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Case Report

Charcot's Arthropathy of Elbow Associated with Type I Arnold-Chiari Malformation – A Case Report

Sahoo Pabitra Kumar[1], Manjarisahu Mamata[2], Mohanty Ram Narayan[3]

Abstract

Jean Martin Charcot first described neuropathic arthropathy in 1868 in a tebes dorsalis patient. The joints most commonly affected are the weight bearing joints. It is classically described as painless lesion. We report a case of 50-year-old man presented with clumsiness of gait. He had undergone surgery for cervical syrinx-ACM type-I with craniocervical decompression, C1-C2 laminectomy and enlargement of foramen magnum with excision of fibrous band. During evaluation of the patient , his elbow was found swelling with mild pain on movement for which the patient was not concerned. Thorough evaluation confirmed the case to be an uncommon case of Charcot's arthropathy involving elbow associated with cervical syrinx without involving shoulder.

Key words: **Syringomyelia, neuropathic arthropathy, Arnold-Chiarry malformation (ACM).**

Introduction:

Charcot's joint or neurogenic arthropathy is a chronic progressive degenerative arthropathy associated with an underlying neurologic disorder. Charcot's arthropathy of elbow is relatively rare entity with a few case reported in the literature. Patients with Charcot's arthropathy present with a swollen erythematous joint usually in the setting of a sensory neuropathy. Common causes of Charcot's arthropathy include tebes dorsalis, syringomyelia, diabetes mellitus, alcoholism, amyloidosis, peripheral neuropathy including congenital sensory neuropathy[1]. Elbow joint is an uncommon site of neuropathic arthropathy.

Jean Martin Charcot first described neuropathic arthropathy in 1868 in a tebes dorsalis patient. After that there has been much discussion about the cause and pathology of the condition. Sensory affection with mechanical disorders could produce the features of Charcot's joint. The affected joint lacks ability to respond *via* reflexes to abnormal stress. Consequently the subchondral bone of the involved joint disintrigrates leading to joint collapse and considerable joint deformity. The disease is mostly of the hypertrophic type and is manifested as soft tissue swelling, subluxation, para-articular debris, osseus fragmentation and disorganisation[2]. The joints most commonly affected are the weight bearing joints. However hip and knee are affected in tebes dorsalis, ankles and feet in diabetes mellitus and shoulder in syringomyelia[1]. Although it is classically described as painless lesion in neuropathic joint one-third of the patients can have pain[3]. There may be history of injury recently or in distant past. The diagnostic features of neuropathic arthropathy includes "5Ds" i.e, debris, density (sclerosis), destruction, disorganisation and dislocation[4].

The purpose of this report is to present an uncommon condition with affection of a non-weight bearing joint by Charcot's arthropathy which was also mild painful. A thorough evaluation is essential to diagnose such a condition which mimics and contrast neuropathic arthropathy.

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Case Report:

A 50-year-old man came to our department with the

complaints of progressive swelling and deformity of left elbow since last two and half months associated with pain on movement of elbow (Fig 1). He has difficulty in walking with clumsiness of the gait. His medical record shows he had pain neck radiating to left upper limb for 15years and low back pain for 6years. Pain was confined to back for one year subsequently radiated to left lower limb. Last 3years he had increased neck pain and back pain and found difficulty in walking and clumsiness of the gait. He was advised MRI of whole spine. MRI finding shows–syringomyelia with AC malformation type-I (Figs 2&3). Then he had undergone surgery for cervical syrinx-ACM type-I with craniocervical decompression C1-C2 laminectomy and enlargement of foramen magnum with excision of fibrous band. After surgery pain was relieved and gait improved. Since one year, increased intensity of pain and gait further deteriorated. He had occasional pain in his left shoulder also. Gradual swelling of elbow was marked with restricted joint range of motion. The patient was non-diabetic and normotensive and no history of sexually transmitted disease.

Fig 1- *Swelling and Deformed Left Elbow*

On examination, the left elbow was markedly swollen and fluctuant. Normal skin over the joint without any features of inflammation. On sensory evaluation, superficial sensations diminished in whole left upper limb. He was able to perceive pain sensation to some extent but unable to differentiate between sharp and dull pain. Pressure and vibration and cortical sensations were intact. Motor evaluation features included- tone normal for both upper limbs and in lower limb tone was MAS Gr 1. Voluntary motorfunction (VMC) was poor for elbow and poor to fair for shoulder and wrist. Deep tendon reflexes were not elicitable for biceps and triceps tendons, hypoactive on left upper limb and that of normal on right upper limb. Due to gross swelling and dislocation of elbow the apparent joint range motion of elbow was around 50°. Forearm was in supinated position.Passive pronation possible up to 45°. There was marked instability in varus and valgus test at elbow. Shoulder movements were restricted and painful at terminal range. Grip strength was poor to fair.

His x-ray of left elbow showed marked destruction of articular surfaces of bone ends, diminution of joint space, dislocation of joint, condensation of subchondral bone with fragmentation and intra-articular calcification with new heterotrophic calcification in surrounding tissue (Fig 4).

Laboratory studies and other investigations-Hb, DC, TLC, platelets, ESR, FBS, BUN, creatinine, Na, K, bicarbonates, chlorides values were within normal limit. Inflammatory markers like CRP, ESR were within normal range.VDRL test was negative.

Fig 2- *MRI Showing Syringomyelia with AC Malformation*

Fig 3- *MRI Showing Syringomyelia with AC Malformation*

Management of neuropathic arthropathy is usually conservative, aiming towards reducing further articular damage by prevention of repetitive trauma. A number of surgical procedures have been described in literature,but none of them are satisfactory. On physiatrist point of view, goal setting was done considering functional outcome and vocation of the patient.The goal of management was directed towards improvement of gait pattern, hand function and to reduce the rate of deformity at lowest level. The patient had undergone a course of therapy and considerably improved his gait pattern. He was trained about simple modification of his activities of daily living. Protection of the joint that is susceptible to trauma and the same time useful joint movement for ADL achieved with use of special designed splint (Fig 5). A static splint with soft lining (Fig 6) was used as night splint to prevent progression of the deformity. Another splint i.e. elbow cage with free joint and pull over strap (Fig 7) was fitted for day time use. With the use of that splint patient was able to drive motor cycle and rejoined back to his job.

Discussion:

Neuropathic arthropathy of elbow is a rare condition. On literature review there are approximately 3-8% elbow neuropathic arthropathies out of all the cases of neuropathic arthropathy[3,5]. Most of the documents report only one or two cases except one study by Carl showing 5 cases of Charcot's arthropathy of elbow[6]. A variety of diseases had been reported in literature associated with neuropathic arthropathy of elbow out of which syringomyelia being the commonest one[7]. The current concept on aetiopathology includes the prominent role of misuse or abuse of insensitive joints. Loss of pain and proprioceptive sensations lead to relaxation of soft tissue structures around the joints which cause injury,

Fig 4- *Straight X-ray Left Elbow Showing Features*

Fig 5- *Splint*

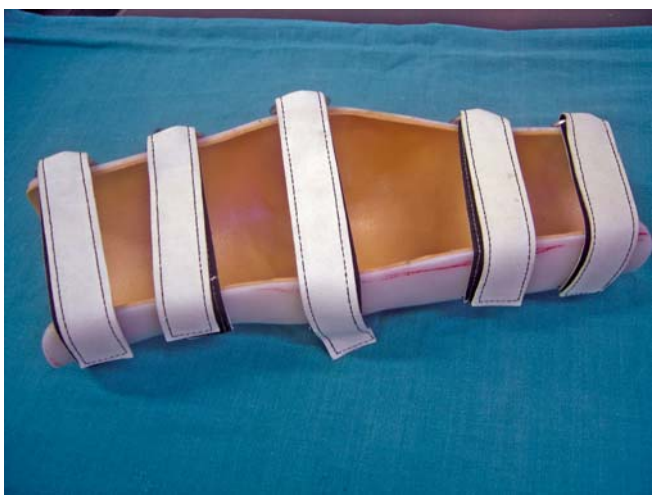

Fig 6- *Static Splint with Soft Lining*

Fig 7- *Splint for Day Time Use*

malalignment and abnormal loading of the joints even with normal physiological loads of daily activities. Cumulative injury leads to progressive degeneration and disorganisation of articulation. Repeated trauma results in fibrillation and fragmentation of joint cartilage resulting in formation of loose bodies. Joint capsule often stretched beyond tolerance both by haemoarthrosis and the stress on the joint.

The neurovascular theory describes active bone resorption by osteoclasts secondary to sympathetic dysfunction[8] and a neutrally mediated persistent hyperemia[9,10]. Radiologic findings can be classified as hypertrophic (productive) or atrophic (destructive). Neuropathic arthropathy of ankle, knee and elbow most often exhibits hypertrophic changes whereas the foot, hip and shoulder more commonly revealed atrophic changes[10]. MRI is the most effective modality for visualising a syrinx. Syringomyelia develops in 75%-85% of patients with a type I Arnold Chiari malformation[11].

Management of neuropathic arthropathy varies from simple conservative methods to extreme surgeries. Several studies have demonstrated a beneficial effect of bisphosphonates in the treatment of neuropathic joints. Bisphosphonates reduce disease activity and bone turn over as a result of inhibition or apoptosis of activated osteoclasts[13,14]. Other treatment options include prosthetic replacements, resection arthroplasty or arthrodesis. Total joint replacement in neuropathic joint has bad outcomes because of associated adverse factors which include, lack of protective pain sensation and reflexes, presence of osteoporotic bone and laxicity of the surrounding ligamentous and muscular tissues. Non-operative treatment with the use of braces is probably the best solution for long-term management of these cases.

Conclusions:

Neuropathic arthropathy of elbow is a rare condition. If neuropathic arthropathy is found in elbow as diagnosed from radiographic pictures, the underlying cause should be found out. The principle of management is to treat the underlying disease and reduce the severity of the deformity and at the same time retaining the functional abilities. Conservative treatment with therapy and brace has good outcome especially for non-weight bearing joints affected with neuropaticarthropathy.

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Editorial

International Day of People with Disability (IDPwD) 2014
Sustainable Development: The Promise of Technology

Disability Day, or the International Day of People with Disability, is a day that has been promoted by the United Nations since 1992. The aim of Disability Day is to encourage a better understanding of people affected by a disability, together with helping to make people more aware of the rights, dignity and welfare of disabled people, as well as raise awareness about the benefits of integrating disabled persons into every aspect of life, from economic, to political, to social and cultural. Disability Day is not concerned exclusively with either mental or physical disabilities, but rather encompasses all known disabilities, from Autism to Down Syndrome to Multiple Sclerosis.

The History of Disability Day

Everything started in 1976, when the United Nations General Assembly made the decision that 1981 should be the International Year of Disabled Persons. The five years between the making of that decision and the actual Year of Disabled Persons were spent contemplating the hardships of the disabled, how the opportunities of the disabled could be equalized, and how to ensure the disabled take part fully in community life enjoying all of the rights and benefits non-disabled citizens have. Another issue that was touched on was how world governments could go about preventing disabilities from touching people in the first place, so much of the talk was about the viruses and other illnesses that lead to various kinds of disability. The decade between 1983 and1992 was later proclaimed the United Nations Decade of Disabled Persons, and during that time, all of the concepts previously created became parts of one long process that was implemented in order to improve the lives of disabled persons the world over.

How to Celebrate Disability Day

Each year since 1992, a variety of events are held in many countries. Disability Day is used for holding discussions, forums and campaigns relating to disability, and communities are encouraged to organize meeting, talks, and even performances in their local areas. These can range from hosting a musical to a play, with disabled people being involved in these productions. The overall aim is to show non-disabled people that a person with a disability can be a vibrant member of society, as it happens that the entirely healthy are not always quite aware of this fact, which can lead to different kinds of discrimination of varying degrees of severity. The disabled, on the other hand, benefit from such performances by proving to themselves that there are many things they can still do, despite their conditions, which can help with their self-esteem and avoid mental issues such as depression from plaguing them. In general, these kinds of events are meant to challenge and them get rid of various stereotypes so that disabled people can enjoy lives free of discrimination and additional hardship.

IDPwD 2014

Would fall on Wednesday, 3rd of December 2014. Throughout human history, technology has shaped the way people live. Today information and communications technologies in particular have impacted a lot of people's daily lives. However, not all people have access to technology and the higher standards of living it allows.

With an estimated one billion people worldwide living with a disability, and 80% of them living in developing countries, access to technology is key to help realize the full and equal participation of persons with disabilities. Under the theme of "Sustainable Development: The promise of technology", this year's International Day of Persons with Disabilities will look at this issue in the context of the post-2015 development agenda.

At UN Headquarters, this year's commemorative events will be organized by the Department of Economic and Social Affairs (UN-DESA). Representatives from Member States, UN system, civil society, the private sector and others will discuss how advances in technology can be utilized to improve the lives of persons with disabilities, with three different sub-themes:

- Disability-Inclusive Sustainable Development Goals
- Disability and Disaster Risk Reduction / Emergency Responses
- Creating Enabling Work Environments

2015 IDPwD will fall on Thursday 3rd December.

– Dr RN Halder

Original Article

Efficacy of Polypropylene Braces in the Management of Adolescent Idiopathic Scoliosis in Girls

Sreekala VK[1], Sujith KR[2]

Abstract

Scoliosis is lateral curvature of the spine. Adolescent Idiopathic scoliosis occurs in 2% of adolescent girls and 0.5% of adolescent boys without any obvious cause.

A polypropylene spinal brace worn for more than 16 hours a day has been shown to be effective in preventing progression of the curvature in all the cases in this study. The study group of patients are adolescent girls with scoliosis of 20 to 50 Cobb's angle. They are all given polypropylene spinal braces with pulling straps to correct the curvature. They were all doing moderate physical activity for half an hour a day (swimming).

Key words: **Scoliosis, polypropylene brace, Cobb's angle.**

Introduction:

Scoliosis is measured in anteroposterior/ postero-anterior x-rays of spines by Cobb's method and is known as Cobb's angle. The curves less than 20 are observed for progression. Curves between 20 and 40 need braces to prevent progression or correction of the deformity. Generally, curves more than 40 need surgical correction. Different types of materials are used in different centres for making the braces. In curves between 20 and 40 bracing is very effective. Mild curves usually do not progress. Curves more than 50 progress, in spite of bracing.

The method of measuring the angle of curvature is shown in Fig 1.

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A reduction in Cobb's angle following intervention is observed.

Objectives:

1. To study the efficacy of polypropylene spinal braces in correcting the deformity in adolescent idiopathic scoliosis in girls.
2. To assess the effect of duration of wearing the brace in correction of the deformity.

Materials and Methods:

Subjects are selected from among the patients attending the OPD of Physical Medicine and Rehabilitation, Medical College, Thiruvananthapuram. They were evaluated clinically and radiologically .

- Cobb's angle was measured accurately and recorded. Spinal braces made of polypropylene were given to all the selected subjects (Fig 2). They were advised to use the braces 23 hours a day regularly. But they were using it for varying duration (Table 1). Two girls who were using it for less than 16 hours a day were found to progress. Those who wore the braces for less than 16 hours a day were excluded from the study. Others were reviewed every 3 months. There were 24 of them. X-ray was repeated and Cobb's angle measured. All were given moderate physical activity (swimming) for half an hour a day.

The observations were analysed.

Funding agency: State Commissionerate for Persons with Disability, Kerala.

Inclusion criteria:

1. Girls with idiopathic scoliosis between the ages of 11 and 16 years when detected.
2. Curves between 20° and 40° Cobb's angle when first detected.
3. Girls with curves between 40° and 50° not willing for surgery after explaining the prognosis to responsible caregivers.

Exclusion criteria:

1. Those girls with cardiorespiratory problems / neurological deficits.
2. Girls with connective tissue disorders like Marfan's syndrome and Ehler Danlos syndrome.
3. Those wearing braces for a period of less than 16 hours a day were excluded at the end of the study before analysis.
4. Those with curves less than 20° and those with more than 50°.

Observations:

1. Most girls were 12 to 14 years when first detected (Fig 3).
2. Most of them had a dorsolumbar curve (77.3%) (Fig 4).
3. Majority had a right primary curve (68.2%) (Fig 5).
4. Risser's sign 2 was seen in 63.6% and 31.8% had Risser's sign 3 (Fig 6).
5. Those who wear the brace for 16 to 23 hours have the same outcome.
6. None had progression of the curve while under study
7. 40% had a reduction in Cobb's angle of 4 to 10.
8. Those with 20 to 40 Cobb's angle get a significant reduction. (Figs 7 & 8).
9. Those with more than 40 curve remained unchanged; but no progression was observed while under study.

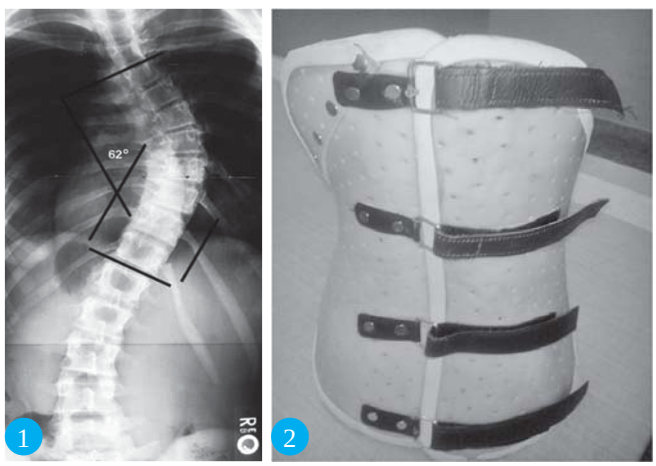


Fig 1- *Method of Measuring Angle of Curvature;*
Fig 2- *Spinal Braces*

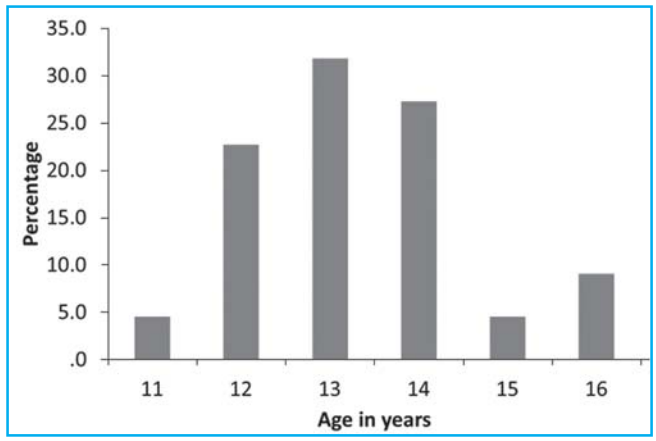


Fig 3- *Age Dirtribution*

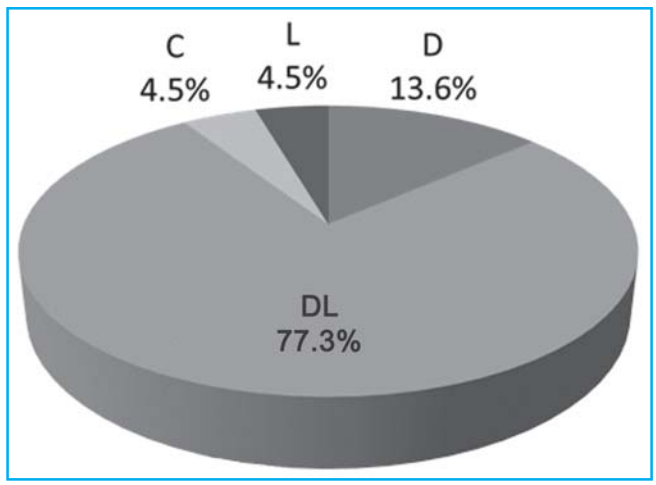


Fig 4- *Level of Curve*

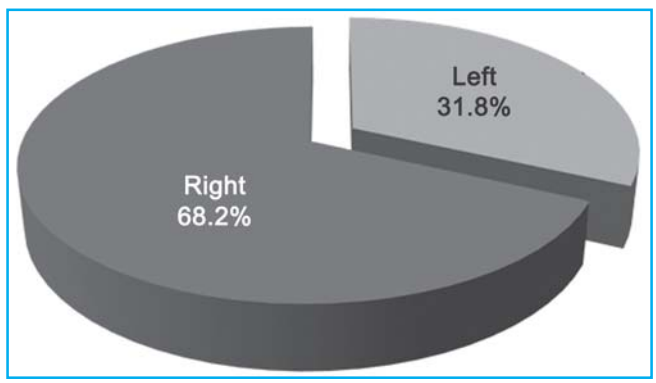


Fig 5- *Side of Curve*

Review of Literature:

1. Most spinal braces are effective in preventing progression of the curve[1].
2. Most studies insist on wearing the brace for 23 hours a day[2].
3. Significant correlation is seen between growth rate (height) and progression of the curve[3].
4. Very few studies have reported reduction in Cobb's angle i.e. improvement in the curve[4].

Discussion:

Scoliosis is lateral curvature with rotation of the spine. Significant scoliosis is curves of more than 10° Cobb's angle. Idiopathic scoliosis means curvatures of spines with no obvious cause. It is more common among adolescent girls.

Adam's bend test: Ask the patient to bend down. If there is scoliosis an asymmetry can easily be observed (Fig 9). It can be measured with a Scoliometer (Fig 10).

Measuring Cobb's angle: PA view of the spines is taken initially and repeated every 3 months (Table 2 & Fig 11).

The upper and lower end vertebrae are marked by looking at the intervertebral spaces above and below. The vertebra with a symmetrical IVD space above is taken as the upper end vertebra that with a symmetrical IVD space below is taken as the lower end vertebra. Lines are drawn in the x-ray film extending, the upper border of the upper end vertebra and the lower border of the lower end vertebra. Perpendiculars are drawn to these lines. The angle subtended by these perpendiculars is the Cobb's angle.

Risser's sign: An x-ray of the pelvis showing the apophysis of iliac crest is essential. At the age of skeletal maturity, the crescent shaped apophysis of the iliac crest completely fuses with the iliac crest. From the age of 12 years the apophysis starts fusing from lateral to medial and depending on lateral one-fourth, two-fourths, three-

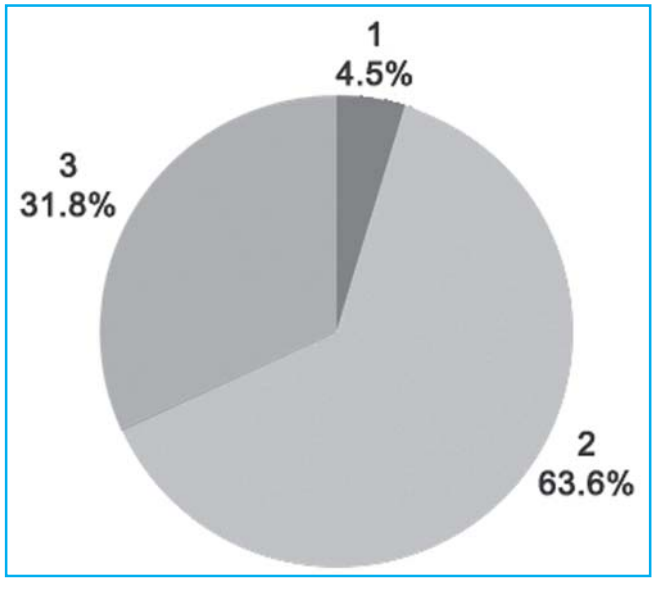


Fig 6- *Risser's Sign*

Table 1: *Duration in Hours for Braces Used*

Measurement	Duration in hours
Mean	18.86
SD	3.270
Minimum	12.0
Q1	16.0
Medium	18.0
Q3	22.3
Maximum	23.0

Table 2: *Follow-up*

Measurement	3 months	6 months	9 months	12 months
Mean	40.59	39.05	36.14	32.82
SD	7.998	7.853	6.916	8.110
Minimum	24.0	24.0	24.0	20.0
Q1	34.5	34.5	31.5	26.0
Medium	42.0	40.0	38.0	34.0
Q3	48.0	45.0	40.0	40.0
Maximum	50.0	50.0	48.0	45.0

Table 3: *Comparison of Cobb's Angle at Different Follow-up*

Measurement	3 months	6 months	9 months	12 months
Mean	40.59	39.05	36.14	32.82
SD	7.998	7.853	6.916	8.110
F	84.957			
P	P<0.001			

Table 4: *Cobb's Angle and Risser's Grading*

Cobb's angle	Risser's sign	Grading
10 to 19°	2 to 4	Low
10 to 19°	0 to 1	Moderate
20 to 29°	2 to 4	Low to Moderate
20 to 29°	0 to 1	High
>29°	2 to 4	High
>29°	0 to 1	Very High

fourths or complete fusion, the Risser grading is done as Risser 1, 2, 3 or 4.

Risk of progression depends on Cobb's angle and Risser grading.

Low risk means 5 to 15% chance of progression. Moderate risk means 15 to 40% chance of progression. High risk means 40 to 70% chance of progression. Very High risk means 70 to 90% chances.

Generally, curves less than 30 at bone maturity are unlikely to progress. Curves measuring 30 to 50 progress at an average of 10 to 15 over a lifetime. Curves more than 50 at maturity progress steadily at a rate of 1 per year.

In most patients, life threatening effects on pulmonary function do not occur until the scoliosis curve is 100 or greater.

Social isolation, limited job opportunities and lower marriage rates are more significant than cardio-respiratory problems. Only 10% cases need surgery.

Aim of treatment is to prevent progression of curve during growth spurt.

An effective brace prevents progression in most cases.

For curves more than 50 surgery is the best option.

The present study is a longitudinal descriptive study with four follow-ups in 12 months.

A polypropylene spinal brace costs anything between Rs. Ten thousand and fifteen thousand. The cost of a few, could be met with the fund from State Commissionerate for persons with disabilities

Suggestions:

1. School students of 9 to 16 yrs age group can be screened for early detection of scoliosis along with routine medical check up. Adam's bend test can be used as the single screening test. A scoliometer if available can be used for screening.
2. Those who are suspected to have scoliosis can be subjected to further investigations like x-ray.
3. Adolescent girls and their mothers should be made aware of such a condition so that they will take care. If detected sufficiently early conservative management is enough to correct the deformity or prevent progression. Awareness to mothers of adolescent girls can be given through residents' associations among other health awareness programmes. Awareness to school girls can be given through school health programmes.

Conclusions:

1. Adolescent idiopathic scoliosis can be effectively treated conservatively if detected sufficiently early.
2. Wearing a spinal brace for 16 hours gives the same results as in those who wear it for 23 hours a day.

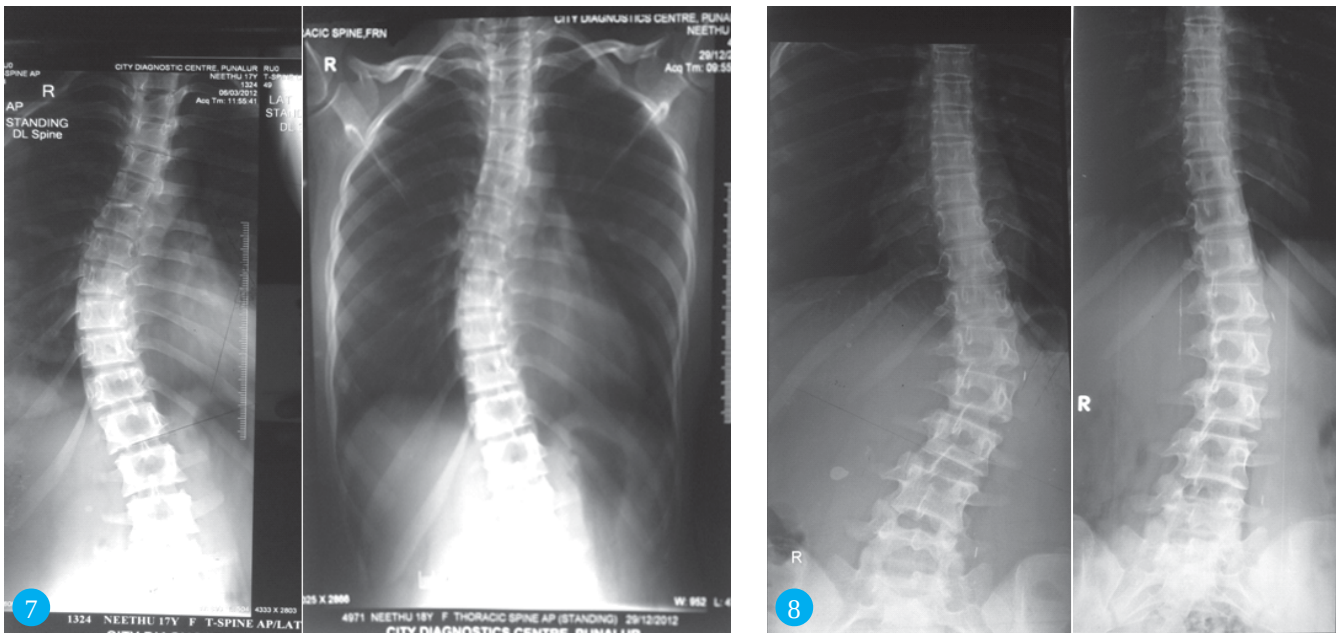


Fig 7 & 8- *Cobb's Angle with Significant Reduction*

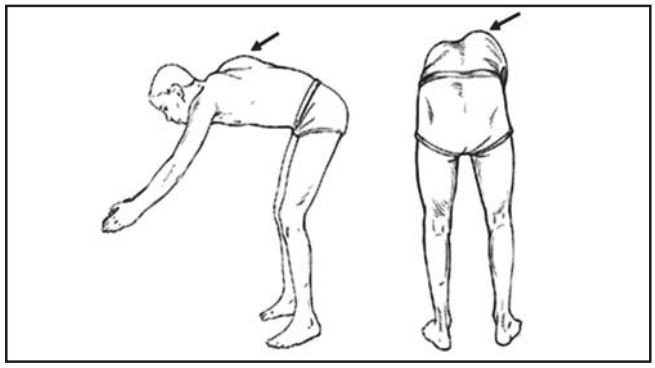


Fig 9- *Adam's Bend Test*

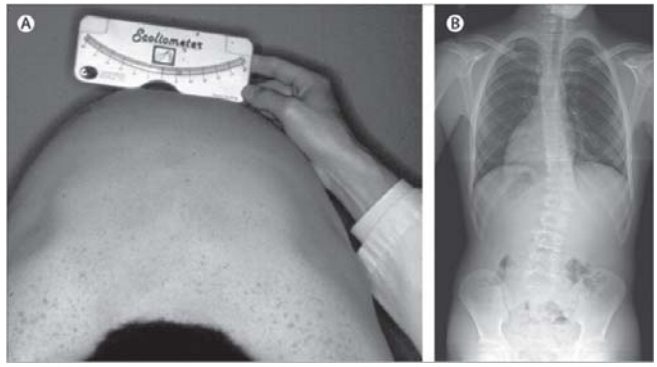
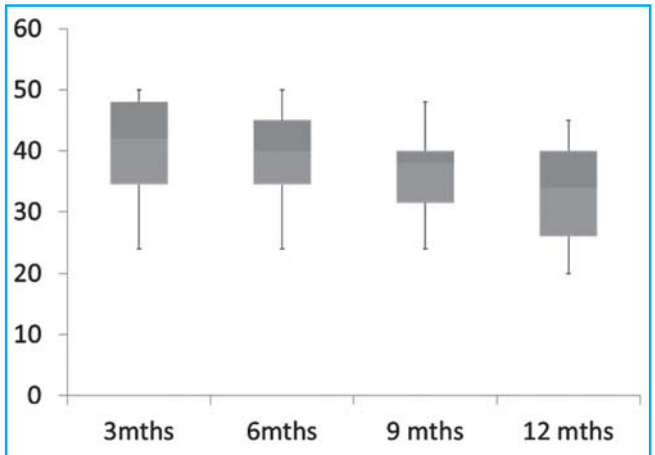


Fig 10- *To Measure with Scoliometer*



- Box plot diagram describing Cobb's angle at 3 , 6, 9 and 12months
- Lower and upper end of the whisker in each box represents minimum and maximum Cobb's angle respectively. Lower border of the blue coloured box represents 25th percentile and the upper border of the brown coloured box represents the 75th percentile.

Fig 11- *Cobb's Angle at Various Follow-up*

3. Conservative management can correct the deformity or at least prevent progression of the deformity.
4. Studies with larger sample size and comparative studies with other types of braces are necessary to arrive at further conclusions like which material is best for spinal braces in scoliosis. The controversy regarding duration of wearing a brace can also be resolved with a larger study for longer duration.

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Case Report

Bilateral Facial Nerve Palsy – A Case Report

Singh Ningthoujam Jungindro[1], Ghanachandra K[2], Gautamji RK[3], Wangjam Kunjabashi[4]

Abstract

We report a case of 24-year-old female with facial paralysis involving both sides in a sequential manner. This could not come to a definite aetiology with series of investigations and hence treated as bilateral Bell's palsy. Bilateral facial nerve palsy is a rare condition and requires prompt action to trace to a definite cause so as to rule out life threatening causes and plan specific management in the right's hand.

Key words: **Bilateral facial nerve palsy, neurosarcoidosis, Bell's palsy.**

Introduction:

The incidence of the bilateral facial nerve palsy is very rare ranging from 0.3% to 2.0% of all facial palsy cases[1]. There are many causes of bilateral facial nerve palsy enlisted in the literature of which Bell's palsy accounts only 23%[2,3]. Many a time it is a sign of an underling serious condition and some of the causes need early diagnosis and prompt treatment. Hence such cases require extensive investigations to come to a diagnosis. Here we report a case of bilateral facial nerve palsy where after extensive investigations we could not get a definite cause and treated as Bell's palsy.

Case Report:

A 24-year-old unmarried female diagnosed as two weeks' old left sided infranuclear facial palsy was referred to us for electrotherapy. She was taking oral methylprednisolone and antiviral drugs. On examination she had mild fever and occipital headache for which she was taking acetaminophen 500 mg three times daily and cefuroxime 1g/day orally in divided doses. We advised for electrical stimulation of the facial muscle and active and passive orofacial muscle exercises. Within 6 days of treatment the right side of the face also got paralysed. The priority was to rule out life threatening diseases like leukaemia, Guillain-Barre syndrome (GBS). On taking history she was a beautician and denied of taking any abusive drugs or alcohol. On examination she had House-Brackmann[4] grade V bilateral facial nerve palsy (Fig 1a,b,c) Bell's phenomenon could be elicited on both sides. Taste sensation was present but reduced on both side and there was no hyperacusis. Muscle bulk on both sides of the face was reduced. Eye opening was normal and other cranial nerves (V, VI, IX and X) were intact. Skin sensation was preserved. Endoscopic examination of nose and paranasal sinuses revealed only septal spur on left side.

Routine haematological reports were normal except reduced total lymphocyte count (TLC) of 970/cumm. Cerebrospinal fluid (CSF) analysis shows cell count of 5/µl, predominantly lymphocyte, sugar 40mg% and protein 50mg/dl. Gram-stain was negative. HIV antibody detection test was negative. Impedance audiometry was bilateral 'A' type. Chest x-ray was within normal study. Computed tomography (CT) of the chest showed multiple calcified lymph nodes in aortopulmonary window and paratracheal region and hyperattenuating foci in right middle lobe suggestive of old healed granuloma. Magnetic resonance imaging (MRI) and contrast enhance CT of the brain showed normal study.

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Fig 1- *(a) Unable to close the eyes on both sides (Bell's phenomenon); (b) Trying to show the teeth; (c) Trying to make furrows on forehead*

Fig 2- *After one year: (a) Able to show the teeth; (b) Still not able to make furrows*

We could not correlate the bilateral facial palsy to a definite cause hence treated as Bell's palsy. Oral methylprednisolone was continued for a month and stopped by tapering the dose. Electrotherapy was stopped after one month stimulation and continued with orofacial muscle exercises as home based therapy. After one year follow-up we found that the palsy reduced to House-Brackmann grade II (Fig 2a, b). The frontalis muscle palsy and intermittent occipital headache still persist.

Discussion:

Bilateral facial nerve palsy is defined as the involvement of the opposite side within thirty days of the onset of the first side[5]. It is a rare finding to have bilateral facial nerve palsy and is seldom due to Bell's palsy. The true incidence of bilateral facial palsy may be under estimated due to uneven manifestation of the two sides making it very difficult to identify a partial paralysis on one side[6]. There are many causes of bilateral facial palsy listed in literature. Infective conditions like Lyme disease, HIV, GB syndrome were ruled out by haematological profile and CSF analysis, though treponemal antibody test was not done. The patient was in antibiotic (cefuroxime) and if due to Lyme disease, must have responded. Moreover Lyme disease is not common in this part of the country. Inflammatory demyelinating polyneuropathy (GBS) typically presents as progressive ascending palsy of voluntary muscles of limbs and trunk. Cranial nerves (CN) commonly involved are IX, X and VII. Here in our case there is no limb involvement and other CN are intact.

Neoplastic conditions like acute leukaemia was ruled out from the blood picture (TLC 970/cumm). Tumours that can cause facial palsy like cerebellopontine angle (acoustic neuroma) tumour could not be revealed from CT and MRI of the brain. Impedence audiometry shows normal pattern (A-type) which conclude that there is no pathology in the middle ear cavity. We came across four cases reported in the literature where bilateral facial palsy is the only presentation of sarcoidosis (neurosarcoidosis)[5,7-9] but in our case we could not get any remarkable findings in chest x-ray and chest CT. CT showed only old healed granuloma in right middle lobe and multiple calcified lymph nodes

in aortopulmonary window and paratracheal region which could be due to earlier tuberculosis infection and could not correlate with the present condition. Moreover, there was no sign of hilar lymphadenopathy. CSF findings were normal (though oligoclonal IgG and angiotensin-converting enzyme assays were not included).

On not able to find a definite cause of the bilateral facial palsy we treated the case as Bell's palsy and in one year follow-up the palsy reduced to HB grade II. Unfortunately, the frontalis muscle palsy and intermittent occipital headache still persist.

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Original Article

Injuries and Health Benefits Experienced by Performing Artists - Experience of a Small Island Community

Jonathan P Mamo

Abstract

Objective: To review the health benefits and injury profile of performing artists in a small island population.

Method: A questionnaire was distributed to a number of performing arts companies in the Maltese islands and the responses given over a two-week period were analysed. The questionnaire included basic demographics, the form of performing art in which they are involved and the forms of injuries experienced over a five-year period.

Results: Seventy-four individuals from the five main branches of performing arts responded to the questionnaire. Injury rates varied between the subgroups with the largest number of respondents in the 18-25 years age group and with 71% of all respondents claiming one or more separate injuries related to their art. Overall injury rates were higher in the arts requiring more frequent and powerful body contact. Repetitive strain injuries, back pain and knee injuries were the three most common ailments reported.

Conclusions: Physical activity has a direct effect on the experience of injuries but also improves mental and physical health of participants. The complications of minor injuries in performing artists are more grievous than when occurring in those who are not involved in the performing arts. It is recommended that performing arts specific preventive measures should be employed to decrease the number of injurious contacts between performers, including improved training modalities and ongoing medical care without reducing, or imposing upon, artistic expression.

Key words: **Physical activity, injuries, art, health.**

Introduction:

The performing arts are those forms of art which differ from the plastic and static arts in so far as the former uses the artist's own body, face, voice and own physical presence (or absence in some circumstances) as a medium[1]. It is not all that different from sports in many areas. Dancers, singers and actors undergo hours of physical and mental preparation for any performance. The mental and physical strain can often result in injuries and other biomechanical abnormalities. This however does not mean that participating regularly in a performing art is not of benefit to the individual. The scientific evidence based on many epidemiological, clinical, and physiological studies justifies claims that individual participation in adequate amounts of regular physical activity can improve health and prevent disease.

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Materials and Methods:

A total of seventy-four performing artists participated in a questionnaire survey carried out over a two-week period with the aim to review the types and severity of injuries sustained in their field of artistic expression. Two hundred questionnaires were sent to a random selection of performing artists attending the main theatre and dance groups in the Maltese islands. The questionnaire comprised a set of questions including the form of performing art within which the respondent was involved; the types of injuries sustained over a five-year period; and whether they considered a need for a specialised form of medical care for performing artists. The respondents hailed from the following major artistic groups; performing artist/stage actor, dance-related, singer/vocal-related, musician and allied professional.

Fig 1 demonstrates this division and demonstrates that the greatest number of respondents was from an acting and stage background, with similar numbers of respondents from the musical and dance scene. Only four respondents were from the allied professional field – involving the stage work including lights systems; sound control and set-up.

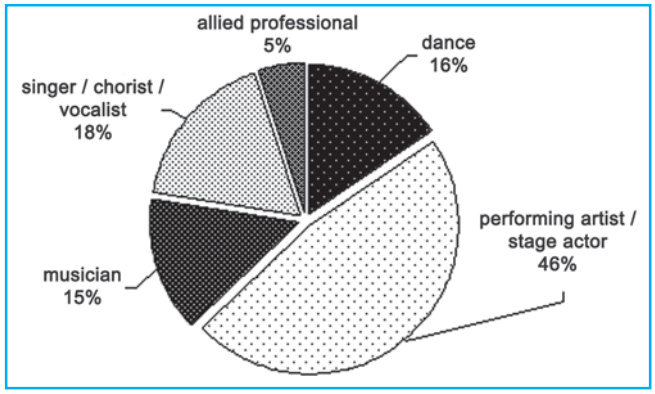

Fig 1- *No of the Individuals in Their Relevant Performing Art Subgroups*

Results:

This survey had a 37% response rate (n=74). Injury rates were varied between the sub-groups with fifty individuals (67.6%) of respondents claiming one or more separate injuries related to their art. Fifty respondents were from the 18-25 years age group, two aged <18, eighteen in the 26-40 age group and four individuals over the age of 40. Overall injury rates were higher in the arts requiring more frequent and powerful body contact such as dancing and stage acting with repetitive strain injuries, back pain and knee injuries being the three most common complaints.

Of the respondents; fifty individuals (67.6%) documented one or more injuries in their related art – a total of 158 separate injuries which were divided as shown in Table 1. There were twenty-one individuals (28.4%) who were treated for one or more episodes of anxiety, twelve individuals (16.2%) had attended clinics or specialist for weight abnormalities (overweight or underweight including anorexia), and three (4.1%) were treated for one or more episodes of depression. Three individuals (4.1%), all from the dance subgroup, noted severe menstrual abnormalities which were being followed up by a medical/gynaecological specialist. Sixty-four respondents (86.5%) commented on the need for more specialised care of performing art related injuries in Malta.

Table 1: *Number of Individual Injuries Reported*

Type of complaint	No. of individuals
Repetitive strain injury	21
Back pain	20
Knee pain	20
Voice loss / injury	16
Tendon pain	11
Neck pain	11
Shoulder pain	10
Ankle pain	9
Wrist / finger injury	8
Foot pain	8
Elbow pain	5
Hip pain	5
Dermatological problems	5
Auditory related	3
Dental related	2
Other	4

Discussion:

The potential health benefits of participating in the arts to individual people and to the community have received widespread attention internationally over the past few years. The arts have been used as mediums in areas such as health promotion and also as therapeutic interventions. In Malta there have been some rare occasions where arts projects have been used specifically to tackle health problems including bullying and drug abuse[2]. Countries such as Israel and the UK have set up a course in "Medical Clowning", inspired by the film *Patch Adams*[3], and based on the theory that humour can mask pain, where students learn techniques in which the patient is the "star" and clowns are integrated into the medical team[4]. The "Alexander Technique" for example, is a performing art method which focuses on relaxation and the relationship of the head and neck to the back. While originally developed for speech and singing, this technique has expanded into a general theory of enhanced respiratory function, tension prophylaxis and care of patients with mobility problems such as Parkinson's disease[5-8].

The regular exercise and social interaction derived from regular participation in a physical activity such as the performing arts has been shown to have positive benefit in reducing cardiovascular disease, depression, diabetes and cancer. Improvements have been observed in patients with mild depression and anxiety, where the physiological changes with regular exercise extend the

range of activities that can be undertaken with confidence and ease[9]. A change in lifestyle such as an increase in physical activity, such as dance, dramatically reduces the individual risk of coronary heart disease and stroke. Habitual physical activity also helps reduce the risk of developing non-insulin dependent diabetes mellitus[10]. Laboratory studies have shown that exercise can increase insulin sensitivity and improve glucose tolerance, which offers an explanation for the favourable effect of physical activity on conditions such as polycystic ovarian disease (PCOD) and insulin resistance. Good metabolic control can still be achieved by young diabetic patients who participate in sport because exercise leads to a predictable reduction of the exogenous insulin requirement[11]. Several recent epidemiological studies[12-13] have also observed that physically active people are less likely than those who have a sedentary lifestyle to develop breast and colon cancer and studies have also shown an increased quality of life in those who have been treated for breast cancer.

There are, however, also numerous published studies regarding the effects of intense physical activity on menstruation. Long term effects have been shown to be greatest in young girls who start intense exercise before menarche showing an increased chance of delayed menarche, impairment of growth and pubertal progression, subsequent menstrual dysfunction, and suboptimal bone health[14]. Management of exercise related menstrual dysfunction aims primarily to restore normal menstrual cycles. Advice on altering the volume and intensity of training programmes and reducing the stressors of competition may be effective[15].

One of the many obstacles encountered by the Performing Arts is funding for projects and this also translates into a lack of funding for health promotion. Healthcare budgets in many countries include money for the arts. This funding ranges from money for arts-inspired healthcare education (through "theatre-in-education" projects or arts information projects) to formal strategies of occupational and artistic therapy, university teaching modules that strive to educate doctors and nurses into more empathetic human beings through the use of art and literature, artistic attempts to brighten hospital environments and reduce the clinical atmosphere, and the longstanding culture of "hospital radio". All these activities are potentially classifiable as arts, and all are an integral and generally accepted part of national healthcare in a wide variety of countries.

In an editorial, Richard Smith suggested that the British Government should spend more on the arts and less on health care in the understanding that the improvement of our own social surroundings would give rise to a healthier population[16].The WHO states in its declaration that "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"[17].

Arts medicine has many challenges. Due to the demands in musical and physical performance, physical condition requirements vary considerably to normal requirements or demands. Small irritations or minor pains which may appear 'normal' to a non-artist, can be career threatening to the performing artist. An upper respiratory tract infection, for example, may cause the cancellation of an important concert. For wind players, recovery from such common problems as Bell's palsy can result in everyman's asymptomatic presentation which will be deemed from a visual diagnosis as fully cured only to discover that you still cannot play properly because you cannot yet form an 'embouchure'. Even trivial matters as herpes simplex (cold sores) can be totally debilitating for a brass player. Additionally; sprains, strains and minor tendon tears completely ground any physical actor or dancer. The medical community needs to fully recognise the significance of both the ailment as well as the psychological significance that the performer attaches to the problem.

Repetitive strain injuries (the commonest complaint in the survey) cannot be simply eliminated by altering simple motions. Meinke (1994)[18] commented that the "only hope of making meaningful interventions in this particular work situation, especially where there has been injury, is by changing the 'worker'". Many of the difficulties in making any such changes that may seem logical or necessary from the mechanical perspective are never so transparent to the artist because so much of movement, both good and bad, is tied to a perception of artistic necessity and instrumental technique from which a particular tone or expression is derived. The extent to which the communication between artist and physician can be improved is in no small way tied to the development and promotion of specialty clinics which have personnel who are both adequately trained medically and who are also empathetic personally to the patient as artist as well as the artist as patient.

It is impossible to get an accurate reflection of the size of the problem which encompasses performing arts medicine but at least one Canadian study[19] at a large music school showed a population of 300 students of whom 15% experienced playing-related health problems.

That percentage extrapolated over the entire Canadian university music school population represented an enormous number of students with serious need for competent and caring health professionals. It becomes patently obvious that all of the stake-holders in the performance field must unite to support and contribute to the on-going dialogue in arts medicine[20].

Efforts to set up appropriate clinics in developed countries are complicated by the fact that the majority of patients are uninsured. The uninsured status of most performers currently presents a major obstacle to the ability of performers to obtain care and the ability of clinics to provide it without courting financial instability[21]. This is further exacerbated by the fact that some of the insurers of health care are unwilling to cover some of the treatment prescribed.

Conclusions:

The large percentage of injuries shown in the study indicates the need for a future comparison between the performing arts and other physical activities such as sports. The long term aim of any future performing arts physician is to ensure that as many people as possible can participate safely in the arts and that these people have the appropriate availability of medical services as and when required. At the same time it is important to note that the arts will continue to conserve artistic expression of a particular art without compromising it to reduce injury risk. Needless to say; the potential health gain both from a physical and mental health aspect from getting involved in the arts is enormous and not to be taken lightly.

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Original Article

Comparative Study between Jaipur Foot and Polyurethane Foot

Joshi Mrinal[1], *Agarwal Mahima*[2], *Gothwal Jyoti*[3]

Abstract

Objective: To draw a comparison between Jaipur foot and polyurethane (PU) foot in terms of breakage and functional capabilities.

Study Design: Cross sectional, observational study.

Setting and Participants: Outpatient door of Department of Physical Medicine and Rehabilitation, SMS Medical College and Hospital, Jaipur, Rajasthan. A total of 136 individuals were evaluated at the start of the study, and a total number of 88 could be followed up to 6 months.

Results: 13 patients reported dissatisfaction for reasons other than that of prosthetic foot, 11 (23.40%) out of 47 using Jaipur foot had loose fitting socket and 2(4.87%) of PU foot were dissatisfied because of cosmesis. Breakage was responsible for dissatisfaction in 6.38% of Jaipur foot users as against 18 (43.90%) in PU foot users. Forty-six (97.87%) of Jaipur foot users had an locomotor capability index (LCI) score of 21 while only 1 had less than 1 in basic activity as against 100% of PU foot users having scores 21. On advanced activity, 38 (80.85%) of Jaipur foot and 31 (75.60%) of PU foot users had scores less than 21. On Houghton scale, 29 (61.70%) of Jaipur foot and 27 (65.85%) of PU foot had scores of 11-12.

Conclusion: Jaipur foot has been more cosmetically and functionally acceptable but PU foot has also shown fare cosmetic acceptance and shock absorption quality, with comparable mobility and functional use but because of greater and early breakage, its improvisation and redesigning is required for greater acceptance.

Key words: **Jaipur foot, polyurethane foot (PU foot), locomotor capability index (LCI), Houghton scale, timed up and go test (TUG), timed walk test (TWT).**

Introduction:

Amputation is an acquired condition that results in the loss of a limb, secondary to injury or diseases. Loss of a limb causes permanent disability that can affect a patient's self image, and activities of daily living. To rehabilitate such amputees, artificial limbs are necessary. The basic purpose of an artificial limb is to enable the amputee to perform essential daily activities in an easy, natural and more comfortable manner[1].

History of an artificial limb is not new in India. The earliest mention of an artificial limb was in Rig Veda (1500 to 800 BC). The artificial limbs in earlier times were simpler, but not suitable for amputees living in rural areas of India. As time passed, various field trials and testing were done with different types of prosthesis, and subsequently; the modifications were also done according to the needs.

For a prosthesis to be appropriate for use in Indian conditions, it should be low cost, made from locally available raw material, durable, simple to repair, light weight and culturally acceptable[2]. Thus came into existence the Jaipur foot, in the making of which SACH foot served an important purpose as it was modified in

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1968. According to Kabra and Narayanan[3], Jaipur foot provides movement in all three planes. In sagittal plane, it is capable of 22 degrees to 37 degrees dorsal deflection (dorsiflexion plus toe extension) from horizontal. The heel of Jaipur foot is compressible by 1 to 3 cm at a peak load of 70kg. The compressibility is uniform and load dependent. When heel is compressed, simultaneous plantar flexion of the forefoot occurs. The Jaipur foot is capable of 26 to 29 degrees of pronation and 17 to 22 degrees of supination at a peak load of 40kg. Internal rotation of 10 to 12 degrees and external rotation of 4 to 8 degrees was obtained at peak load of 40 kg in this study[3].

Polyurethane prosthetic foot was developed in 1987 as a modification of the Jaipur foot at the application development section, chemical engineering complex, Vikram Sarabhai Space Centre, Tiruvananthpuram and also in Calicut. Trials and field testing on PU foot were time consuming and slow. Feedback information did not come at regular from amputees in view of their social and economic conditions. A fatigue testing machine was designed and fabricated at VSSC, capable of loading up to 95 kg and operating with flex cycles at 40 cycles/minute and adjustable stroke lengths to simulate walking conditions and loads. It is able to simulate the dorsiflexion, plantar flexion and heel compression[4].

To the best of our knowledge, there are no published data comparing Jaipur foot with PU foot. This study was done to access the clinical use and durability of PU foot and Jaipur foot using parameters of mobility and patient's satisfaction, and draw a comparison between both on standard scales.

Materials and Methods:

Study design: Cross sectional, observational study.

Setting: Out patient door of Department of Physical medicine and rehabilitation, Sawai Mansingh Medical College and Hospital, Jaipur, from 1st October 2009 to 1st October 2010.

Evaluation of study subjects: All the amputees, old and new users were subjected to detailed general physical examination and questions regarding the demographic profile. Specific questions were asked regarding average walking distance in a day, working hours in a day while wearing shoe, total duration of use, ability for cross legged sitting and squatting. Each amputee was subjected to timed up and go test (TUG) and timed walk test (TWT).

Outcome measures: TUG test measures the mobility by assessing many of the basic components of mobility. It was originally developed for use with geriatric population. It is quick, reliable (inter and intra rater) and valid with a variety of conditions. The subject is observed rising from an armchair, walking 3 m, and returning to the chair on a standard carpet. The test is reported in seconds, and the time to carry out the test is 1 to 2 minutes[5].

Timed walk tests (TWTs) measure function in terms of mobility and have been used with a variety of clinical conditions[5], including lower limb amputees.[6] Timing of walking can be carried out in several different ways, either testing speed over a short distance (e.g. 10 meters[7] that can include an 180° turn[8]) or cardiovascular fitness/endurance in which the subject is asked to walk as far as he/she can in a given time (i.e. 2,[8] 6,[9] or 10 minutes[5]).

Locomotor capability index (LCI) is amputee specific and measures lower limb amputee locomotor capability during and after rehabilitation[10]. LCI consists of 14 items divided in 2 sub scales, basic and advanced. Higher scores on LCI, greater the capability of the amputee. It is a self - report tool, takes five minutes to complete and scores are simple to calculate. It is widely used[10]. It had good validity and reliability[10,11].

Houghton score measures function of lower limb amputee fitted with prosthesis in terms of wear and use of prosthesis[12]. It is appropriately responsive to change in prosthetic use in individuals with lower limb amputation after rehabilitation. It consists of four items, length of time wearing the prosthesis, manner in which it is used, whether an assistive device is used outdoors, and the individuals' perception of stability while walking over rough terrain. The responses are summed easily to give a score from 1 to 12[13]. It has content and face validity, poor to good construct validity dependent on the comparison measure, some responsiveness to change (item 4 not on its own), some floor and ceiling effects, good test-retest reliability, and adequate internal consistency. It is recommended for routine clinical use[13].

Statistical Analysis:

A total of 136 amputees were employed in our study at the start of the study, but we were able to follow 88 individuals up to 6 months. Simple mathematical tools were used along with students' T test for final results.

Results:

Demographics: A total of 68 below knee lower limb amputees, in each category were examined out of which 47 using Jaipur foot and 41 using PU foot could be followed up to 6 months. Most (90%) were male users, with nearly 113 (83%) being in the age group of 18-60 years, 13 (10%) above 60 years and rest 7% below 18 years. Nearly 50% individuals were manual labourers and the rest 50% constituted of private jobs, students and those doing no work at all. Nearly 74 (55%) individuals had an amputation because of vehicular accidents and rest due to other causes including diabetic foot, gangrene, malignancy and congenital anomalies.

Satisfaction levels: This is shown in Table 1. Nearly 70% users of Jaipur foot were satisfied as against only 51% of PU foot users.

Duration of use related to breakage site: It is shown in Table 2 that 41 (87.23%) patients using Jaipur foot had no breakage at the end of 6 months as against 22 (53.65%) in PU foot category. None of the Jaipur foot broke in the first two months as against majority of the PU foot breaking in first 6 months of use.

Comparison of Jaipur foot and PU foot in terms of cross legged sitting and squatting: There was no much difference in terms of squatting and cross legged sitting in both the feet. It is depicted in Table 3.

Comparison on LCI: There was insignificant difference in basic and advanced activity of both the feet (p-value 0.866). It is shown in Tables 4 and 5.

Comparison on Houghton scale: It is shown in Table 6. There was no significant difference in functions of

Table 1: *Satisfaction with Jaipur Foot and Polyurethane Foot*

Sl No	Levels of satisfaction	Cause of dissatisfaction	No of patients using Jaipur foot (%)	No of patients using PU foot (%)
1.	Dissatisfied	Appearance	-	2 (4.87)
		Weight	-	-
		Gait	-	-
		Loose fitting	11 (23.40)	-
		Breakage	3 (6.38)	18 (43.90)
2.	Satisfied		33 (70.21)	21 (51.21)
	Total		47 (100)	41 (100)

Table 2: *Total Duration of Use and Breakage Site of Jaipur foot vs PU Foot*

Sl No	Duration (Months)	Breakage site										No of patients (%)	
		Sole		Ankle		Toe		Combination		No breakage			
		JF	PU	JF	PU	JF	PU	JF	PU	JF	PU	JF	PU
1.	0-1	-	3	-	3	-	-	-	-	-	-	-	6 (14.63)
2.	1-2	-	5	-	3	-	-	-	-	-	-	-	8 (19.51)
3.	2-3	-	3	-	-	-	-	-	-	-	-	-	3 (7.31)
4.	3-4	1	2	-	-	1	-	1	-	-	-	3 (6.38)	2 (4.87)
5.	4-5	-	-	1	-	1	-	-	-	-	-	2 (4.25)	-
6.	5-6	-	-	1	-	-	-	-	-	41	22	42 (89.36)	22 (53.65)
	Total											47 (100)	41 (100)

below knee amputees fitted with prosthesis (p-value-0.785) as measured on Houghton scale.

TUG and TWT: Nearly 42(89.36%) users of Jaipur foot were able to complete TUG test in 6-10 seconds as against 30 (73.17%) of PU foot users. There was no significant difference in mobility of both feet (p-value=0.175) in TUG test and TWT (p-value=0.499).

Table 3: *Jaipur Foot versus PU Foot in Terms of Cross Legged Sitting and Squatting*

Sl No	Squatting/cross legged sitting	No of patients using Jaipur foot (%)	No of patients using PU foot (%)
1.	Squatting absent/cross legged sitting absent	15 (31.91)	15 ()36.58
2.	Squatting present/cross legged sitting absent	20 (42.55)	21 (51.21)
3.	Squatting present/cross legged sitting present	7 (14.89)	2 (4.87)
4.	Squatting absent/cross legged sitting present	5 (10.63)	3 (7.31)
	Total	47 (100)	41 (100)

Table 4: *Locomotor Capability Index of Jaipur Foot versus PU Foot in Basic Activity*

Sl No	Age (years)	Basic activity						No of patients (%)	
		0		<21		21			
		JF	PU	JF	PU	JF	PU	JF	PU
1.	0-20	-	-	-	-	4	1	4 (5.81)	1 (2.43)
2.	21-40	-	-	-	-	21	24	21 (44.68)	24 (58.53)
3.	41-60	-	-	1	-	19	12	20 (42.55)	12 (29.26)
4.	61-80	-	-	-	-	2	4	2 (4.25)	4 (9.75)
	Total							47 (100)	41 (100)

Table 5: *Locomotor Capability Index of Jaipur Foot versus PU Foot in Advanced Activity*

Sl No	Age (years)	Basic activity						No of patients (%)	
		0		<21		21			
		JF	PU	JF	PU	JF	PU	JF	PU
1.	0-20	-	-	-	-	4	1	4 (8.81)	1 (2.43)
2.	21-40	-	-	1	2	19	22	20 (44.68)	24 (58.53)
3.	41-60	2	1	4	5	15	6	21 (41.55)	12 (29.26)
4.	61-80	-	-	2	2	-	2	2 (4.25)	4 (9.75)
	Total							47 (100)	41 (100)

Table 6: *Houghton Score for Jaipur Foot versus PU Foot*

Sl No	Age (years)	Houghton score						No of patients (%)	
		7-9		9-10		11-12			
		JF	PU	JF	PU	JF	PU	JF	PU
1.	0-20	-	-	1	-	3	1	4 (8.51)	1 (2.43)
2.	21-40	-	-	3	4	18	19	21 (44.68)	23 (56.09)
3.	41-60	6	2	6	5	8	6	20 (42.55)	13 (31.70)
4.	61-80	1	1	1	2	-	1	2 (4.25)	4 (9.25)
	Total							47 (100)	41 (100)

Discussion:

Jaipur foot has been used for amputees as artificial prosthesis since early 1960. Late professor Emeritus, Dr PK Sethi gave the basic design. The design was not patented as his vision was that technology should be spread at all levels while using local technology to suit local needs. The biggest advantage has been its wide spread use but a great disadvantage was that, many factories and person cropped up for manufacturing due to which the quality was compromised and large number of patients were coming with frequent failure of prosthetic feet.

Though the shock absorption capacity of SACH foot was found to be better, the Jaipur foot allowed a more natural gait and was closer in performance to the normal foot[14].

As observed in our study, the most common cause of lower limb amputation is road traffic accidents followed by vascular diseases, which is in contradiction to the studies done in western countries where the vascular pathologies were reported to be the most common cause of amputation. Majority of amputees in our study were working reflecting the motivation and acceptance of prosthesis.

The average walking distance, floor activity and working hours were comparable in both the groups. On comparison of satisfaction regarding the use of prosthesis, 20 (48.7%) individuals were dissatisfied with PU foot as against 3 (6.38%) by Jaipur foot. The chief reason as per our observation was an early breakage of prosthetic foot, most commonly in the first three months of fitting. There were 2 patients, who were not satisfied with the appearance of PU foot that seemed to be lighter in colour as compared to Indian skin tone.

When we compared the Jaipur foot and PU foot on TUG test and TWT, the difference between the two was not significant there by suggesting that mobility is comparable in both the groups. On comparison of Jaipur foot and PU foot on LCI, there was an insignificant difference in basic and advanced activity of both types of prosthetic foot. Comparison on Houghton scale revealed no significant difference between both.

Amongst the users of Jaipur foot, breakage at the end of 6 months was minimal. Three (6.38%) had breakage at the ankle and 3 (6.38%) had it from sole and toe, forty one (87.25%) had no breakage and were still using prosthesis at the end of 6 months. Breakage at ankle was frequent in Jaipur foot because it allows movement at this joint in all planes. This is in agreement with the findings of Narayanan SG who revealed that that the prosthesis enjoys considerable mobility in three planes, confirming its known versatility, the prosthesis is robust; and, the testing machines deliver reproducible results and are suitable for in-house testing of ankle-foot prostheses[15].

PU foot had significant number of breakages occurring within the first three months, 17 (41.46%) and more than half of the individuals (53.6%) reported foot breakage by the end of 6 months. On statistical comparison, durability of Jaipur foot was found to be significant (p-value=<0.05). Heim[16] commented that durability needs of the foot should be at least 3 years. It appeared that 3 years is the minimal life-expectancy target for prosthetic feet in low-income countries. Thus, Jaipur foot seems to match breakage criteria as against PU foot. Jensen *et al*[17] state that the results with the conventional SACH foot constructions with polyurethane as filling and covering materials were so poor after 18 months that their use cannot be recommended in tropical areas of the developing world.

BMVSS started a project on PU foot with support from ISRO and various rubber industries, the PU foot could be manufactured on large scale while keeping a strict industrial quality control as against Jaipur foot which is hand crafted. The PU foot for this study was procured from BMVSS.

The Jaipur foot is made from natural rubber compound and wooden blocks. The main function of proximal wooden block/ankle block is to provide anchorage for the carriage bolt and this bolt moves with wooden blocks in various movements. The sponge rubber universal joint is the most important design feature of Jaipur foot. Several layers of rubber are glued together to form a large block. The entire block is then enclosed in closed shell of a hard rubber. As the sponge rubber block is made of separate layer, it causes dissipation of stress along the line of cleavage, thereby protecting the sponge rubber block from breaking up, and lastly the two mm thick hard rubber encloses the structural component of foot pieces. The exterior is covered with rubber cushion compound and sole is made of rubber tread compound. The cosmetic features are very satisfactory and acceptable to these patients and during bare foot walking it gives a realistic appearance[18]. As against this, Jensen and Raab[19] report the failures of Jaipur foot were due to skin fracture and gliding between sponge rubber layers of the heel block.

The polyurethane foot on the other side is made of microcellular polyurethane foam, which is widely used as shoe soling, structural foam, car bumper and other exterior parts of vehicle. Polyurethane used for soling material is tough, flexible, hard wearing, durable elastomeric material over the wide density material. With polyurethane, it is possible to produce single density out soles in any range of thickness and shape over the density, range predominantly between 350 and 650kg/m^3[3,20].

The current polyurethane design has small hard plastic ankle block which extends a little up to mid foot section to provide keel effect and rest of the foot is made of injected and molded polyurethane foot. The possible mechanism, where the movements take place will be gliding of polyurethane shell over the hard plastic rubber, due to continuous shear of two different materials, polyurethane microcellular foam and hard plastic, result in early breakage and invariably in all cases of breakage, foot is broken at or near the tip of hard plastic block.

Perry[21] mentions three main functions of the physiologic foot as shock absorption, weight bearing stability, and progression. Valmassy[22] further described five functions of the foot as load bearing, leverage, shock absorption, balance, and protection.

The polyurethane foot has good heel cushion allowing well the initial first rocker but after the loading response there is no forefoot keel which would help roll over from second to third rocker and also the fall of tibia from mid stance to pre swing result in large shear force acting between the hard plastic block and polyurethane cover causing breakage from inside to outside. So in spite of good shock absorption and weight bearing surface the lack of proper keel might be responsible for early breakage that has been observed[23].

The strength of our study was that to our knowledge it is the only comparative study between the Jaipur foot and PU foot. We included function as the end point of our study, it was not physician assessed and it was wholly subjective both in terms of acceptance and function. There was a large follow-up which is rare in Indian scenario. Limitation of our study was small sample size and no objective evaluation of prosthetic feet was done.

Conclusions:

Jaipur foot is more acceptable as far as movement, function and cosmesis is concerned. Most of researchers have labelled it as a handicraft item but being made individually, by hands, which is a strong positive factor for Jaipur foot. PU foot has its advantage that it can be made in large numbers and with consistent quality, but it still has basic design flaws and is not very well cosmetically accepted.

PU foot holds promise as a future prosthetic foot in developing nations but further research and design up gradation is needed. Taking the plus poits of Jaipur foot PU foot can be modified for the benefit of the amputtee.

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Medical Philately

Country Togo

Date 1976

Disability Blind/sight impairment || White Cane || Dark Glasses

Meta philately, stamps, Digital Disability, theme, imagery of disability on postage stamps, Outside Centre, Togo, 1976, World Health Day, Blind, White Cane, Dark Glasses

Number SG1131

Country Tunisia

Disability Blind/sight impairment || White Cane

Meta philately, stamps, digital disability, theme, imagery of disability on postage stamps, outside centre, Tunisia, 1976, World Health Day, Prevention of Blindness, Blind, White Cane

Number SG861

Stamps published on International Day of Persons with Disabilities - 3 December

Neck Stiffness in Sprengel Deformity and Klippel Feil Syndrome

Pramanik R[1], Halder RN[2]

A 25-years male patient referred to PMR OPD for management of intermittent neck stiffness for last 1 year. He was not suffering from any significant neck pain though he has been treated with several courses of analgesics and muscle relaxants. When we examined the patient after proper exposure we found a low hair line, web neck and Sprengel deformity of scapula in the left side (Fig 1). After that we did x-ray of his cervical spine which showed vertebral fusion (Fig 2). A clinical diagnosis of Klippel feil syndrome was established and his neck stiffness was due to blocked vertebra. His cardiovascular and respiratory system was normal on clinical examination. His chest x-ray was normal but USG of whole abdomen picked up a horse shoe shaped kidney.

We started him on static neck exercises, muscle relaxant and deep heat therapy. He responded well with couple of week's conservative care.

Fig 1

Fig 2

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PG Forum

REHAB CHALLENGES

A 30-years old male patient presented with bilateral flail upper limb for last two years. The weakness started five years ago after a fall from a tree. Initially there was a paraesthesia and mild weakness of both upper limbs which progressed over last few years. Now his upper limb muscle power is 0 with hypotonia without any dissociative anaesthesia (Fig 1). There was spasticity of grade 1 in both lower limbs with bilateral extensor planter reflexes. But he has unaided community mobility. There was significant sublaxation of both shoulders (Fig 2). Clinically a diagnosis of long segment myelopathy was established. His MRI cervical spine (Figs 3 & 4) was showing a syrinx along with bit of demyelination along with possible Arnold-Chiari malformation.

We started him with shoulder pouch, exercise therapy, counselling, and Occupational therapy. He wants to be independent in maintaining ADL and IADL.

Please opine regarding rehabilitation plans for this young patient with bilateral flail upper limb?

Fig 1-

Fig 2-

Figs 3 & 4-

PG Forum

REHAB QUIZ

1. **All are true about SEATTLE except?**
   A) Has a U shaped keel which acts as a compressed spring
   B) Narrow and lighter
   C) Relatively high arch which interferes with mediolateral stability
   D) Light foot for geriatric

2. **Which of the prosthetic foot extends upto the transtibial socket?**
   A) DYNASTEP
   B) FLEX
   C) FLEX WALK
   D) CARBON COPY II

3. **All are advantages of osseointegration except?**
   A) Excellent suspension
   B) Osseoperception
   C) High impact activities permitted
   D) Easy to don and doff

4. **All are true about C-LEG except?**
   A) Determine the phase of the gait cycle and the speed at which the user is ambulating
   B) Microprocessor knee
   C) Contains magneto-rheologic fluid
   D) Measures knee joint angle during gait

5. **% increase in energy expenditure/unit distance in cases of transfemoral amputee?**
   A) 69
   B) 79
   C) 89
   D) 99

6. **In ULTIMATE knee all are true except?**
   A) Can walk slopes and stairs
   B) Weight limit upto 60 kg
   C) Provides proprioceptive feedback
   D) Expensive

7. **All are drawbacks of Mc kibben artificial prosthesis except?**
   A) Maximum displacement is limited
   B) Requires complex control algorithm
   C) Deformation of rubber tube
   D) High force output

8. **All are characteristic of Bionic hands except?**
   A) Fixed thumb
   B) Fingers that move independently and bend at natural joints
   C) Multi-flex wrist option or manually rotatable
   D) Upgraded Biosim software

9. **All are eligibility criteria of myoelectric prosthesis except**
   A) Must have EMG voltage of at least 15μV
   B) The scar must be able to hold the weight of the arm
   C) Must pass motor/control test
   D) Must pass sensory/control test

10. **Which type of Symes prosthesis having a removable posterior wall?**
    A) Canadian syme prosthesis
    B) Veterans administrative prosthetics centre (VAPC) syme prosthesis
    C) Flexible posterior build up syme prosthesis
    D) None of the above

ANSWERS

Answer of September 2014:

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

Original Article

Relationship of Knee Specific Life-long Daily Activities with Radiographic Grading and Functional Disability in Patients Suffering from Osteo-arthritis of Knee

C Zonunsanga[1], Hmingthanmawii[2], Romi Singh Nongmaithem[3], Minggam Pertin[4], MS Chongreilen Chiru[5]

Abstract

Aim: To identify the relationship of knee specific lifelong daily activities with radiographic grading and the functional disability in patients suffering from osteo-arthritis (OA) of the knee

Study design: Cross sectional study

Duration of the study: October 2011 to September 2013

Settings: Physical Medicine and Rehabilitation (PMR) Department, Regional Institute of Medical Sciences (RIMS), Imphal.

Study population: All patients suffering from OA knee, who fulfilled American College of Rheumatology (ACR) criteria for classification of idiopathic OA knee, who attended the department during the study period.

Materials and Methods: Functional disability status of the patients was assessed using a WOMAC questionnaire besides complete clinical examination, Kellgren and Lawrence radiological grades was used for radiographic grading. Life-long daily activities involving the knee in regards to the job, occupation, leisure activities were recorded using a pre-structured, validated format.

Results: A total of 80 patients were studied. The mean WOMAC score was 38.74±14.36. Majority of the patients (52.5%) had a grade II OA. There was statistically significant association between WOMAC score and squatting ($p<0.01$), WOMAC and kneeling/ knee bending activities ($p<0.05$), WOMAC and VAS pain ($p<0.01$). Multivariate regression showed significant association of WOMAC score with squatting (OR 0.09, 95% CI 0.01-0.83) and knee bending activities (OR 0.25, 95% CI 0.05-1.27). None of the knee activities were found to be associated with radiographic grades.

Conclusion: Time spent for knee activities such as squatting and kneeling or knee bending activities in a day caused higher functional disability in OA knee patients. No direct association could be established between knee specific activities and radiographic grades.

Key words: **Knee specific lifelong daily activities, osteo-arthritis, WOMAC, Kellgren and Lawrence radiological grades.**

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Introduction:

Osteo-arthritis (OA) is a chronic degenerative disorder of multifactorial aetiology[1]. It is the most common joint disorder and can affect any joint in the body, but the disorder is more common in joints of knee, hip, fingers and spine, of which OA of the knee is the most common[1,2].

It is important to study the factors for development and disability associated with OA knee. Population based studies have been carried out elsewhere to identify the specific occupational, sports and certain life-long daily activities as risk factors for development of OA knee[3,4], and the association of certain risk factors with radiographic grades was also studied[5,6]. Squatting, kneeling or knee bending activities, sitting on floor cross legs, carrying weight, climbing up and down the slopes

in hilly terrain, etc, are the main activities involved in day to day activities with the people living in this part of the country. These activities are all knee specific activities and are involved continuously over a period of time in such individuals. Hence, it is of great interest to find out any association of such factors with knee osteo-arthritis and the magnitude of functional disability of the patients, and the degree of radiographic grades.

The present study attempts to find out the relationship of knee specific lifelong daily activities with radiographic grading and the functional disability in patients suffering from primary osteo-arthritis of the knee.

Materials and Methods:

It was a cross sectional study, subjects were recruited from patients suffering from OA knee, attending the Department of Physical Medicine and Rehabilitation, RIMS during October 2011 to September 2013.

Inclusion criteria were based on ACR criteria for diagnosis of OA knee[7]. The criteria (clinical and x-ray) include:

a. Knee pain **plus**
b. At least 1 of 3
   - Age more than 50 years
   - Stiffness less than 30 minutes
   - Crepitus **plus**
c. Osteophytes on x-ray of knee joint.

Patients with severe comorbid conditions, such as heart disease, stroke and vascular disease, inflammatory disease of joints like rheumatoid arthritis, recent knee trauma and patient with cognitive impairment were excluded from the study.

Informed consent was taken from the subjects before including them for the study. Approval of the Institutional Ethics Committee was also taken before starting the study.

Functional disability assessment:

Besides clinical examination, functional disability status of the patients was assessed using Western Ontario and McMaster universities index of Osteoarthritis (WOMAC) questionnaire[8]. The WOMAC Index is a disease-specific, self-administered questionnaire, for assessing functional status and outcomes in OA knee. It contains 24 parameters, targeting areas of pain, stiffness and physical function. The questionnaire was translated into the local language (Manipuri). Forward backward translation procedure was applied as recommendation made by Beaton *et al*[9]. Pre-testing of the Manipuri version was done in 15 patients in a target population by using the probe technique[10]. The final accepted Manipuri version was then used for the study purpose.

Radiographic assessment:

X-ray of both knee joints: antero-posterior view (standing) as per recommended by Altman *et al*[11]. The lateral view of knee joint in slight flexion in recumbent position was also taken to see patello femoral compartment. The severity of the disease was graded by Kellgren and Lawrence radiological grading[12] for OA of the knee joint.

Knee specific daily activity assessment:

Life-long daily activities involving the knee in regards to the job, occupation, leisure activities were recorded using a pre-structured, validated format[4]. This has been used in population based studies for identifying risk factors for OA knee in Asia – Pacific COPCORD studies in countries viz. Iran and Bangladesh[13]. The structured questionnaire contains daily time spending of squatting, knee bending and kneeling, sitting cross legs on the floor, sitting chairs, stairs climbing, standing, walking in plain and hilly terrain, carrying of weight, cycling, driving, etc. The patients were extensively interviewed by a trained interviewer (doctors /nurses) who noted down their lifelong daily activities based on life-course approach[4], including job working hours and leisure time activities. The average time spent in a day for each knee activities, that patients had performed for majority of their life was noted and categorised based on hours or minute.

Statistical analysis:

Data collected were analysed using SPSS version 16. The relationship between knee specific daily activities, radiographic grading, WOMAC disability scores and clinical variables like duration of illness, VAS pain score and BMI were analysed using Chi-square test and Fisher's exact test. Association of time spending per day for knee activities with functional disability and radiographic grades were also analysed with multivariate regression method. Associations were expressed as odd's ratios (OR) with 95% confidence intervals (95% CI). $P<0.05$ was taken as significant for all tests.

Results:

A total of 80 patients suffering from OA knee were studied. The characteristic findings of study group are depicted in Table 1. The mean age of the patients was 56.24±8.24 years. The mean duration of illness was

7.76±4.98 months. Majority of the patients were female, comprising 77.5%. Number of patients having both knee involved was 43 (53.8%).

The mean WOMAC score was 38.74±14.36. The Kellgren and Lawrence radiographic grading of the study shown in population is shown in Fig 1. Majority of the patients (52.5%) had a grade II OA changes followed by grade III which was 37.5%.

Relationship between knee activities with WOMAC and radiographic grades:

The relationship between knee specific daily activities with WOMAC score and radiographic grades are shown in Table 2. There was statistically significant association between WOMAC score and squatting ($p<0.01$), WOMAC and kneeling/knee bending activities ($p<0.05$), WOMAC and VAS pain ($p<0.01$), WOMAC and BMI ($p<0.05$). The duration of illness was found to be significantly associated with the radiographic grades ($p<0.01$).

After analysis with multivariate regression, after adjusting for BMI, age, duration of illness, it was observed that there was still statistically significant association of WOMAC score with squatting (OR 0.09, 95% CI 0.01-0.83) and knee bending activities (OR 0.25, 95% CI 0.05-1.27). None of the knee activities was found to be significant with radiographic grades as shown in Table 3.

Discussion:

In this cross-sectional study we observed that more time spent for squatting in floor per day and more time spent per day for activities involving kneeling and knee bending were positively associated with functional disability. We also found positive association between knee functional disability and BMI and also with severity of pain.

Since activities such as squatting, kneeling, stair-climbing, walking, sitting, are parts of WOMAC questionnaire, the difficulty in performing one or more items were expected to increase the overall WOMAC score. So we tried to find out if average time spent per day for such activity for the past years will affect the functional disability. But we could find only time spent

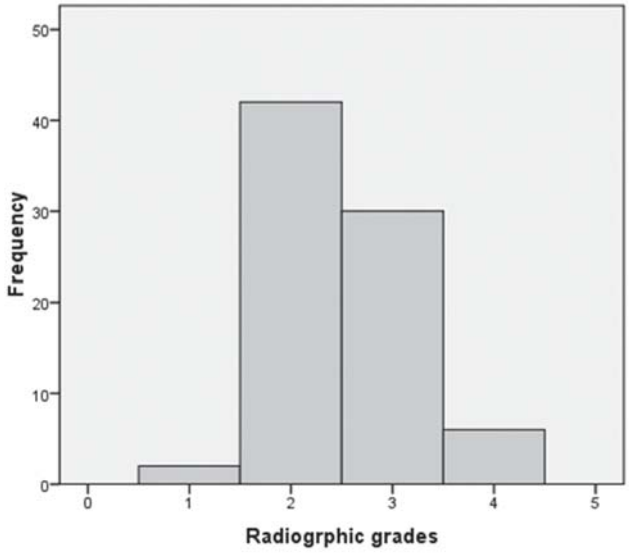

Fig 1- *Kellgren and Lawrence Radiographic Grading*

Table 1: *Demographic, Clinical and Radiographic Characteristics of the Patients*

Characteristics		Value
Mean age (in years)		56.24 ± 8.24
Male : female18 :62		
Mean duration of illness (in months)		7.76 ± 4.98
Mean BMI (kg/m2)		24.98 ± 3.94
Occupation No of patients (percentage)	Housewife	42 (52.5%)
	Sedentary occupation	9 (11.2%)
	Moderately sedentary	20 (20%)
	Farmer/labourer	9 (11.2%)
No of patients with knee involvement (per cent)	Left	18 (22.5%)
	Right	19 (23.8%)
	Both	43 (53.8%)
Mean WOMAC score		38.74 ± 14.36

Table 2: *Association of Radiographic Grading and WOMAC Score with Knee Specific Daily Activities*

Daily activities	WOMAC	Radiographic grades
Squatting 0.009 **	0.271	
Knee bending activities	0.038 *	0.398
Stairs climbing	0.981	0.854
Walking plain surface	0.496	0.771
Walking hill	0.274	0.213
Standing	0.910	0.910
Sitting chairs	0.221	0.232
Sitting cross legs	1.000	0.911
Lifting heavy objects	0.283	1.000
Driving	0.586	1.000
Pain (VAS)	0.003 **	0.588
Age	0.167	0.779
BMI	0.028 *	0.941
Duration of illness	0.373	0.001 **
WOMAC		0.207

* P<0.05, Significant; ** P<0.01, Highly significant

Table 3: *Relationship between WOMAC and Radiographic Grades with Knee Specific Daily Activities Using Multivariate Regression Method*

Activity		WOMAC OR (95 % CI)	Radiographic grades OR (95 % CI)
Squatting	>30 minutes (reference)		
	≤30 minutes	0.09 (0.01-0.83)*	1.66 (0.63-4.36)
Kneeling	>30 minutes (reference)		
	≤30 minutes	0.25(0.05 - 1.27)*	0.76(0.29-1.67)
Climbing stairs	>3 stories (reference)		
	1 storey	1.00 (0.10 - 9.97)	0.16 (0.01 -1.55)
	2-3 stories	0.90 (0.08 - 9.98)	0.10 (0.01-1.67)
Walking plain surface	>3 hours(reference)		
	<2 hours	1.08 (0.24 - 4.85)	1.21 (0.38 - 3.88)
	2-3 hours	0.60 (0.10 -3.44)	1.22 (0.35 - 4.21)
Walking hilly terrain	>30 minutes (reference)		
	≤30 minutes	0.42 (0.12 - 1.42)	1.76 (0.71 - 4.35)
Standing	>2 hours (reference)		
	≤2 hours	1.29 (0.38 - 4.38)	0.95 (0.39 - 2.30)
Sitting in chairs	≥3 hours		
	<3 hours	2.18 (0.61-7.78)	0.58 (0.23 - 1.42)
Sitting cross legs	≥1 hours(reference)		
	Nil	1.44 (0.25-8.16)	1.41 (0.40 - 4.87)
	<1 hour	1.20 (0.20 -7.05)	1.16 (0.33 - 4.06)
Lifting objects	≥5kg/day (reference)		
	<5 kg/day	0.46 (0.13-1.62)	1.71 (0.61-4.74)

* P<0.05, Significant

per day for squatting and kneeling or knee bending activities were significantly associated with functional disability score. Time spent for more than 30 minutes per day for squatting significantly increased the WOMAC score with OR 0.09, 95% CI 0.01-0.83 (p<0.05) while time spent for kneeling or knee bending activities per day for more than 30 minutes significantly increased functional disability with OR 0.25, 95% CI 0.05-1.27 (p<0.05). Cooper *et al*[3] also observed significant increased risk in subjects whose job demanded more than 30 minutes squatting per day (OR 6.9, 95% CI 1.8-26.4), kneeling (OR 3.4, 95% CI 1.3-9.1), and climbing more than 10 flights of stairs per day (OR 2.7, 95% CI 1.2-6.1) in their study of 109 patients suffering from OA knee. Dahaghin *et al*[4] in their population based COPCORD study with random selection of 480 OA patients from Stage 1, Phase 1, who were match controlled with normal individuals (for age and sex), also found that two specific knee activities viz. squatting (OR 1.51, 95% CI 1.12-2.04), cycling (OR 2.06, 95% CI 1.23-3.45) were found to be risk factors for development of OA knee. Activities involving knee bending had borderline significance (OR 1.98, 95% CI 0.98-3.99).

Cooper *et al*[3] observed no significant association of OA knee with activities involving heavy lifting, prolonged walking, standing, sitting or driving. Dahaghin *et al*[4] also observed that there were no extra risks for OA knee with activities like climbing stairs, prolonged standing, sitting on floor and walking up/down hill. The present study also could not find any statistically significant association between WOMAC scores with time spent for walking hill and plain, stairs climbing, standing, sitting in chairs, and cross-leg sittings, and driving vehicle.

Thambyal[14] showed that squatting created peak external moments that were more than 2.5 times greater than those during walking. Accordingly we expected that there would be an association between squatting and knee bending activities to have associated with disability and

radiographic changes. But we could find their association only with functional disabilities, but not with radiographic grades.

Zeng *el al*[15] in their study found that the prevalence of both knee pain and knee OA had a two-fold increase in residents staying in multistoried buildings who required stairs climbing. Muraki *el al*[16] had observed that kneeling, squatting, walking and lifting heavy objects were associated with more severe radiographic grades. In the present study too, we tried to evaluate if any relationship existed between knee specific daily activities which were more commonly involved in people living in this part of the country, such as squatting, kneeling, stairs climbing, walking, hill climbing, sitting cross legs etc, with severity of radiographic grades. But we could not find any significant association between these knee activities with the radiographic grades. The reason could be because of small sample size study. Moreover we did not find climbing stairs as a risk factor for OA knee as also reported by Dahaghin *et al*[4]. This could be because of socio-economic condition of this region where buildings with higher than 2 stories were uncommon as also shared by Dahaghin *et al*[4].

There are some studies[17-19] which attempted to assess the relationship between radiographic grades and functional disability. We found no association between functional disability with severity of disease graded from radiographic findings. This explains that the degree functional disability varies widely with the same degree of OA as also shown by Thumboo *et al*[20.]

Cubukcu *el al*[18] found that none of the WOMAC subscores were related with Kellgren-Lawrence grading. In other studies[17,19], correlation between self-reported disability and radiographic change could not be established. This absence of association may be explained by the fact that pain which is the major complain in OA knee has great influence on the functional disability status and not on the radiographic grades. Association between pain and WOMAC score was highly significant ($p<0.01$) but we did not find positive association between pain and radiographic changes. These finding were in line with findings by Creamer *el al*[17] and McAlindon *et al*[19] who also observed that functional status in OA knee was determined by pain severity, age, obesity and psychological anxiety and not by bony changes in radiograph.

Majority of our patients were housewives (52.5%) whose main job was to look after household activities in their family. In this part of the country, household activities such as cleaning utensils, clothes, cleaning floors, and cooking etc, involved mainly of squatting and knee bending activities. So while managing OA knee, we should give more importance on this particular patient group and consider lifestyle modification taking into consideration of sociocultural context of the society.

The limitations of this study include being a small sample size of the study. The lifestyle and activities can change throughout a person's life, this fact makes very difficult to find associations of knee activities with osteo-arthritis, its functional disability and radiographic changes which develops only gradually. As Dalhagin *et al*[4] also reported, a life-course approach helps reduce these problem by counting the years of exposure to each knee specific activities. Finally the study was conducted on a hospital based population of patients suffering from OA knee seeking medical care, this may not be generalised to the whole ethnic population.

A population based study representing the ethnic community would be desirable to further confirm whether or not these activities are associated risk factors for development of OA knee leading to functional disability and radiographic changes in the course of the disease. While recording these knee specific activities, a proper life course approach should be considered.

Conclusions:

From the present study it was observed that the functional disability caused by OA knee is influenced by the knee activities in day to day work and leisure time. Time spent for knee activities such as squatting and kneeling or knee bending activities in a day are risk factors for development higher disability on OA knee patients. No direct association could be established between knee specific activities and radiographic grades. Pain due to OA knee is associated with higher disability but not necessarily with higher radiographic grades. The functional disability does not correlate with the degree of radiographic grades in OA knee patients.

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Original Article

Post Total Contact Casting Healing Pattern in Leprotic Chronic Plantar Foot Ulcer

Bhakat D[1], Pramanik R[2], Das P[3], Haldar RN[4], Kataruka M[5]

Abstract

Introduction: role of TCC in diabetic foot ulcer is well established in literature. Hansen's disease is very common in the tropical country like India but rarely seen in developed world. That's why there is scarcity of literature about the efficacy of TCC in leprotic neuropathic ulcer.

Objective: (1) to observe overall improvement pattern of plantar foot ulcer after doing Total Contact Casting. (2) To look for the time duration to heal the ulcer.

Study design: Longitudinal analytical study.

Sample size: 22.

Study duration: 7 months.

Place of study: Department of Physical Medicine and Rehabilitation, IPGME & R, SSKM Hospital, Kolkata.

Inclusion criteria: Grade 1 and grade 2 plantar ulceration (WAGNER classification), Ulcers treated previously with local dressing, antibiotics and orthosis but no improvement, Ambulatory patients.

Exclusion criteria: Grade 3 ulcer (WAGNER), Age less than 18 years, Patients unwilling to have cast, Grossly deformed foot.

Methodology: After taking institutional ethical committee clearance the patient fulfilling the above criteria the aassessment of ulcer was done by Wagner's grading, site and size of the ulcer after getting the patient's consent. Then the ulcers were debrided off under aseptic condition and TCC (Total Contact Casting) was done.

Outcome measures: Duration to heal, improvement in the size of the ulcer, downgrading of WAGNER classification.

Assessment: At 0 week, 1st week, 3rd week and 6th week.

Result analysis: as per the statistical analysis by Statistical version 6 [Tulsa, Oklahoma: Stat Soft Inc., 2001] and Graph Pad Prism version 5 [San Diego, California: Graph Pad Software Inc., 2007] it was shown that the surface area and width of ulcer were improved with statistical significance due to TCC. Interestingly there was no difference noted in improvement of hind foot and fore foot ulcers.

Conclusion: TCC is helpful in improvement of size of ulcer in short period of time without any anatomical variation of site of ulcer.

Key words: **Leprosy, neuropathic foot ulcer, TCC, plantar foot ulcer.**

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Intoduction:

Neuropathic plantar ulceration is one of the serious handicap to the patient with anaesthetic feet in active life. The only way to heal a plantar ulcer is to provide rest it. If the patient walks on the ulcer,it spreads and osteomyelitis ensues; the scarring and distortion make further inevitable ulceration until walking finally becomes impossible.Neuropathic trophic plantar ulceration can be seen in variety of conditions involving insensitivity of the foot including diabetes, leprosy, hereditary neuropathy, tabes dorsalis, herniated nucleus pulposus , treated for months and years by various forms of local applications and dressings requiring high cost , time and money. To receive this treatment patients have to walk from their homes on bandaged feet, continuing

the mechanical stresses which are largely responsible for worsening ulceration.

Therefore it is necessary to treat the patients by methods which allow ambulation. Before the era of total contact casting (TCC) results were poor with other conservative means. The regularity and speed with which these trophic ulcers heal in a walking plaster is most impressive and support the concept that the ulceration is related mainly to mechanical factors. The recurrence/worsening of ulceration can be avoided not by TCC but also by the wearing of shoes which provide conditions similar to those in a plaster. These strengthen the idea that mechanical loading of the neuropathic foot is clearly part of the aetiology of foot ulceration and is subsequently a major factor in delaying wound healing. Therefore, off-loading the affected plantar areas is an important component of prevention and treatment. A number of off-loading mechanisms are available, but not all of them are evidently practical.

Total contact casting has been time tested over many years. The earliest published report of casting for trophic ulcerations dates back to the 1930s[1]. Dr Joseph Kahn in India described an ambulatory technique for the treatment of plantar ulcers occurring in the patients with Hansen's disease as an alternative to prolonged, expensive periods of bed rest in the hospital. Dr Paul Brand[2] and his associates refined and popularised the current technique in the early 1960s at the Gillis W. Long Hansen's Disease Center in Carville, Louisiana[2]. Total contact casting as a treatment of neuropathic plantar surface ulcerations has since been applied to a variety of conditions involving insensitivity of the feet.

The main purpose of treating neuropathic plantar ulcerations by total contact casting is to reduce excessive mechanical forces (including vertical pressure and horizontal shear) on the plantar surface of the feet as advocated by Brand[3] and Ctercteco *et al*[4], while maintaining ambulation. According to Coleman *et al*[5], the TCC was designed to equalise loading of the plantar surface by equal "total contact" of the plantar skin with the cast material, thereby minimising pressures at an ulcer site. Since the first published report total contact casting has been applied in diabetic plantar foot ulcer in several studies and the results are very promising. It is now well accepted that TCC is the gold standard among methods used to heal diabetic foot ulcers[6,7].

Hansen's disease is very common in tropical countries like India. Leprosy is one of the few chronic illnesses that meet the demanding criteria for possible elimination, i.e, it can be diagnosed by practical and simple diagnostic tools or by clinical signs alone, availability of an effective modality to interrupt its transmission in the form of MDT and a single significant reservoir of infection, humans. However, despite all the encouraging parameters which are sustainable, leprosy eradication seems a distant possibility considering the current scenario[8,9]. New cases continue to occur in almost all endemic countries and high-burden pockets exist against a low-burden background. The number of new cases detected during 2011, as reported by 105 countries, was 219,075 and India topped the list with its contribution of 58.1 per cent to the pool[10]. There is scarcity of literature about the efficacy of TCC in leprotic neuropathic foot ulcer. The aim and objectives of our study is to observe overall improvement pattern of plantar foot ulcer after doing TCC and to look for the duration of ulcer healing.

Materials and Methods:

Before initiating the study clearance of The Institutional Ethics Committee was taken. Individual informed written consent was taken from each patient. The prospective analytical study was conducted on twenty-two (22) patients in the department of Physical Medicine and Rehabilitation, IPGME&R, SSKM Hospital, Kolkata,for a period of seven months (Feb'12-Aug'13).

The study included grade 1 and grade 2 plantar ulceration (WAGNER classification) which did not improve with local dressing, antibiotics and orthoses among ambulatory patients (age more than 18 years). The exclusion criteria of the study was patients unwilling to give consent, age less than 18 years, grade 3 ulcer (WAGNER), patients unsafe in mobility while in cast. Patients with leprotic neuropathic plantar foot ulcer, residents of Kolkata and surrounding districts, attending the Physical Medicine and Rehabilitation OPD at IPGME&R, SSKM Hospital, Kolkata who fulfilled the inclusion and exclusion criteria were included in the study.

Selected patients were included in this study for further assessment and intervention and examined at baseline first on the basis of the parameters like size of the ulcer, Wagner classification and other characteristics of ulcer. A detailed clinical history, examination and a baseline investigation were taken for all patients.To observe the improvement pattern the patients were identified individually with their name, address, contact number. All the patients received education regarding routine care of the cast and warning signs. The debridement of the

ulcer was done under strict aseptic condition and all the patients were advised to follow the advice and report accordingly if they face any problem. Before the cast is applied, the ulcers are debrided off all necrotic tissue and hypertrophic edges are shaved to create a smooth transition from the ulcer's bed to adjacent skin without an intervening shelf of keratin. The wound was then cleaned with 10% solution of povidone iodine. Single sterile gauze dressing (5×5) cm was used to cover the each ulcer, in order to limit bulk and prevent excessive pressure.

For application of the TCC patient was placed in the prone position with the involved limb's knee flexed to 90 degrees and the ankle in neutral position. The plantar surface of the ulcerated foot should be parallel to the floor. After proper positioning a small amount of cotton padding was placed loosely between adjacent toes to absorb any moisture and prevent maceration. Then a roller cotton 10-15cm wide was applied from the knees to toes. The distal end of the roller cotton was then folded back over the dorsal aspect of toes and secured with paper tape. Wrinkles in the roller cotton were avoided to prevent an uneven surface at the interface with the skin. Then plaster was applied loosely and was molded exactly to match the contour of the foot, ankle and leg without any formation of wrinkles. The cast was applied 2cm distal to the fibular head to a point distally up to covering of the toes. Usually two rolls of plaster (15cm) are adequate to create a three-layer inner shell. A rocker sole was created by layering plaster cast (15cm) on the bottom of the cast from heel to toe. Then a rubber chappal was attached to the layered plaster cast to complete the rocker sole, with the help of two roll of plaster. The whole thing was then reinforced with one to two roll of 10cm plaster cast.

After casting, the patients were examined and assessed in consecutive four visits: visit 1 (0 week), visit 2 (1st week), visit 3 (3rd week) and visit 4 (6th week) on the

Fig 1- *CASE 1 - Before TCC*

Fig 2- *CASE 1 - After 3 weeks of TCC*

Fig 3- *CASE 2 - Before TCC*

Fig 4- *CASE 2 - After 6 weeks of TCC*

Table 1: *Descriptive Statistics of Numerical Variables - Whole Cohort [n = 22]*

Variables	Valid number	Mean	Median	Minimum	Maximum	Std. Dev.	Standard error
Age	22	44.41	40.50	18.000	81.0	17.031	3.631
L_V1	22	22.95	23.50	10.000	39.0	7.895	1.683
W_V1	22	17.27	15.00	8.000	26.0	6.088	1.298
SA_V1	22	434.09	363.00	80.000	1014.0	271.911	57.972
L_V2	22	20.36	19.50	8.000	36.0	7.804	1.664
W_V2	22	14.45	12.50	6.000	24.0	5.804	1.237
SA_V2	22	331.09	255.00	48.000	828.0	232.096	49.483
L_V3	22	11.86	11.00	0.000	34.0	9.468	2.019
W_V3	22	8.82	9.00	0.000	20.0	7.062	1.506
SA_V3	22	161.18	99.50	0.000	680.0	181.154	38.622
L_V4	22	4.14	0.00	0.000	26.0	8.073	1.721
W_V4	22	3.64	0.00	0.000	18.0	6.898	1.471
SA_V4	22	65.86	0.00	0.000	416.0	128.454	27.386

L=Length, W=Width, SA=Surface area

basis of the all the data documented in our stipulated proforma and parameters like ulcer size, Wagner grade, time taken to heal ulcer and to look for any worsening of the ulcer.

The main outcome measure of the study was improvement of the size of the ulcer, downgrading of Wagner classification and time taken to heal the ulcer. TCC was removed and done again in each follow-up visit for the maximum period of 6 weeks and cast failure was considered in those patients who failed to achieve Wagner grade '0' after the period of six weeks. Then the results were analysed according to the standard statistical methods to look for the aims and objectives of the study.

Results:

The analysis was carried out by using software Statistica version 6 [Tulsa, Oklahoma: StatSoft Inc., 2001] and Graph Pad Prism version 5 [San Diego, California: GraphPad Software Inc., 2007]. In our study we attempted Kaplan-Meier survival analysis to study the trend in ulcer healing in terms of number of days to complete the healing. Out of 22 patients, 68.18% (n=15) were males and 31.82% (n=7) were females. In descriptive statistics of numerical variables all numerical variables were normally distributed. The mean age group was 44.41 with standard deviation of 17.031 (Table 1).

Among the study population majority of the ulcer were in forefoot (55%, n=12), followed by hindfoot (41%,

Table 2: *Overall Distribution of the Ulcers*

Site	No of cases	Per cent
Right great toe	1	4.55
Left 1st metatarsal head	4	18.18
Right midfoot	1	4.55
Right heel	5	22.73
Left heel	4	18.18
Right 1st metararsal head	2	9.09
Right 2nd metatarsal	2	9.09
Right 3rd metatarsal head	1	4.55
Left 5th metatarsal head	2	9.09

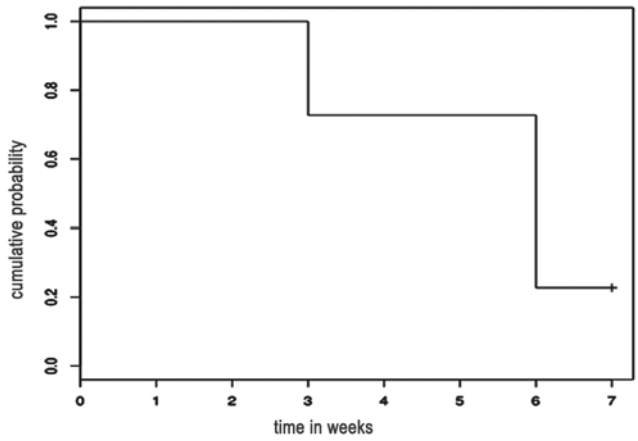

Fig 5- *Kaplan Meier Curve Showing Cumulative Probability of Ulcer Healing*

Table 3: *Significance of Change in Ulcer Dimensions Over Time*

Table 3a: *Surface Area of Trophic Ulcer*

Repeated measures ANOVA No of data sets 4 F-value 50.170 *p* <0.001

Tukey's multiple comparison test	Mean difference	q	p-value	95% CI of difference
SA_V1 vs SA_V2	103.00	4.4062	<0.05	15.704 to 190.30
SA_V1 vs SA_V3	272.91	11.675	<0.001	185.61 to 360.21
SA_V1 vs SA_V4	368.23	15.752	<0.001	280.93 to 455.52
SA_V2 vs SA_V3	169.91	7.2685	<0.001	82.613 to 257.21
SA_V2 vs SA_V4	265.23	11.346	<0.001	177.93 to 352.52
SA_V3 vs SA_V4	95.318	4.0776	<0.05	8.0222 to 182.61

Table 3b: *Longitudinal and Transverse Length of Trophic Ulcer*

Repeated measures ANOVA No of data sets 4 F-value 92.432 *p* <0.001

Tukey's multiple comparison test	Mean difference	q	p-value	95% CI of difference
L_V1 vs L_V2	2.5909	2.9102	ns	-0.73374 to 5.9156
L_V1 vs L_V3	11.091	12.458	<0.001	7.7663 to 14.416
L_V1 vs L_V4	18.818	21.137	<0.001	15.494 to 22.143
L_V2 vs L_V3	8.5000	9.5476	<0.001	5.1754 to 11.825
L_V2 vs L_V4	16.227	18.227	<0.001	12.903 to 19.552
L_V3 vs L_V4	7.7273	8.6796	<0.001	4.4026 to 11.052

Table 3c: *Width of Trophic Ulcer*

Repeated measures ANOVA No of data sets 4 F-value 80.680 *p* <0.001

Tukey's multiple comparison test	Mean difference	q	p-value	95% CI of difference
W_V1 vs W_V2	2.8182	4.1755	<0.05	0.29773 to 5.3386
W_V1 vs W_V3	8.4545	12.527	<0.001	5.9341 to 10.975
W_V1 vs W_V4	13.636	20.204	<0.001	11.116 to 16.157
W_V2 vs W_V3	5.6364	8.3510	<0.001	3.1159 to 8.1568
W_V2 vs W_V4	10.818	16.029	<0.001	8.2977 to 13.339
W_V3 vs W_V4	5.1818	7.6776	<0.001	2.6614 to 7.7023

n=9) then midfoot ulcer (4.55%). The overall distribution of the ulcers in the study is shown in Table 2. In our study most of the ulcer (63.64%) was in Wagner grade 2 and there was 36.36% Wagner grade 1 ulcer. Seventeen (77.27%) of the twenty-two ulcers were healed and five (22.73%) ulcers were stamped as non-healed ulcer at the end of six weeks, as those five ulcers failed to achieve Wagner grade '0' at the end of six weeks. Among five cast failure ulcers two (40%) were from hindfoot and three (60%) from forefoot.

In our study the data revealed statistically significant difference between subsequent visits starting from visit 1 to visit 4 with p-value <0.05, regarding the change in ulcer dimensions (length, width, surface area) over time by using Tukey's Multiple Comparison Test except the change in length in between vist 1 and visit 2 where the p-value was insignificant. The change in ulcer dimensions over time shown in Table 3.

During the course of treatment only 27.27% (n=6) ulcers healed at the end of three weeks (Figs 1&2) with 95% confidence interval 8.66%-45.88% whereas 77.27% (n=17) ulcers healed at the end of six weeks (Figs 3&4)

Table 4: *Comparison of Numerical Variables between Forefoot and Hindfoot Ulcers- Unpaired t Test*

Variables	Mean fore	Mean hind	p-value	Valid No Forefoot	Valid No Hindfoot	Standard deviation Forefoot	Standard deviation Hindfoot
Age	44.25	45.67	0.858	12	9	18.071	17.306
L_V1	20.75	25.11	0.221	12	9	6.877	8.937
W_V1	16.00	18.44	0.380	12	9	5.608	6.876
SA_V1	357.17	511.56	0.209	12	9	215.628	328.851
L_V2	18.25	22.33	0.245	12	9	6.982	8.631
W_V2	13.42	15.44	0.449	12	9	5.961	5.940
SA_V2	276.58	384.56	0.308	12	9	206.306	267.344
L_V3	9.42	14.67	0.226	12	9	9.180	9.975
W_V3	7.75	10.11	0.473	12	9	7.899	6.431
SA_V3	134.17	197.33	0.454	12	9	158.649	221.293
L_V4	4.08	4.67	0.877	12	9	7.465	9.592
W_V4	3.92	3.67	0.938	12	9	7.141	7.280
SA_V4	63.42	76.44	0.828	12	9	115.461	155.903

with 95% confidence interval 59.76%-94.78%. Kaplan Meier curve (Fig 5) depicted that 22 ulcers in this study also reinforce the improvement pattern over time period(after 3rd week 27.27% and after 6 week 77.27% patients improved).

Then we calculated and compared the different variables between forefoot and hindfoot ulcers using Student's unpaired 't' test, unfortunately it fails to show any statistically significant difference and all the p-values were >0.05 (Table 4).

Discussion:

Neuropathic plantar foot ulceration mostly due to the consequence of diabetes and Hansen's disease is one of the regularly treated condition in the department of Physical Medicine and Rehabilitation. In our prospective analytical study, conducted at the department of Physical Medicine and Rehabilitation at IPGME&R, over the period of seven months, we look for the efficacy of TCC as a treatment modality in patients with leprotic neuropathic plantar foot ulcer affecting unilateral foot. After getting ethical committee clearance, we included total 22 patients. Fortunately we did not lost any of them; all the patients of study population completed the study and attended follow-up visits. It's worth to mention that in our study we noticed mostly male in their middle age (mean age–44.41 years) were affected which is corroborating with the study conducted by Myerson *et al*[11] showing a male predominance with mean age group of 4th and 5th decade. However the other study reported by Fagila *et al*[12] showed the most of the patients are in their 6th decade with male dominance.

Off-loading is an aetiologic therapy of neuropathic plantar foot ulcers. It has been proven by literature that when correctly applied it not only interrupt the pathogenic chain which produces the ulceration but also to induce modifications in the histology of the ulcer, shifting it from a chronic inflammatory state to a much more evolutive condition. Most of the study done by Myerson *et al*[11], Fagila *et al*[12] , Brenner[13] etc reported that most of the ulcer in their study group were diabetic. Since the earliest published report regarding TCC in leprotic plantar foot ulcer by Dr. Joseph Kahn in India, there is some scarcity of literature about the role of TCC in Hansen's patients.In our study majority of the ulcer were grade-2. Only 36.36% were Wagner grade-1 ulcer. We excluded the patients of Wagner grade 3, 4, 5 at the very beginning. In our study most of the ulcer were in forefoot (55%) followed by hindfoot (41%) and midfoot (4%) ulcer which is quite favourable with the findings of the study done by Myerson *et al*[11] conducted on 71 neuropathic foot ulcers.

After statistical calculation we got statistically significant (p-value <0.05) difference by using repeated measure and Tukey's multiple comparison test in the reduction of ulcer length, width and surface area in subsequent visits except the reduction of length in between visit 1 and visit 2. This finding of reduction of ulcer dimensions over time course of our study did not differ from the recent study done by Fagila *et al*[12] published in 2010.

Achieving Wagner grade '0' was our final outcome which was also described by Boulton *et al*[13]. During our study period we got only 27.27% of the foot ulcer of total study population healed (Wagner grade '0') at the end of 3rd week. But majority of the ulcer (77.27%) of total study population healed after receiving treatment for 6 weeks which is at par the literature[14,15]. In the study by Ezio Fagila *et al*[12] found 73.9% healing rate in TCC group of diabetic foot ulcer. Sinacore[16] noted healing in 82% of 33 diabetic neuropathic ulcers after an average of forty-four days in total contact cast. Helm *et al* reported a 73% rate of healing in twenty-two patients with an average time to healing of thirty-eight days. Similar finding also noted by Bowker *et al*[17], who found healing in 100% of seven patients who wore a total contact cast for an average of six weeks. The combined results of these studies yields an average rate of successful healing of 75.5% after an average of 38.7 days but we found scarcity of literature after extensive search regarding leprotic plantar foot ulcer management. Till today it has not been extensively studied like diabetic foot ulcer. That's why we found difficulty to compare our data with other literature.

- In our study among the cast failure cases 60% were from forefoot but while comparing the different variables among the forefoot and hind foot ulcers by using Student's unpaired t test which did not revealed statistically significant difference and all the p-values were >0.05. However the other studies by Martin and Conti[18], Sinacore[19], etc showed the response was better in forefoot ulcer. During the study some minor treatment complications occurred, none of which required cessation or change in treatment. Last but not the least this study has limitation like small sample size, no control group, difficulty in assessing variation of improvement according to anatomical site due to small sample size.

Conclusion:

- TCC is definitely helpful in majority of the patients(77%) with leprotic plantar foot ulcer.
- Nearly ¼ patients responded well in 3 weeks time but most of the patients (74%) improved in 6 weeks.
- TCC is shown to be effective for statistical improvement of surface area, length and width of the ulcer.

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Case Report

An Unusual Case of Lower Tibial Stress Fracture in a Patient of Meningomyelocele with Equinus Deformity

Kothari S Y[1], Gupta Ajay[2], Kumar Amod[3]

Abstract

A patient of meningomyelocele (MMC) with severe equinus deformity at left ankle, presented with pain and swelling above the ankle. The patient was ambulatory and walking independently bearing weight on anterior aspect of heads of metatarsals. On clinical and radiological examination a stress fracture of distal tibia angulating posteriorly was noted. This case is presented for its uniqueness and also to highlight the significance of altered biomechanics which cause stress fracture.

Key words: **Meningomyelocele, stress fracture, equinus deformity.**

Introduction:

In a stress fracture or fatigue fracture clinical and radiological signs of healing are established before that of fracture are apparent. It is the result of excessive/ abnormal tension or traction stress on both cortices of the bone. According to Wolff's law every change in the form and the function of a bone, or in its function alone, is followed by certain definite changes in its internal architecture and secondary alterations in its external confirmation. It derives from this law that in confirmation to a particular type of stresses over the bone trabeculae, the trabeculae orient themselves along the stress lines so as to resist the stresses effectively[1]. New bone trabeculae are formed in the line of excess/ abnormal stress before the original trabeculae show signs of fracture. March fracture and Dance fracture are well known entities.

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Case Report:

A case of meningomyelocele with paralytic equinus at left ankle, walking with foot tilting posteriorly, putting excessive posterior tilting torque on lower tibia, is reported here (Fig 1). The child had developed stress fracture of the lower end of the tibia, as seen in the x-ray (Fig 2). Serum alkaline phosphatase was within normal limits indicating normal bone turnover. Altered biomechanics are explained in Fig 1, which caused repetitive and abnormal stresses in turn causing lower tibial stress fracture.

The patient was treated by correction of ankle deformity by lengthening of tendoachillis and subsequent application of a well padded ankle foot orthosis.

Discussion:

Tibial fractures are the most common lower extremity stress fractures[2]. Anterior stress fracture of the tibia usually result from tension stress and known for non-union[3,4]. Posteromedial stress fracture occurs on the compression side of the tibia and has a good prognosis[5]. Tibial stress fracture with meningomyelocele presents with painless swelling and warm surface. Its management depends upon correction of the biomechanical abnormality.

In normal human gait most of the energy at heel strike is absorbed by the movements at the subtalar joints. In

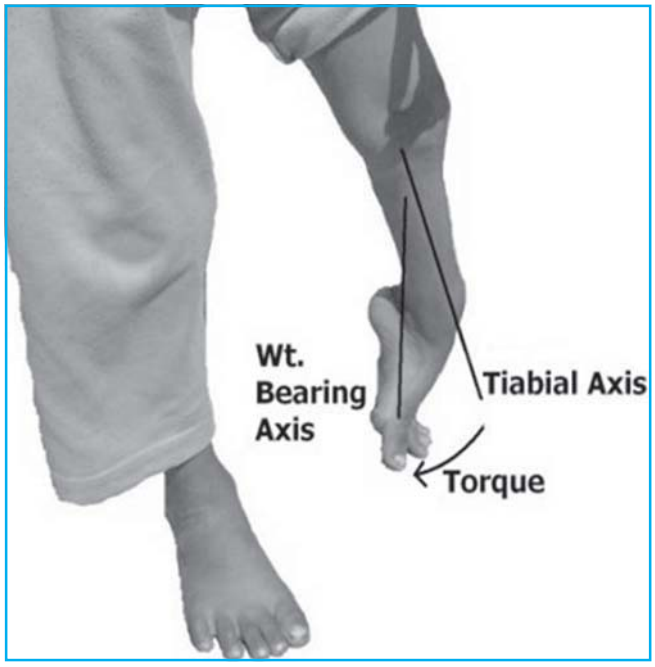

Fig 1- *Child with Altered Biomechanics in Weight Bearing Position and Torque Angle between the Tibial Axis and Weight Bearing Axis*

Fig 2- *Lateral Radiograph of Left Lower Limb Showing Tibiotalar Angle of 32 Degrees and Stress Fracture Angulating Posteriorly*

severe equinus foot as in our case, the anterior aspect of the fore foot strikes the ground. The shock absorbing capacity of the subtalar joint is lost. In subsequent stage flatfoot position is not achieved and weight is not distributed over the foot. In this child the equines deformity is so large (32 degrees) that the heel strike is absent. Due to deforming force at ankle acting anteriorly and ground reaction force acting posteriorly, undue strain was placed on anterior tibial cortex which lead to stress fracture angulating posteriorly. Joint contractures, muscle weakness and repetitive stresses are predisposing factors for tibial fracture[6].

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