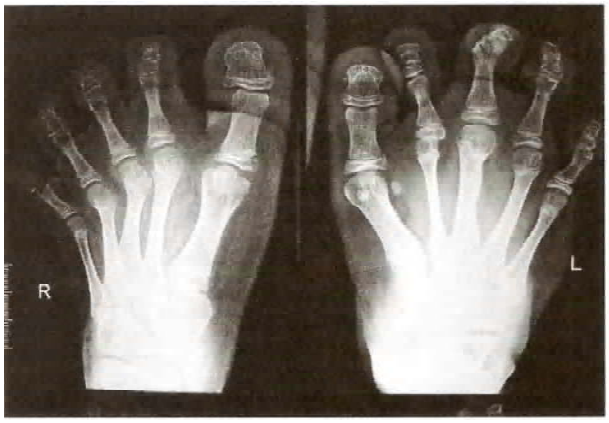


Fig. No. -2A Digital X-ray of feet - A.P. View

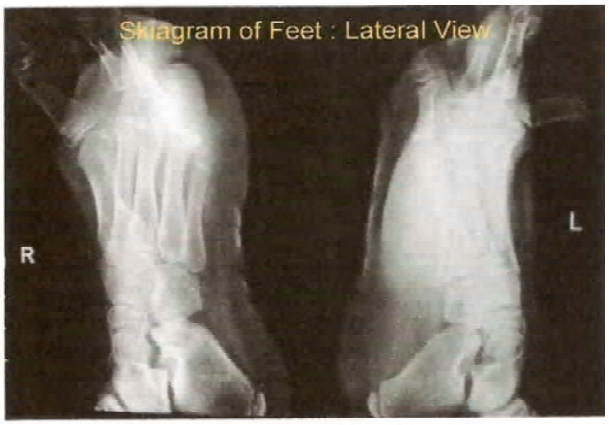


Fig. No. -2B Digital X-ray of feet - Lat. View

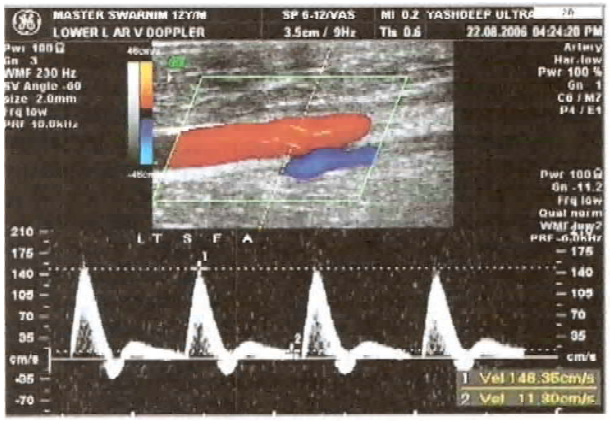


Fig. No. -3 Colour Dopler Study

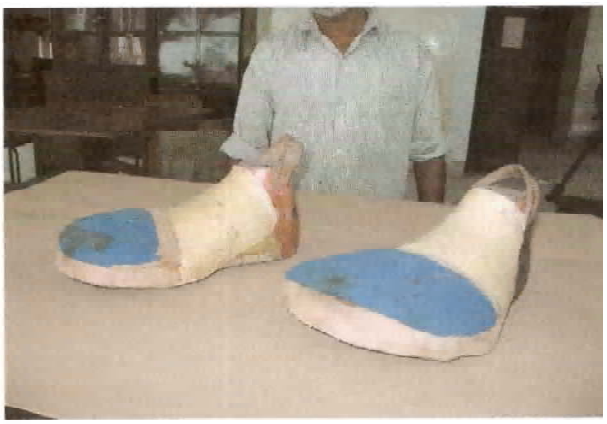

Fig. -4 Special Shoe Last

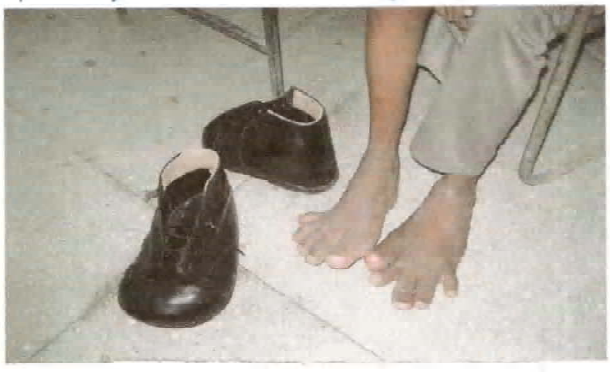

Fig. No. -5 Special Orthopaedic Boot

## Discussion

The enlargement of body part is always a matter of investigation to pinpoint its cause. Gigantism is defined as excessive stature, the result of over secretion of growth hormone prior to the skeletal maturity. Overgrowth syndromes are generally characterized by the overgrowth of involved parts. The typical condition in this group is Klippel Trenaunay Syndrome, (KTS). KTS is characterized by a triad comprising of soft tissue hypertrophy, diffuse venous malformations and capillary haemangioma[1]. The vascular malformation in the Parkes Weber Syndrome is an arterio-veneous (AV) malformation which grows in proportion to the growth of the child and also in relation to the haemodynamic changes such as increased blood flow, causing vessel dilatation, obstruction and thrombosis[2].

Progressive congenital hypertrophy of feet in 25 years old female whose mother has taken Thalidomide during pregnancy was also reported[3]. They excluded neurofibromatosis, AV Fistula, KT Syndrome and Adrenal tumor etc.

Macrodystrophia Lipomatosa (ML), a case of localized overgrowth was also reported that was subjected to radiological evaluation[4]. In this case the child was having enlargement of bony as well as soft tissues involving second and third toe of the right foot.

A neglected case of ML of the foot in an elderly man was also reported[5]. According to them ML was a rare disorder, characterized by the three dimensional enlargement of one or more fingers or toes with predominantly fibroadipose tissue.

The present case was extremely challenging from the diagnostic point of view. The localized gigantism was excluded from the diagnosis since hypertrophy was generalised and all the components of feet showed concomitant increase in size. Neurofibromatosis was excluded since there was noevidence of Café-au-lait spots, scoliosis, congenital bowing, pseudoarthrosis and plexiform neuroma etc. Further there was no evidence of Arterio-venous malformation in the feet or limbs, Kilppel-Trenaunay syndrome, Hyperostosis, Parkes-Weber syndrome and an adrenal tumor.

According to available literature the treatment includes multiple closing wedge osteotomies in the forefoot and multi-stage debulking of the tissue in association with skin reductions. However, the parents of the present case refused any such surgical intervention.

Authors believe that this is the first reported case of bilateral muscular and bony hypertrophy of the feet.

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# Acupuncture as a Modality in Buerger's Disease

**RK Ghatak, Utpal Chakraborty**
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## Abstract

A 32 yrs male patient presented with history of claudication pain and ulcers on left great and 2nd toes. He was a smoker. He was diagnosed as having Buerger's disease. The patient was treated with acupuncture therapy, with remarkable subjective and objective improvement. It is felt that acupuncture could be tried as a therapy in Buerger's disease.

Key Word: Acupuncture, Buerger's Disease

## Introduction

Buerger's disease is an inflammatory occlusive vascular disease of the distal vessels of extremities with late involvement of cerebral, visceral and coronary vessels. Male smokers usually under 40 yrs of age are usually affected.[1] The condition was first described by Winiwater in 1879 and then by Leo Burger in 1908.[2]

Pathologically, affected vessels show infiltration of polymorphonuclear leucocyte followed by thrombus formation inside the vessel. Later on, polymorphs are replaced by mononuclear cells, fibroblasts and giant cells. Finally, organization of thrombus, perivascular fibrosis and recanalisation occur.

Clinically, patient shows features like Raynaud's phenomenon, claudication of the affected extremity and migratory superficial thrombophlebitis. Later on, dry and slowly progressive gangrene, precipitated by minor trauma, of the distal affected extremity sets in.[3]

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On physical examination, proximal arterial pulsation are normal with reduced or absent distal pulses.

Arteriography shows segmental affection of the distal vessels associated with collateral vascularisation. Colour doppler USG is a noninvasive diagnostic procedure.[4] Excision biopsy and pathological examination, though confirmatory, are rarely performed in an area with compromised vascularity.

There is no specific treatment. Tobacco smoking is universally forbidden in such patients. Treatment like Buerger's exercise, Buerger's position, reflex stimulation by heating the healthy side, anti-inflammatory drugs, steroids and anticoagulant have no permanent beneficial effect. In early vasospatic stage, sympathectomy (Lumber or cervico-dorsal) has some role. Free omental graft to the affected extremity shows some promising result.[2, 4]

The present study was conducted to explore possibility of using an alternate therapy in a disease which has no definite relief in conventional modern medicine.

## Case Details

A 32 years old male Hindu farmer presented to the department of Physical Medicine and Rehabilitation, Burdwan Medical College, with the history of cluadiction pain in the distal left lower limb and itching of left 1st and 2nd toes for 4 months. He also had pain and burning sensation, more intense at nights, of left 1st and 2nd toes for 2 weeks. He also noticed appearance of pus point at the tip of affected toes. He used to smoke about 10 bidis (indegenously made tobacco rolled in leaves) daily since 16 yrs of age. He had no other addiction. There was no history of diabetes or hypertension. There was no family history of Buerger's disease.

On clinical examination, distal pulses (anterior tibial, posterior tibial and dorsalis pedis) of the left lower extremity were absent. He had ulcers on the tip of the left 1st and 2nd toes with some discharge.

He was clinically diagnosed as Buerger's disease. Routine examinations like routine blood, blood sugar and urine were done and showed no abnormality. Colour Doppler examination was done and confirmed Buerger's disease.

The patient was offered Acupuncture treatment as a modality after taking his consent.

Proper asceptic measures were followed. Treatment was given in selected acupoints as per anatomical acupuncture.[5] Acupoints namely: UB 40, UB 57, UB60, GB34 and Liv2 on the left side were selected. Treatment was given on alternate days for 6 weeks and then again for 4 weeks on once weekly basis with an interval of 5 days between them. Electropuncture[5] for 30 minutes was given during each treatment session.

After completion of treatment, the patient perceived warm sensation and noticed a reddish colour change of the sole of the affected foot after walking for some distance. Temperature of the distal affected limb remained cold even after completion of treatment.

Patient was evaluated for subjective and objective changes initially before starting the treatment, at the completion of alternate day therapy and finally at end of therapy. Colour Doppler ultrasonography was repeated after completion of the therapy and showed no change. VAS (0-10cm.) was used for measuring intensity of subjective pain. Walking distance was used for measuring claudication distance. Photographs were taken to follow changes in condition of digital ulcerations.

Subjective pain evaluated on the VAS scale at the begninnig of therapy was 10, at the end of six weeks of therapy it was 6 and at the completion of therapy at the end of 10 months it was zero.

Claudication distances at the beginning of therapy was 50 meters, and at 6 and 10 weeks it was 0.75 Km and 1.5 Km respectively. There was no improvement of peripheral pulsations even after completion of treatment. There was remarkable improvement of the condition of ulcers of left great and 2nd toes at the end of the 10 weeks therapy.

## Discussion

Modern medicine has no curative definitive treatment. Acupuncture is explored as a treatment modality in Burger's disease. Acupuncture is a component of Traditional Chinese Medicine (TCM).[6] It has some scientific basis.[7] It is extensively studied in LBP. [8, 9]

The acupuncture treatment can be done by any qualified doctor having training in it. It can be done even in peripheral rural centers, by maintaining aseptic precautions. The total cost of therapy is low as only a set of needles are needed for each patient.[9]

There was remarkable subjective and objective improvement in the treated patient. But there was no perceptible change in peripheral pulsation, temperature of the affected peripheral extremity or in Colour Doppler studies. The improvement in the patient may be probably due to improvement of capillary circulation of the affected extremity. Patient's perception of warm sensation and colour change of the sole of the affected foot after walking for some distance also support this.

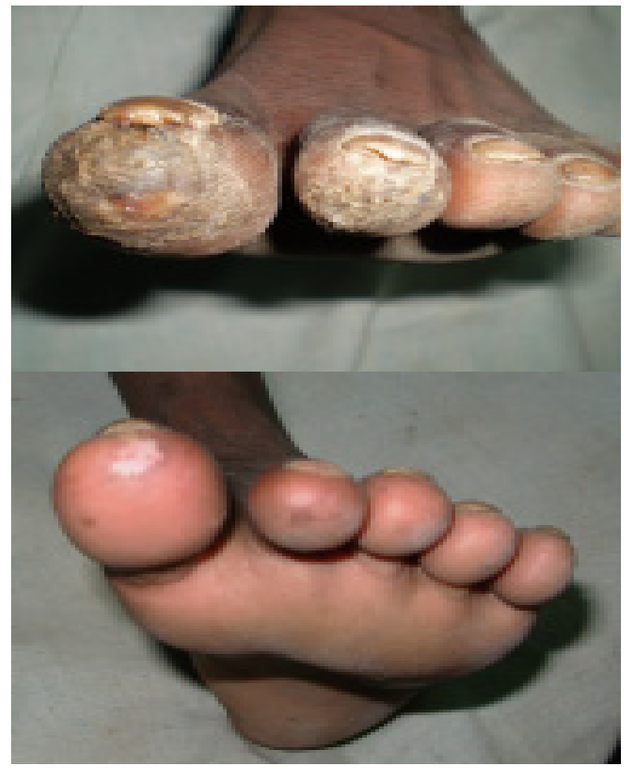

Fig 1. Ulcer at the beginning of treatment (top) and at the end of the treatment (bottom)

Acupuncture can be used in Buerger's disease which, at present, has no curative treatment in modern medicine. Acupuncture is simple, cost-effective, accessible to poor rural people. It has some scientific basis and can be administered by trained qualified doctors. Though it cannot be said with certainty that it was acupuncture alone that caused improvement in the condition of the patient presented here or it was the natural course of illness, more extensive studies are needed before coming to a defnitive conclusion but is worth consideration to use this modality as one of the treatment modalities.

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# A Legend

The first encounter with this personality happened during the course of an examination when this luminary asked a question that foxed me with its depth. The surprise got further deepened when his student answered the question so ably. Not stopping at that the rain of questions put so vividly added to my surprise. I had not known this person so well earlier and used to wonder who he was other than just knowing his name. One examination went by and another one came and at times I used to feel a bit restless at the time he would spend asking questions, digging into one X-ray film and keeping on asking the radiological features connecting it to the clinical features and then slipping into the depths of pathology and blood parameters and then surgery and the basis of giving a particular medicine. It was nothing less than first class understanding of medicine so well knitted into the minds of the great man. The restlessness converted into a long admiration and then curiosity into what this person was made of.

The contacts I had in the same department were so strong and I used to get pre-occupied that it did not allow me to 'mix' so much with him and to 'know' him further other than meeting during the examination time. Once, I had more time and peeped into his inner self to fiind a person who was dedicated from all angles, to his professions, students, patients, work and more work. He was a storm of knowledge that no one could stand in front without getting carried away. His students loved him and touched his feet and he would smilingly keep teaching, keep petting, scolding and keep getting the work done from them. His patients would worship him and his one word of advice was enough for them to bow in front of him and follow. His care for the persons with disability specially those having gait difficulties was so great that patients won't leave him even if he was busy with examinations, meetings or other affairs. He always carried the latest enviable gadgets with him. He had the best digital camera when those were unknown in India. If during those times, anyone had one, he would have kept it in the safest closet at his home to be brought out only during family picnics or functions but this gentleman carried it on his shoulder always ready to click the stills or the movies in the clinic. To top it further, he also carried a laptop not to show that he was affluent but only to show that he had his hard drive full of videos and the stills of the patients before surgery and after surgery. He had used his personal gadgets so well in place of the expensive instruments like the gait analysis equipment which run into crores and most laboratories doing only a couple or more of analyses on a daily basis but still having nothing much to show save a few laboratories. He had an inventory of patients with different gait deviations and the effects of surgeries he so ably performed on those poor and needy patients make them walk better and straighter to the delight of their parents and to the awe of the so called professionals like us. It was no surprise that he was a master in teaching the gait analysis, including mimicking the deviations in the gait so well on the stage. That shows the dedication to his work and the commitment to teach from the heart. If we look into the dossier of his works, we would find a strong database of patients of spinal cord injuries for which he dedicated his life. He may be called perhaps the only person in India who has such a big demographic profile of patients with spinal cord injuries and amongst the largest databases with long follow-ups in India, where it is so rare to find people even think about maintaining one. He opened up realities and quashed the myths about the early management of spinal cord injuries and brought forth the guidelines of its management in India. That was the reason he was called in all conceivable conferences whether these be in India or overseas. He was busy doing that only until the last few days of life coming back from one international meeting and preparing to go for another presenting his research work so well appreciated all over.

Looking back into his personal life, he was a pal to all. No one can forget the everlasting smile on his face and his readiness to go out and do anything possible to make someone comfortable. I can't forget the sumptuous lunches and dinners with his family which also gave us an opportunity to peek into his home having loads of photographs from his wide travels and the hoards of food so well packed and organized in deep freezers. Such an organized person, with such an educated and well mannered and loving family, such a big heart of a friend, a father, a husband, a teacher a colleague a researcher that the Almighty thought perhaps he was better with HIM rather than continuing to serve on HIS behalf in this worldly world. Dr Navnendra Mathur's span on this earth was in our eyes cut short by HIS call to the heavenly abode perhaps doing all the good work now in association with HIM. He would be remembered by all who came in contact with him directly or indirectly through his works. No one can forget the smile and 'ho jayega, janab' (it would be done, Sir) attitude for any request. God does not send such emissaries often on this earth. He would be in our hearts for ever.

*Dr U Singh*
*Editor*