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Print Edition

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Editor's Note

In the past two decades, Physical Medicine and Rehabilitation has seen changing trends. Now, it can be seen that there is hardly any field of Medicine, where need for PMR is not felt. More and more specialists in other fields of Medicine are finding need for PMR and are looking towards us helping them with the treatments they offer. Challenges in the diagnosis of the patients being treated were not many until the recent times, when we find ourselves engaged with making the final diagnosis. Perhaps, the basic nature of the Rehabilitation Medicine specialist being a good listener and looking after each and every aspect of the needs and care of the patient makes the PMR specialist spend more time with the patient. Such challenges have at times awed specialists in other fields, making them recognize and respect the field of PMR as an important field of medicine, elevating from the previous 'label' by a few as a mere service department. This demands from us still wider base of knowledge and more responsibility, giving us an impetus to be better diagnosticians, which comes so naturally to PMR specialists.

As the definition of disability is broadening, further research into various aspects of disability related issues and the nomenclatures came up. World Health Organization ventured to revise the International Classification of Impairments, Disability and Handicap (ICIDH), which was used as one of the references, making them more acceptable culturally. The trend is towards the usage of socially and culturally meaningful definitions, while avoiding certain words that give negative perspective to the disabled in the ICIDH-2 version. Surprisingly, it was primarily a group of psychiatrists, who ventured to take up the responsibility for modifying these definitions. But they felt it was wiser to compare their notes with the PMR specialists, even for defining the standards of severity of psychiatric disabilities comparing with those of the patients with Spinal Cord Injury. It can be seen that the responsibility on the shoulders of PMR specialists is increasing.

It would not be wrong to say that the PMR is being looked upon as a "light-house" in the field of disability and handicap. By continuing our participation in various research activities as well as laying down standards in disability issues, we can live beyond the expectations of our fellow specialists from other fields. The message in a nutshell is that the PMR specialists have to put on the firm attire of better diagnosticians, better managers and better researchers to really shine as a beacon.

Dr U Singh

Common Peroneal Nerve Decompression in Leprosy

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Abstract

Common peroneal nerve decompression was performed in 21 leprosy cases of which 18 could be re-examined later. In 3 of them motor functions were normal whereas other cases had clinically manifest motor damage of 12 weeks or longer duration. Sensory improvement following neurolysis was seen in 3 cases. Of the 11 cases who had motor recovery, only five cases could get adequate foot lift during walking. Post-operatively several patients who did not get sensory recovery, complained of parasthesia in the common peroneal nerve innervated area of the leg and foot.

Key words: Common peroneal nerve, Leprosy, Hensen's disease, sensory-motor deficit, multi drug therapy (MDT), paralysis, muscle power.

Introduction

The involvement of nerve trunks in leprosy usually presents as parasthesiae and nerve pain and at times leads to sensory-motor deficits. Sensory loss generally precedes the changes in motor function. In the last few decades reconstructive surgery has been able to restore function by means of tendon transfers. However, contradictory opinions have been expressed about the usefulness of nerve decompression procedures to restore the sensory - motor functions in the mixed nerve trunks affected with leprosy.

Damage to the mixed nerve trunks starts primarily as a result of internal compression caused by ongoing antigen - antibody reaction and resultant edema inside the nerve. External compression starts playing the role when turgid nerve becomes too thick to move and gets entrapped.

When leprosy lesions affect common peroneal nerve (CPN), the patient is at risk of paralysis of extensors of ankle and toes that gives static, dynamic and some times neurotrophic

disorder of foot. Medical treatment alone is not found to be adequate in such situations and surgical intervention is called for. Muir (1948)¹ was of the opinion that a painful nerve swelling with pressure paralysis was suitable for decompression. Observations of several workers²⁻⁶ suggest that in leprosy patients, after nerve decompression, pain and paresthesia disappear in nearly all the cases and cases with impending nerve paralysis tend to improve muscle power.

In literature there are many reports on surgical decompression of ulnar, median and posterior tibial nerves in leprosy but very few reports on common peroneal nerves. We have been performing nerve decompressions on mixed nerve trunks in leprosy for quite some time and report here our experiences with common peroneal nerve.

Materials and Methods

Twenty one patients, in 12-55 years age group, had decompression of CPN. Duration of disease varied from 3 months to 15 years. Fourteen of them had borderline tuberculoid leprosy, 3 neuritic, 2 borderline lepromatous and 1 borderline and 1 lepromatous leprosy each. Diabetes and spinal disease were ruled out in all the cases.

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Two cases did not turn up for follow-up examination and another had immediate tendon transfer for drop foot along with nerve decompression. These 3 cases were excluded from the series.

CPN involvement and/or damage varied from 3 months to 6 years (mean 13 months). Left side was affected in 15 and right in 6. Three cases had bilateral disease of which, 2 had recovery on the non-operated side under steroid therapy during the post-operative follow-up.

Average time between the onset of CPN symptoms/damage and operation was 3 months to 4 years (mean 9 months). Nerve swelling and disability were main presenting features. In 10 cases pre-operative steroids (up to 40 mg per day) were given for varying periods (8-16 weeks). The failure to respond to oral steroids had brought them for surgical relief.

CPN trunk was thickened and could be palpated well just below the head of fibula. There was no pain but tenderness on deep pressure could be elicited. Four cases had gross thickening of the nerve trunk.

Sensory loss was present in the CPN innervated area of the leg and foot in 17 cases. In 1 case it was confined to anterior tibial area (between the cleft of great toe and second toe). In one case there was no sensory loss. Motor damage was present in 15 cases and in 10 of them only anterior compartment muscles were affected. Three cases did not have any clinical motor damage. As a group only one patient did not have any manifest sensory-motor damage.

Nine patients in this series had complete posterior tibial nerve damage (bilateral in 2) and 5 had partial damage.

Surgical Procedure

Our approach aimed at extensive and wide exposure along with extraneural neurolysis. The nerve was identified close to biceps femoris tendon

and was exposed in the popliteal fossa up to the neck of fibula and followed distally into fibular tunnel. Both superficial and deep parts of fibrous arch were released and its thick edges excised. The epineurium was carefully incised longitudinally, where the nerve was swollen, so as to release the tension avoiding injury to the blood vessels on the surface of the nerve. A curved hemostat forceps was passed and the passage was dilated in the downwards direction. The abscess, if present was evacuated and the wound was closed using skin sutures.

Post-operatively the patients were prescribed 10 mg prednisolone (betamethasone equivalent) and 300 mg aspirin daily for 6 months or more depending upon the response. Anti-leprosy drugs were continued till the disease became inactive. Wound dehiscence was seen in 3 cases.

Post-operatively only 14 cases received steroids. Five cases did not get steroids for reasons like plantar ulcers, wounds etc. Of these 5 cases one did not have any motor damage and other 2 had partial motor recovery. In all, 7 cases received steroids both pre and post-operatively.

Results

The patients were seen one month after operation, then at 3 monthly intervals upto the time they kept visiting us. This period varied from 4 months to 8 years (mean 32 months). Most of the cases were seen at least upto 12 months post surgery.

Follow-up was available in 18 cases. Fourteen cases came regularly and completed MDT schedules. Four cases were irregular and of these 2 did not recover. All the regular cases had recovery of some sensory and/or motor functions. In none of the patients apparent disability worsened even though muscles grade in toe extensors fell down to grade zero from grade 3 (2 cases). Post-operatively all except one had residual thickening of CPN near the neck of fibula.

Recovery of sensory and/or motor functions was seen as early as 3 months after surgery (range 3-16 months, mean 7 months). Sensory recovery was noted only in 3 cases of which one did not have any pre-operative loss of motor functions. Of the remaining 2, one did not get back the muscle strength and other had recovery of sensory and motor functions both. Of the patients who did not have sensory recovery, 9 complained of paresthesia in CPN innervated area of leg and foot.

Outcome about motor functions has been shown in Figure 1. Three cases had no pre-operative motordamage. Of the remaining 15 cases 11 showed some motor recovery. Even though some of the muscles gained normal strength, overall recovery was partial. Useful muscle strength to have dorsiflexion and adequate foot lift while walking was seen in 5 cases only. Peronei gained near normal strength in 5 out of 8 cases where they were paralysed. The order of muscle recovery was peronei > tibialis anterior > extensor hallucis > extensor digitorum longus in that order.

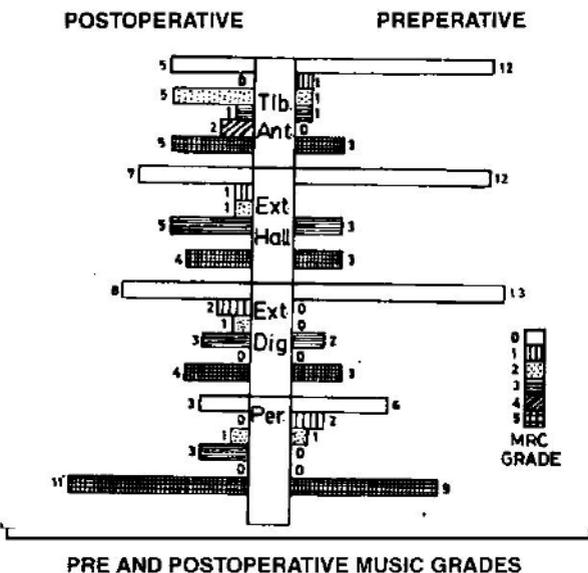


Figure: 1. Strength of CPN innervated muscles before and after Nerve Decompression.

Three cases had tendon transfers for correction of drop foot deformity including one having drop foot for 12 years who opted for immediate surgery along with nerve trunk decompression.

Detailed analysis of cases who had motor recovery showed that in 9 of them, nerve damage was about 6 months old and they had received corticosteroids post-operatively. Seven of the 11 cases who showed motor recovery, had paralysis of both anterior and lateral compartment.

Nerve abscess was found, on exploration, in 5 cases. Of these, 3 did not have any clinical motor damage. Of the remaining, 2 one had only sensory recovery and another only motor recovery.

Discussion

The CPN is closely related to the head and neck of fibula and superior tibio-fibular joint. After leaving the popliteal fossa the nerve passes laterally behind and below the fibular head and over the upper fibres of soleus to reach the peroneus longus (PL) which is attached there by its two heads. The superficial head is attached to head of fibula and adjacent part of tibial condyle. The deep head is composed of tendinous tissue which extends upwards from the tibial shaft on to the neck of fibula. The nerve passes between the two heads of PL and here the nerve is in the form of thin flattened band with its constituent branches arranged as collateral bundles well separated from each other exposing the nutrient vessels which lie unprotected between them. It then curves round the neck of fibula and finally between the two heads of muscle and divides into superficial and deep branches. Just before the nerve enters PL it is held applied to bone and muscle by the attachment of deep fascia. Nerve therefore, is fixed as well as angulated at this site.

Several types of entrapment of CPN is described viz. postural, dynamic and idiopathic.⁷ Peroneal nerve entrapment usually is attributed to an excessively thick, overhanging edge of the fibrous arch formed by the superficial head of PL.

The arch comprises of two bands - superficial and deep, which must be released in order to completely decompress the nerve. Beyond this, the nerve is compressed between the two heads of the muscle and narrowing of the fibular tunnel through which it passes. Well developed muscle mass adds to the compression.

In this confined space there is slight sliding movement of the nerve during leg and foot movements particularly those of inversion and plantar flexion. A friction constrictive fibrosis developing at this site may impair nerve function. The fibrous arch therefore also contributes to dynamic entrapment during activities like running, jogging, fast walking and to postural entrapment during activities like squatting, kneeling or cross-legged sitting. Superficial peroneal nerve can also get entrapped at the place where it pierces the fascia of lateral compartment to emerge on the dorsum of foot near ankle. It is possible that a double compression can exist in some cases thereby preventing the recovery of sensory functions on the dorsum of foot.

Chronic irritation of leprosy-affected inflamed entrapped nerve both from inside and outside leads to intraneural and extraneural edema which further restricts mobility of the nerve in its sheath during flexion-extension of the knee leading to formation of adhesions, further aggravating the problem. Repeated flexion- extension of the knee causing movement of the nerve within the tight arch can precipitate the damage in already inflamed nerve.

The relative fixation of nerve makes it more susceptible to traction injuries. Proximal part of the nerve trunk suffers more in the process. The traction forces are strong enough to disrupt the nutrient capillaries leaving the perineurium intact. There are two reasons for comparative lack of resistance of CPN to ischemia - (i) Its exposed nutrient vessels and scarcity of the interfascicular connective and fatty tissue (ii) The main intrinsic vessels run loose in the epineurium in 88% cases.

There are few large funicular bundles in the nerve as it leaves the popliteal fossa and a relative lack of areolar connective tissue which make them more prone to compression.⁸

Carayon and Huet⁹ reported a series of 9 cases of early leprosy neuritis of CPN (about 6 months old) of which 6 had complete and one had partial recovery after nerve decompression. In another series¹⁰ 12 of the 32 (37%) operated cases of CPN neuritis had recovery of muscle power. Good results have been reported in a series of non-leprosy cases also.⁷

We have reported very good results of ulnar and median nerve decompressions^{6,11-12} with recovery rates varying from 50 to 60%. However, with common peroneal decompression results are not that impressive. In our series of 15 leprosy cases only 5 cases (33%) improved to have useful function in contrast to what we observe with ulnar and median nerves where many cases with complete palsy also improve.

Appearance and persistence of parasthesiae in cases who did not have sensory recovery probably indicates the irritability of regenerating neurons attempting to reach their final destination. The patients who had sensory recovery did not get parasthesiae.

Poor success rate with common peroneal neurolysis even though done at the "appropriate time" needs explanation. Post-operative splinting of the foot may not have been done for adequate period. Keeping foot off the ground during period of recovery which may be as long as 6 months, is not practical. Even if done, it needs supervised mobilisation as there is risk of pathological fractures in foot bones due to increased osteoporosis because of steroids and immobilisation, defeating the very purpose for which the surgery has been performed. The blood supply of the nerve somehow got compromised, may be due to disease process, thereby making any recovery impossible. The patients are probably

presenting too late for surgery as evident by failure of sensory recovery.

Non-operative treatment is generally prescribed because spontaneous recovery is known to occur atleast in leprosy. Some workers have advocated waiting for spontaneous recovery to take place. The spontaneous recovery takes very long time and what percentage of these cases fail to recover is not documented. Many a times, even though steroids are prescribed, proper splinting and rest is not practical as it interferes with the mobility of the patient. Such splinting, to be effective needs at least 6-12 weeks and by this time enough osteoporosis and disuse atrophy of proximal muscles occurs. Stretched leg muscles are slow to gain strength and at times recovery is so poor to be of any functional value.

There are many leprologists who still believe that steroid alone will do good may be at higher doses given for a longer time. This apparently speaks their ignorance about the anatomical peculiarities of the region, pathomechanics of nerve damage and strong belief that inflamed nerve returns to its "normal" thickness once the inflammation has subsided. There is nothing like surgery versus steroids as interpreted by many people. A combined approach appears more logical and in larger interests of the patients.

It seems better to decompress the nerve if there is no response to oral steroids within 3 months of therapy. Operative decompression is safe and time taken for recovery is usually reduced. We feel convinced that operation should be performed relatively early in the course of disease as an adjunct to the steroid therapy in interest of the patients. Correction of drop foot is more troublesome than the nerve decompression. Limited waiting period of 8-10 weeks is justified so as not to interfere with a rapid spontaneous recovery which is always a possibility.

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Medico-legal Problems in Sports Medicine (Case Studies)

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Abstract

The role of sports physician does not end with treatment of sports injuries. Issues like age and sex determination, declaration of fitness, doping, HIV infection etc. are becoming more relevant these days. Sports physicians should be competent and conversant with these problems and they should always be cautious in dealing with these problems. Different legislation; increased awareness of the right among sporting population on one hand and management of sports injuries without proper facilities; fast decision making under pressure on the other hand, sports physicians are exposed to many medico-legal problems in the course of their employment. Few cases are discussed here to increase awareness among physicians dealing with sports.

Introduction

A registered medical practitioner should be conversant with the duties, rights, privileges and obligations of being a medical professional. Ignorance of these duties do not make valid excuse for dereliction and negligence of duties. Wilful and deliberate negligence will tantamount to malpractice and may call for legal proceedings¹. Important legislation related to medical practitioners are: i) Constitution of India, 1950; ii). Consumers Protection Act, 1986; iii). Law of Torts; iv). Indian Penal Code, 1860; v). Medical Council Act, 1965 and vi). Employees State Insurance Act, 1948².

Sports injuries are common and often devastating. Besides, other issues like age and sex determination, declaration of fitness, doping etc. are gaining ground thereby increasing the responsibility of the sports physician. At the same time, there has been considerable increase in public awareness of rights. Along with these, current trend

of litigation have made physician more vulnerable to legal liability.

Physicians should always take necessary precautions in their professional practice to avoid any charge of professional misconduct and negligence. Professional negligence or "malpraxis" (want or lack of reasonable care and skill or wilful negligence on the part of the medical practitioner in course of professional attendance on his patient leading to his bodily injury, sufferance or even loss of life) may be treated as civil or criminal malpraxis and a case may be taken up against the medical practitioner in a civil or criminal court. In civil malpraxis, the suffering or loss can be compensated with money but in criminal malpraxis the physician is liable for imprisonment with or without fine as per law. If the physician exercises reasonable care and skill in attending his patient, he need not worry for any litigation against him by the patient or party³.

The generally accepted definition of the standard of care for medical practice is as follows - "A physician is under a duty to use that degree of care and skill which is expected of a reasonably competent practitioner in the same class to which

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he belongs, acting in the similar circumstances". Under this standard, advances in the profession, availability of facilities, specialisation or general practice, proximity of the specialist and special facilities and all other relevant considerations are included. Medical liability is based on the premise that any person who fails to act in a reasonable manner and causes another to be injured unnecessarily¹.

Sports persons and physicians interact in many situations which may not be possible to be included in a single ethical code. However, if a physician develops a suitable level of skill and knowledge and maintains it, he can practice sports medicine without fear of being sued. Besides, a basic understanding of medico-legal principles should diminish fears about being sued and should motivate physicians to practice sports medicine. In an attempt to increase awareness and familiarise the medico-legal principles among physicians dealing with sports, a few selected medico-legal cases are discussed in this article.

Illustrative Cases

Case No. 1: During 1990 Asian Games at Beijing, an Indian female hockey player was refused from participating in the competition. The player did not have requisite gender verification certificate from the representing country. Gender verification test was done at Beijing and she was declared "male" genetically.

Case No. 2: During a nation-wide sports talent search examination, a young female volleyball player from Haryana was declared overaged depending on her physical and biological characters against her age proof certificate issued by the school authority. Her parents went to court for the alleged injustice and damages done to her. Matter was finally handed over to a team of experts who ultimately confirmed the age.

Case No. 3 : During the selection of state players for the prestigious Subroto trophy, one footballer was declared overaged for his attempt

to conceal age by shaving both his pubic and axillary hair. He protested to the authority that he had to do it on medical ground which the sports physician refused to accept since such condition needing shaving both pubic and axillary hairs are unknown.

Case No. 4: A football player after collision with an opponent fell on the ground. Suspecting neck injury the physician on duty checked the grip strength and was found alright. On the advice of the physician he was taken to the sideline outside the field and there he was found to be quadriplegic. The physician was blamed for not following the accepted guidelines of shifting the injured by using a stretcher.

Case No. 5: During a very competitive boxing bout, in the last round, a boxer with the better score had profuse nasal bleeding. The bout was stopped momentarily and the ring doctor was asked whether he should be allowed to continue or not. Ring doctor tried to control the bleeding for about 2 minutes but failed. He was declared unfit to continue the bout on medical ground and the opponent with lesser score was declared as the winner. The injured boxer protested against the bias decision of the ring doctor. Medical Commission and Indian Boxing Federation stood for the ring doctor after reviewing the video clips.

Case No. 6: In 1990, during the final selection, an internationally reputed hockey player was found physically unfit because of injury. However, he was selected as the captain of the Indian team with lots of pressure on the physician because his presence was of paramount importance for the team. After the dismal performance at the Beijing Asiad, another senior player complained against the selectors including the physician for declaring him fit. As a protest he resigned from participation in international competitions.

Case No. 7: Death of a footballer during the Santosh Trophy in Kerala was reported. Blame for the debacle was put on the organisers and the

physician on duty for their failure to provide life saving facility in the stadium. Following an investigation, the organisers were blamed by All India Football Federation.

Case No. 8: One Judo player was found unfit for participation in a competition because he had only one testis. In spite of the physician's exhaustive explanation to the coach and parents about the danger of contact sports in such cases, his father on the insistence of the coach told the physician, "Why are you bothering him? You forget about his testes. He should play."

Case No. 9 : In 1991, a national record holder long distance walker was tested positive for anabolic steroid during a National Athletic Meet. He told that his physician had prescribed this without his knowledge. The physician was asked to give explanation. The physician explained that he prescribed rational drugs which were not in the International Olympic committee's banned list of medicines and he did not prescribe anabolic steroids in particular for the athlete. The athlete was finally asked to show the medical prescription. He ultimately confessed that he injected anabolic steroids by himself without prescription. He was banned for two years for doping.

Case No. 10: Before starting the XXV Olympic at Barcelona, 4 countries strongly protested against Magic (Earvin) Johnson who was tested positive for HIV infection joining the United States basketball "dream team". Ultimately a referendum issued by the Russian and the Medical Commission (International Olympic Committee) subdued the matter.

Discussion

To ensure an equal chance of winning for everyone, a female should compete only among females. The female participant should be physically and genetically female. Sex test for females started during XIX Olympic at Mexico to avoid participation of males among females.⁵ It is

mandatory to certify sex especially females before sending for international competitions by an accredited physician. In absence of such certificate, the host country would perform sex verification test.⁶ In case no. 1, it was better to perform sex verification at the time of selection to avoid the huge expenditure involved in their training and movement. Sex determination from the absence or presence of Barr bodies in the cells of the buccal mucosa is the simplest and is least expensive. The Barr bodies can be detected in 40-50% of female cells, while in males they are present in less than 10%.¹ Only in doubtful cases chromosome studies is required to ascertain sex.

Issue of age determination does not arise on Olympic and Asian Games as there is no age group competitions. But this issue may arise in age group competitions as in cases no. 2 and 3. In such cases the physician should give his opinion regarding the age of the participant based on the findings of physical, dental and radiological examinations keeping in mind the racial and geographical variations.

Opinion and advice of the physician is very important. He needs quick decision making. Thus, the physician who provides health care services to the sports persons must be qualified and competent. He should always stand on his sound clinical knowledge without any external influence. Case no. 4 amounts to professional negligence on the part of the physician. He should not make any compromise in delivering standard health care services to the sports persons.

The legal liability of inaccurate/false certification are : i) when a certificate is admitted in the court of law as an evidence and proved to be false, the one who has issued it is liable for the same punishment as giving a false evidence i.e. ranging from 3 years imprisonment and fine to life imprisonment; ii) wilfully and recklessly issuing a certificate is a professional misconduct as per Indian Medical Council and punishable by striking

the name off the register, iii) alteration/additions in certificate with an intention to deceive attracts charge of forgery and is liable to 2 years imprisonment with fine, iv) liability for civil or criminal negligence charges in a suit filed by a person who suffered damages while acting upon such a certificate.⁷ In cases no. 5 and 6 the question was whether the player was physically fit or not. Physical fitness was cleared by the physician and not by the selector or persons who gave pressure on the physicians. At the time of issuing such certificates the physician should remember the rules of issuing medical certificate and also the liability of inaccurate/false certificate.⁷

Death during competitions like in case no. 7 may be due to pre-existing disease of the participant or because of the injury sustained during the competition. Therefore, a thorough pre-competition check-up is necessary to avoid loss of life of sports persons. In most instances no standards are available to guide the physicians to screen for any silent pre-existing condition/disease like silent myocardial infraction. Nonetheless, physicians should be aware of the existence of such conditions and should perform suitable tests in doubtful cases. Physicians should remember that evaluation of physical fitness in such situation is neither an emergency nor a therapeutic emergency and that he is not compelled to give on-the-spot opinion. At present none of the stadia in India has full-fledged life saving facilities. The presence of a doctor in the field is a matter of protocol only. Most of the time competitions are held without a doctor. In such a situation the organisers are to be blamed. The doctor should ensure that all essential items are available in the complex and the organisers are well informed of the required items and services. To minimise delayed medical interventions there is a need to improve availability, accessibility and affordability of the essential facilities or services and also a need to keep abreast with the advancement in management and

technology in sports medicine.

The issue of participation in body contact events like Judo by a player with a single testis as in case no. 8, had been a great problem before 1991. In those days doctors excluded any player with a single or mal-descended testis from contact sports reasoning that such testes may be easily injured. Players with mal-descended testes were allowed to play after the testes have been replaced to the scrotum. However some physicians allow players with single testes to enter contact sports on the assumption that injury to the testes is rare if the supportive or protective cups are worn. This difference in opinion was finally resolved when American Academy of Paediatrics in 1991 recommended that a young player with absent or mal-descended testes can join contact or collision sports with the use of protective cups.^{8,9} If a player with single testis is allowed to participate, the player, their parents, and the coach should be informed of the risk involved.

In case of doping as in case no. 9, physicians should have a thorough knowledge of the banned drugs which includes; stimulants, narcotics, anabolic steroids, beta-blockers and diuretics.¹⁰ He should also know and do everything to upkeep the three basic principles of the Medical Commission, International Olympic Committee; (a) defence of medical ethics (b) protection of health of athletes and (c) ensuring an equal chance of winning for everyone.¹⁰ Doping is against all these three principles and banning that long distance walker for two years was as per rules.¹⁰ It is the ethical commitment of the physician to protect the health of the athlete and ensure an equal chance of winning for everyone. A physician may knowingly or unknowingly prescribe a banned drug to an athlete. Unfortunately the general practitioners are not well informed of the banned drugs and its alternatives. Therefore, there is still chance of continuing such prescriptions. Taking this advantage athletes almost always blame physicians

for prescribing such banned drugs without their knowledge. Ever since human quest for "success at all cost" remains, doping would remain in one way or other. Coaches, athletes would continue experimenting newer performance enhancing drugs without the knowledge of the physician. It is going to be a serious health problem for the next century.

Regarding participation of HIV positive sports person as in case no. 11, the risk of transmission after cutaneous or mucous membrane exposure is 0-0.04% (or about 10 times lower than parenteral injury).¹¹ The transmission among sports persons can be treated as a theoretical possibility. To bring HIV infected persons to the mainstream should always be appreciated instead of isolating them

Conclusion

Sports medicine contains unique traps into which the unwary physician may stumble. Sports physicians should familiarise with legal principles applicable to sports medicine. Understanding of such principles should diminish fear about being sued and should motivate physicians to practice sports medicine according to acceptable medical standards. Good medicine is good law and one should not fear legal reprisal in the presence of proper medical performance.

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Comparative study of HDPE below knee prosthesis with Jaipur foot and Laminated below knee prosthesis with SACH foot - *Cost, efficacy and utility in rural setting*

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Abstract

There have been various claims about the ideal below-knee (BK) prosthesis for our rural amputees. However, to date we have not come across any comparative study. This study was undertaken in an attempt to compare the cost, efficacy and utility of High Density Polyethylene (HDPE) BK prosthesis with Jaipur foot and Laminated BK prosthesis with Solid Ankle Cushion Heel (SACH) foot. Twenty unilateral BK amputees belonging to the rural and urban slum areas in and around Delhi and using Laminated BK prosthesis with SACH foot for more than 6 months were studied as per inclusion/exclusion criteria. All the Laminated prostheses were replaced by High Density Polyethylene prostheses with Jaipur foot. A comparative difference in cost, efficacy and utility between the two prostheses was studied.

Majority of the amputees were male belonging to the age group of 26-35 years. Most of them were manual workers. Road Traffic accident (RTA) related amputation were the commonest cause. Laminated prosthesis with SACH foot was found almost 4 times costlier than HDPE prosthesis with Jaipur foot. Looseness and breakage was found more frequently with the HDPE prosthesis. No significant differences between the two prostheses were observed in negotiating architectural barriers or in the ease to carry out activities of daily living (ADL). However HDPE prosthesis was also found favourable in religious activity and in activities related to water. Therefore HDPE prosthesis was found superior in terms of lower cost, lighter weight and with better efficacy and utility in rural setting as compared to the Laminated prosthesis.

Key words : Activities of daily living (ADL), Below knee (BK) amputee, High Density Polyethylene (HDPE), Jaipur foot, Laminated prosthesis, Solid Ankle Cushion Heel (SACH) foot.

Introduction

Artificial limbs manufactured in different Limb fitting Centres in India are based on Western design and technology. These limbs are not found favourable by the rural amputees because they do not take into consideration the various geographical, socio-economic and cultural

variations, existing in this Country. An appropriate lower limb prosthesis in India should be: a) low cost, b) locally available, c) capable of manual fabrication, d) adapt to local climate and working conditions, e) durable, f) simple to repair, g) as light as possible and h) psychologically as well as cosmetically acceptable.¹ Various authors had claimed Jaipur foot and HDPE prosthesis with Jaipur foot fulfills the above cited criteria.^{2,3}

This study was conducted to compare the cost, efficacy and utility of HDPE BK prosthesis

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fitted with Jaipur foot and laminated BK prosthesis fitted with SACH foot in the rural set-up.

Material and methods

Twenty amputees using laminated BK prosthesis with SACH foot for more than 6 months were studied.

Inclusion criteria;

- a. Unilateral, uncomplicated below knee amputees.
- b. Age between 14-55 years.
- c. Belonging to rural or urban slum areas.

Exclusion criteria;

- a. Amputees with multiple associated problems.
- b. Unmotivated patients.

All the laminated BK prostheses were replaced by HDPE BK prostheses with Jaipur foot. Patients were followed up in terms of cost, efficacy and utility of the HDPE prosthesis as compared with the laminated prosthesis at the end of 6 weeks and every 3 months thereafter for the duration of the study (2 years). Analysis was done using both descriptive and inferential statistics.

Observation and Results

Out of the 20 amputees studied, 16 were male. Majority of the patients (n=9) belonged to the age group of 26-35 years and were mostly laborers and farmers (n=10). The commonest cause of amputation was train and road traffic accident (n=11), followed by peripheral vascular disease (n=4). Mean length of the stump was 16.15 cm. Three patients had adherent scar and another two had painful stumps due to neuroma.

The overall cost of the laminated prosthesis inclusive of the cost of raw material, fabrication and patient's expenditure to procure the prosthesis was Rs. 4682 approximately whereas the cost of HDPE prosthesis was Rs. 1030. Breakage of

prosthesis and looseness of the socket was common in HDPE prosthesis. Therefore, prosthesis related pain was more common with HDPE prosthesis. However the need of repairing for both the prostheses was statistically insignificant. Difference in weight between this two prostheses was significant [$p < .001$]. Mean weight of the laminated prosthesis was 3 ± 0.4 kg. and 1.2 ± 0.6 kg., for the HDPE prosthesis. Stability while performing ADL was comparable for both the prostheses. HDPE prosthesis was cosmetically more acceptable (n=12) than laminated prosthesis (n=7) though the finding was not statistically significant.

Architectural barriers such as threshold, steps/staircase, uneven roads and terrain, high basement of house were found disturbing day to day activities in 5 patients using laminated prosthesis and in 3 cases using HDPE prosthesis. Prosthesis related problems like heaviness, cumbersome, ill fitting, pain, skin reaction, excessive sweating, loosening etc., was noted in both the prostheses in variable degree. However, differences were insignificant. The differences between the two prostheses while performing important activities such as sitting, walking, dressing, cycling, toilet and recreational activities were found statistically insignificant. In activities involving water, HDPE prosthesis with Jaipur foot was found favourable and in religious activities the laminated prosthesis with footwear (leather shoes) was found restrictive.

Discussion

In the present study, male/female ratio was 4:1. This is comparable to other similar studies.⁶⁻⁹ Males are mostly involved in outdoor activities and therefore, more prone to injuries and accidents. Commonest age group for amputation ranges from 21 to 40 years.^{2,5,6} Maximum patients in this study were also in the age group of 26 to 35 years. As persons in this age group are more active with

increased family and social responsibilities and hence, more exposed to injury.

Train and road traffic accident caused the maximum amputation (57-74%) followed by peripheral vascular disease (PVD) (14-24%).^{5,6} Straats¹⁰ had reported 14,000 amputations every year in India due to train accidents. The present study also showed 55% and 20% of amputation due to RTA and PVD respectively. This may be explained by the non-existence and non-observance of proper traffic rules and regulation by the general population, coupled with reckless driving, overloaded buses, trucks and trains, assorted animal drawn carts, rickshaws, extremely crowded and inadequately maintained roads. Prevalence of PVD may be due to tobacco chewing and smoking habits in the rural areas.

Laminated below knee prosthesis was found more costly (Rs. 4682) than the HDPE below knee prosthesis (Rs. 1030.50). The actual cost of the prosthesis was worked out as follows;

- a) Actual cost of the raw materials.
- b) Cost of fabrication
- c) Patients expenditure to procure the prosthesis.

The rural amputees are poor and when considering the cost of the prosthesis, which may represent a year's earning, may decide against owning a prosthesis to feed their family or to buy a cow.¹⁰ Sometimes the cost of transportation and accommodation may be as great or greater than the prosthesis cost.¹¹

The reasons for the lower cost of Jaipur HDPE prosthesis are a) the use of locally available materials, b) the wage bill for the locally trained limb makers are much lesser than that would be required by a qualified prosthetist.⁶ This study also highlighted a few additional reasons such as; a) the time taken for fabrication was much less, b) prosthetic fitting and training took less time since

most of the amputees were already trained with the laminated prosthesis.

In the present study 40% of the patients with HDPE needed some form of repair mostly for breakage and looseness of socket within 6 months of their use against 25% in case of laminated prosthesis. Sharma⁵ reported that 84% of the patients needed new prosthesis due to breakage or loosened prosthesis and another 12% for change of foot-piece and straps. Goenka⁶ reported that in 66% of HDPE prosthesis, the shank was broken-30% at the medial and 24% at the lateral hamstring release sites and remaining 12% at various sites. In this study, the incidence was lower (45%). The lower incidence maybe due to the modification done on these weaker areas, where an additional strip of HDPE have been used to reinforce the brim.

The use of plastic or other materials, which will neither rust nor rot is important in the community, where the amputee walks through mud and wading through water is a daily occurrence.¹² Limitation of laminated prosthesis due to rain, muddy road or field was noted in this study [$p < 0.001$], because of the shoe. Jaipur HDPE prosthesis is claimed to be waterproof and many amputees work in their fields, wading through water and mud.^{3,4} In the present study it was observed that HDPE prosthetic shank needed metal screw to join the prosthetic foot, breakage occurred mostly though the hole drilled to fix the screw.

Weight of the HDPE prosthesis (1.2 ± 0.6 kg.) was found significantly lighter than laminated prosthesis (3.0 ± 0.4 kg) [$p < 0.001$]. Weight of the HDPE prosthesis was mostly due to the Jaipur foot. Whereas, weight of the laminated prosthesis comes from the shin block and the materials (polyester resin, catalyst, accelerator, etc.) used for laminating the socket and shin block. Footwears were included in the overall weight of the laminated prosthesis, as it is an integral parts of the prosthesis. Weight of the prosthesis is an important consideration while selecting an ideal prosthesis because energy consumption is directly proportional to the

prosthetic weight and in terms of minimum gait disturbance.

65% of the patients felt that the laminated prosthesis was cosmetically inferior to HDPE prosthesis (45%). Inability or difficulties in wearing shoes over the Jaipur foot is another problem. This point is relevant because due to the change of time, some of our rural amputees need to wear shoes occasionally depending on their vocation, occupation and social roles. Heaviness was complained by 30% in laminated prosthesis against 10% in HDPE prosthesis. The weight of the laminated prosthesis was heavier than the HDPE prosthesis [$p < 0.001$] which depend upon the weight of the Jaipur foot piece of variable sizes. Jaipur foot is heavier than most other prosthetic feet.¹³ However the overall weight of the HDPE prosthesis is light and as such walking is possible at a faster speed and for a longer distance.^{5,6}

Excessive sweating from the stumps of HDPE users while walking long distances especially in summer occurred in 20% of cases.⁶ Sharma⁵ in his study did not come across perspiration even during the summer season. In the present study excessive sweating was observed in 10% of patients.

Therefore while comparing the comfort of the two prostheses, no statistically significant difference was observed except for the seasonal problem [$p < 0.01$].

Meanley¹² had stated that many centres are seeking to ensure that the limbs they produce are appropriate to the culture in which they are situated. In many tropical countries, barefoot walking or the use of open toe sandals is common and footwear is removed when entering a home, place of work or religious sites. Religious activities were not possible with the laminated prosthesis because of the shoe. Some patients have stated that they would rather prefer to remove the laminated prosthesis while entering a temple or while eating food on the ground because even if they could

remove the shoe from the prosthetic foot with difficulties, they do not feel comfortable walking barefoot and of course, donning on the shoe afterward is also another problem. The HDPE prosthesis does not have such problems and is ideal for the amputees in the rural areas, who have to adjust to their cultural need and habit.

Conclusion

HDPE prosthesis when compared with the laminated prosthesis was found lighter, cheaper, not affected by seasonal problems and religious restriction. However, in the other important factors like cosmesis, stability, comforts, ease in performing ADL and other activities, there were no statistically significant differences between the two types of prostheses.

Therefore, HDPE BK prosthesis with Jaipur foot was found superior in terms of low cost, lower weight, with a comparable better efficacy and utility in rural setting, as compared to the laminated prosthesis with SACH foot.

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Is it a "Disuse Pain syndrome" - A cause for Undiagnosed Knee Pain?

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Abstract

In a study ten patients of both the sexes in different age groups were selected to assess the isokinetic torques of muscles in undiagnosed knee pain and outcome after correction of the torque deficiencies. Patient selection was for a specific knee pain, mild to moderate felt during getting up from squatting and low seat or walking, without any orthopaedic or neurological disorders. All the patients were found to have reduced down their physical activities remarkably before developing pain. Isokinetic torques were measured in an isokinetic dynamometer which showed significantly low torque values on the affected side in comparison to the asymptomatic side or control. Torque deficiencies were taken care of with exercises - making the patients completely symptom free in five to six weeks time. Looking at the fact that knee has an exceptionally high number of muscles attached to the capsule and muscles play a very important role in stabilising this joint, a conclusion can be drawn. It can be said that the change in the state of physical activities involving the lower limbs of an otherwise healthy person to a lower state or prolong sedentary habit may produce loss and imbalance of knee muscle strength. That is expressed in knee pain to be treated with restoration of the loss.

Key words : isokinetic torque, concentric, eccentric, dynamometer, physical habit change.

Introduction

In the knee joint two bones are required to be in better congruity taking the two menisci in between; so is the static and dynamic stability of the joint calling in for enhanced role of the capsule, ligaments and muscles of the joint. This raises a corollary where imbalances of muscle torque production in between agonists and antagonists in concentric or eccentric modes are to be considered in etiopathogenesis of knee pain with more emphasis.

In this study, isokinetic peak torques of quadriceps and hamstrings were estimated in the patients where a known cause for knee pain could not be established. Results were also observed after correcting the deficiencies.

Materials and Methods

Initially cases were detected in the out patients Department of Physical Medicine and

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Rehabilitation, AIIMS, New Delhi with knee pain diagnosed as osteoarthritis (O.A.) of knees by different practitioner out side the department. But those cases could not be taken as O.A. as their clinical features did not confirm with the diagnostic criteria of American Rheumatism Association for O.A. knees.

American Rheumatism Association criteria for O.A. (1987).

Clinical criteria	Clinical and radiological criteria
Knee pain and at least 3 out of 6 criteria as below	Knee pain osteophytes and 1 out of 3 criteria s below
1. age>50 years	1. age>50 years
2. stiffness<30 minutes	2. stiffness
3. crepitus	3. crepitus
4. bony tenderness	
5. bony enlargement	
6. no palpable warmth	

Later cases were found with knee pain who were taking NSAID on regular basis with partial

or temporary relief. None of them had any established diagnosis for knee pain before they attended the out patient department for relief. They were selected for the present study according to the inclusion criteria and exclusion criteria as mentioned below. So far in last 14 months 10 cases were detected in the O.P.D. The cases were examined clinically, radiologically and in isokinetic dynamometer at two speeds - 60°/sec and 120°/sec.

Inclusion criteria

1. Localised knee pain of any duration.
2. Any age group and sex of the patient.
3. Apparently healthy person otherwise.

Exclusion criteria

1. Bony lesion at the affected joint e.g. osteoarthritis, rheumatoid arthritis.
2. Neurological disorder affecting the limb e.g. neuropathy, polio, etc.
3. Recent trauma (in the preceding 4 weeks) to the painful joint.
4. Knee pain diagnosed due to any of the following causes

Anterior knee pain

Osteoarthritis, Chondromalacia patellae
Prepatellar pretendinous bursitis
Quadriceps tendon tendinitis - jumper's knee
Osgood-Schlatter's disease
Hoffa's body inflammation
Plica syndrome
Tight lateral retinaculum
Unstable patella

Medial knee pain

Anserine bursitis
Medial meniscus tear
Medial collateral ligament bursitis
Semimembranosus bursitis

Lateral knee pain

Iliotibial tract syndrome
Bicipital tendon bursitis

Lateral meniscus tear, bursitis
Popliteal tendon bursitis

Therapeutic interventions

All the patients were managed with tablet Ibuprofen (400 mg) three tablets a day for initial 5 days to avoid the muscle soreness¹ at the initiation of exercise therapy and an exercise schedule as follows -

Isokinetic concentric exercise for both quadriceps and hamstrings at the speed of 120°/sec, 150 repetitions in one sitting and three sitting in a week for all the patients along with plyometrics (jumping in different heights) except three cases as they were more than 50 years of age, till the patients turned pain free. Only eccentric exercises were given where it was found to be deficient in comparison to concentric one.

All the patients were completely symptom free and the tenderness also disappeared in 4 to 6 weeks time except case no 6 who discontinued after 4 weeks time when his pain was reduced by about 70% and dynamometry also showed improvement. The dynamometric estimation was done after the patient turned symptom free and discharged from exercise schedule to continue at home with exercise walking only 4-5 km at a stretch in a day within 30-40 minutes time.

Observations

1. All the patients reduced down their physical activities involving lower limbs (walking, running etc.) in 6 months to 4 years time before they developed pain symptom in the knees, one patient (case 2) never walked more than quarter of a kilometer per day in last thirty years of her life.
2. In case of unilateral knee pain the affected knee muscles were unable to produce more than 20% torques in relation to the opposite side both at concentric and eccentric modes (cases 1,2,3,4,5).

3. In case of bilateral knee pain affected quadriceps generated 20% less torque in comparison to control of same sex, age group, body weight and habit pattern but having no history of habit change regarding walking, running etc. (cases 8,10).
4. All the patients were advised to take Tab. Ibuprofen if required for pain after initial 5 days, but no body required any after the initial days.
5. There was isolated loss of isokinetic eccentric strength of quadriceps in a couple of patients presented with knee pain during walking only, unlike the previous group. But they had similar tenderness at the medial joint line and below. (cases 9, 10).
6. In 5-6 weeks of exercise regime deficiencies

of isokinetic torque production was made up and a symmetry was established between two sides in unilateral affection. In bilateral affection torque production in both the sides became as good as normal being, seen in control. (unilateral cases - cases 1-7 and 9, Table - 2 and Table-4; bilateral cases - cases 8 and 10 Table-2, Table-3 and Table-4).

7. In a group of two patients who were regularly on sports activities before stopping them due to one disease or injury, developed pain after total confinement to bed for a period and starting normal activities (cases.7,8)
8. Maintenance was with brisk and uninterrupted walking daily as an exercise for five kilometers in thirty to forty minutes time period.

TABLE - 1
Clinical features of the Patients

Case	Age (Years)	Sex	Symptom	Duration	Habit Change	Tenderness/ Grade	Site
1	22	M	A(L)	4m	+(4Y)	0	0
2	52	F	A,B(L)	6m	-	+1 ⁰	MTC(L)
3	31	M	A(L)	6m	+(1.5Y)	+1 ⁰	MJL(L)
4	39	F	A,B(L)	15D	+(2Y)	+1 ⁰	MTC(L)
5	55	F	A,B,C(R)	3m	+(6m)	+1 ⁰	MTC(R) MJL (R)
6	56	M	A,B(L)	3m	+(2Y)	+1 ⁰	MJL(L) MTC(L)
7	13	F	A,B,C(R)	4m	+(5m)	+2 ⁰	LJL(R)
8	16	M	A,B,C(R,L)	6m	+(8m)	+1 ⁰	MJL(R,L)
9	34	M	B(R)	1Y	+(1Y)	+1 ⁰	MJL(R)
10	35	M	B,C(R,L)	1.5m	+(1.5Y)	+1 ⁰	MJL(R)

Abbreviations used in Table - 1

- A: symptom of pain during getting-up from squatting and climbing stairs.
 B: symptom of pain in the knee/knees during walking.
 C: symptom of pain in the knee/knees at rest.
 M: male. F: female.
 L: left. R: right.
 MTC: medial tibial condyle. MJL: medial joint line.
 LJL: lateral joint line. PUP: patellar upper pole.
 m: month. Y: year. D: day.

TABLE - 2
Features of dynamometry before therapy

Case	Mode	Speed	Muscle Torque (ft-lb) Hamstrings/Quadriceps (H/Q)		% Difference Between Two Sides	Eccentric-Concentric Ratio (E/C)			
						60°/sec		120°/sec	
			R	L		R	L	R	L
1	CON	60°/sec	47/112	44/75	33% L D	0.4	0.6	0.8	1.2
		120°/sec	31/70	27/52	25% L D				
	ECC	60°/sec	42/49	42/42	14% L D				
		120°/sec	44/62	38/63	1.6% L U				
2	CON	60°/sec	30/48	29/22	54% L D	0.6	1.0	1.1	2.8
		120°/sec	21/36	10/9	75% L D				
	ECC	60°/sec	27/29	36/22	24% L D				
		120°/sec	23/40	43/25	37% L D				
3	CON	60°/sec	48/73	35/54	26% L D	0.9	1.2	1.5	2.0
		120°/sec	35/54	30/41	24% L D				
	ECC	60°/sec	54/71	65/67	6% L D				
		120°/sec	50/83	78/82	1% L D				
4	CON	60°/sec	36/57	28/28	50% L D	0.9	0.6	0.3	0.7
		120°/sec	32/51	35/32	37% L D				
	ECC	60°/sec	32/55	20/19	65% L D				
		120°/sec	39/16	38/25	36% L U				
5	CON	60°/sec	8/9	18/23	60% R D	1.1	1.3	2.6	1.0
		120°/sec	7/7	11/14	50% R D				
	ECC	60°/sec	13/10	20/30	66% R D				
		120°/sec	26/18	19/15	16% R U				

TABLE - 2 (Continuation)

Case	Mode	Speed	Muscle Torque (ft-lb) Hamstrings/Quadriceps (H/Q)		% Difference Between Two Sides	Eccentric-Concentric Ratio (E/C)			
						60°/sec		120°/sec	
			R	L		R	L	R	L
6	CON	60°/sec	28/41	20/38	7% L D	1.19	0.9	2.33	2.4
		120°/sec	12/24	11/21	12% L D				
	ECC	60°/sec	38/49	33/36	26% L D				
		120°/sec	44/56	37/51	9% L D				
7	CON	60°/sec	49/50	44/68	26% R D	0.7	0.6	0.8	0.4
		120°/sec	40/50	35/72	30% R D				
	ECC	60°/sec	32/36	30/41	12% R D				
		120°/sec	51/40	30/30	25% R U				
8	CON	60°/sec	47/75	52/100	25% R D	0.4	0.5	0.2	1.8
		120°/sec	40/69	17/46	33% L D				
	ECC	60°/sec	38/33	31/55	40% R D				
		120°/sec	31/20	65/83	75% R D				
9	CON	60°/sec	75/127	92/159	20% R D	0.4	0.4	0.4	1.0
		120°/sec	57/96	59/112	14% R D				
	ECC	60°/sec	66/45	77/58	22% R D				
		120°/sec	75/43	104/112	61% R D				
10	CON	60°/sec	58/92	43/63	31% L D	0.5	0.6	0.3	0.9
		120°/sec	51/72	37/50	30% L D				
	ECC	60°/sec	47/50	43/38	24% L D				
		120°/sec	59/26	23/49	46% L U				

Abbreviations used in Table-2

RU: right sided torque value up

LU: left sided torque value down

RD: right sided torque valude down

LD: left sided torque value down

TABLE - 3
Showing the torque values of the control subjects for bilateral knee pain

Case	Age (Years) /sex	Mode	Speed	Torque Hamstrings/quadriceps	
				R	L
C8	16/M	CON	60°/sec	58/82	50/72
			120°/sec	60/75	64/79
		ECC	60°/sec	52/88	61/86
			120°/sec	55/62	68/77
C10	35/M	CON	60°/sec	67/112	76/113
			120°/sec	61/95	63/101
		ECC	60°/sec	66/91	79/87
			120°/sec	71/95	83/102

TABLE - 4
Dynamometric findings after the therapy

Case	Mode	Speed	Isokinetic torque (ft-lb) Hamstring/quadriceps (H/Q)		% torque raised from before in quadriceps		% of torque difference between two sides	Eccentric/concentric ratio (E/C)			
			R	L	R	L		60°/sec		120°/sec	
			R	L	R	L	R	L	R	L	
1	CON	60°/sec	74/112	78/112	0%	33%	0%	1.0	0.9	1.1	1.2
		120°/sec	56/74	55/89	6%	71%	16% LU				
	ECC	60°/sec	72/113	91/109	76%	159%	3% LU				
		120°/sec	76/85	89/112	37%	76%	23% LU				
2	CON	60°/sec	32/51	26/31	6%	40%	39% RU	0.8	1.4	1.5	0.7
		120°/sec	24/40	25/47	11%	422%	14% LU				
	ECC	60°/sec	32/41	34/44	41%	50%	6% LU				
		120°/sec	52/60	32/33	50%	32%	45% RU				
3	CON	60°/sec	76/108	64/93	47%	72%	13% RU	1.0	1.0	0.8	1.5
		120°/sec	73/110	69/90	103%	119%	18% RU				
	ECC	60°/sec	65/110	66/108	54%	61%	2% RU				
		120°/sec	70/92	71/142	10%	73%	56% RD				

TABLE - 4 (Continuation)

Case	Mode	Speed	Isokinetic torque (ft-lb) Hamstring/quadriceps		% torque raised from before in quadriceps		% of torque difference between two sides	Eccentric/concentric ratio (E/C)			
			ps (H/Q)		R	L		60°/sec		120°/sec	
			R	L	R	L	R	L	R	L	
4	CON	60°/sec	39/63	32/55	10%	96%	14% RU	1.03	1.03	1.03	1.02
		120°/sec	35/52	39/48	2%	50%	8% RU				
	ECC	60°/sec	52/65	40/57	18%	200%	14% RU				
		120°/sec	49/54	50/49	237%	96%	10% RU				
5	CON	60°/sec	24/39	26/44	333%	91%	11% LU	1.05	0.09	1.0	1.06
		120°/sec	32/30	30/30	328%	114%	0%				
	ECC	60°/sec	18/41	22/48	310%	60%	17% LU				
		120°/sec	33/30	29/32	66%	113%	6%				
6	CON	60°/sec	44/68	34/64	65%	68%	8% RU	1.02	1.12	0.9	1.2
		120°/sec	53/60	43/55	150%	161%	8% RU				
	ECC	60°/sec	42/70	40/72	42%	100%	3% LU				
		120°/sec	57/58	56/66	4%	29%	12%				
7	CON	60°/sec	56/88	52/79	76%	16%	10% RU	0.9	0.9	1.02	0.9
		120°/sec	63/72	55/74	44%	3%	3% LU				
	ECC	60°/sec	75/80	68/76	122%	85%	5% RU				
		120°/sec	64/74	68/66	85%	120%	11% RU				
8	CON	60°/sec	62/92	58/109	23%	9%	18% LU	0.9	0.8	0.9	0.9
		120°/sec	64/86	55/96	25%	108%	12% LU				
	ECC	60°/sec	74/85	78/92	157%	67%	8% LU				
		120°/sec	68/79	81/90	295%	8%	14% LU				
9	CON	60°/sec	84/141	93/160	11%	1%	12% LU	0.9	0.8	0.9	1.0
		120°/sec	78/106	82/114	10%	2%	7% LU				
	ECC	60°/sec	78/138	89/132	206%	127%	4% RU				
		120°/sec	91/98	105/118	127%	5%	17% LU				
10	CON	60°/sec	76/108	64/93	11%	1%	12% LU	0.9	0.8	0.9	1.0
		120°/sec	73/110	69/90	10%	2	7% LU				
	ECC	60°/sec	65/110	66/108	206%	127%	4% RU				
		120°/sec	70/72	71/142	127%	5%	17% LU				

Discussion

This has been well known that weak quadriceps may produce pain in the knee joint by producing repeated synovitis - as described by Lewin in 1952.²

In cases of anterior knee pain where no well defined orthopedic lesion could be identified eccentric component was found to be 85% less than the concentric torque by Bennett and Stauber in 1986.³ In their study the rehabilitation programme was eccentric training till the pain was relieved. It has been theorised that eccentric loss has been due to neurophysiological deficiency - removal of which alleviates pain. Success rate of 93% with full reversal of deficiencies have been claimed by the authors.³

But this 85% reduced eccentric torque in relation to concentric one bearing responsibility for knee pain, has been questioned by Trudelle and Jackson in 1989 as they found 35-54% of normal population showed such deficiency.⁴ Conway et al found eccentric and concentric ratio to be more than 0.95 in all the 30 cases of their study on patello-femoral pain.⁵

A pain-free healthy knee joint has an average isokinetic strength of the muscles. The isokinetic strength represented by the isokinetic torque is to be in proper proportion in between antagonising muscles/muscle groups.⁶ The balance is disrupted due to lesser use of knee joint in daily activities for month to years back. This is analogous to deconditioning as by disuse or lesser use, quadriceps and hamstrings become less strong and efficient to produce torque to maintain knee in proper functional stability. In other way it is to be suggested that imbalance and deficiencies of the opposing muscles are to be inculcated for the pain in the present study. As the eccentric action of the quadriceps plays a vital role in shock absorption during heel strike phase of gait cycle isolated eccentric loss of muscle strength can produce pain during walking only. When there are both eccentric and concentric loss of muscle strength for obvious

reason pain appears during getting up from squatting, low seat and also during walking. One eccentric - concentric ratio as E/C has been used in this study which becomes abnormally low in case of eccentric loss. Usually it varies from 1.3-1.7 upper limit being considered 2.0 in case of a normal knee in the velocities used here.⁷

With the limitation of the study comprising a very small number of patients, lack of long follow up and adequate control we can still well conclude that change of physical habit in using the lower limb or sedentary habit for long period of life may derange the isokinetic strength of knee muscles producing pain in the knee. This may occur either unilaterally or bilaterally for the reason unknown; restoration of these deficiencies makes the joint pain-free.

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Long Term Morbidity in Persons with Neuropathic Bowel

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Abstract :

Life expectancy and survival following Spinal Cord Injury (SCI) has improved over the past few decades due to better management of life threatening complications and efficient rehabilitation. Concomitant problems like bladder and bowel incontinence are now being addressed to improve the quality of life of the spinal cord injured persons. Despite similarities between pathways of innervation of the bladder and the distal bowel, functional disturbances of the latter have received less attention.¹

In this study we evaluated the bowel evacuation practices of a group of SCI patients who had been rehabilitated from our centre to assess the effectiveness of our bowel training programme and the long term bowel problems faced by our patients .

Materials and Methods

Patients with SCI lesions who were rehabilitated from our department and who had come for their annual medical follow up were examined to evaluate their long term morbidity due to bowel dysfunction. Patients were interviewed by the medical team regarding the frequency, method of bowel evacuation and problems relating to their bowel function. Fifty three SCI patients were evaluated in the study. There were 49 males and 4 females and their age ranged from 20 - 60 years. Twenty seven patients had been disabled for more than 5 years and 26 patients for the period of less than five years. There were 5 cervical, 27 thoracic, 20 lumbar and 1 sacral cord injuries. Patients were described to be doing "digital stimulation" (DS) if they were able to trigger defaecation by inserting their finger and performing circular movements in the anal canal to stimulate contraction of the rectum and evacuation of the bowel whereas

"Digital evacuation" (DE) implied manual removal of the faeces with a finger. If a patient was following neither of the above techniques and was able to empty his bowel by straining alone this was denoted as "straining". In addition to ascertaining their bowel history, their general health status was reviewed by clinical examination. This was followed by a rectal and sigmoid colon examination by the second author.

Patients were considered to have flaccid bowel (lower motor neuron lesion) or spastic bowel (upper motor neuron lesion) depending on the absence or presence of the anal wink and bulbocavernosus reflexes.² Patients were considered socially continent if they had not more than one bowel accident per month. Bowels were considered to be constipated if they had less than three bowel actions per week (Connel et al³). Those who had hard stools but had bowel movements every day were classified separately. No patients were on medications for bowel mobility or on suppositories or enemas.

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Results

Of the 53 patients, 21 had flaccid and 32 patients had spastic bowel. The method of bowel evacuation followed by the patients was as follows - 20 (40%) of the patients were doing DS, 16 (30%) were doing DE and 17 (30%) were straining to pass stools. Among the 53 patients evaluated, 25 had no complaints regarding their bowel function, while 28 patients had complaints which included constipation, bleeding per rectum, hard stools, and diarrhoea. The relationship between the type of bowel, the method of bowel evacuation and the symptoms is given in Table 1.

The frequency of bowel evacuation was once a day in 37 patients (70%), on alternate days in 10 patients (20%), once in 3-4 days in 2 patients (4%) and twice daily in 4 patients (8%). Fourteen patients reported the consistency of the stool as hard whereas only 6 patients complained of constipation.

Anal tags were observed in 20 cases and haemorrhoids in 37 cases. Among the patients with anal tags, 15 had spastic bowel and 5 had flaccid bowel. Of the 37 patients with haemorrhoids, 17 of them had flaccid and 20 had spastic bowel. The relationship of these pathologies to the method of bowel evacuation is given in Table 2.

TABLE 1.

Distribution of Evacuation Technique, Bowel Type & Lower Gastrointestinal Symptoms

Symptoms	DS		DE		Straining	
	UMN n=17	LMN n=3	UMN n=6	LMN n=10	UMN n=9	LMN n=8
Bleeding	7	3	5	3	5	5
Hard Stools	2	2	2	3	2	3
Constipation	-	-	-	-	4	2
Diarrhoea	1	-	-	3	-	-

DS: digital stimulation, DE: digital evacuation, UMN: upper motor neuron, LMN: lower motor neuron.

TABLE 2.

Distribution of Evacuation Technique Vs Lower Gastrointestinal signs.

Signs	DS		DE		Straining	
	UMN n=17	LMN n=3	UMN n=6	LMN n=10	UMN n=9	LMN n=8
Haemorrhoids	10	3	3	10	7	4
Anal tags	8	1	3	3	4	1

DS: digital stimulation, DE: digital evacuation, UMN: upper motor neuron, LMN: lower motor neuron.

Among the 25 patients who did not have any complaints regarding their bowel functioning, examination revealed 18 cases of haemorrhoids, 11 anal tags, 1 mucosal tear, 1 prolapse and 2 fissures (some cases had more than one finding). Only three of the patients who had no complaints had normal sigmoidoscopy findings.

26 patients reported bowel accidents. 3 patients (6%) had bowel accidents once a week, 9 patients (17%) once a month, 9 patients (17%) once in every 2 months and 5 patients (9%) once in 3-6 months.

Discussion

Management of neuropathic bowel following spinal cord injury continues to be a challenging problem. While restoring normal bowel evacuation and volitional control over bowel movements is not possible, social continence can be achieved so that persons can be restored to a useful role in their families and in society.

SCI affects the physiology of the GI tract. Problems include delayed gastric emptying, altered gastric acid secretion caused by autonomic dysfunction, abnormal colonic myoelectric activity¹ and delayed oro-anal transit time². The absence of post prandial colonic myoelectrical and motor activity in the colon is thought to be due to lack of parasympathetic neural continuity to the descending colon and rectum via the 2nd, 3rd and 4th anterior sacral roots. Hence the colonic and rectal stasis has been shown to be the main causes of delay in the gastrointestinal transit time in SCI. The frequency of defaecation is reduced in spinal cord injury patients and the commonest bowel problem is considered to be intractable constipation.²

Neuropathic bowel caused by spinal cord injury has been reported to frequently require a bowel programme with stimulant suppositories for effective defaecation.⁵ The bowel training programme at this centre involves the use of

stimulant suppositories and digital evacuation in the initial stages of rehabilitation. Once a regular bowel pattern has been established, the patient is gradually weaned off suppositories. Thereafter, bowel movement are triggered by digital stimulation at a specified time in those with spastic bowel and by digital evacuation in those with flaccid bowel. Patients are advised a high fibre diet and some of them needed bulking agents in the initial stages of bowel training. However, at discharge every attempt is made to minimize medication as most of the patients cannot afford to buy them on a long term basis.

The methods of bowel evacuation taught to patients while they are undergoing rehabilitation are either DS or DE. Those with spastic bowel use digital stimulation to initiate reflex peristalsis and those with flaccid bowel are taught to do a manual digital evacuation. Some patients are able to clear their bowel by straining though this method is not routinely recommended for bowel training.

As expected, this study has shown that the technique of bowel evacuation most favoured by patients with spastic bowel is DS (53%). 28% pass stools by straining and the rest 19% do DE. 48% of patients with flaccid bowel do DE, 38% pass by straining and 14% by DS.

Most patients (69.8%) had daily bowel evacuation. This is in contrast to the frequency quoted in literature - Han et al⁴ quotes a frequency of 2.85 +/- 1.96 days and Gulati et al⁶ found that only 33% of their patients had daily bowel evacuation. 67% of their patients used medication and 79% of them used a suppository. However, none of the patients in this study were on oral laxatives, rectal stimulant suppositories or enemas.

Social bowel continence has been defined by King et al⁷ as one or fewer accidents (ie defaecations not on the toilet at the desired time) per month. According to this definition 77% of our patients had social continence. 22.6% were incontinent and had bowel accidents occurring at least once a month.

A high incidence of haemorrhoids (74%) in chronic spinal cord injury has been reported earlier.⁸ In this study the incidence of haemorrhoids is high (70%), but only 53% of the patients complained of bleeding per rectum. Haemorrhoids were found to be more prevalent in patients with flaccid bowel doing DE (81%). Since haemorrhoids develop as a result of frequent high pressures in the anorectal marginal veins⁹ it was surprising that despite the raised intra abdominal pressure in patients who were straining to empty their bowel, the prevalence of haemorrhoids among them was relatively less.

Anal tags, a marker of chronic fissuring was also observed to be widely prevalent (38%). Anal tags were found more commonly in patients with spastic bowel doing DS (45%). Patients who were straining for bowel evacuation had a low prevalence of anal tags and also had high continence (82%) rate in our study. These findings suggest that straining, whenever possible, as a method of bowel evacuation, may result in decreased long term morbidity compared to other methods.

As reported by Han et al¹, we found that there was no significantly increased prevalence of bowel problems or anorectal abnormalities in relation to the duration of spinal cord injury. Among those who had been injured for less than 5 years, 69% showed abnormalities and of those who had been injured for more than 5 years, 77% cases showed abnormalities. However Stone et al⁶ had reported that chronic GI problems were rare in the first five years after injury suggesting that chronic gastrointestinal problems were acquired later and therefore may be avoided. It needs to be mentioned that this was a survey or study conducted on persons who came for the followup and therefore does not represent all the persons rehabilitated into the community.

Although about half the patients (28) had no complaints regarding their bowel function, only three patients had normal findings. 75% of the 28 persons without symptoms had haemorrhoids and 45% had anal tags. These complications would have gone unnoticed if one were to rely on the patient's history alone and therefore examination of the lower gastrointestinal tract is mandatory during review of persons with spinal cord injury.

Conclusion

We conclude that anorectal pathology is common in patients with neuropathic bowel and many of them may remain asymptomatic. Regular local examination is essential to detect these complications early, more so as many of them may not have any complaints regarding their bowel function. It is also reassuring to record that it is possible to train most of the patients with neuropathic bowel to be continent and have regular bowel evacuation without the use of medications. This is of particular significance in the developing country where most patients would find life time medications unaffordable. In spite of these patients being not on any medications for the bowel the distal bowel complications rates were similar to those quoted in literature.

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Challenges in the Conservative Management of Intervertebral Disc Prolapse

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Abstract

Seven cases attending the Department of Physical Medicine and Rehabilitation, having Intervertebral Disc Prolapse are presented in this paper. Five cases had the Intervertebral Disc Prolapse in the lumbosacral region and two in the cervical region. The cases belonged to different age groups. All the cases had varying degree of neurological deficit, both motor and sensory. MRI was done in all the cases to confirm the diagnosis. All the cases were put up for surgical removal of disc but surgery was not done for certain reasons, viz. the patients did not have finances, they were afraid to get it done or the surgery was delayed for certain reasons. They were subjected to conservative rehabilitative management with prolonged rest. In all the cases motor deficit reverted to normal and the sensory deficit improved considerably. All the patients at the end of the treatment were pain free and did not have any motor deficit. They were able to perform all their activities of daily living without any modifications, while taking due precautions to prevent any aggravating factors. A follow-up of the patients upto a period of about six months after the "clinical cure" is presented. From the study it is concluded that careful prolonged conservative management has a role in the management of Intervertebral Disc Prolapse with neurological deficits and all such patients need not be rushed in for surgical removal of discs.

Key words: Intervertebral disc, Cervical spine, Lumbar spine, MRI, Rehabilitation.

Introduction

With the advent of modern high powered investigations like CT scans and MRI scans, impetus for surgery is really strong whenever an anatomic defect is present. It has also been the general feeling that most surgeons are relying less on the clinical examination and more on the findings of such investigations. There is no doubt that patients with intervertebral disc prolapse (PID) are being operated more often than the times, prior to advent of these investigations, though data on such is not available in the scientific literature.

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Some of the recent studies suggest that conservative management gives satisfactory results in a high proportion of patients with disc herniation in-course of few months of treatment onset. This is likely to occur in mild to moderate nerve root compression. Chances of successful outcome with surgery are higher in patients with a marked nerve root compression, no or mild back pain and short duration of symptoms. The results of surgery often deteriorate in long term because of recurrence of radicular and specially low back pain. In most patients the deterioration is not related strictly to surgery because chances of pain recurrence or worsening with time are similar in the patients treated conservatively and in those who undergo surgery.¹ In this study, the outcome of non-surgical rehabilitation management is observed in patients

having PID with neurological deficit and clear indication for surgery which could not be performed due to one or the other reason.

Material and Method

Seven male patients (Table 1) in the age group of 19 years to 60 years, diagnosed to be having PID on the following criteria were studied:

- (a) those having neck or back pain,
- (b) presence of radicular pain,
- (c) having a positive straight leg raising (SLR) test of below 60° (in lumbosacral disc prolapse) and
- (d) having motor and sensory deficits.

All these cases were seen by the physiatrists in the Department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences (AIIMS) and also in the Department of Neuro-surgery, AIIMS. All the patients were subjected to MRI, which confirmed the diagnosis. In all the seven patients surgical removal of the disc was advised by consensus amongst specialists from both the departments based on the standard criteria for indications of surgery:²

- a) Acute protrusion with nerve root compression, with a well defined neurological deficit,
- b) chronic degenerative disc with referred pain where failure of adequate trial of non-operative therapy, though none of our patients was in this category,
- c) progressive motor deficit

All the patients were advised surgery but refused to undergo surgery for the following reasons:

- (i) Refused
 - a) due to fear 3 patients
 - b) due to financial reasons 2 patients
- (ii) Surgery delayed for some reason 2 patients

In all the seven patients, the conservative treatment was continued with the following regimen during the early phase: prolonged rest, no exercises till 80% of the pain subsided, superficial heat, analgesics and non-steroidal anti-inflammatory medicines. Bracing with soft cervical collar was given in all cases with cervical involvement. Lumbosacral belt was limited only to the early phase of treatment for the fear that the patient might try doing various activities with the belt on and might not be restricted to rest as advocated. Steroids were given in only one case having an acute attack with neurological deficit, that reported within two days following onset of PID in the lumbo-sacral region. It were given in a tapering dose over 5 days. The important points, made clear to all the patients were (i) a clear understanding of their condition, (ii) need for surgery, (iii) risks of either kind of management, (iv) life style to be expected and (v) possible complications in either approach of treatment. Rest was advised according to the following criteria:

Total bed rest, till the time SLR test was below 45° or the presence of continuous pelvic list.

Relative rest, allowed to move about in the house and in the vicinity of the house. No bending, lifting weight nor going to work till SLR was between 45° to 60° and with no list or occasional list.

Rest on demand, when the SLR was above 60° and when there was no list.

All the patients were advised to take standard precautions about posture and positioning. None

Table 1: Patients' Profile

Age (yrs)	Occupation	Motor deficit	Level
19	Naval trainee	EHL+Ankle DF	L4-5
32	Businessman	EHL. (recurrent)	L4-5
40	Office attendant	EHL+Ankle DF	L4-5 & L5S1
45	Driver	Lt.EHL + Rt. GS	L4-5 & L5S1
36	Policeman	Quadriceps + Ankle DF	L2-3 & L3-4
60	Politician	Deltoid and Biceps	C4-5 & C5-6
31	Businessman	Wrist DF	C5-6 & C6-7

EHL: Extensor hallucis longus, DF: Dorsiflexors, GS: Gastrosoleus

of the patients was advised any traction. The exercises were started only after SLR was above 60°, without the presence of any list and presence of occasional radicular pain.

End of the treatment was decided on the following criteria:

- a) when the patient was pain-free
- b) when the patient was list-free
- c) improvement of motor deficit
- d) no major recurrence of radicular pain
- e) able to perform Activities of Daily Living (ADL) with precautions
- f) no episodes of increase in neurological deficit
- g) reduction in sensory deficit

During the time the patient was coming for the follow-up, need for surgery was made known to the patient every time. Duration of continuation of the therapy was based on the above criteria, irrespective of the time elapsed. The patients were followed-up upto about six months after clinical recovery.

Observations and Results

With the continuation of the conservative treatment, observations as noted are depicted in the Table 2.

The table depicts improvement in the motor power of the muscles and the time taken for the

recovery of each muscle from the initial level. The last column indicates the total duration of the follow-up of the patient, when last seen, after the first visit to the hospital.

Discussion

The literature repeatedly shows that surgery is often recommended as a definitive treatment in lumbar disc herniations.¹ It has been studied that the natural course of the lumbar disc herniation followed up over a period of one to five years indicate that the results after surgery have been satisfactory in 45% cases and unsatisfactory in 55% cases.² In the same study it was quoted that 30-95% patients showed improvement in the non-surgical group in cases of lumbar radiculopathy. Acute protrusions respond well to surgery. In most patients with conservative treatment normal life pattern returns within 2 months. In this study all patients had a clear indication for surgery. There was no grey zone in the indication for surgery. There was no comparison available to show how did they fare as compared to the conservative group. In light of the literature, our small group of patients took longer to return to their normal life pattern. Results of surgery versus conservative depicted in two studies^{4,5} show immediate results are better with surgery but 3 years later, there is relatively no difference statistically between the

Table 2

Age (yrs)	Occupation	Mm. involved	Power improvement	Time taken time	F.U.
19	Naval trainee	EHL+Ank. DF	2 to 4+	8 mo	1 yr
32	Businessman	EHL	3+ to 4+	6 mo	3 yrs
40	Office attendant	EHL+Ank. DF	3 to 5	6 mo	2 yrs
45	Driver	EHL + Rt. GS	2+ to 5-	5 mo	9 mo
36	Policeman	Quad + Ank.DF	3- to 5-	3 mo	6 mo
60	Politician	Delt. and Biceps	2 to 5	2.5 mo	9 mo
31	Businessman	Wrist Dorsiflex.	2+ to 5	1.5 mo	4 mo

mo: months, yr/yrs: year/years EHL: extensor hallucis longus, GS: Gastrosoleus, Delt.: deltoid DF: Dorsiflexors

two groups. Psychological factors in the causation of back pain need to be carefully screened before subjecting the patients for surgery since they may greatly influence the outcome after any treatment. Saal et al⁶ state that lumbar radiculopathy can be treated conservatively. Some studies have reported the success rate of 71% in case of treatment by non operative means.¹ The above fact has been supported by another study⁷ which further suggests that surgery should be undertaken if patient does not respond after at least 2 months of conservative treatment. Thus it can be concluded that a high proportion of patients with PID make a satisfactory recovery with aggressive conservative management and this recovery is accompanied by resolution of the disc herniations in significant number. Only a small proportion of patients need surgical decompression.

Therefore, it can be implied that there should not be a great rush for surgery in patients with PID. Of course, unless the patient understands what the doctor wants him to do and both the patient and the doctor work together towards the common goals.

Conclusions

Careful non-surgical rehabilitation treatment has a role in the treatment of PID with neurological deficit. It is very important that the physician makes the patient understand the problem. One should not just base the surgical indication on the findings of the CT and MRI scans, without their

clinical correlation. There should not be a rush for surgery in most cases. It appears that in the indications for surgery in the cases of PID, the zone of grey areas (whether surgery should be done or not) is increasing.

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Study of social and vocational status in mentally subnormal children

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Abstract

This study was carried out on forty mentally subnormal children of 6-15 years age group with varying severity of mental subnormality attending the Department of Physical Medicine and Rehabilitation and Pediatrics OPD, All India Institute of Medical Sciences, New Delhi. Those children below 70 on IQ scale were included in the study. A questionnaire was applied to assess their social and vocational skills. It was observed that the majority of subjects understood simple gestures and instructions of parents, welcome visitors at home, behaved appropriately with parents and sibs, expressed their requirements and were interested in watching television and going for outings. This brings forth the conclusion that mentally subnormal children are much active in creating social relations and also have potential vocational skills contrary to the common belief. These potentials need to be exploited and the children need more exposure to the normal social environment for a good social development. This needs appropriate schooling.

Introduction

Mental subnormality is a group of conditions of developing period, which manifest as low learning capability and insufficient adaptive skills. The prevalence of mental subnormality is reported to be 1-2%.^{1,2}

With a lot of work being done in mental subnormality, this topic still remains a mystery. The social and vocational maladjustment that results has not found a breakthrough in applied medicine. The social stigma attached to mental subnormality prevails at large. No study was found in the review of literature assessing the status of mentally subnormal children in social and vocational aspects in India. There is lack of vocational and recreational facilities for the mentally subnormal. This is why the study was conceptualized.

WHO has defined mental retardation as a condition of arrested or incomplete development of mind.^{3,4} It is especially characterized by impairment of skills manifested during the

developmental period, which contribute to overall level of intelligence i.e. cognitive, language, motor and social abilities.¹ It grades the severity of mental subnormality as mild, moderate, severe and profound (Table 1).

There have been many conceptual changes in management of mental subnormality since the old days. Most recent definition of mental subnormality according to the American Association on Mental Subnormality (AAMR), 1992 is: mental retardation is characterized by significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the ten adaptive skill areas (Table 2). Mental subnormality manifests before 18 years of age and refers to substantial limitation of present functioning.^{5,6}

AAMR 1992 propounded three steps in describing a mentally subnormal person (Table 3). The definition does not label the child by severity of mental subnormality. This definition is more subjective and difficult to use than WHO definition but gives a functional novel approach to the diagnosis and management of mental subnormality. This definition considers capabilities

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of the particular individual in terms of his intelligence and adaptive skills and his social environment at home, school and in the community. With these two considerations, the functioning of the individual is assessed and appropriate supports are given in individual fields

of requirement.⁶ The type of supports needed may be intermittent, limited, extensive or pervasive.⁷ The presence of strengths in other areas are searched for and improved further. With appropriate supports, the functioning should improve.

Table 1: Severity grades of mental subnormality

<i>Sr. No.</i>	<i>IQ</i>	<i>Severity</i>	<i>Capabilities</i>	<i>Training required</i>
1	50-69	Mild	Acquire languages of daily use, full independence in self care, difficulty in academic achievements, capable of semiskilled or unskilled work, noticeable social and emotional immaturity	Functional education
2.	35-49	Moderate	Limited use of language, may need supervision even in self care, trainable in basic skills or supervised practical work	Manual skills training
3	20-34	Severe	Motor impairment in addition to above	Systematic habit training
4	<20	Profound	Cannot understand or comply with instructions, most are immobile & incontinent, require constant help	Use of legs, hands and jaws

Table 2 : Adaptive skill areas for diagnosis of mental retardation (at least 2 out of 10 should be deficient)

Communication	Self-care
Home living	Social skills
Community use	Self-direction
Health and safety	Functional academics
Leisure	Work

Table 3 : Steps in AAMR 1992 definition of mental subnormality

Step 1	Diagnosis	<ol style="list-style-type: none"> 1. Intellectual functioning approximately 70-75 or below 2. Significant limitations in two or more adaptive skill areas 3. Age of onset is 18 years or below
Step 2	Classification	<ol style="list-style-type: none"> 1. Psychological/emotional strengths and weaknesses 2. Overall physical health and etiology 3. Current environmental placement and extent of adaption
Step 3	Profiles and intensities of needed supports (in each of the 4 dimensions)	<ul style="list-style-type: none"> • I-Intellectual functioning & adaptive skills • II-Psychological/emotional considerations • III-Physical health/etiology management • IV-Environmental supports and optimization

Materials and Methods

The study attempted to find out the present state of mentally subnormal children in social perspectives and vocational potential. It also attempted to find out the recreational and leisure activities in these mentally subnormal children.

This is a cross sectional descriptive study on assessment of the mentally subnormal children from social, vocational and recreational perspectives. The WHO definition is used to pick up the cases for this study as the functional utility of grading of severity needs to be questioned as far as the social and vocational aspects are concerned.

Inclusion Criteria

1. Intelligence quotient < 70
2. Children aged 6-15 years where the IQ tests are more valid and social and vocational potentials are exposed.
3. Informed consent from the parents of the children

Exclusion criteria

1. No deficiency in adaptive skill areas
2. Any condition hampering IQ testing. E.g. deafness.

An expert clinical psychologist did the IQ testing throughout the study and the children were accordingly classified as mild, moderate, severe and profound mental subnormality. One of following three IQ tests was applied along with Vineland Social Maturity Scale for assessment of social quotient.⁸

1. Mallin's Intelligence scale for Indian children⁸
2. Seguin form board⁸
3. Gessel developmental scale

A proforma was made containing questions regarding the subject's:

- Behavior with parents, siblings and visitors
- Hobbies and leisure activities

- Household work
- Group activities
- Schooling
- Independent outdoor ambulation
- Safety consciousness
- Outings

Questions were asked to the parents of the subjects on this proforma by a single interviewer. The data was collected on consecutive cases during the period of September 1997 to September 1998. Since there was no such study in the Medline search, prevalence of the variables in this study is not available. Hence a study of forty subjects was planned.

The data was analyzed and the results were as follows. Seventeen (42.5%) out of the forty subjects were mild, 14 (35%) moderate, 7 (17.5%) severe and 2 (5%) were having profound mental subnormality. Age distribution was almost uniform. Males were twice the numbers of female subjects. Majority of the parents was educated. Three fourths of the mothers were housewives. The statistically significant outcomes were:

1. All children enjoyed outings
2. All of them followed gestures of parents
3. Mild cases had more interest in viewing television ($p < 0.01$)
4. Children who were sent to school welcomed visitors at home ($p < 0.01$)
5. Children who welcomed visitors at home also offered help at home ($p = 0.001$)
6. Having good sleep was found to be associated with following parents' instructions and welcoming visitors at home ($p < 0.01$)
7. Those children who were taken for outings had eye contact with visitors ($p < 0.01$)
8. Children who enjoyed outings behaved well with parents ($p < 0.05$)

Schooling was correlated well but not statistically significantly with moving

independently and being informed about current happenings. Milder grades of severity correlated with sense of handling money, household work and hobbies.

The observations also showed that severity of mental subnormality did not correlate with eye contact, welcoming visitors, enjoying outings, household help, music, schooling, indicating requirements, behavior with parents and following their instructions.

Discussion

In the review of literature, no such study was found in Indian context. This study strives to find out the present state of the mentally subnormal children in social, vocational and recreational activities. It is based on the observation of the parents' view about their children.

In sixty percent of the subjects, the mother came forward with the information on the child.

Only one of the mothers was illiterate. All other parents were literate. This might be showing the fact that literate parents are more aware about the rehabilitation needs of their children.

One fourth of the mothers were doing some job. Majority was housewives. This is an advantage for the child that the mother who can care best for the child can pay him attention too. However, this might also indicate that the mother couldn't go for a job because of the special care her child needed.

The study came up with 2:1 male to female ratio. This is of no significance as an indicator of prevalence because the males are cared for more than the female children in India. Another fact is the hopelessness of cure and social stigma attached to mental subnormality might restrict the turn-up of these children at the hospital. Another hospital-based study in India has found the ratio to be 3:2 among sample size of 50.⁹

Welcoming visitors at home is a social activity and shows no correlation with severity of

mental subnormality. This indicates that socialization is present in the severe grades of mental subnormality also.

Sending the children to school was associated with further incidence of socialization. This could be because the child is exposed to social atmosphere amongst his peers and teachers. He is also taught about the manners and social activities at the school. Also it was found that schooling was not correlated with IQ. So the children should be sent to school irrespective of their severity of mental subnormality. The IQ score should not interfere with sorting out the management strategies.

Children who had good sleep behaved socially better. This shows the importance of good sleep and conducive environment to achieve socialization. Sleeping well gives adequate rest to mind and might make it more receptive to learning social skills.

Taking the children for outings improves their exposure to environment and thus is associated with having eye contact with people. These children should not be restricted to home and neglected. On the contrary, they need more exposure to the society so that they can mix well socially. This also improves their behavior with parents.

Conclusion

It is concluded that the mentally subnormal children have social skills and enjoy leisure activities. They also have vocational potential. Social interaction is not dependent on severity of mental subnormality. These potentials may remain suppressed due to restricted exposure of the special children to their social environment. Hence exposure of the mentally subnormal children to social environment outside home is needed in the form of sending to school and mainstreaming.

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An Unusual case of SLE with Transverse Myelitis

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Abstract

Transverse myelitis is one of the dreaded neurological complications of SLE. Till now very few cases have been reported with transverse myelitis as initial presentation in SLE. Early diagnosis with immediate intervention leads to reduction in morbidity and mortality. Presented here is a case of 22 year old female who had been previously diagnosed as Polymyositis, Rheumatoid arthritis, Hypothyroidism and Viral myelitis. The patient was treated with intrathecal Methotrexate with Dexamethasone and pulse Cyclophosphamide, Methylprednisolone and daily Hydroxychloroquine, which have been reported previously. Patient improved in her renal pathology and knee effusion with no change in her neurological status. However, patient significantly improved in her functional status with active rehabilitation care.

Key Words: Systemic lupus erythematosus; Transverse myelitis; Cyclophosphamide; Methotrexate; Hydroxychloroquine; Rehabilitation.

Introduction

Transverse myelitis (TM) in SLE is a well known but rare clinical condition. Because of its unusual presentation patient may be treated as a different clinical condition initially.^{1,3} This causes increase in morbidity and mortality.² In the recent past ineffectiveness of steroids led to the use of other drugs such as Cyclophosphamide, Azathioprine and Hydroxychloroquine.^{4,5}

Reported here is a case of SLE with TM, which had been treated as Hypothyroidism, Rheumatoid arthritis, Polymyositis and Viral myelitis. As described in the previous reports this case was also positive for Antiphospholipid syndrome.^{4,6} The patient was treated with intrathecal Methotrexate with Dexamethasone, pulse therapy of Cyclophosphamide with Methylprednisolone and daily hydroxychloroquine. Along with the report,

diagnostic difficulties, clinical presentation, therapy, pathology and prognosis are also discussed.

Case Report

22 years old girl reported to casualty with history of urinary retention for one day. She was catheterized and sent back home, next day she landed up with history of sudden onset of flaccid paralysis of both lower limbs. She was admitted in neurology where magnetic resonance imaging (MRI) of spine was done. MRI showed cord expansion from D5 to conus with skip lesions at D4 suggestive of myelitis. She was diagnosed as Viral myelitis and treated with IV Methylprednisolone 1G for 3 days. Inj. Troparin 0.3ml daily with maintenance dose of oral prednisolone 40mg daily. There was no clinical response after 14 days. MRI brain was done, which was normal. After 22 days there was no change in the neurological status. At this stage, the patient was transferred to rehabilitation ward.

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In the department of PM&R history was taken again. Past history revealed history of joint pains, low backache, with on and off fever. The history also revealed that she was previously diagnosed as Polymyositis, Rheumatoid arthritis and Hypothyroidism by other specialists and was treated accordingly for these ailments. She was on Eltroxin for 4 months and taken steroids on and off and also on oral methotrexate for nearly 4 months. Examination findings revealed right knee effusion, reduced tone and absent jerks, with motor and sensory level of D8. Functional Independence Measure (FIM) score was 64.

Initial investigations as follows: ESR 55mm 1st hr, ANA was positive, proteinuria was present. CSF analysis showed 10 WBC/cmm mainly polymorphs, globulin was present with glucose 60mg/100ml and proteins 75mg/100ml.

Provisional diagnosis of SLE was made and treatment was started with IV Cyclophosphamide 600mg and Methylprednisolone 1g pulse therapy with maintenance dose of Prednisolone 40mg daily. Patient had hematuria for 2 days after giving cyclophosphamide, Troparin was stopped and following this hematuria stopped. There was no response to first pulse until the sixth day, so Intrathecal Methotrexate 10mg with Dexamethasone 20mg was started. After 2 days there was sensory improvement by 2 segments below the level of lesion. Further investigation reports came after 15 days of therapy. There was reduced complement component C3- 48mg% (Normal 70-120mg%), Positive Anti-DS DNA 249 IU (Normal 0-60), anti cardiolipin antibody 30GPL Units (Normal.0-10, Lupus anti coagulant was negative with normal clotting factors. CMG showed acontractile hypotonic bladder. After one month oral Hydroxychloroquine 400mg with tablet aspirin daily was added.

Final diagnosis of SLE Transverse myelitis with Antiphospholipid syndrome was made. Pulse therapy was continued every month for another 4

months. Her right knee effusion resolved after 8 weeks and proteinuria stopped after 3 months. Again T3, T4 and TSH were repeated they were within normal limits.

After 3 months the patient developed different episodes of infection in the form of acute suppurative otitis media once, Ingrowing toenail and Klebsiella chest infection, and these responded to antibiotics. In the 5th month she developed splinter hemorrhages around toe nail and web spaces. On investigation prothrombin time was prolonged, aspirin was stopped, vitamin K was started to which it responded.

Repeat MRI after 4 months showed atrophy of cord with arrest from D5 to conus. There was mild progression of disease from D2 to D4. During hospital stay patient learned clean self intermittent catheterization (CSIC), transfer activities, able to stand with hip knee ankle foot orthosis (HKAFO) with assistance. At the time of discharge her sensory and motor level was D9 and FIM score of 106.

Discussion

Spinal cord involvement in SLE is reported as early as 1939 itself.¹ After the major work done by Penn et al⁸ in 1968, transverse myelitis in SLE has become a clinically known entity. However, in developing countries where special clinics like those in developed countries are not there, connective tissue disorders and diagnosis of SLE with Transverse myelitis is a more difficult task. The diagnostic dilemma anywhere in the world is because of its different presentations. The usual presentations here are fever, vomiting, sore throat, stabbing low backache with or without urinary retention and progressive flaccid paraparesis or quadriparesis within 24-48 hours.^{1,9} Common site of involvement is usually mid thoracic region, including our case.¹⁰ In a majority of patients initial laboratory and clinical findings do not fulfill the American Rheumatology Association criteria for SLE.¹¹

Because of its antedated manifestations patient may be labeled as one or more of the Multiple Sclerosis, Tuberculosis, Pyrexia of Unknown Origin, Vitamin B₁₂ deficiency and Rheumatoid Arthritis.¹⁻³ Sometimes the auto-immune mechanism in SLE causes thyroiditis and thrombocytopenia. It might cause proximal muscle weakness with bleeding episodes. So there are more chances of treating patient as Hypothyroidism, Polymyositis like our patient and Idiopathic Thrombocytopenic Purpura.²

If any patient comes with spastic paraparesis or flaccid paraparesis with urinary retention, it is a must to establish a link between SLE either clinically or with laboratory findings. In our patient initial serological findings for SLE were negative before the onset of flaccid paraparesis. The only supportive evidence initially were the past history and routine investigations with high ESR and proteinuria. The other immunological reports came only after the first pulse therapy and intrathecal methotrexate and they confirmed our provisional diagnosis. There are reports with abnormal detection of ANA in patients with multiple sclerosis without any other features of SLE.¹² Sometimes MRI findings were also normal in patients of SLE with paraparesis.⁴

There is a great emphasis in the past that early aggressive treatment with steroids and immunosuppressive drugs will make a difference in patients functional outcome.¹³⁻¹⁵ Many modalities have been tried including immunoabsorption and radiotherapy.^{16,17} But still significant disability and death occurred in early treated patients also.¹⁸

Klaiman et al reported significant improvement in neurological status after treating with cyclophosphamide, methyl prednisolone and hydroxy chloroquine.⁵ Valesini R et al has tried intrathecal methotrexate and dexamethasone and reported a good response even after relapse of the disease.¹⁹ Correlating these trials with our patient,

our patient's neurological status did not improve much. However proteinuria was stopped, and knee effusion resolved. There are reports showing best outcome with cyclophosphamide for nephritis in patients with SLE.

After giving five pulses once in every month, MRI was done which showed there was cord atrophy with myelomalacia changes. Schantz et al and James et al reported atrophy of cord with clinical improvement in neurological status after the therapy.^{18,20} But our patient showed myelomalacia changes with progression of disease from D2-D4 in spite of therapy, but she did not show any neurological or clinical manifestations of this.

Not only due to its rarity and decreased awareness, the high mortality and morbidity is due to its unknown pathology. Till now 3 pathogeneses have been explained. Provenzal et al reported vacuolar degeneration of the peripheral spinal cord white matter with sparing of grey matter.¹⁰ These findings also can be seen in patients with AIDS myelopathy.²¹ The other possibilities are infarction of cord or compressive myelopathy with hemorrhage and necrosis caused by subdural hematoma.²² There is clear cut mention about absence of vasculitis in these patients.¹⁰ Our patient had hemorrhage around toe nail and web spaces in the 4th month with prolonged prothrombin time. Possibility of SLE associated coagulopathy has to be kept in mind. According to Carols et al there is a strong association between transverse myelitis in SLE and antiphospholipid syndrome.⁶ There are reports with mention about demyelination or antibodies against CNS antigens in SLE.²³ Lupoid sclerosis is a term used for SLE with involvement of CNS resembling clinical features of multiple sclerosis.

Conclusion

SLE with Transverse myelitis is the least understood clinical entity. From this case's clinical

experience we would like to emphasize that if any patient, specifically female, comes with spinal cord involvement or any myelitis without any other explanation, SLE should be kept as one of the differential diagnoses. And the patient should be assessed thoroughly with history and repeated laboratory investigations, not just one time investigation.

In spite of high mortality and morbidity rate, early rehabilitation intervention can definitely make a difference in patient's functional outcome, as did in our patient where FIM score improved from 64 to 106.²⁴

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Letter to Editor

Development of Paraplegia Kit : Safdarjang Experience

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Spinal cord injury is a devastating injury which inspite of the best management often leads to a life in wheel chair, not only this, these patients are threatened for the rest of their lives to develop complications like pressure sores, urinary complications etc.

Department of Rehabilitation, Safdarjang Hospital has been involved in the rehabilitation management of such patients for the last 20 years, it has a 15 bedded spinal injury unit with 10 male & 5 female beds. Patients are admitted on these beds after they are medically stable. Generally incomplete cervical lesions or lesions below that level are accommodated on these beds. While the patients is on rehabilitation bed, his medical condition is improved to maximum possible, further complications are prevented and patient is trained to live with the residual disability which includes physiotherapy, occupational therapy, provision of ambulatory aids and appliances. In addition to this, a unique feature of this department is to provide education to the patient and his attendant about the disability and how to cope with it through formal class room teaching. After the discharge patients are followed up in out patient spinal injury clinic held once a week. During the course of this exercise which is being undertaken at our department a selfcare kit consisting of certain useful equipment has been developed,

which is provided to these patients with the aim of preventing the serious complication and to facilitate their living.

This kit consists of four components :-

Name of equipment

- A. Wheel chair foam cushion (seat & back)**
- B. Catheter kit with leg bag & condoms**
 - 1. Plastic catheter
K-90 for men
K-91 for women
 - 2. Xylocaine jelly
 - 3. Plastic box
 - 4. Measuring glass (upto 750ml capacity)
 - 5. Two small bowls
- C. Folding commode chair**
- D. Personal hygiene kit**
 - 1. Sports shoe with padded inside
 - 2. White bath towels - 1 large
 - 3. Hand towels - 2
 - 4. Nail cutter - 1
 - 5. Tooth brush, tooth paste
 - 6. Oil
 - 7. Hair comb
 - 8. Cotton socks gray - 2
 - 9. Woollen socks upto knee - 2
 - 10. Looking mirror with long handle

A. Wheel Chair Foam Cushion

This, developed at the department, consists of a piece of 6mm commercial grade plywood of the size of wheel chair (16" x 16") on which is pasted 3" good density rubber sheet over which 1" sponge foam of good density (26/28) is pasted.

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The whole thing is covered by linen cloth and over it leather foam is incorporated and finally loose matting cloth cover is provided. Similarly a back cushion is prepared having a thickness of 2". The varying density of rubber and foam covering prevents spoiling of the rubber & foam due to accidental soakage. The mat covering prevents direct contact of the skin with leather foam, as well as takes care of perspiration, and being a loose covering it is washable and can be changed easily. As is universally known that merely providing a cushion does not ensure prevention of ischial sores, therefore our patients are trained to practice push-ups at a regular interval.

B. Catheter Kit

As we all know, self intermittent catheterization is a universally acceptable procedure of urinary drainage in SCI patients. Patients are trained in the procedure of SCI by using catheter kit after draining the bladder by credes manouver or by tapping technique.

C. Folding Commode Chair

Since in our set up most of the patients come from rural background they are ordinarily accustomed to ease themselves in the fields and usually they do not have any toilet in the house. After getting the spinal injury they are dependent on others for the toilet activity to be performed in

the bed. With the aim to make the patient independent in toilet activity a simple easily available folding steel chair has been modified into a commode chair and in our practice we have found it a very useful aid, in regaining independence in toileting activities in SCI patients.

D. Personal Hygiene Kit

Maintenance of a high standard of personal hygiene can not be over emphasized in SCI patients because they are prone to recurrent infections. With that aim and keeping in view their problem of bladder and bowel incontinence a set of personal hygiene equipments has been incorporated in paraplegic kit. Nail cutter need special mention as regular clipping of nail is of vital importance in these patients otherwise there may be a chance of injury in the anal mucosa (while stimulating bowel evacuation or doing digital evacuation). Thus providing an item worth Rs. 5/- to the patient can save him from a grave complication like trophic ulcers and also regulates the temperature of the part by external means. In addition to all these benefits the use of personal hygiene kit also ensures better look of the patient which increases his acceptance in the community.

Total cost of the kit works out to about Rs. 1500/-.

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