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IJPMR Editorial Office :
Dr U Singh, Editor IJPMR
Professor and Head
Department of PMR
AIIMS, Ansari Nagar
New Delhi 110029
India

Tel: + 91 11 26594916, 26593232
FAX: + 91 11 26588663
email: usingh@aiims.ac.in

Web : http://www.ijpmr.com

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Review Article

Stem Cells in PMR Practices

Dr Ak. Joy Singh, MBBS, MD, DNB, DSM, PhD, Assoc. Professor, Dept. of Physical Medicine & Rehabilitation

Dr L. Suresh Roy, MBBS, MD, Assistant Professor, Department of Physiology

Regional Institute of Medical Sciences, Imphal, Manipur

Abstract

Stem cells are one of the most fascinating areas of biology today. But like many expanding fields of scientific inquiry, research on stem cells raises scientific questions as rapidly as it generates new discoveries. Stem cell therapy presents the potential promise to heal the defective systems in the body and the field is witnessing some path breaking research currently. The technology is provocative and promising, but the future is far from certain. Nevertheless, the science that is unfolding about neural and muscular development, autoimmune diseases especially Rheumatoid Arthritis is exciting in its potential implications. This article contains current information derived from internet searches on their use in some common conditions in Physical Medicine and Rehabilitation practices.

Keywords: Stem cell, Stem cell therapy, Spinal cord injury, Stroke, Myopathy, Rheumatoid arthritis

Introduction

Stem cells have two important characteristics that distinguish them from other types of cells. First, they are unspecialized cells that renew themselves for long periods through cell division (self renewal). The second is that under certain physiologic or experimental conditions, they can be induced to become cells with special functions (potency). Therefore, when a stem cell divides, each new cell has the potential to either remain a stem cell or become another type of cell with a more specialized function, such as the beating cells of the heart muscle or the insulin-producing cells of the pancreas, a muscle cell, a red blood cell, or a brain cell etc.

Sources

Stem cells are derived from three main sources: embryo, adult and the umbilical cord.

Embryonic stem cells: These stem cells are derived from the epiblast tissue of the inner cell mass of the earliest stages of development of the embryo called blastocyst before it would implant on the uterine wall. These cells can self replicate and are pluripotent. Because of their combined abilities of unlimited expansion and pluripotency, embryonic stem cells remain a theoretically potential source for regenerative medicine and tissue replacement after injury or disease.

Adult stem cell: The term adult stem cell refers to any cell which is found in a developed organism that has two properties: the ability to divide and create another cell like itself and also divide and create a cell more differentiated than itself. Sources of adult stem cell have been found in bone marrow, blood stream, cornea and retina of the eyes, dentine, liver, skin, pancreas and gastro intestinal tract. In contrast to the embryonic stem cells, these are not capable of forming all the cells of the body, i.e. they are not pluripotent. Adult stem cells are dispersed throughout the body of a mature animal and behave very differently depending on the local milieu. Also, the adult stem cells share no common features and thus have no means of characterization; as opposed to these the embryonic stem cells can be defined by their origin, i.e. the inner cell mass of blastocyst. The origin of the adult stem cells remains a controversy till date.

Umbilical cord stem cells: These are cells harvested from the cord blood. Cord blood is rich in stem cells, and after appropriate human leukocyte antigen [HLA] matching, it may be used to treat a variety of conditions. Characteristics of these cells are identical to adult stem cells except that they are not derived from adults and that their concentration is far more in umbilical blood as compared to adults.

Address for correspondence: Dr Ak. Joy Singh, Department of Physical Medicine & Rehabilitation, Regional Institute of Medical Sciences, Imphal (India) -795004, Email: joyakoijam2@yahoo.com

The intermediate cell is called a precursor or progenitor cell. Precursor or progenitor cells in fetus or adults are partly differentiated cells and eventually divide and give rise to mature differentiated cells. These cells are often committed which means that they tend to differentiate only along a particular cellular development pathway; however, some recent studies have shown that this may not be as definitive as was once thought.

Neurological diseases

Until recently, the inability of the adult brain cells to regenerate after sustaining damage was an accepted scientific dogma. However, evidence has accumulated over the last decade that neurons and astrocytes can be generated from isolated cells of the adult mammalian central nervous system. On the basis of this phenomenon of adult CNS plasticity, or neurogenesis, stem cell-based therapies have been developed for various CNS diseases, including stroke, traumatic brain injury, spinal cord injury and neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease.

The reasons for these stem cells receiving such attention for the treatment of neurological disorders relates to their:

1. Capacity to proliferate in culture with the prospect that large numbers of cells can be derived from a limited source.

2. Potential to be harvested from patients themselves.

3. Ability to migrate and disseminate following implantation within the adult CNS.

4. Possible tropism for areas of pathology.

5. Ease of manipulation using viral and non-viral gene transfer methods.

6. Ability to better integrate into normal brain cytoarchitecture with the potential for physiologically regulated release of substances.[1]

It also seems likely stem cell implants stimulate endogenous host repair mechanisms or provide a degree of neuro protection which limits the effects of ongoing damage rather than replace lost neurons and repair the damaged neural architecture.

Spinal Cord Injury[2]

Injury to neural tissue results in a permanent deficit as neurons do not have the ability to repair or regenerate. Isolation and preparation of specific population of adult stem cells have evolved to the point of a stable, long term culturing with capacity to differentiate into neural phenotypes from all three neural lineages: neurons, astrocytes and oligodendrocytes. Major strategies in stem cell therapy in spinal cord injury are based upon activation of endogenous neural stem cells and exogenous stem cell transplantation[3]. In animal experiments, different varieties of adult stem cells viz olfactory ensheathing cells, cultured spinal cord stem cells, bone marrow derived stem cells and dermis-derived stem cells have been implanted in a rat model of spinal cord injury. And although no definite conclusions were reached on which of them is best for neural injuries, each of these showed ability to incorporate into spinal cord, differentiate and improve the locomotor capability[4]. The presence of neural stem cells (NSC) in the adult mammalian spinal cord suggests the latent capacity of regeneration of injured spinal cord if the NSC are activated properly. In this situation it is crucial to understand the underlying mechanisms of maintenance, activation and differentiation of neural stem cells and subsequent process, including the migration, survival and functional maturation of differentiated cells which may be possible by further studies[5,6]. Experiments involving the use of human umbilical cord blood, a rich source of non-embryonic stem cells, showed that cord blood derived stem cells migrate and participate in the healing of neurological defects caused by traumatic assault.

Human experiments involving persons with paraplegia are being conducted in many centres in the world. Ravinovich et al. [7] implanted human neural stem cells from the foetal brain and haematopoietic liver tissue into the injured human spinal cords 1 month to 6 years following injury. Contraction of some muscles and partial recovery of sensitivity was observed in 40% of the patients. Unpublished human adult stem cell therapies for spinal injury revealed that many of the centres are using olfactory bulb cells extracted from the spinal injury patient's upper nose. Also, certain reports that have originated from mainland China and Portugal has concurred with results of animals experiments in terms of improvement in neurological recovery following stem cell infusions. Where there is no cure for the local and distant damage sustained in spinal cord injury, current research in the field of stem cells, shows great promise.

Stroke

Several new therapies are under investigation to address the long-term disability of stroke survivors. Growth factors, amphetamines, cortical stimulation, and new approaches to physical therapy (e.g., constraint-induced therapy) offer the possibility of improving neurologic deficits months or years after the recovery process has reached a plateau. Stem cell therapy offers hope for stroke patients, especially for those who have missed the narrow 3- hour window for administration of tissue plasminogen activator. Borlongan CV and Hess DC[8] provided preclinical evidence that neuroteratocarcinoma (NT2N)

cells, a clonal cell line, considered to be neural progenitor cells, significantly attenuated motor and cognitive deficits when transplanted to adult rats 4 weeks after middle cerebral artery occlusion. It is possible that transplanted cells secrete trophic factors that help to maintain marginally surviving cells or otherwise enhance the local environment sufficiently to improve function. Transplantation might also conceivably produce a host reaction that could include sprouting of new axons and synapse formation.

It remains uncertain which type of cell would be most appropriate for transplantation into stroke patients. Various cell types (e.g., porcine foetal cells, embryonic stem cells, and immortalized neuronal cells and bone marrow stromal cells) are being investigated. Recent experimental studies raised the possibility of using mesenchymal stem cells (MSCs) as stroke therapy. There is increasing evidence that MSCs promote functional recovery in animal models of ischemic stroke. In specific culture conditions, human MSCs can differentiate into cells that express markers of neuronal progenitor cells and can engraft and migrate along paths that resemble those of neuronal progenitor cells. It is still controversial, however, whether spontaneous cell fusion or true differentiation was the primary cause for these unexpected cell outcomes. MSCs are eminently suitable for human trials because these cells can be obtained readily from bone marrow under local anesthesia, are easily expanded by culture, and potentially could be delivered to injured brain tissue without the need for invasive stereotaxic operations. Moreover, the use of patients' own bone marrow cells should circumvent the problems of host immunity and graftversus-host disease. Bang et al. [9] reported that in patients with cerebral infarcts, the intravenous infusion of autologous MSCs appears to be feasible and a safe therapy that may improve functional recovery.

Nan and associates[10] reported that intravascular infusion of cord stem cells provides neurological improvement in rats with brain haemorrhage. They suggested that cord blood cells may not need to penetrate into the midbrain since they also release growth factors such as brain-derived neurotrophic factor (BDNF), neurotrophin-3(NT3) and Nerve growth factor (NGF) that can stimulate the growth of endogenous stem cells in the brain.

Amplification of endogenous stem cells provides an alternative way of re-innervating the damaged brain and correcting neurological impairments. Among the many stem cells mobilization agents, granulocyte colony-stimulating factor (G-CSF) received much attention. G-CSF exerts an apoptotic effect on neurons possibly through its receptors and implicates neurogenesis by stimulating the progenitor cells as a mechanism underlying G-CSF's therapeutic recovery. Shyu and colleagues[11] explored the therapeutic potential of G-CSF therapy in ischemic stroke in a phase I study. The assessment of functional score at 12 months revealed significant improvement in fluorodeoxyglucose in the cortical areas surrounding the ischemic core in G-CSF patients compared with control patients over and above improvement in motor scale score. Since G-CSF may act primarily on neurons, it is likely that earlier the treatment, the more potent the neuroprotective effects. G-CSF may hold as an important therapeutic probability of stroke management in the future.

Cerebral Palsy

The similar logistics of stem cell therapy in ischemic stroke also applies for the management of Cerebral palsy. However study in this population is sparse.

Mueller et al. [12] examined whether human neural stem cells (hNSCs) replace lost cells in a newborn mouse model of brain damage. Mice received brain parenchymal or intraventricular injections of hNSCs derived from embryonic germ (EG) cells. The locations of hNSCs within the mouse brain were determined through DiD fluorescence and immunodetection of human-specific nestin and nuclear antigen. The stem cells migrated away from the injection site and were found at sites of injury within the striatum, hippocampus, thalamus and white matter tracts and at remote locations in the brain. Subsets of grafted cells expressed neuronal and glial cell markers. hNSCs restored partially the complement of striatal neurons in brain-damaged mice. They concluded that human EG cell-derived NSCs can engraft successfully into injured newborn brain, where they can survive and disseminate into the lesioned areas, differentiate into neuronal and glial cells and replace lost neurons. Another data available from the centre of immunotherapy who had subjected 125 severely brain injured patients with cerebral palsy to a stem cell transplantation therapy via a lumbar puncture (subarachnoidally) showed apparent neurological improvement in 85% of cell grafted cerebral palsy patients.

The Department of Neurology, All India Institute of Medical Sciences undertook the project on Intra-arterial infusion of autologous bone marrow stem cells in patients with static encephalopathy including cerebral palsy to test the hypothesis that intra-arterial infusion of autologous bone-marrow derived stem cells in patients with non-progressive (static) encephalopathy, with special reference to cerebral palsy, and hypoxic-ischemic encephalopathy is feasible, safe and improves neurological functional outcome[1]. The outcome is awaited.

Rheumatoid Arthritis[13]

Haemopoietic stem cell transplantation (HSCT) is a new

therapeutic measure for some severe auto immune diseases[14,15]. The rational of the therapy is to‘re-set’ the immune system and induce tolerance. Support to this treatment modality has been provided by the coincidental observation, that in patients who had both an autoimmune disease and a haematological malignancy, treatment of the malignancy with bone marrow transplantation (BMT), also resulted in a ‘cure’ of the autoimmune disease. HSCT is different from the conventional BMT, in that the individual’s own stem cells (autologous) are removed, his or her bone marrow is ablated and stem cells are then re-infused into the individual. Thus, autologous HSCT following haematoimmunoablation is more a support or rescue event, rather than BMT in the clinical sense. Recent developments in HSCT have brought a level of safety, which allows it to be considered as a therapeutic opinion for autoimmune diseases. The European Blood and Bone Marrow Transplantation (EBMT) approve autologous HSCT in patients with severe, active rheumatoid arthritis with no other significant end-organ disease. Autologous bone marrow stem cell transplantation requires a skilled team effort and is associated with an approximate mortality risk of about 6.5%. However, the benefit risk ratio of HSCT in autoimmune disease appears to justify the initiation of prospective controlled comparative studies. Other methods like autovaccination and chemo-stem cell therapy are also attempted in the treatment of rheumatoid arthritis.

Myopathy

Cell transplantation is believed to be an attractive technique among the various prospective methods of healing muscle wasting and other degenerative diseases. Cell-based therapies involve the delivery of normal cells to the dystrophic muscle, with the hope that the delivered cells will fuse or repopulate the dystrophic muscle, thereby improving muscle pathology and function. An initial study using grafting a normal muscle into a dystrophic recipient muscle bed approach showed nearly normal contractile properties in adult dystrophic hosts after implantation of a muscle graft, suggesting that muscle transplantation may indeed be a viable treatment[16]. However, some ethical issues make this form of treatment difficult to pursue particularly the required use of newborn muscle in order to overcome problems seen with adult tissues, including appropriate reinnervation and revascularization.

A second, more promising cell-based approach is myoblast transfer, a procedure that involves injecting or transplanting donor muscle precursor cells (myoblasts) into a dystrophic host. Injected myoblasts can indeed fuse into host *mdx* myofibers and can result in dystrophin expression at 30–40% of normal levels. Despite some promising results, myoblast transfer has many obstacles which include attaining sufficient distribution and fusion of donor cells with host muscle fibers, extending the donor myoblast survival period (since many cells die soon after transplantation), and eliminating the immune response to donor myoblasts or newly synthesized dystrophin protein[17]. In human clinical studies, even with multiple injection sites, the efficiency of myoblast transfer was very low and failed to improve muscle strength in the Duchene muscular dystrophy patient group[18,19, 20].

An alternative cell-based method to myoblast transfer is the systemic delivery of precursor cells with myogenic potential. These multipotential cells, referred to as side population (SP) cell (progenitor cell), can be derived from different tissues including bone marrow and muscle. SP cells demonstrate a clear plasticity to myogenic and hematopoietic lineages[21]. In initial studies, intravenous injection of isolated SP cells from marrow and muscle into *mdx* mice, led to the incorporation of donor nuclei within existing muscle fibers and to the expression of dystrophin[21]. Unfortunately, the frequency of incorporation of donor nuclei and the level of dystrophin expression were rather low and did not result in major therapeutic benefits. Although the idea of isolating multipotent progenitor cells that can give rise to myogenic progeny is quite appealing, a great deal of work is still required to further characterize these cells before clinical trials can be envisioned.

Recently, attention has turned to the adult mesenchymal stem cell[22]. A variety of protocols have been developed to isolate the rare cells that are capable of many cell divisions and of generating several alternative types of cells. One type of these stem cells, called the mesoangioblast because of its apparent derivation from endothelial cells, has generated particular interest, because it offers both a means of dispersing myogenic cells and a total yield of muscle sufficient for use in therapy. When injected intra-arterially, mesoangioblasts become lodged in capillary beds downstream in the muscle. From these diffuse sites, the cells invade and progressively repair fibres in large, disparate regions of muscle. This procedure provides hope for the broad distribution of myogenic cells, but the intra-arterial delivery must be repeated in order to treat a chronic disease such as muscular dystrophy[23].

Cord Blood Banking

Cord blood banking is considered by many as “biological insurance”, as stem cells are being used to treat a variety of cancers and blood disorders and that research shows possible value against Alzheimer’s disease, Parkinson’s disease, and heart disease. Therefore, saving your baby’s cord blood may one day possibly help your baby, siblings, or other family members should they ever need it. Though cord blood banking has some legitimate uses but appears

to be a poor investment except for people who (a) have a relative with a disease for which cord blood effectiveness has been demonstrated or (b) are wealthy enough to afford betting more than $3,000 per year on a long shot. In India, it is believed that the practice of cord blood banking exists in Mumbai and Chennai.

Challenges

Some issues remain at the forefront of the controversy involving stem cell research -legislation, ethical issues related with use of human embryos or stored cord blood, allotransplantation and xenotransplantation, enrolment of participants for stem cell study, astronomical cost, standardisation, insurance and unintended outcomes. The period between laboratory experimentation and clinical treatment can be decades long. Researchers directly treating patients with experimental therapies can be subject to the disciplinary bodies of their institutions, rather than outside entities. Also, the risks of forming unwanted tissues and teratocarcinomas by stem cells require further evaluation and long term follow ups.

References

1. Padma SMV. Stem cell therapy in static encephalopathy including cerebral palsy. Indian Journal of Medical and Paediatric Oncology 2005; 26: 16-18.
2. Bagaria Vaibhav, Patil Nilesh, Sapre Vikram, Chadda Anshul, Singrakia Manoj. Stem cells in orthopaedics: Current concepts and possible future applications. Indian Journal of Medical Sciences 2006; 60(4): 162-69.
3. Bhan S. Stem cells in spinal cord injury. Indian Journal of Medical and Paediatric Oncology 2005; 26: 21.
4. Bambakidis NC, Theodore N, Nakaji P, Harvey A, Sonntag VK, Preul MC, et al. Endogenous stem cell proliferation after central nervous system injury: alternative therapeutic options. Neurosurg Focus 2005;19: E1.
5. McDonald JW, Becker D, Holekamp TF, Howard M, Liu S, Lu A. Repair of the injured spinal cord and the potential of embryonic stem cell transplantation. J Neurotrauma 2004; 21: 383-93
6. Lucarelli E, Donati D, Cenacchi A, Fornasari PM. Bone reconstruction of large defects using bone marrow derived autologous stem cells. Transfus Apher Sci 2004; 30:169-74.
7. Rabinovich SS, Seledtsov VI, Poveschenko OV, Senuykov VV, Taraban VY, Yarochno VI, Kolosov NG, Savchenko SA, Kozlov VA. Stem cell transplantation treatment of spinal cord injury patients. Biomed Pharmacothery 2003; 57: 428-33.
8. Borlongan CV, Hess DC. New hope for stroke patients: mobilization of endogenous stem cells. CMAJ 2006; 174(7): 954-55.
9. Bang OY, Lee JS, Lee PH, Lee G. Autologous mesenchymal stem cell transplantation in stroke patients. Ann Neurol 2005; 57: 874-82.
10. Nan Z, Grande A, Sanberg CD, Sanberg PR, Low WC. Infusion of human umbilical cord blood ameliorates neurologic deficits in rats with haemorrhagic brain injury. Ann NY Acad Sci 2005; 1049: 84-96.
11. Shyu WC, Lin SZ, Lee CC. Granulocyte colony-stimulating factor for acute ischemic stroke: a randomised control trial. CMAJ 2006;174: 927-33.
12. Mueller D, Shamblott MJ, Fox HE, Gearhart JD, Martin LJ. Transplanted human embryonic germ cell-derived neural stem cells replace neurons and oligodendrocytes in the forebrain of neonatal mice with excitotoxic brain damage. J Neurosci Res 2005; 82(5): 592-608.
13. Gupta SJ. Bone marrow transplantation and gene therapy for RA. In: ICP Technical report - Rheumatoid arthritis. Siddhartha Kumar Das (editor). Association of Physicians of India. 2007: 5-77.
14. Snowden J, Brookes PM, Biggs JC. Haemopoietic stem cell transplantation for autoimmune disease. Br J Haematol 1997; 99: 9-22.
15. Tyndall A. Haematological stem cell transplantation in the treatment of severe autoimmune disease: first experiences from an international project. Rheumatology 1999; 38: 774-76.
16. Law PK, Yap JL. New muscle transplant method produces normal twitch tension in dystrophic muscle. Muscle Nerve 1979; 2: 356-63.
17. Partridge TA, Morgan JE, Coulton GR, Hoffman EP, Kunkel LM. Conversion of mdx myofibres from dystrophin-negative to -positive by injection of normal myoblasts. Nature 1989; 337: 176-79.
18. Gussoni E, Pavlath GK, Lanctot AM, Sharma KR, Miller RG, Steinman L, Blau HM. Normal dystrophin transcripts detected in Duchenne muscular dystrophy patients after myoblast transplantation. Nature 1992; 356: 435-38.
19. Karpati G, Ajdukovic D, Arnold D, Gledhill RB, Guttmann R, Holland P, Koch PA, Shoubridge E, Spence D, Vanasse M. Myoblast transfer in Duchenne muscular dystrophy. Ann Neurol 1993;34: 8-17.
20. Mendell JR, Kissel JT, Amato AA, King W, Signore L, Prior TW, Sahenk Z, Benson S, McAndrew PE, Rice R. Myoblast transfer in the treatment of Duchenne muscular dystrophy. N Engl J Med 1995; 333: 832-38.
21. Gussoni E, Soneoka Y, Strickland CD, Buzney EA, Khan MK, Flint AF, Kunkel LM, Mulligan RC. Dystrophin expression in the mdx mouse restored by stem cell transplantation. Nature 1999; 401: 390-94.
22. Terry Partridge. Disciplining the Stem Cell into Myogenesis. N Engl J Med 2006; 354(17):1844-45
23. Sampaolesi M, Torrente Y, Innocenzi A. Cell therapy of alpha-sarcoglycan null dystrophic mice through intra-arterial delivery of mesoangioblasts. Science 2003; 301: 487-92.

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Dynamic Evaluation of the Venous Pressure During Passive Plantar Flexion and Dorsiflexion Exercises with the RAGodoy® Apparatus

José Maria Pereira de Godoy*, Maria de Fátima Guerreiro Godoy, Fernando Batigália # ,Maria Inês Geraldi Xavier@**

*Livre Docente of the Vascular Service of the Medicine School in São José do Rio Preto (FAMERP), Brazil and CNPq researcher

** Occupational therapist, Professor of the *Lato Sensu* Postgraduation Course in Lymphovenous Rehabilitation of Medicine School in São José do Rio Preto-Brazil -FAMERP

#Prof. Dr. of the *Stricto Sensu* Postgraduation Course of Medicine School in São José do Rio Preto-Brazil-FAMERP

@Physiotherapist of the *Lato Sensu* Postgraduation Course in Lymphovenous Rehabilitation of FAMERP

Abstract

Objective: The objective of this case report was to dynamically evaluate pressure changes during passive exercises using a device that performs plantar flexion and dorsiflexion.

Design and setting: The medial vein of the left hallux was punctured using a 0.9 mm x 25 mm angiocat catheter and this was connected to a DTX Plus ™ sensor. With this portable apparatus, pressure variations are measured at half-second intervals and the data stored in a numerical form. The RAGodoy® apparatus was used to perform passive exercises that stretched and bent the ankle joint.

Six evaluations were made and the minimum and maximum pressures during each session were assessed. Main outcome measures and results: In all the sessions, variations in the pressures were obtained with a minimum pressure of 8 mmHg and a maximum of 77 mmHg.

Conclusion: The device, named the RAGodoy®, creates pressure variations in the venous system, which assist blood flow in the lower limbs and thus it can be used to avoid venous stasis.

Key words: Dynamic venous pressure, Lower limbs, Passive exercises, Device, RAGodoy®.

Introduction

The main purpose of venous circulation is to return the blood back to the heart where it is re-oxygenated and recirculated. When a person is motionless and seated, part of the venous system has to work against gravity. In combination with the anatomic characteristic of valves, the muscles and tendons that surround the deep veins, work as a pump that forces the blood from the legs back to the heart. The venous valves act to prevent reflux and thus this pumping mechanism compensates the effects of gravity and prevents venous hypertension converting the static condition into a dynamic flow [1,2].

Variations in the venous pressure gradient during walking exist between the veins in the thigh and lower leg as a consequence of the action of these muscle pumps [2].

Virchow's triad objectively defines the three major components that lead to thrombotic events: venous stasis, endothelial lesion and hypercoagulability.

The prevention of thrombosis is necessary in patients who are exposed to thrombotic risk, however they can

Address for correspondence: Rua Floriano Peixoto, 2950.São José do Rio Preto-SP-Brazil Zipe code: 15020-010 E-mail: godoyjmp@riopreto.com.br

not always receive the recommended treatment due to contra-indications such as in cases of active bleeding and immediately after suffering strokes. The main location affected by thrombosis is the lower limbs with the calf muscle region being the most common site.

Mechanisms that prevent venous stasis may be useful in patients who are contra-indicated for anticoagulation [3]. The use of an apparatus to perform plantar flexion and dorsiflexion exercises with continuous passive movements may improve the venous flow of the limb [4].

The objective of this report was to make a dynamic evaluation of pressure variations during exercising with an apparatus that performs plantar flexion and dorsiflexion exercises.

Method

The medial vein of the left hallux of a 46-year-old male volunteer, who presented with telangiectasia (CEAP 1) of the lower limbs at clinical examination, was punctured with a 0.9 mm x 25 mm angiocat catheter. The catheter was then connected to a DTX ™ Plus sensor, a portable device development by Godoy & Braile in Braile Biomédica in São José do Rio Preto, Brazil. This device is utilized for invasive pressure measurements, collecting the data at half-second intervals and storing them for future management.

The RAGodoy®, an apparatus that performs plantar flexion and dorsiflexion exercises, was utilized to dynamically evaluate venous pressure variations during passive exercising (Figure 1). Six evaluations were made, the data were stored as numbers and presented in the form of a graph.

Figure 1 shows the equipment and the positioning of the limbs during exercising

Results

In all evaluations, variations in the pressure gradient were detected as are illustrated in Table 1.

Table 1: Minimum, maximum and mean pressure variations (mmHg)

Evaluation	*Minimum Index (mmHg)*	*Maximum Index (mmHg)*	*Mean (mmHg)*
1	12	75	18
2	8	62	19
3	13	43	30.5
4	12	77	42
5	17	66	20
6	18	66	23

Discussion

The RAGodoy® is an apparatus that was developed with the primary objective of preventing deep vein thrombosis (DVT) in immobile individuals such as patients in the surgical center, intensive care units and on hospital wards. However, the first studies were on patients with lymphedema, where the objective was to perform mechanical lymph drainage [4]. The action of the apparatus is to reproduce some of the movements in structures experienced during walking that is, bending and stretching the ankle joint. One of factors in Virchow's triad is venous stasis; a dynamic study of venous return has already proven that this apparatus causes a pulsating blood flow. No studies discussing this issue were found in the Medline electronic database.

Conclusion

The RAGodoy® apparatus causes return pressures in the venous systems of lower limbs that may be utilized to prevent venous stasis.

References

1 Stranden E. Dynamic leg volume changes when sitting in a locked and free floating tilt office chair. Ergonomics. 2000 Mar;43(3):421-33.

2 Recek C. Principles of surgical treatment of varicose veins with regard to new findings on venous hemodynamics. Rozhl Chir. 2002 Sep;81(9):484-91.

3 Viarrengo LMA, Meirelles GV, Potério filho J. Resultdos do tratamento de varizes com laser endovenoso:estudo prospectivo com segmento de 39 meses. J Vasc Br 2005,Vol.4,No 3 Supl.1 S19.

4 Godoy JMP, Godoy MFG. Development and evaluation of a new apparatus for lymph drainage: preliminary results. Lymphology. 2004 Jun; 37(2):62-4.

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Design & Development of Lower Extremity Paediatric Prosthesis, a Requirement in Developing Countries

Prasanna K Lenka, M-Tech, Prosthetic & Orthotics Engineer
Dr Amit R Chowdhury, PhD, Biomechanics
Dr Ratnesh Kumar, MBBS, MS (Ortho), DNB (PMR), Director, NIOH
National Institute for the Orthopaedically Handicapped, Kolkata

Abstract

There are more than 10 million physically handicapped people in India. A majority of them belong to poor strata of the society. In the present condition prosthetic fitment centers are not sufficient to deal with such large amputee population. Children are mostly victim of society in low per capita income country in general. Children with congenital amputation, loss of limb with street accidents/trauma, frost bite etc need special attention for the prosthetic fitment. More than 80% of major amputations of the lower extremity are attributed to peripheral vascular disease[1]. About 10 percent of congenital anomalies are treated as, or require, amputation[2]. As children are in the growing age, the prosthetic device is required to be changed frequently. This accelerated rehabilitation greatly reduced the overall cost of the patient's care and returned them to full function much faster[3]. The major constraint in frequent change of prosthetic device in developing country is lack of sufficient number of prosthetic fitment center, skilled prosthetists, paediatric prosthetic kits and low income group of amputee. To face this challenge we have designed a low cost Paediatric prosthetic

Keywords: BK prosthesis, Biomechanic, Adjustable Prosthesis

Introduction

Although many prosthetic principles used in treating adults apply to the treatment of children as well, the child with a lower-limb deficiency presents the prosthetist with a unique range of considerations, both practical and philosophical. Most techniques used with adult amputees must be downsized, sequenced in degree of complexity, modified or completely altered to match the ever-changing needs of children[4]. A sequence of emotions occurs following a traumatic loss of a limb, amputation due to cancer or other disease, or birth of a child with a congenital absence[5,6]. Each person holds an idealized image of the body, which he uses to measure the percepts and concepts of his or her own body[7]. According to Kolb[8], an alteration in an individual's body image sets up a series of emotional, perceptual and psychological reactions Although prosthesis design is a complicated process deals with many discipline including materials science, Prosthetic science, mechanical science, biomechanics etc., the case of children should to be handled very carefully. Child amputees must develop positive self-esteem and body image to achieve self-acceptance. Body image includes physical, psychological and social aspects and is formed by constantly changing emotions and body perceptions[9]. Disturbances of one's body image occur when changes are not accepted or when previous images do not coincide with reality. If an amputee cannot acknowledge a missing limb, then he or she may never completely accept his or her body or situation.

In the present situation of India, there is no such design to suit children of lower limb amputation. Internationally also percentage of Trans Tibial Amputees (TTA) is more[10]. Most of designs including International Committee of the Red Cross (ICRC), Pyramidal, and Artificial Limbs Manufactuing Corporation (ALIMCO) etc are of general type to fit all age group in lower limb. At the growing age in children there is a need of change of prosthesis after 6 months or even earlier to keep the force distribution equal in both limbs and to avoid limb length discrepancy. As shown in figure 2, there was no scope of adjustment in growing children in an ortho-prosthesis. The prosthetic fitment is important in children from psychological point of view and is essential to deliver the prosthesis in a short time for school going children. In India there are insufficient government aided centers for

Address for correspondence: Mr Prasanna Kumar Lenka, NIOH, Bon Hoogly, BT Road, Kolkata 700090. lenka_pk@yahoo.co.uk

prosthetic fitment. Prosthesis is being fitted in centralized locations in the urban areas so traveling cost for people coming for fitment is also a great factor. The cost of prosthesis is also a factor in low income group to do frequent change in children. An indigenously designed prosthetic kit with height adjustment for trans-tibial prosthesis was developed in our institute. The kit consists of an adjustable pylon, coupling device and foot ankle mechanism. The foot ankle mechanism consists of light weight rubber material and a polypropylene keel. The main objective of this development was to design a low cost, light weight and simpler height adjustable pylon with coupling device. The said adjustable pylon has been used for both TTA and congenital limb deficiency for making extension prosthesis in case of growing children. The design is very simple and innovative. It is designed in AutoCAD 2006 and simulated ANSYS®.

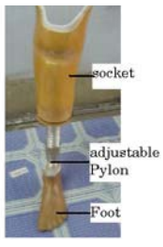

Fig. 1: Parts of Pediatric Prosthesis

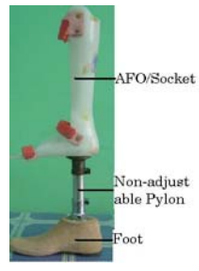

Fig. 2: Non adjustable Ortho-prosthesis

Methods

Trans tibial paediatric prosthesis is a scientific mechanical device; the major parts can be categorized as socket, adjustable pylon and foot. The Parts are shown below in figure 1.

Socket is the interface between child's stump and the prosthetic device and should be changed regularly during their growing age. In most of the conventional design the pylon is an aluminum pipe, stainless steel or titanium pipe and length of the pylon is fixed for a particular child. Feet are available in different sizes and can last for 2 to 3 years for a particular child. Generally for children when a socket is required to be changed, the pylon has to be changed if there is no scope of height adjustment. In case of extension prosthesis also the patient has to bear the cost of new pylon if no scope of height adjustability is incorporated. In figure 2, an ankle foot orthosis (AFO) containing extension with conventional pylon is shown, where there is no scope of height adjustment. In this paper, a height adjustable pylon with locking mechanism at any desirable height is discussed.

Selection and Description of Materials

By proper use of material and structural design, the shank deformability can be altered to mimic natural ankle joint motions. At the same time, structural integrity should be maintained without permanent deformation and buckling of the prosthesis. Changes in shank flexibility may alter the stress distribution at the prosthetic socket-residual limb interface, which is related to the comfort perceived by the amputees[11]. In general, two approaches exist for investigating shank deformation and its effect on socket-limb interface stress: experimental measurements and theoretical analyses. Experimental measurements require the use of stress/strain sensors attached to appropriate positions of the shank and the socket inner surface. Theoretical analyses such as finite-element (FE) methods, which have been widely used in lower-limb prosthetics in the past decade, can be useful to study the deformations and stresses. The advantage of the use of FE analysis is that stress, strain, and motion in any parts of the model can be predicted and parametric analyses can be performed easily without the need to fabricate prostheses. In previous FE models, the focus was on investigating the variation of stresses distributed at the limb-socket interface under different socket modifications[12,13], material properties of the sockets[12,14] and liners[15], and frictional properties at the interface[16] We used linear, elastic, isotropic material property throughout the prosthetic model. Different materials were used for different portions of the model especially in the foot. High strength rubber, ordinary rubber, and wood were used for making the foot. Again steel (316-L)/ aluminum/nylon was used for making the pylon portion of the model. Initially we designed prototype in aluminum and stress analysis made by ANSYS® under boundary conditions. Basically material selections depend on child weight and different weight range. Our experiment was tried on stainless steel, aluminum and Nylon plastic. Elastic properties (Young's Modulus and Poissons ratio) of different materials used in the analysis are shown in the following table 1.

	Steel	Alumi-num	Rubber	Wood	High Strength Rubber
Young's Modulus (MPa)	0.20530e6	74000	4	12000	6.9
Poisson's Ratio	0.3	0.35	0.45	0.21	0.24

Table-1: Material properties used in Pediatric prosthesis

Technical information

The Components of the Pediatric Prosthesis from top to bottom are

1) Socket Adopter

2) Socket Aligner Cup

3) Upper Shank

4) Lower Shank

5) Locking Knot

6) Foot Aligner Cup

7) Socket Fixing Bolt and Washer

8) Foot Fixing Bolt and Washer

The CAD drawing of various parts shown in figure-3

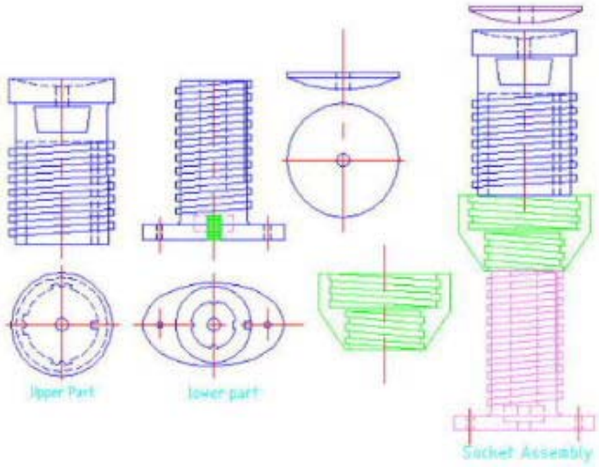

Fig. 3: Auto-Cad Drawing of Parts of adjustable Pylon

Prosthetic fitments were tried on Jaipur foot, Polyurethane (PU) foam foot and child size Solid Ankle Cushioned Heel (SACH) foot. The weight of adjustable pylon for different material is shown below in table 2. Stainless steel pylons were tried on adult patient.

Material	Stainless Steel	Aluminum	Nylon
Weight	1.390 gm	530 gm	400 gm

Table-2: Weight of Pediatric prosthesis in different material

Biomechanical Analysis

To calculate the effectiveness of design both static and dynamic analyses were made. The load limit of this design was tested in Regional Testing Center, Kolkata and observations are given in the results section. A dynamic calculation need completed calculation and scientific instruments[17], a simplified model made from modeling software based on 3D free body diagram

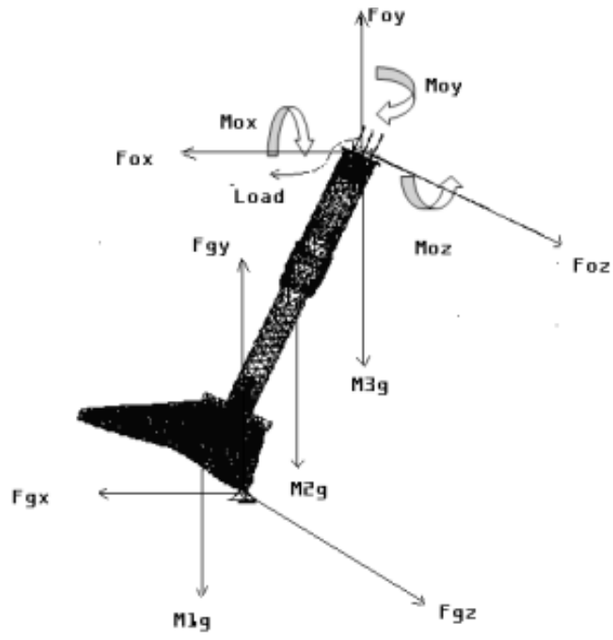

Fig. 4: Free body diagram of Model of Adjustable pylon

explained in figure 4.

F_{ox} , F_{oy} , F_{oz} are force component in X, Y,Z direction applied at the interface between socket adopter and adjustable pylon at the point "O"

M_{ox} , M_{oy} , M_{oz} are Moment component in same way

â = ä á / ät and ã = ä â / ät

M_i (i= 1,2,3……) = Segmental Mass . Shank Upper, Shank Lower and foot plus shoe

L_i (i=1,2,3……) = Length of segment from the point "O".

F_{gx} , F_{gy} , F_{gz} are the ground reaction forces measured in force plate on foot.

X_g, y_g, z_g are the distance in x, y, z axes between the point of application of gravity and O

r- Distance form o to CG of whole device

I_o - Moment of Inertia about Z axis

$M_{oz} - M_1 g l_1 \sin á – M_2 g l_{-2} \sin á – M_3 g l_3 \sin á + F_{gx} y_g + F_{gy} x_g = I_o ã$ ——————————————— (1)

$M_{ox} + F_{gy} z_g + F_{gz} y_g = 0$ ——— (2)

$M_{oy} + F_{gz} x_g + F_{gx} z_g = 0$ ——— (3)

$F_{ox} + F_{gx} = (m_1+m_2+m_3)$ (r ã cosá - r â$^{-2}$ siná) ——— (4)

$F_{oy} + F_{gy} - (m_1+m_2+m_3) g = (m_1+m_2+m_3)$ (r ã siná - r â$^{-2}$ cosá) ——— (5)

$F_{oz} + F_{gz} = 0$ ——————— (6)

Based on value of m_1= .175 kg, m_2 =.197 kg, m_3 =.875 kg and lengths of different component for a particular prototype made up of aluminum the r and I_o are calculated.

Total Strength of coupling device and kinetic energy required to propel or walk for a child is also evaluated.

From the dynamic equations of both rotational and translational movement, the total force falling on interface of socket and adjustable pylon was simulated.

Statistics

For clinical trial participant mainly children from both sex and different age group were considered to check and bench mark the viability of the new design. Among them some of them were first time users.

Here only TTA statistics are shown; however we have fitted three extension prostheses and two trans-femoral (TF) without knee joint for children of age 5 to 12 years.

From the distribution graph shown in figure 5, it is seen that most of children fall under the age group of 9-12 and corresponding body weight of 20 to 35 kg.

Results

As per conditions of Assistance to Disabled Persons (ADIP) scheme by the government of India, a child can get a new prosthesis after one year free of cost if he/she belongs to below the poverty line income group. In the new design, only socket change and little adjustment in cosmetic can increase the life span of the prosthesis further without the need for discarding the prosthesis fully. The cost of socket and cosmetic cover can be treated as repair cost which under the scheme can indirectly help a lot of poor patients.

Out of 28 children, we have changed socket in following manner:

1. Two times in six month interval- 15
2. One time after three months interval-5
3. No change-5
4. Not Reported for follow up-3

The concept in pediatric prosthesis was tried on bilateral amputee also. As we know stability and confidence is most important in case of bilateral amputation, so height was adjusted from minimum to actual in a phased manner. From stability point of view lower height of CG means more stability. The cost of adjustable pylon in Nylon and Polypropylene is only Rs 200/- (Two hundred only), where as the conventional pylon with coupling device in India is Rs 800/- (Eight hundred only).

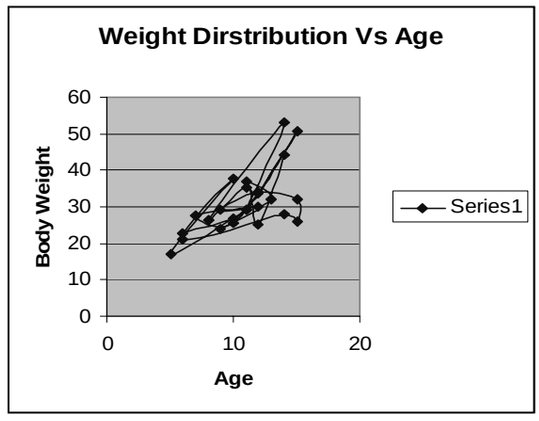

Figure-5: Age and Weight distribution of Subjects

Discussion

The commonly available endoskeletal prosthetic designs in India are from the following institutions

National Institute for Rehabilitation Training and Research (NIRTAR) Design

ICRC technology

Christian Medical College (CMC) Vellore

ALIMCO design (Pyramidal type)

Mobility India

Each of above design has its own advantages and disadvantages as it needs high skilled professional to fabricate align and fit. The electric and metal cutting tools are needed. There is no provision of height adjustment. It is also not suitable for children as far as the size and weight are concerned. Moreover, the long-term studies are not available on their usage. The proposed design appears to have advantage of simplicity, height adjustment and better load distribution. The New design is especially suitable for children and economically viable in countries with people having low socio-economic status.

In summary, the advantages of the new prosthesis are height adjustability, ease of fabrication, being light in weight, re-adjustability, reusability and low cost.

References

1. Lee D. Faucher, MD, Donald G. Shurr, CPO, PT. Ambulation on Postoperative Day 1 after Bilateral Transtibial Amputations A Case Report and Literature Review, Journal of Prosthetics & Orthotics 2005; 17: 47-49.
2. Challenor YB. Limb deficiencies in children. In: Molnary GE, ed. Pediatric rehabilitation. Baltimore, MD: Williams & Wilkins, 1985: 177-197.

3. Feinglass J, brown JL, Losasso A, et al. Rate of Lower extremity amputation and arterial reconstructions in united states 1979 to 1996, Am J Public health 1999;89: 1222-1227.
4. Donald R. Cummings, Susan L. Kapp, CP, Lower-Limb Pediatric Prosthetics: General Considerations and philosophy JPO 1992; 4 (4): 196-206.
5. Drotar D, Baskiewicz A, Irvin N, Kennell J, Klaus M. The adaptation of parents to the birth of an infant with a congenital malformation: a hypothetical model. Pediatrics 1975; 56: 710-7.
6. Turgay A, Sonuvar B. Emotional aspects of arm or leg amputation in children. Canadian Journal of Psychiatry 1983; 28:294-7.
7. Kolb LC. Disturbances in body image. In: Arieti S, ed., American Handbook of Psychiatry. New York: Basic Books, 1959; 1: 749-69.
8. Kolb LC. Disturbances in body image. In: Arieti S, Reiser MF, eds. American Handbook of Psychiatry. New York: Basic Books 1975; 4: 810-37
9. Novotny MP. Body image changes in amputee children: how nursing theory can make the difference. Journal of the Association of Pediatric Oncology Nurses 1986; 3: 8-13.
10. Bodily KC, Burgess LM, Contra lateral Limb and patient survival after leg amputation, Am J Surgery 1983; 146: 280-2.
11. Winson C. C. Lee, BSc; Ming Zhang, PhD; David A. Boone, CP, BS, MPH; Bill Contoyannis, MEng Sc,Finite-element analysis to determine effect of monolimb flexibility on structural strength and interaction between residual limb and prosthetic socket. JRRD 2004; 41: (6A): 775-86
12. Silver-Thorn MB, Childress DS. Parametric analysis using the finite element method to investigate prosthetic interface stresses for persons with trans-tibial amputation. J Rehabil Res Dev. 1996; 33: 227-38.
13. Reynolds DP, Lord M. Interface load analysis for computer-aided design of below- knee prosthetic sockets. Med Biol Eng Comput. 1992; 30: 419-26.
14. Quesada P, Skinner HB. Analysis of a below-knee patellar tendon-bearing prosthesis: a finite element study. J Rehabil Res Dev. 1991; 28: 1-12.
15. Simpson G, Fisher C, Wright DK. modeling the interactions between a prosthetic socket, polyurethane liners and the residual limb in transtibial amputees using non-linear finite element analysis. Biomed Sci Instrum. 2001; 37: 343-7.
16. Jia X, Zhang M, Lee WCC. Load transfer mechanics between transtibial prosthetic socket and residual limb-a dynamic effects Journal of Biomechanics.2004; 37: 1371-7.

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Professor & HOD
Physical Medicine Rehabilitation Department
Regional Institute of Medical Sciences
Imphal-795004

Tel: 0385 2414493(O); Fax: 0385 2414625
email: w_kunjabasi@dataone.in

Dr. N Romi Singh
Organizing Secretary
Diplomate N.B.(PM & R), MNAMS
Associate Professor
Physical Medicine Rehabilitation Department
Regional Institute of Medical Sciences
Imphal-795004

Tel: 0385 2414493(O); Fax: 0385 2414625
email: dr.romi.singh@gmail.com

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A Study to Evaluate the Effectiveness of Phenol Blocks to Peripheral Nerves in Reducing Spasticity in Patients with Paraplegia and Brain Injury

Dr E Rajendra Kumar, MBBS, D.Ortho, DNB(PMR), Assistant Professor in PMR*

Dr Venugopal K, MBBS, DNB(PMR), Senior Lecturer in PMR**

Dr George Tharion, MBBS, DOrtho, DPMR, DNB, Professor of PMR**

Dr S Bhattacharji. MS(Ortho), D RehabMed, DNB, Prof & Head of PMR**

*Nizam Institute of Medical Sciences, Hyderabad, Andhra Pradesh

**Christian Medical College, Vellore, Tamil Nadu

Abstract

Primary objective: To evaluate effectiveness of phenol blocks of peripheral nerves in reducing spasticity brain injured and spinal cord injured patients.

Secondary objectives: To measure the change in the range of motion after phenol blocks to peripheral nerves, to identify the electrophysiological changes and to study the cost effectiveness and side effects of phenol blocks.

Study design: Descriptive study

Setting: Tertiary referral centre, India.

Methods: This study was conducted from March 2000 to January 2002 among 20 patients with spasticity. Spasticity was measured by modified Ashworth scale and range of motion was measured with a standard goniometer on 1st, 7th, 14th and 21st days of the study. Nerve conduction studies, gait analysis, and functional independence measure was measured on 1st and 21st day of the study. Nerve blocks were done on 7th and 14th day of the study with 0.5% bupivacaine and 6% phenol in water respectively.

Results: 20 patients were included in the study, out of which 85% had spinal cord injury and 15% patients had brain injury sequelae. Spasticity measured by modified Ashworth scale, showed a statistically significant reduction with neurolysis. Following obturator neurolysis abduction of hip joint improved significantly and with posterior tibial neurolysis there was significant improvement in dorsiflexion and plantar flexion range of the ankle joint. Functional improvement measured with the FIM score also showed statistically significant improvement after neurolysis. H reflex amplitude was significantly reduced following neurolysis. There was a statistically significant reduction in the consumption of systemic medications for spasticity following the injection.

Conclusion: Range of motion in neighboring joints improved significantly after blockade of spasticity using Phenol neurolysis. There was statistically significant reduction in the amplitude of the H reflex. There were no major adverse effects following neurolysis with phenol and it was found to be significantly cost effective when compared to systemic antispastic medications.

Key words : Phenol blocks, spasticity, spinal cord injury, H reflex.

Address for correspondence: Dr.E.Rajendra Kumar, Assistant Professor, Department of Physical Medicine & Rehabilitation, Nizam's Institute Of Medical Sciences Punjagutta, Hyderabad. E-mail: elluri_rk@hotmail.com

Introduction

Spasticity is a velocity dependant increase in tonic stretch reflex and exaggerated tendon jerk resulting from hyper excitability of the stretch reflex[1]. It is one of the most disabling aspects of brain and spinal cord injury. This needs to be treated if it interferes with activities of daily living, self care or when it causes discomfort or pain[2]. Common measures to control spasticity include passive stretching, serial casting, orthotics, medications, interventions such as nerve blocks, intrathecal blocks[3, 4], intrathecal medications, blockade of neuromuscular junction with botulinum toxin injections, surgical neurectomies[5] and tendon releases[6]. Many of these procedures are expensive and require a hospital set up to implement. Chemical neurolytic agent 6% phenol is a widely available drug which is inexpensive and has a wide margin of safety.

This study was undertaken to evaluate the effectiveness of phenol nerve blocks in the reduction of spasticity and to study the side effects and cost effectiveness when compared to orally administered systemic antispastic medications.

Materials and Methods

This study was conducted in the Department of Physical Medicine and Rehabilitation at a tertiary care teaching hospital during March 2000 to January 2002.

Inclusion criteria:

1. Patients who were observed to have disabling spasticity, at least 6 weeks after the onset of the lesion.

2. Spasticity in adductor group of muscles of the hip causing difficulty in performing activities of daily living or spasticity in the gastrosoleus group of muscles resulting in difficulty in walking or sitting in a wheelchair

Exclusion Criteria:

1.Comatosed patients.

2.Patients who could not give an informed consent, patients on anticoagulants,

3. Patients with renal calculi, vesical calculi, ingrowing toe nails, pressure ulcers, pneumonia or heterotopic ossification as these could cause increase in spasticity

This study was approved by the research committee of the institution and all patients were included in the study following an informed consent. They continued to have their rehabilitation programme depending on their medical condition. Department of Pharmacy of the institution provided ampoules of 6% phenol in water and 0.5% Bupivacaine. Bupivacaine was injected on day7 and 6% phenol in water was injected on day 14 of the study.

Measurements: Following measurements were done:
1. Spasticity was measured by modified Ashworth scale[7].

2. Range of motion was measured with a standard goniometer. Spasticity and range of motion were measured on days 1,7,14 and 21. On day 7 and day 14 spasticity and range of motion were measured one hour before and one hour after the intervention.

3. Electrophysiological parameters related to gastrosoleus: H reflex - latency, H reflex - amplitude, M wave – amplitude and H: M ratios were measured at the beginning and at the end of the study. Mystro + EMG/NCS machine was used for measurement.

4. The cost of antispastic medications that patient was taking through out the study period was recorded.

5. Any side effects following the injections were recorded.

6. Functional independence measure related to self care and locomotion was scored at the beginning and at the end of the study.

Technique of the nerve block: The nerves to be blocked were located using a needle electrode connected to an electrical nerve stimulator using a connecting wire wound around its base. The drug was injected to this nerve under strict aseptic precautions. The fibers intended for blockade was identified by stimulating the nerve. The intra neural topography of the fibers served as a guide during the stimulation[8]. For stimulation, a direct current lasting 0.05-0.1msec with a current strength of 3-5mA was used at the rate of 0.5-3Hz. Once the desired nerve was identified with minimal current, 3ml of solution was injected.

Obturator Nerve Block: With the patient supine and hip in maximum abduction, the adductor longus tendon was identified and the needle was directed posterior to the adductor longus muscle, approximately 3 cm below the pubic tubercle. To locate the posterior branch of the obturator nerve, needle was directed posteriorly from the adductor longus tendon towards the ischial tuberosity.

Posterior tibial Nerve Block: The patient was positioned in the prone position. The needle was inserted at a point 3 cm proximal to the popliteal crease lateral to the midline in the popliteal fossa.

Cost of antispastic medication

1. Tab Valium 5mg Rs.1/-

2. Tab Tizanidine 2mg Rs.7.50/-

3. Tab Baclofen 10mg Rs.10/-

Cost of injection phenol Rs.70/-

Results

Among the 20 patients included in this study, there were 18 males and 2 females. The spasticity was due to spinal cord injury in 17 patients, and following brain injury in 3 patients.

Spasticity was measured using modified Ashworth scale.

On day 1, Grade 3 spasticity was present in 16 patients and Grade 4 spasticity in 4 patients. After neurolysis with 0.5% Bupivacaine and 6% phenol respectively on 7th and 14th day, spasticity was reduced to Gr.0 in three patients and Gr.1 in 14 patients (p=0.00) (Table 1).

Day 1			
Mean	SD		
3.20	0.41		
Day 7			
Before Bupivacaine		**After Bupivacaine**	
Mean	SD	Mean	SD
3.20	0.41	0.25	0.44
Day 14			
Before Phenol		**After Phenol**	
Mean	SD	Mean	SD
3.20	0.41	0.80	0.52
Day 21			
Mean	SD		
0.80	0.52		
p-value: 0.000*			

Table 1: Spasticity as measured by Modified Ashworth score before and after Neurolysis (*statistically significant)

Range of motion: Thirteen patients had limited range of hip abduction because of adductor spasticity. After neurolysis of obturator nerve with 0.5% bupivacaine on 7th day, range of motion improved to twice the pre-injection range but reverted back to base line value within a week. After neurolysis with phenol on 14th day the abduction range doubled and this effect persisted on 21st day. These results were statistically significant with a p value of 0.00.

There was no change in hip flexion, extension and knee flexion range in these patients. Seven patients had limited dorsiflexion of ankle due to gastrosoleus spasticity. On the 7th day after neurolysis of posterior tibial nerve with 0.5% bupivacaine there was significant improvement in dorsiflexion of ankle but this effect did not last till 14th day. After neurolysis with phenol on 14th day, ankle dorsiflexion range improved again and this effect was persistent at 21st day (p=0.00). Ankle plantar flexion range also improved in these patients (p=0.002) (Table 2).

Functional Independence Measure: All patients included in this study were assessed for ADL independence which was measured with FIM. Feeding, grooming, bathing, toileting, upper-half dressing & lower-half dressing were measured as a part of self care activities. In locomotor activities, walking/wheel chair activities and stair climbing were measured. 9 patients were fully dependant in activities of daily living and 11 patients were partially dependant. All patients showed

Variable			**Hip F**	**Hip E**	**Hip Abd**	**Hip Add**	**Knee F**	**Ankle DF**	**Ankle PF**
Day 1		**Mean**	108	7.25	12.25	24	123.85	11.50	24.29
		SD	12.42	5.00	10.70	6.00	6.50	11.90	7.32
Day 7	**Before Bupivac**	**Mean**	108	7.25	12.25	24	123.85	11.50	24.29
		SD	12.42	5.00	10.75	5.98	6.50	11.82	7.32
	After Bupivac	**Mean**	108	7.25	31.50	25.50	123.85	23	34.29
		SD	12.40	5.00	5.87	6.86	6.50	8.01	7.87
Day 14	**Before Phenol**	**Mean**	108	7.25	12.25	24	123.85	11.50	24.29
		SD	12.42	5.00	10.10	5.98	6.50	11.10	7.32
	After Phenol	**Mean**	108	7.25	27	25.50	123.85	23	34.29
		SD	12.42	5.00	4.70	6.86	6.50	8.013	7.87
Day 21		**Mean**	11.0	7.25	27	25.5	123.85	23	34.29
		SD	14.31	4.99	4.70	8.63	6.50	8.01	7.87
p-value			0.33	1.11	0.00*	0.08	0.33	0.00*	0.002*

TABLE 2: Range of motion in hip and knees before and after neurolysis.

Abbreviations used in table: *statistically significant. F=Flexion, E=Extension, Abd=Abductors, Add=Adductors. DF=Dorsiflexion, PF=Plantar Flexion, Bupivac=Bupivacaine

significant improvement in self care and locomotion. Patients who received blocks to obturator nerve showed significant improvement in self care activities and patients who received posterior tibial blocks showed significant improvement in locomotion (p=.005) (Table 3).

Variables	Day 1		Day 21		P Value
	Mean	SD	Mean	SD	
Partial FIM Score	28.25	14.90	34.30	14.14	0.005*

Table 3: Modified FIM scores before and after neurolysis. *stastically significant

Electrophysiological Data: H-reflex latency, amplitude, M-wave amplitude and H: M ratios were measured on the 1st day and 21st days of the study. H- Reflex amplitude showed a significant decrease following phenol injections (p=0.04) but H: M ratio and H-reflex latency were not significantly changed on comparing the results with the t-test for paired samples. (Table 4)

Evaluation of cost of antispastic medication: All the patients who were included in the study were taking antispastic medications through out the study period. 4 patients were using a combination of oral Baclofen and Tizanidine, 6 patients were using a combination of Diazepam and Tizanidine, 7 patients were using only Tizanidine and 3 patients were using only Diazepam. Following nerve blocks there was reduction in consumption of systemic drugs in 9 patients, and there was a significant reduction in cost of medications (p=0.023) (Table 5).

Variables	Day 1		Day 21		P Value
	Mean	SD	Mean	SD	
H reflex (Latency) msec	28.62	8.10	229.88	3.90	0.48
H reflex amplitude (mv)	416.32	426.7	239.68	294.49	0.04*
M wave amplitude (mv)	6.90	5.53	9.64	18.73	0.57
H : M ratio	0.16	0.17	0.11	0.099	0.29

Table 4: Electrophysiological parameters before and after neurolysis

Variables	Day 1		Day 21		P Value
	Mean	SD	Mean	SD	
Cost of antispastic drugs	31.09	28.74	27.72	30.64	0.02*

Table 5: Cost of medicines used (in rupees) before and after neurolysis. *statistically significant

Side effects of Phenol: All patients were followed up until the end of the study to evaluate side effects for phenol blocks. No adverse effects as described in the literature were noted.

Discussion

Spasticity is one of the most disabling symptoms in patients with upper motor neuron syndromes like spinal cord injury and brain injury. It can cause pain and muscle shortening which is a major source of disability. The main goals of treatment are to reduce the deforming force as a result of spasticity, to improve function and prevent secondary complications due to spasticity.

Spasticity can be treated with physical modalities, oral medications, surgical methods and chemical neurolytic agents. Physical modalities commonly used are prolonged stretching, casting, orthotics, biofeedback and electrical stimulation. These physical methods are labour intensive and often provide only transient relief. The advantage of oral medications is that it can be used to reduce generalized spasticity but most of these medications are expensive. Side effects are common when these drugs are administered for long periods. A number of surgical procedures can be under taken for reducing spasticity but these procedures are expensive.

Chemical neurolytic agents like ethyl alcohol and phenol[9] are options for decreasing localized spasticity. Ethyl alcohol in higher concentration selectively denatures the proteins and injures cells by precipitating and dehydrating protoplasm[9]. It is easily available but its disadvantages include skin irritation, permanent peripheral nerve palsy and painful muscle necrosis. Neuromuscular junction blocking agents like Botulinum toxin[10] exerts a paralytic effect by rapidly and strongly binding to presynaptic cholinergic nerve terminals. It is very expensive and this often prevents use of this drug.

Phenol[11] (benzyl alcohol) is the major oxidized metabolite of benzene. Khalili[12] and colleagues performed perineural injections and Awad[13] pioneered intramuscular injections of phenol. Phenol when used for neurolysis denatures protein causing tissue necrosis. Wallerian degeneration occurs approximately 2 weeks following the injection and eventually there is re-growth of most of the axons. The duration of action of phenol blocks has been reported to be approximately 10-11 months using 2-3% Phenol. For the tibial nerve, Petrillo[14] et al showed an average of 13 months improvement using 5% phenol. Keenan et al[15] reported an average duration of improvement of 5 months

for Musculocutaneous7 nerve. Well controlled studies have in general reported an average duration of effect of phenol nerve block as 6 months.

In our study, 20 patients with spasticity following spinal cord injury or brain injury were treated with nerve blocks, either Obturator nerve block (13 patients) or Posterior tibial nerve blocks (7 patients), All of them showed significant but transient reduction of spasticity after the injection of 0.5% Bupivacaine on the 7th day of the study but there was a recurrence of spasticity as its effect was of short duration. After giving phenol nerve blocks on 14th day, reduction in spasticity was observed on the same day and this continued till the end of the study on the 21st day. From these results it is inferred that 0.5% Bupivacaine is a short acting agent whereas 6% phenol reduces spasticity for more than seven days. As spasticity decreased, there was definite improvement of range of motion in the neighboring joints. 13 patients showed consistent improvement in hip abduction range after giving bupivacaine injection and phenol injections to the Obturator nerve. The increased hip abduction range helped them in positioning, maintaining proper perineal hygiene and in self care activities like toileting and lower half dressing. It also helped in proper ambulation by decreasing the scissoring of the gait. The 7 patients who received injections to their Posterior tibial nerve showed significant improvement in dorsiflexion range which helped them in sitting, walking and climbing stairs.

Several standard physiological tests were used to assess spasticity of which H-reflex amplitude and H: M ratio have been shown to change in spasticity. Katz et al[16] showed increased H:M ratios in spasticity following spinal cord injury. In our study H amplitude was significantly diminished post phenol injection but H: M ratio was not significantly affected. H reflex amplitude can be used as an indicator of effectiveness of phenol block.

The common side effects of phenol blocks reported in literature are burning sensation and dysaesthesia. When phenol is injected into a vessel it can leads to thrombosis, ischemia and tissue sloughing. An overdose can cause tremors, central nervous system depression, and cardiovascular collapse. None of the patients included in our study group had any side effects as described in the literature.

Conclusions

Phenol block to peripheral nerves reduces spasticity in persons with spinal cord or brain injury. There was statistically significant improvement in range of movement in joints after nerve blockade using 6% phenol and 0.5% bupivacaine but the effect with bupivacaine was short lived. There was a reduction in H-reflex amplitude after the phenol blocks. Chemical neurolysis with phenol is a safe and cost effective method to reduce spasticity and to improve functions in patients with spinal cord injury and traumatic brain injury.

References

1. Lance JW, Nathaniel H Mayer. Clinicophysiological concepts of spasticity and motor dysfunction in adults with an upper motor neuron lesion. Muscle and Nerve 1997; 6:2-12.
2. Mey Thaler JM, Renfroc SG, Grabb PA et al. Long Term continuously infused intrathecal Baclofen for spastic / Dystonic hypertonia in Traumatic brain injury - 1 year experience, Arch Phys Med. Rehab 1999:80:13-9.
3. Nathan PW. Chemical rhizotomy for relief of spasticity in ambulant patients. BMJ 1965; 1 (5442): 1096 – 1100.
4. Wilkinson HA. Phenol for Post traumatic spasticity. Neurosurgery 1985; 16 (4): 583.
5. Keenan M, Todderud E, Henderson R and Bottle M. Management of intrinsic spasticity in hand phenol injection or Neurectomy of motor branch of ulnar nerve. Journal of Hand Surgery 1987; 12A:734-39.
6. Jordan C. Current status of functional lower extremity surgery in adult spastic patients. Clinical Orthopaedics and Related Research 1988; 233: 116-125.
7. Bohannon RW, Smith MB, Interrator reliability of modified Ashworth scale of muscle spasticity. Phys Therapy 1987; 67: 206.
8. Jacqueline J. Wertsch, Theresa A, Oswald Margaret M Roberts. Role of intraneural topography in diagnosis and localization in electrodiagnostic medicine. Physical Medicine & Rehabilitation Clinics of North America 1994; 5(3): 465-476.
9. Ross D Zaforte, Michael. C. Munin, Phenol and alcohol blocks of treatment of spasticity, PMR. Clinics North America 2001 (Nov); 12: 817 – 832.
10. On AY, Kirzali Y, Kismali B et al. Mechanism of action of phenol block and Botulinum toxin type A in relieving spasticity Electrophysiological investigation and follow up. American J Phys Med Rehabil 1999; 78 : 334.
11. Felsental G. Pharmacology of Phenol in peripheral nerve blocks: A review, Arch Phys Med Rehabil 1974; 55:13.
12. Khalali A, Betts H. Peripheral nerve block with phenol in management of spasticity- indication and complications. JAMA 1967; 200: 1155.
13. Awad E. Phenol block for control of hip flexor and adductor spasticity Arch. Phys. Med. Rehabil 1972; 53: 55.
14. Petrillo CR, Knoplock S. Phenol blocks of tibial nerve for spasticity- A long term followup study. International disability study 1998; 19: 97.
15. Keenan MAE, Tomas ES, Stone L et al. Percutaneous phenol block of musculocutaneous nerve to control elbow flexor spasticity. Journal of Hand surgery 1990; 15A: 340.
16. Richard T. Katz, Management of spasticity. Physical Medicine & Rehab 1988;16:108– 116.

IJPMR 2008 April; 19 (1): 18-20 ***Case Report***

Catatonia and Multiple Pressure Ulcers: A Rare Complication in Rehabilitation Setting

Dr Abhishek Srivastava, MBBS, MD (PMR), Senior Resident & PhD Scholar*
Dr Anupam Gupta, MBBS, MD (PMR), Assistant Professor*
Dr Pratima Murthy, MBBS, MD (Psych), Professor**
Dr T Murali, MBBS, MD (Psych), Professor & Head*

*Department of Psychiatric & Neurological Rehabilitation
**Department of Psychiatry
National Institute of Mental Health & Neuro Sciences (NIMHANS)
Bangalore 560029, India.

Abstract

An eighteen years old boy reported with a continuous course illness characterized by features of catatonia secondary to severe depression with multiple pressure ulcers over sacrum and heels. Ulcers were effectively managed by a team of physiatrist, psychiatrist and rehabilitation nurses. Immobility, reduced nocturnal movements, increased skin fragility and poor nutrition contributed to the development of the pressure ulcer in bed bound patients. Efforts should be directed towards prevention of pressure ulcers to reduce additional morbidity. Key Message: First case to be reported of a patient with catatonia secondary to depression having multiple pressure ulcers.

Key words: catatonia, depression, pressure ulcer, rehabilitation

Introduction

Pressure ulcer is best described as "an area of unrelieved pressure over a defined area, usually over a bony prominence, resulting in ischemia, cell death, and tissue necrosis[1]. Pressure due to immobility is the most important risk factor in the development of pressure ulcer. However, no case is reported till date in literature of pressure ulcer in a patient with catatonia. We report a case with multiple pressure ulcers secondary to immobility due to catatonia in a patient with severe depression and how he was managed by combined efforts of a multidisciplinary team.

Case Report

An 18 years old man with no significant past, personal or family history with well adjusted pre-morbid personality presented with an acute onset continuous illness characterized by low mood and withdrawn behavior for last nine months, mutism, staring and stereotypic behavior with posturing, reduced oral intake, and negativism for three months and multiple ulcers over back and heels for last one month. The symptoms started while he was preparing for his board exams and worsened when he was unable to perform well in the examinations. At evaluation he was apathetic and had open eyes with fixed gaze but no emotional responsiveness and reaction to stimuli. He was mute with no spontaneous acts and no rigidity. He was poorly kempt and had asthenic built. Systemic examination was normal. He had three pressure ulcers (details follow). He was diagnosed as a case of catatonia with severe depression and multiple pressure ulcers. Routine haemogram and biochemistry were within normal limits. He received oral benzodiapines (Tab. Lorazepam 2mg three times a day), antibiotics (Cap. Amoxycillin 500mg three times a day) and vitamin supplements. He was referred to rehabilitation department for the management of pressure ulcers. He had three pressure ulcers - one rectangular shaped, grade III ulcer over sacral region 5.0 X 2.5cms in size, clean and granulating (Figure 1), and two circular ulcers over bilateral heel grade II 1cm in diameter with necrotic slough

*Address for correspondence: **Dr Abhishek Srivastava,** Department of Psychiatric & Neurological Rehabilitation, National Institute of Mental Health & Neuro Sciences (NIMHANS), Bangalore 560029, India.Email: abhisrivastav_jai@yahoo.com, Fax: 91-080-26564830*

Fig. 1. Sacral ulcer

Fig. 2. Bilateral Heel Ulcers

(Fig. 2). Wound swab cultures showed growth of Enterobacter species sensitive to amoxicillin. There was no evidence of osteomyelitis on X-rays of pelvis and ankle and foot. He was put on conservative regimen of management consisting of nursing on water mattress, proper bed positioning, regular pressure relief, daily debridement and dressing of pressure ulcers, and appropriate antibiotic as per the culture along with continuation of the supportive medications. Catatonic features responded initially to benzodiapines but later electroconvulsive therapy was initiated and seven sessions were conducted. Patient responded well to the combined approach and was shifted to oral anti-depressant (Cap. Fluoxetine 20 mg once a day) and was discharged after an inpatient stay of over eight weeks. At the time of discharge, he was euthymic with adequate oral intake, taking medications regularly and all pressure ulcers were completely healed.

Discussion

The incidence of pressure ulcer in hospitalized patients ranges from 2.7% - 29%, and prevalence from 3.5% - 69%[2]. Prevalence of pressure ulcers in psychiatric hospitals ranges from 1.4 – 3.8% in older people above 65 years and 0.0 - 0.8% in younger patients [3]. The common causes for development of pressure ulcer in patients with psychiatric diagnosis are: impaired consciousness, dementia, Parkinson's disease[4], depression[5], altered psychological behavior or splint usage in psychotic patients[6]. A common factor in all these conditions is immobility, leading to prolonged unrelieved pressure, tissue ischemia and cell death.

Pressure ulcers are caused by the interaction of multiple, diverse, etio-pathological factors that can be classified as patho-mechanical or patho-physiological[7]. Common patho-mechanical (extrinsic or primary) factors are prolonged pressure and immobility along with shear and friction, where as fever, anemia, malnutrition, decreased lean body mass and neurological disease are common patho-physiological (intrinsic or secondary) factors.

Immobility in bed tends to cause pressure ulcers on occiput, sacrum, heels, malleoli, and trochantric regions[8]. Our patient had ulcers over sacrum and heel. Nocturnal movements associated with sleep tends to decrease as hospital stay increases[9] and analysis of periodic body movements in persons at risk for pressure ulcers suggest a relationship between spontaneous body movement and the development of pressure ulcer[10]. Our patient developed ulcers before admission to the hospital but must have had reduced body movement at night. There is increased association of skin fragility and poor healing with an altered psychological behavior. This combination of vulnerability to recurrent pressure sores in association with the pathological intellectual debility is described as 'ectodermic syndrome[6] that might have also contributed to ulcer generation in our patient. Our patient had lean body mass (BMI-19, low normal) but haemoglobin (12.6gm/dl), serum albumin (3.9gm/dl), and absolute lymphocyte count (2240/cumm) were with in normal range suggesting minimal contribution from patho-physiological factors in ulcer development in spite of reduced oral intake for last few weeks.

It is imperative to treat the patient's medical condition that predisposes to pressure ulcers. If possible, the patho-physiological factors should be controlled in conjunction with the elimination of the patho-mechanical factors. In our case, medications and electroconvulsive therapy was started to eliminate the primary pathology by the psychiatrist and the rehabilitation team provided proper care of the ulcers by conservative regimen consisting of appropriate medications, dressing and advice for proper nursing care for controlling the physiological factors and early healing of the ulcers.

The incidence of pressure ulcers in patients with psychiatric illness, especially with catatonia might be more

than what is reported in the literature. Pressure ulcers significantly increase length of stay, morbidity and the cost of management. All efforts should be directed towards prevention of pressure ulcers in bed bound patients to reduce additional morbidity.

Acknowledgement

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References

1. National Pressure Ulcer Advisory Panel. Pressure Ulcers: Incidence, Economics, and Risk Assessment - Consensus Development Conference Statement. West Dundee, IL, S-N Publications, 1989
2. Meehan M. Multi site pressure ulcer prevalence survey. Decubitus 1990; 3:14-7.
3. Mookhoek EJ. Pressure sores in a psychiatric hospital: a report of 10 years of systematic decubitus treatment. Tijdschr Gerontol Geriatr 1994; 25 (2): 54-7.
4. Narita H. Prevention of decubitus ulcer in patients with severe mental disorders. Kango Gijutsu 1986; 32 (5): 589-93.
5. Grand E. Decubitus ulcer as a symptom of depression: The prognosis is dependent on the form of depression and on its treatment. Pflege Z 1994; 47(10): 544-7.
6. Heliporn M. Psychological factors in the causation of pressure sores: case reports. Paraplegia 1991; 29 (2): 137-9.
7. Brand P. Pressure sores: The problem. In. Kenedi R, Cowden J, Scales J (eds): Bed Sores Biomechanics. London, Mac Millan Press, 1976, 19-23.
8. Lloyd EE, Baker F. An examination of variables in spinal cord injury patients with pressure sores. SCI Nurs 1986; 5: 669-81.
9. Barbenel JC, Fergeson-Pell MW, Beale AQ. Monitoring the mobility in bed. Med Biol Eng Comput 1985; 23: 466-69.
10. Exton-Smith AN, Sherwin RW. The prevention of pressure sores: The significance of spontaneous bodily movements. Lancet 1961; 2: 1124-8.

IJPMR 2008 April; 19 (1): 21-23 ***Case Report***

Acupuncture as a Modality in Low Back Pain

Dr RK Ghatak, M.B.B.S; D.C.H; M.D (PMR), Associate Professor & Head, Dept. of Physical Medicine
Dr Tusher Kanti Das, B.Sc, D.H.M.S, C.Acu (D.H.S, W.B), Medical officer, Acupuncture

Burdwan Medical College, Burdwan, West Bengal

Abstract

32 years married muslim female having chronic low back pain for four years was treated in the Deaprtment of Physical Medicine, Burdwan Medical College, West Bengal in the year 2005. Patient could not tolerate NSAIDS due to recurrent peptic ulcer. Physiotherapeutic exercises and management with Ultrasonic therapy had to be withdrawn due to nausea and vomiting reported by the patient. Patient was then put on Acupuncture treatment. There was remarkable improvement with Acupuncture within 2 months. Exercise therapy and advice regarding posture care was continued along with acupuncture therapy.

KEY WORDS: Low Back Pain, Acupuncture

Introduction

Low back pain is a common ailment in the practice of Physical Medicine and is a leading cause of loss of (LBP) working days.[1] Everybody experiences LBP once or twice in his/her life. Majority of LBP cases improve without treatment.[2, 3] A numbers of cases improve with medical treatment within a few days. In refractory cases facet joint injection, epidural infiltration and even neurosurgical intervention are needed. But these types of invasive treatment are not available in primary level of hospitals. So a search is done for a modality which is available in primary setup, not costly and can be administered by attending physician with a little training. Acupuncture is such modality which has some scientific basis. [4]

Burdwan Medical College, West Bengal has one Acupuncture unit. One refractory case of chronic LBP, where NSAIDS could not be administered and usual physiotherapeutic heat therapy could not be continued, was advised Acupuncture treatment. Before starting of Acupuncture treatment patient could not walk without assistance due to pain and spasm. There was remarkable improvement and the patient could do usual ADL activities independently within 2 months of Acupuncture therapy.

Case Report

A 32 yrs married muslim lady, resident of Burdwan district of West Bengal, attended OPD of dept. of Physical Medicine with the main complaints were LBP for 4 years and a feeling of tremors of both lower limbs for 4 months.

There was no history of trauma. Bowel and bladder habit were normal. There was no involvement of any other joints or morning stiffness.

Her 1st conception resulted in premature delivery at 7th month of pregnancy. . The baby died 3 days after delivery. Incompetence of uterus was diagnosed as the cause. Thus Shirodkar's operation was done following her 2nd and 3rd pregnancy. The second baby was a female delivered in the year 1993 and still alive.

Whole episode started following her 3rd conception. The patient noticed cessation of movement of the baby at 6th month of pregnancy. Planned abortion was conducted at 7th month of pregnancy. After the abortion, menstrual flow became painful and foul smelling. Lower abdominal pain and low back pain started 4 months after the abortion. For the last 9 months, abdominal pain gradually decreased in intensity but low back pain increased in intensity.

Patient had past history of migranous headache since her childhood for which she used to take paracetamol as self medication.

The patient suffered from pain abdomen with passage of black stool twice, first in the year 1995 following ingestion of some tablet for headache and again in the year 2000 after taking some NSAID for toothache. She was treated for peptic ulcer and was advised to avoid pain killer.

On 22.9.2005, she first attended urology dept. of Medical College Hospital. Kolkata, for accidental finding of stone

Address for correspondence: Dr. R.K.Ghatak, A-11/523, Kalyani, Dist- Nadia 741235, West Bengal. Email: drrkg2005@yahoo.co.in

in right kidney in X-ray of lumbosacral spine done for low back pain. From there she was referred to orthopaedic dept. and finally to Physical medicine dept. of Medical College Hospital, Kolkata. From the dept. of Physical Medicine of Medical Hospital, Kolkata she was advised to attend dept. of Physical Medicine Burdwan Medical College, Burdwan as patient was a resident of Burdwan district. Patient first reported at the dept. of Physical Medicine of Burdwan Medical College, Burdwan on 15.10.2005.

She was helped by two of her relatives to walk to the examination room. She could not move her spine due to pain. On examination there was guarding of lumber spinal movement due to pain and spasm but no neurological deficit was detected. No tremor or fasciculation of lower limbs was noted. Bowel and Bladder were not involved.

X-ray L.S Spinal on 4.9.05 showed early degenerative changes along with suspected kidney stone on the right side. UGS lower abdomen done on 15.9.05 showed right sided nephrolithesis. X-ray KUB done on 23.11.05 after treatment at Urology dept of Medical College, Kolkata showed no evidence of any radio opaque calculus in right kidney.

Thyroid function test done on 7.9.05 showed TSH level at 4 μu/ml. Fasting blood sugar on 21.12.05 was 76 mg/dl. Blood examination done on 24.12.05 showed TLC 4100 and ESR 11 mm after first hour.

MRI of L.S. Spine on 3.10.05 reports posterior annular bulge of L4-L5 disc causing pressure on both existing nerves and thecal sac. Height and hydration of all lumber i.v. discs were almost maintained. Lumber vertebrae are normal in height with few osteophytic spicules and end plate changes. Minimal grade 1 anterior spondylolisthesis of L5 over S1 is seen. No evidence of any infective or metastatic lesion was seen.

On her 1st visit in dept. of Physical Medicine, Burdwan Medical College, She was advised to take absolute bed rest for one week. Lumbo-Spinal brace was advised. Ultrasonic therapy to low back was also advised.

Patient could not tolerate ultrasonic therapy**.** On 1st day of therapy she noticed nausea. After 3rd day of therapy, she suffered from repeated vomiting. Ultrasonic therapy was continued but vomiting increased in intensity. On enquiry it was revealed that patient suffered from nausea even on application of dry heat in lower back. So ultrasonic therapy was withdrawn.

After one week there was some improvement of pain but still patient could not walk independently. NSAIDS could not be prescribed as for past history of malena.

So there was search for alternate treatment. Acupuncture was considered and a try was given.

Proper consent was taken from the patient before starting Acupuncture treatment. Acupuncture therapy was started on 23.11.2005. Proper aseptic measures were followed. Acupoints selected were along paraspinal region and lower limbs following principles of anatomical acupuncture. Initially only manual stimulation of the inserted needle and hammering of lower back were done. On the 4th day of treatment, electrical stimulation of the needle (Electroacupunture) was added.

Selected points were UB23, UB25, UB54, UB40, GB30, GB34, and UB60. UB stand for Urinary Bladder Channel and GB stands for Gallbladder Channel.

Initially, alternate day therapy for 20 minutes for 12 sittings was done. Then there was a gap of 7 days. Then biweekly treatment was continued for 4 weeks.

Patient was evaluated for subjective and objective changes. For pain VAS scale (0-10) was used. Patient was evaluated initially before starting of acupuncture treatment, at completion of alternate therapy and finally after completion of biweekly therapy.

Results

At the initiation of the acupuncture treatment, there was excessive pain (Score 10 on a numeric scale) which was lessened to a great extent at the end of alternate day therapy (Score 5). After completion of acupuncture treatment there was minimal pain left. (Score 2)

Before initiation of acupuncture treatment, patient was not able to move her spine due to pain and spasm. Independent standing or walking was not possible. After completion of therapy patient improved so that she could flex her lower spine to some extent with pain. After completion of treatment, patient improved to a great extent so that she was able to do her ADL activities independently with minimal difficulty. She was even able to cross railway over bridge independently.

Discussion

Acupuncture is a component of Traditional Chinese Medicine (TCM).[5] Acupuncture originated in china in prehistoric times. The word 'acupuncture' comes from two Latin words 'acus'(needle) and 'punctura'(puncture). In TCM (Traditional Chinese Medicine), a disease process is thought to be due to disharmony between two opposite forces (yin and yang) and flow of qi. Qi is considered to be vital force concentrated in bilateral pathways or channels called meridians that run longitudinally throughout the body. [6]

The acupuncture would be used to bring yin and yang into balance or to release the stagnation of qi. [7] This is achieved by inserting thin, noncutting needles along the

meridians into specific points called acupoints. [6]

Researchers have considered acupuncture to be a form of neuromodulation. There are two theories regarding pain control achieved by acupuncture. First, acupuncture may stimulate large sensory afferent fibers and suppress pain perception as explained by gate control theory of pain. Second, the needle insertion may act as noxious stimuli and induce endogenous production of opiate like substance to effect pain control.[4]

According to Yellow Emperor,s Classic Internal Medicine, there are 360 acupoints corresponding with 360 days in a year(according to Chinese lunar calendar), but thorough searching reveals only 295 acupoints. The acupoints are organized essentially into 12 meridians (channels) to coincide with the ancient Chinese system of 12 time intervals in the day. [7]

Manual stimulation of the inserted needle is done to generate De. Qi. Sensation, which is considered essential for achieving result of acupuncture treatment. De Qi is usually described as a heavy, numb, aching feeling that is produced when needle enters a acupuncture point. Joseph and Linda concluded that it is not necessary to create this sensation to achieve acupuncture in anatomical basis. Anatomical Acupuncture is the practice of acupuncture using the knowledge of modern anatomy, physiology and pathophysiology. This approach has been developed since 1970 by Dr. Joseph Y Wong. Electroacupuncture is a method where acupuncture needle are stimulated by electrical current instead of manipulation by hand. [8]

In low back pain with or without sciatica, combination of local and distal acupoints is selected. [9]

In the present study, anatomical acupuncture was used. The points selected were paraspinal in lumber spine and on the lower limbs.

Osler, one of the great physician of modern medicine indicated effectiveness of acupuncture in the treatment of lumbago.[6] In a study by Geenfield, 220 patients with the chief complaints of the syndrome of LBP due to various causes, after acupuncture 59% had a reduction of pain to a barely perceptible or zero level lasting from a minimum of 3 months to no recurrence at all.[10]

In the present study, NSAIDS could not be used due to past history of precipitation of peptic ulcer twice following ingestion of drugs for pain. In addition, Ultrasonic or heat therapy could not be continued for precipitation of nausea and vomiting. Nausea and vomiting as a side effect of ultrasound therapy on lower back had not been recorded earlier by any observer.

Conclusion

Low Back Pain is common so far as experience of the physician as well as of patient is concerned. We sometime meet patients where NSAIDS could not be administered either due to GI problem or due to intolerance of the patient. In addition physiotherapeutic modality could not be applied due to intolerance as in the case studied. In some rural set up even basic physiotherapeutic setup is not available. In those setting Acupuncture can come into rescue of the attending physician. Acupunture can be considered as a modality which has some scientific basis and which could be learned by doctors with few months of training. Further exploration of possibility of utilization of Acupuncture in pain management and other areas of rehabilation medicine is needed.

References

1. Weinstein SM, Herring SA, Cole JA. Rehabilitation of Patient with Spinal Pain. In: Delisa JA, Gan BM, editors. Rehabilitation Medicine- Principles and Practice. 3rd Edition. Lippincott-Raven Publishers. 1998: 1423-51.
2. Cole AJ, Herring SA. Preface. The Low Back Pain Handbook- A Practical Guide for the Primary Care Clinician. Ed. Cole. Herring. 1st Indian edition. Jaypee Brothers. 1997: xiii – xv.
3. Andersson GBJ. Diagnostic consideration in Patient with Low Back Pain. In: Kraft GH, Swezey RL, editors. Physical Medicine and Rehabilitation Clinics of North America. W.B. Saunders Company. May 1998. 309 -22.
4. Walsh NE, Domitru D, Schoenfeld LS, Ramamurthy S. Treatment of patient with Chronic Pain. In: Delisa JA, Gan BM, editors. Rehabilitation Medicine- Principles and Practice. 3rd Edition. Lippincott-Raven Publishers. 1998. 1385-1421.
5. Preface. Xinnong C , Editor. Chinese Acupuncture and Moxibustion. 1st Edition. Foreign Language Press Beijing. 1987 : xv.
6. Cotter AC, Shiflett SC, Kuo D, Complementary and Alternative Medicine. In: Delisa JA, Gans BM, editors, Physical Medicine and Rehabilitation. 4th Edition. Lippincott Wiliams & Wilkins. 2005: 465-77.
7. Lee MHM, Liao SJ, Acupuncture in Physiatry. In: Kottke FJ, Lehmann JF, editors. Krusen's Handbook of Physical Medicine and Rehabilitation. 4th Edition. W.B Saunders 1990: 402- 9.
8. Wong JY, Rapson LM. Acupuncture in the Management of Pain of Musculoskeletal and Neurological Origin. In: Kraft GH, Schulman RA, Cotter AC, Harmon RL, editors. Physical Medicine and Rehabilitation Clinics of North America. W.B. Saunders Company. August 1999: 531-45.
9. Jayasuriya A, Clinical Acupuncture. 7th revised edition. Jain Publishers Pvt. Ltd. New Delhi, 1998: 524 -34.
10. Greenfield ME. Acupuncture as a rehabilitation modality in chronic low back pain syndrome. Thesis for Master of Public Health Degree, Yale University Department of Epidemiology and Public Health, New Haven, Connecticut, 1997.

IJPMR 2008 April; 19 (1): 24-26 ***Case Report***

Salvaging a Psycho-Flexed Hand

Dr Abhishek Srivastava[1], MBBS, MD, DNB, Senior Resident & PhD Scholar
Dr Anupam Gupta[1], MBBS, MD, Assistant Professor
Dr Ravi Kumar[1], MBBS, MD, Senior Resident
Dr BN Gangadhar[2], MBBS, MD, Professor & Head
Dr T Murali[1], MBBS, MD, Professor & Head
Departments of Psychiatric & Neurological Rehabilitation [1] & Psychiatry [2],
National Institute of Mental Health & Neuro Sciences (NIMHANS), Bangalore 560029, India.

Abstract

A 35 years old lady presented with clenched fist with the background of a psychiatric symptoms. Examination revealed psychotic features with predominant negative symptoms and secondary contracture of left hand. Presumptive diagnosis of psycho-flexed hand was made and referred to department of Psychiatric and Neurological Rehabilitation. Manipulation under anesthesia, corrective casting, splinting, local electrotherapy, physiotherapy and occupational therapy are established methods of managing contractures in rehabilitation medicine. When contractures of hands are identified in patients with psychiatric illness, same principles can be utilized and can be managed effectively by combined and co-coordinated efforts of a multidisciplinary team.

Key words: contracture, hand, psycho-flexed, psychosis, rehabilitation

Introduction

The term "Psycho-flexed hand" was coined by Frykman et al [1] in 1983 when they reported few cases of hand deformities in patients with psychiatric illness. To our knowledge there are very few similar reports in literature. We report a rare case [1,2] of hand deformity secondary to psychosis, and discuss management approach to salvage her hand.

Case Report

A 35 years old married lady presented with complaints of clenched fist bilaterally and swelling of both hands of 4-week duration. She also had disruption of sleep, reduced appetite and decreased self-care for 6-8 weeks, muttering to self for 2 years, and suspicious behavior and fearfulness for last 2-3 years. She was a housewife from a rural background with no formal education with well adjusted pre-morbid personality. She was poorly kempt, did not make eye-to-eye contact, was continuously muttering to self and had fisting of both hands. She exhibited active negativism, apathetic behavior and restricted affect. Formal assessment of speech, mood, thought and perceptual abnormalities could not be carried out due limited participation by the patient for detailed examination. She was referred to the department of psychiatric and neurological rehabilitation for evaluation and management of the hand deformity. Examination revealed both hands in fisted position but intermittent opening of right hand. There was no evidence of spasticity or dystonia. The left hand had swelling, pitting edema, foul smelling discharge, tenderness on palpation and raised temperature. She resisted opening of the left hand and on forceful opening revealed crusting and fissuring of web spaces and contractures at metacarpo-phalangeal (MCP), proximal (PIP) and distal inter-phalangeal (DIP) joints of all four fingers and adduction contracture of thumb (Figure 1). Bunnel- Littler testing suggested tightness primarily of the intrinsic muscles of hand and capsule of MCP and PIP joints. Long finger flexors were also tight.

Presumptive diagnosis of schizophrenia with predominant negative symptoms and secondary contracture of hand was made. There was no evidence of dystonia or fracture. Abnormal posturing of hand was considered a part of the psychopathology as relatives gave history of patient holding a leaf in her hand and telling that it was her treasure and thereby would not open her hand. The swollen, tender hand with contractures had features

Address for correspondence: Dr Abhishek Srivastava, Department of Psychiatric & Neurological Rehabilitation, NIMHANS, Bangalore 560029, India. Email: abhisrivastav_jai@yahoo.com

Fig 1. Sequence of events: Clenched fist with contracture (At presentation), wrist cock up cast, hand opening with dynamic contracture at metacarpophalangeal and interphalangeal joints (At cast removal), and full range of motion at all joints of hand (At discharge)

suggestive of cellulitis along with secondary deformity due to prolonged closed fisted position. Her hemogram revealed: haemoglobin -11.9 gm%, total leukocyte count 8100/cumm, polymorphs-64%, lymphocytes-34%, and eosinophils-2%, ESR-45 mm after1hr, and platelets-3,56,000/cumm. Serum chemistry showed reduced total proteins of 5.9 gm/dl (N> 6.5gm/dl) and low albumin of 3.1gm/dl (N>3.5gm/dl) suggestive of poor nutrition. Rests of the biochemical parameters were within normal range. Rheumatoid factor and antinuclear antibodies were absent. X-ray of both wrists and hands didn't show any abnormality.

Antipsychotic medications were started (Tab. Resperidone upto 6mg and Tab Lorazepam upto 4mg per day). Local dressing and wound cleansing was tried through the side of the closed left hand along with oral antibiotics (Tab. Ampicillin 250 mg + Tab Cloxacillin 250 mg thrice daily) and anti-inflammatory agents (Tab. Diclofenac sodium 50 mg + Tab Serratiopeptidase 10 mg thrice daily). After ten days of antipsychotics, antibiotics, and anti-inflammatory medications she still did not open her left hand and required examination under sedation. There was improvement in skin condition but had significant tightness of intrinsic muscles and capsule of MP and PIP joints and long finger and wrist flexors. A cock - up wrist cast was applied: wrist in 30 degrees of extension, thumb in abduction, MP joints in flexion and PIP and DIP joints in extension (Figure1) but due to inadequate relaxation, full correction could not be achieved. The objective was to keep the hand in functional position and to stretch the tight intrinsic muscles of hand, wrist and finger flexors. The cast was changed after one week. The second cast was applied under general anesthesia to get adequate muscle relaxation. The skin condition had improved further with healing of fissures and no evidence of foul smell or discharge. She still had tightness of intrinsic muscles and capsule but long flexors were stretchable. Cast was reapplied in maximally corrected position.

Her psychotic symptoms improved only minimally and therefore four days after the application of second cast, Electro Convulsive Therapy (ECT) was started. After two ECT sessions, she had distinct improvement in psychotic symptoms. A total of seven sessions of ECT were given over a period of one month. Considering improvement in her negative symptoms and improved self-care**,** the second cast was removed after two weeks and showed normal range of motion at wrist and MP joints but reduced at PIP and DIP joints (Figure1). The tight muscles at these joints were stretchable, suggestive of dynamic contracture of intrinsic muscles along with residual capsular tightness. Paraffin (wax) bath was started along with passive mobilization of the PIP and

DIP joints, active range of motion exercises for wrist and MP joints and active usage of left hand in performing activities of daily living. After six weeks of inpatient, care she was discharged with no active psychopathology and full range of motion at all joints of left hand (Figure1). She was recommended a home-based exercise program and anti-psychotic medication.

Discussion

Frykman et al[1] described five patients with psychiatric illness (long-term depression, hypochondriasis, and/or schizophrenia) with contractures in hand. Since no organic basis could be identified in those patients, the authors coined the term "psycho-flexed hand" to describe that condition. Hand deformity in patients with psychiatric illness can be secondary to trauma, arthritis, congenital anomaly[3], focal neuro-myotonia[4], primary conversion disorder[5], clenched fist syndrome[6], psychogenic spastic hand[7] or as a part of the active psychopathology[1]. The most conspicuous primary neurological abnormalities in schizophrenic patients were motor coordination problems and involuntary movements[8].

There were no features suggestive of congenital anomaly, arthritis or focal myotonia. Contractures of the hand are rather uncommon conversion phenomenon. She had a well- adjusted pre-morbid personality with no features of conversion disorder. "Clenched fist syndrome" is an entity in which the patient keeps one or both hands tightly clenched. It usually follows a minor inciting incident and is associated with swelling, pain, and paradoxical stiffness. No organic disease can be found and extension of the fingers is always possible under anesthesia. Psychiatrically the patient is classified as having severe anger and poor defense. The prognosis is poor[6]. The diagnosis of psychogenic spasm of the hand is a diagnosis of exclusion that requires a multidisciplinary team[7].

In our case, the primary pathology in the development of the hand contracture (keeping the hand in fisted position) was psychosis (an abnormal belief/delusion that she is holding her treasure in the closed hand and would lose that on opening the hand). The persistent fisted position of the left hand leads to poor local hygiene and secondary infection which secondarily contributed in the development of the contracture.

Manipulation under anesthesia, corrective casting and splinting are established methods of managing contractures in rehabilitation medicine like in rheumatoid arthritis and Alzhiemer's disease[2,9,10]. The same principle can be utilized in managing secondary contractures of hand in patients with psychiatric diseases. Initially antibiotics and anti-inflammatory medications were given to reduce infection, pain and swelling. Following that corrective cast was applied to maintain the functional position of wrist and hand. Antipsychotic agents and ECT were given to control the primary pathology. Once she was amenable to therapy due to reduction in the symptomatology, cast was removed and passive therapy and paraffin bath were started to stretch the tight muscles. Measurement of wrist cock up splint was taken at that time of second cast application but due to significant reduction in the psychopathology and active participation in the management, eventually it was not required. Gradually, active therapy was started along with promotion of using left hand in performing activities of daily living.

Manipulation under anesthesia, corrective casting, splinting, exercises and positioning are established methods of managing contractures in rehabilitation medicine. When contractures of hands are identified in patients with psychiatric illness, same principles can be utilized to effectively treat it.

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References

1. Frykman GK, Wood VE, Miller EB. The psycho-flexed hand. Clin Orthop Relat Res. 1983; 174: 153-7.
2. Souren LE, Franssen EH, Reisberg B. Contractures and loss of function in patients with Alzheimer's disease. J Am Geriatr Soc. 1995; 43(6): 650-5.
3. Yeatman GW. Mental retardation-clasped thumb syndrome. Am J Med Genet 1984; 17(1): 339-44.
4. Modarres H, Samuel M, Schon F. Isolated finger flexion: a novel form of focal myotonia. J Neurol Neurosurg Psychiatry 2000; 69: 110-3.
5. Honing ML, Kon M. Dysfunctional postures of the hand as part of a conversion reaction. J Hand Surg [Br] 1996; 21: 271-5.
6. Simmons BP, Vasile RG. The clenched fist syndrome. J Hand Surg 1980; 5(5): 420-7.
7. Cuenod P, Smaga D, Degive C, Della Santa DR. Psychogenic spastic hand. Ann Chir Main Memb Super 1996; 15(2): 100-8.
8. Ismail B, Cantor-Graae E, McNeil TF. Neurological abnormalities in schizophrenic patients and their siblings. Am J Psychiatry 1998; 155: 84–9.
9. Melvin JL. Role and function of occupational therapy in hand rehabilitation. Am J Occup Ther 1985; 39(12): 795-8.
10. Bureck W. Aims of hand therapy in treatment of rheumatoid hand. Handchir Mikrochir Plast Chir. 2005; 37(1): 52-9.

In-Country WHO Fellowship in Comprehensive Rehabilitation in Spinal Cord Injury at Safdarjang Hospital, New Delhi

Dr Dipen Roy, MBBS, D. Ortho, Orthopedic Surgeon,TS District Hospital, Udaipur. Tripura (S)

I reached Delhi on 03rd June 2007 and was placed comfortably by the administration of Safdarjang Hospital, New Delhi.

On 04th June, I was introduced to the Medical Superintendent of Safdarjang Hospital and received a warm welcome in the Physical Medicine and Rehabilitation Department, I stayed until 30th June 2007..

In my experience, paraplegics and quadriplegics were leading a miserable life of various complications and neglect in the society. Dr. S. Y. Kothari and the whole team of the department showed me the rehabilitation of spinal cord injured patients to lead a useful and productive life.

A structured program for the four weeks duration was given to me under which I was given training in receiving these patients with detailed clinical, laboratory and radiological assessment. These patients are kept in the ward in an innovative way so that the small numbers of beds are utilized to the maximum limit. Treatment is divided in three phases so that the patients can practice this training in the inter-phase period, and come to know that this training is meant for their ultimate rehabilitation in their own milieu.

Skin (frequent change of posture), Bladder (self intermittent catheterization), and Bowel training and treatment is meticulously planned. General health is improved. Complications are treated. Upper limb strengthening and wheel chair ambulation training helps in mobility. Dr. R. Sharma and Dr. D. R. Tripathi are very active and innovative in patient management. Weekly Grand Round attended by full team of the department is a big learning experience, where all patients are thoroughly reviewed, progress assessed and further treatment planned.

Weekly seminars are a platform for theoretical inputs and discussions. All the seminars during my stay were around SCI rehabilitation and covered everything from basics, clinical work to physical, social and vocational rehabilitation. Dr. Sindhu, being young specialist, gives valuable theoretical inputs. Weekly operation theatre visit was a valuable experience in reconstructive and rehabilitation surgery. I could also attend various specialty clinics in the department where Dr. N. Laisram showed me rehab. management of many pediatric cases. Visit to various therapy sections and prosthetic and orthotic workshop was a big learning experience. Mrs. Poonam Dhanda is helping patients in social and vocational rehabilitation. Many patients have got help in getting bank loans for starting own business.

Empowered with this knowledge, I hope, I will be able to disseminate new ideas about rehab management among my colleagues and be able to create some facilities for similar patients, back home. I also plan to get enrolled for DNB in PMR, now that I have developed interest in the field.

I am thankful to the WHO, Safdarjang Hospital, New Delhi and Dr. S. Y. Kothari & Dr. R. K. Wadhwa for this opportunity to learn and my comfortable stay at Delhi. Now I am a proud Associate Member of IAPMR for lifetime.

Forwarded to the journal by
Dr SY Kothari
Additonal DGHS and Head
Department of Physical Medicine and Rehabilitation, Safdarjang Hospital and VMMC
New Delhi 110029

Ethical Issues in Physiatrist Practice

Dr Gita Handa, Assistant Editor, Associate Professor, Department of PMR, AIIMS, New Delhi 110029

Medical ethics is at the centre of medical practice. It is rightly gaining much needed renewed focus and attention in the evolving scenario. The impetus for it may be attributed to the revelations that arose through Nuremberg trials, the framework elements that define research and publications related compulsions, and indeed the context and state of affairs of present day medical jurisprudence.

The physiatrist's practice cannot remain untouched by the moral and ethical dilemmas faced in today's world. Although the pillars of the specialty are grounded in the principles of bioethics, i.e. autonomy, beneficence, non-maleficence etc., physiatric practice has been at times facing dilemmas in patient care and research. Some of the areas of concern include a key domain concerning the principles of patient autonomy which heavily depends on the ability to take independent decision which may not be possible in certain situations. The very fact that there is a need for a rehabilitation team at the intersection of the confidentiality issues sought in patient care, brings to the fore arenas of conflict of opinion in the management support for patients across the different contact points of interaction constituting professionals across specializations. As personal issues are involved in addressing the complex range of problems at the core, where the sum of initiatives and efforts contributed by various practitioners and counselors keeping the patients interest would make a difference to quality of outcome, the risks embedded and inherent in the process as viewed from various quarters cannot be denied.

As the rehabilitation outcome may not be known at the initiation of rehabilitation, true autonomy in goal setting may not be possible and it may be difficult to adhere to purely ethical approach to treatment based on patient autonomy. This issue gets further complicated in certain conditions wherein decision making capacity of a patient gets restricted and sometimes limited such as in brain injury , Mental retardation etc. The physiatrist has to resolve these patient related issues along with issues relating to intra team conflict and patient team conflict on the road to acceptable recovery. The process of rehabilitation is a continuous long term process requiring multiple settings and interactions with multiple third parties such as spouse, children, family members, employers, funding agencies etc. seeking engagement and who are needed to be involved in the goal setting for improved outcomes. Patient's personal belief systems and spirituality related issues present complex outlines that need to be addressed by the physiatrist while taking decisions on the management process and these also involve inclusion of traditional systems of medicine and alternative medicine that patients and circumstances can bring to the fore, raising the contours of ethical demands on the practice and practitioners.

Another area of concern is the substance and nature of resource allocation towards rehabilitation medicine vis a vis acute care, where contradictions pertaining to the basic principles of medical care have become increasingly visible as categorized into preventive, curative and rehabilitative domains. In an era wherein acute care services continue to expand and evolve and rehabilitation continues to be positioned as an optional area in policy decisions, the constraints within the structure of resource allocation poses complex ethical issues for physiatrists.

There are other dilemmas that influence the physiatric treatment decisions and practice. The policy shift towards CBR (community based rehabilitation) also invokes attention towards treatment satisfaction experienced by the patients where demand for better access to physiatric services has been emerging. In this age of state of the art research in aids and appliances, the prescription choices between the modernising and conventional equipment options, in due consideration of efficiency and effectiveness in the context of the situations involved pose additional ethical considerations. As the nature of reimbursement policies come into consideration, the difficulties in shaping choices is shared by the person with disability seeking appropriate care and the medical establishment provisioning the same. A case in point here is also issues pertaining to donated aids and appliances which may not have the desired standard patient friendly specifications matching a given circumstance but may have to be accepted as something which is better than nothing scenario. Another issue increasing the complexity involved is the expectation of internet enabled patients, themselves identifying treatment options and technology devices and therapies for importation, which patients may wish to obtain and accordingly seek physiatrist's opinion or prescription.

Other disease specific issues also keep surfacing daily such as neuropsychological issues in litigation in brain injury sequelae, long term ventilator support for high cervical injured quadriplegic patient, futility of treatment in certain cases and end of life and palliative care issues. HIV and AIDS related disabilities may also affect medical and rehabilitation goal setting. Research areas such as stem cell, bionics, robotics etc., further pose certain ethical issues which need to be resolved.

Thus it appears, the way out of this ethical maze is to inculcate a habit of analyzing each situation according to the case specific options encompassing considerations of medical condition, patient preferences, quality of life issues, and other contextual features in the given situation. Convergence of medical opinion in complex situations may help in arriving at objective analyses and conflict resolution. The physiatrist training should include the basics of ethics training, emphasis on good communication and interaction with the patients and exercises on ethical conflict resolution. There are no specific answers to ethical dilemmas as it varies in every situation and the conflicts of values cannot be resolved to the satisfaction of all. It is evident that ethical issues are assuming increasing importance in present day patient care and physiatrists should take the lead in addressing rehabilitative medical care.