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From The Editors Desk...

As the Corona virus infected number swells, our last issue doubled the size of its precursor. A standing order now limits the future page count to forty. If only we could order the virus around too! As the current page count again exceeds the stipulated, two volumes will be released for the current theme. Getting the virus in installments also seems likely with a second wave possible.

Despite doing PMR in Kerala for a decade, I still don't know who really does what amongst our Physiatrists. As the annual number of practicing Physiatrists swells my knowledge base gets diluted further. The SCI survey published here is a start to address this ignorance, both mine and of any others. I thank all who participated in improving our knowledge base. President sir wants us to develop centres of excellence. Only if we are aware of what our own do, can we walk in that direction.

In 'Oppportunity knocks:' our past-master Dr. Nandakumar shines a light on what most doctors ignore, Quality of Life. Doctor Mathew joins our invited authors with an article on Surgery in the tetraplegic hand. Anyone who read this in Braddom knows how hard it is to learn. Sir gave a talk on this in IAPMRcon 2012 in NIMHANS. When it came as a major question in my university exam, I realized how much he had helped me. I've written a Cold call regarding a suspected COVID inpatient and some anecdotes about getting spinal cord rehabilitation started. Many of us wonder, 'Why should I write?' The article named such addresses this. Quizmaster Dr. Bineesh is up to his usual with a quiz to flex your cerebrum over. The section 'Research is fun' is still on hold, and might be put to an early rest for now.

Our next release will be part two of SCI rehab. Until then, enjoy this issue and stay safe.

Dr. Ravi Sankaran, Associate Professor,
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Contents

(The included articles are the responsibility of each author)

PERSONS WITH SCI HAVE THEIR LIVES TO LIVE

U. Nandakumar Nair
Consultant Physiatrist, Trivandrum

Perhaps, the nineteen eighties weren't a good time for spinal cord injuries (SCI). People with SCI had a difficult life, with infections, sores and dependency. In Trivandrum, we would have several persons with SCI because falls were common and PMR was the ultimate destination for SCI. The state had just two PMR centres and a clear 400 kms separated them. Investigations were difficult; it was difficult to move SCI to places. Not just that, those days some of the simple tests would take more than a day to complete, by the time we get the result, they carry no value.

We never knew that the ultrasonology would be discovered; the images of Neil Armstrong on the moon were all over the place, but the images of urinary system stones were hard to come by. There were no CT images (CAT or EMI scans as they were known). The Nobel Prize in Medicine was awarded to an engineer and a physicist for developing the technology, but the real scanner would be available to SCI persons a decade later.

That meant a life of recurrent episodes of UTI, an unending tryst with pressure sores, declining nutrition and death. In real terms this would mean that most persons with SCI would have short life expectancy. The idea that a short life should not necessarily mean a bad life evolved into the basis of rehabilitation care. Many tools of assessment of how good is the life with SCI soon occupied our academic discussions. The PULSES profile came, then the Barthel. The ADL and IADL were soon to follow. These scales were not simply clinical tools, but a way to understanding life a bit more comprehensively. These were part of an emerging philosophy of life with diseases and would eventually merge into the larger picture of Quality of Life as we know today.

Rehabilitation should look at QOL seriously. Because when people with SCI realize that they have got to live with the impairment, the reality of the quality of life descends on them. The reality behind a person's struggle with QOL is much beyond the wards and clinics that we run, and the FIMs that we pretend to achieve. If rehab scales are used merely to set standards of discharge protocols, what we miss would be a huge part of their biography in which we could positively influence.

There comes a time in the person's life when he/she realizes that continuing to be a patient any further would not count. This day of reckoning does not come quickly, it evolves over time. And that transforms his/her life. Unfortunately for such transformations to be successful and sustained over time, much more is required. Much more is required to re-create a new identity; study of identity and social roles are important in understanding their disability experience.

Client I

Mr Giridas lived a life of adventure. Coming from an economically weak background, he knew he has to fight the forces of nature to survive. He had taken to soft crimes, like illicit brewing and sand traffic which gave him a reasonable profit. He married, had children and settled down to a life of reasonable comfort when he fell. He was perched on a tree and couldn't hold on to something strong enough when he fell and cracked his spine. For years there were treatments. He was in and out of hospitals with recurrent pressure sores, incontinent bladder and repeated UTI. His wife had to seek employment to support the family; that wasn't enough for a family growing family and then he decided to begin afresh. The ICC helped him to get rid of the ever exposed collecting bag, and luck helped him with the pressure sore. He had a wheelchair, with that he would travel fifty meters into the nearby street, re-established old contacts and began the sand traffic. That was okay for a living and he was comfortable for a few years when the next tragedy struck. His wife and neighbours found him in a pool of blood. The initial reports were that it was an attempted homicide, considering the way he was occupied this seemed possible. But investigations revealed that it was a suicide bid. He had on either side, two slashes below knees with a heavy cutting weapon. Of late he had grown suspicious of his wife's fidelity, and was physically abusive. He had develop psychiatric disease, that is difficult to notice, difficult to diagnose, and difficult to get compliance. He passed away two years later.

Later onset psychiatric illness is a problem in SCI, especially among persons in poorer socioeconomic conditions. Physicians with rehab interest should have the eye to detect this; it might save a life. For a discussion on mental health in SCI1, 2, these papers might help.

Client II

Look at Krishnan. He became a SCI person following traffic accident. He underwent treatment and developed anticipation, frustration and neglect in that order. Couple of years later his wife left him and he remained at home vastly unsupervised. During the next year he developed contractures and episodes of pressure sores. But eventually, they healed and with ICC he survived. When he began to move out, the lower limbs would not permit him because of deformities. He eventually got over these problems and scripted a new life of success. The contractures wouldn't yield, so he just left them be. He began moving out on an adapted motorized tri-wheeler. He became a small scale entrepreneur, started a unit manufacturing lotions, soaps and artifacts. He is a trainer of PWD on living skills and can train people to become skilled attendants and careers for PWDs and chronically sick persons. He is also a motivator for early PWDs who decline to use assistive devices. Meanwhile he met a woman who became his partner and that brought in more quality into his life. These COVID- 19 days, he is now involved in making and distributing masks, handwash and sanitizers. Without much specialist medical help he carved out a niche area of survival. Unknown to himself he found a method to focus on his strengths and convert them into a worthwhile life. For a discussion of community reintegration, perhaps this paper3 could help.

Client III

Amina was an educated married young woman trained in allied health sciences. One day in a tiff with her relative, she was pushed over the topspot of a ridge. She fell and became a person with SCI. Like other persons with SCI she went through the initial difficulties. Life as an SCI is very difficult for a young woman. Fortunately for her, her family held together during the period of crisis. She ha big pressure sore, that took time to heal and recurrent UTI that challenged her will to live. With ICC she survived, though brief episodes of skin breakdown still makes distraught, she has withered those stormy periods. Later she became a good wheelchair user, did her household chores on the wheelchair, became pregnant and had her son. She did not go back to the profession she was trained in, but now

she is busy as an activist in the field of wheelchair using PWDs. She occupies a senior position in the group and guides other people in the life of SCI. For a discussion on sexuality and pregnancy issues in women with SCI, excellent reviews are available; this could do as a starter4.

Conclusion

Rehabilitation is a long process. To decide if a person has achieved it or not depends on the process of self actualization he/she has accomplished. How one goes through the journey cannot predicted on the basis of physical findings or management of episodic pathologies. Some persons do well, others don't. Some fail later after showing initial promise. Obviously, there is more to it than a set of pathologies in SCI.

Just like in the management of cardiovascular disease, the rehab physician needs to list down the set of risk factors relevant to rehabilitation. What factors drive some persons to do more what they can and what prevent some from self actualization are linked to social and family support, self concept, psychological and psychiatric issues, economic situation, and perhaps value systems. There is interesting body of work being done in these areas. One can start reading5 from this paper. Whalley Hammell6 has this list of factors that influence the life of a person with SCI: (1) the importance of specific staff qualities; (2) the need for a vision of future life possibilities; (3) the importance of peers; (4) the relevance of programme content; (5) the institutional context of rehabilitation; (6) the importance of reconnecting the past to the future; (7) the importance of meeting the needs of the real world. A hard look at this list will, no doubt unsettle us. The strongest factors that retard rehab are factors related to rehab staff themselves. The dictum of SCI rehabilitation ought to be: persons with SCI have their lives to live: let them.

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Reconstructive Hand Surgery In Tetraplegia

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Introduction:

Tetraplegia in any form, from any cause is not a desirable condition. The functional deficits it can impose are life-changing. However, if there was a choice, one would choose a neurological level of tetraplegia at which hand function can be retained. Losing hand function when the brain is capable of functioning at its highest level is frustrating to say the least. Unfortunately, choice of the neurological level is not an option in traumatic cord injuries or indeed in any other cord lesion. However, good and careful recovery from the accident site with no second mechanical injury is paramount. One additional level of preserved neurology in tetraplegia is incredibly valuable when hand function restoration is planned and carried out. If instead of C6 level of cord injury if one could have C7 preserved, it would make the difference between partial independence and full independence.

Restoration of hand function in tetraplegia has all the established components of medical practice - prevent, treat and restore. Prevent loss of neurology from the time of recovery of patient from the accident site; prevent contractures of the hand, wrist, radio-ulnar, elbow and shoulder joints. Treat all available muscles with exercises to strengthen them. Surgical restoration is possible only when available muscles for transfer are at least MRC grade 4. Orthotic restoration of function, in the event surgical reconstruction is deemed not appropriate, also needs good available muscles and contracture free joints.

The Physiatrist with a special interest in Spinal Cord Injuries is ideally placed to assess and prepare the patient for a possible rehabilitative surgery of the hand starting roughly 3 to 6 months after the initial injury1. Clearly, he/she can supervise prevention of all contractures and maintaining full range of movement of the joints. 'Boxing glove' splinting for the hands in the night is a classic example of the way to prevent hand joint contractures2. Rarely, the Physiatrist is trained specifically to do these surgical procedures, which is an added advantage. All Physiatrists should be aware of the principles of rehabilitation of the hand including surgical procedures that can be done. However, there seems to be a reluctance or lack of confidence in making these decisions or indeed counselling about possibilities. This article is an attempt at addressing the Physiatrist's confidence in decision making and counselling about hand surgery for tetraplegics.

The principles of hand reconstruction in tetraplegia is reasonably straightforward and simple. The aim is to provide a lateral key grip and a crude grip to a given hand. These two grips would cover most motor functions of the hand that does not require fine or delicate movements.

Assessment of the patient consists of:

First, securing an accurate diagnosis of the level of tetraplegia and the function of the hand.

The second step is to look for two point discrimination on the pulp of the thumb and the radial side of the index finger (Waters et al3). A two

point discrimination of 10 mm or less is what we are looking for. The accuracy of proprioception at the metacarpophalangeal and the interphalangeal joints is correlated with 2-point discrimination. Adequate hand control without the use of visual clues could be achieved with proprioception and gnosis predictably present with a 2-point discrimination of 10 mm or less at the pulp of the thumb. (Moberg – 19904).

Third, there is the need to accurately record the muscle power (MRC grading) in the following muscles in this general order;

1) Deltoid and biceps
2) Brachio-radialis
3) Extensor carpi radialis longus
4) Extensor carpi radialis brevis
5) Pronator teres
6) Flexor carpi radialis
7) Extensor digitorum
8) Extesnor pollicis longus
9) Flexor digitorum
10) Intrinsics

Fourthly, assess the spasticity of the available muscles. Step 1 will help in selecting muscles to check for spasticity. Severe spasticity in large muscle groups is not conducive for functional improvement with surgery. It should be first brought under control prior to embarking on the surgical journey.

Some cardinal principles:

1. Use only at least MRC 4 muscles to transfer elsewhere
2. Make sure that spasticity will not impede the function that is expected to be reconstructed
3. Make sure that patient and carers are prepared for the procedure and the rehab that follows
4. Counsel patient about what to expect by way of function (you never get 'normal' function back in a reconstructed hand in tetraplegia
5. If there is no discernible function that can be given, do not embark on the surgery unless it is a 'salvage' procedure or it serves cosmesis

Synergestic muscle actions:

It is preferable to transfer one muscle to another, where they serve synergestic actions. For example,

1. Pronation is synergestic with wrist extension therefore, it is a good substitute when wrist extension needs to be provided. Eg – PT to ECRB transfer
2. Wrist extensors are synergestic with finger flexors – therefore, they can be used for providing the other function. Eg – ECRL to FDP transfer
3. Wrist flexors are synergestic with finger extensors. Eg – FCU to ED transfer
4. Brachioradialis can be substituted for wrist extension or thumb flexion, etc

Actions that can be reconstructed:

1. Elbow extension prior to surgery on the hand
2. Wrist extension
3. Positioning of the thumb
4. Lateral key pinch (passive or active)
5. Crude flexor grip

6. Extension of the thumb
7. Extension of the fingers
8. Radial deviation of wrist
9. Opposition of the thumb

Of these the most important would be extension of the elbow, wrist and lateral key pinch. With availability of more muscles for transfer, more and more function can be added.

Modern attempts at Tetraplegic hand reconstruction were seeded by the work of Eric Moberg, a Swedish Hand surgeon in the seventies (Moberg 1975)5.In 1978 at Edinburgh, Scotland, an International Classification for Surgery of the Hand in Tetraplegia (ICSHT) was agreed upon and later modified in 1984 to its present form6.

The classification starts with available sensory sparing (please refer to page 1, last para). If the two point discrimination of the thumb pulp is > 10 mm, then the classification is Ocular, O for short. This means that they need visual feedback to monitor and guide hand function. If the two point discrimination is 10 mm or less, then the classification is Ocular Cutaneous(Cu) – OCu for short.

Once that is done, we can proceed to classifying on the basis of available muscles (please see page 2 for muscles to be examined). The ICSHT (IC for short) classification starts from 0 to 10. We could transpose the numbers on page 2 starting with 0 and ending with 10. The number 10 is ascribed to exceptions that do not fit 0 to 9. Therefore, the list on page 2 will look like the following:

IC: 0 No transferable muscle below the elbow (Deltoid and biceps may be present)
IC : 1 Brachio-radialis (BR)
IC: 2 Extensor carpi radialis longus (ECRL)
IC: 3 Extensor carpi radialis brevis (ECRB)
IC: 4 Pronator teres (PT)
IC: 5 Flexor carpi radialis (FCR)
IC: 6 Extensor digitorum (ED)
IC: 7 Extensor pollicis longus (EPL)
IC: 8 Flexor digitorum
IC: 9 Intrinsics
IC: 10 Exceptions (X)

You will notice that the classification follows the exact order of the muscle assessments that were made as per the list on page 2.

So the classification at the end of an assessment might look like,

IC: O 1 – which would mean that we have Brachioradialis that is available for transfer with a power of MRC Gr 4, but his thumb pulp has a two point discrimination of > 10 mm (IC= International classification)

Or

IC: OCu 1 – Brachioradialis is available for transfer with MRC Gr 4 and the two point discrimination of the thumb pulp is 10 mm or less

Or

IC: OCu 3 – Brachioradialis and Extensor carpi radialis longus is available for transfer and the two point discrimination of the thumb pulp is 10 mm or less, etc

There is enough literature out there to help make decisions about what surgery can be done for each IC classification (Table 6 on page 29 of the IFSSH document1)

However, I look at functions at the elbow, wrist, thumb and finger flexors primarily and work to give back function to these. Therefore,

Even when there are no muscles below the elbow, you need to correct the unopposed flexion of the elbow by doing posterior deltoid to triceps transfer. At the same sitting, biceps can be lengthened and re-routed (Zancolli 19677)to become a flexor and pronator instead of flexor and supinator. This would allow the patient to manipulate a joy stick and use a universal palmar pouch for 'using' cutlery or holding a stylus.

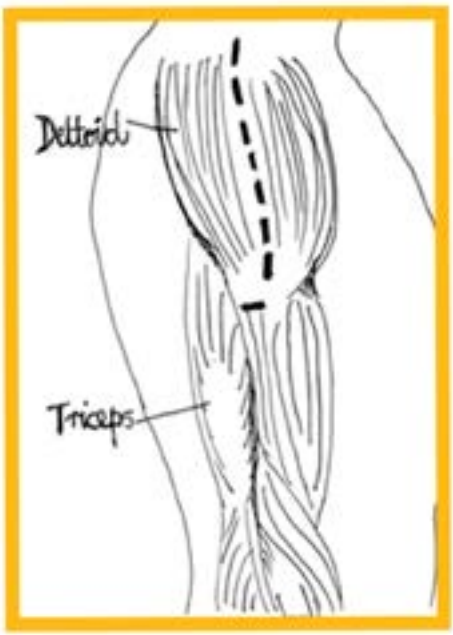

Fig:1 Posterior deltoid to Triceps

Fig 2: A TFL tube or a suitable tendon is used to insert posterior deltoid to Ulna

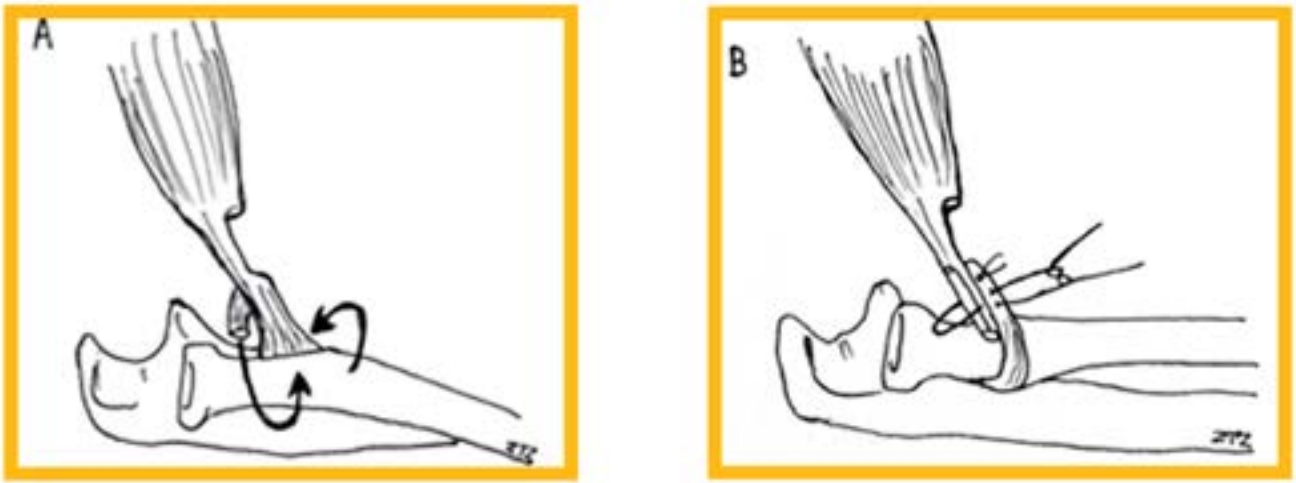

Fig 3: Re-routing of Biceps to promote pronation of the forearm

The next level is the wrist. If only the BR is available and the strength is MRC Gr 4 or more, then that can be transferred to ECRB to give active wrist extension. A prior posterior deltoid to triceps transfer will help increase reach and counteract the BR's elbow flexion moment.

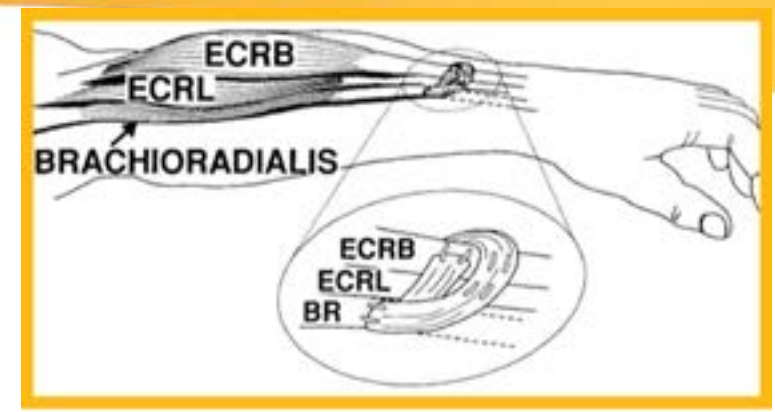

Fig 3: Re-routing of Biceps to promote pronation of the forearm

Once active wrist extension is possible, passive lateral pinch of the thumb can be created using the FPL tenodesis procedure - the FPL is tenodesed to the distal radius to produce a firm passive lateral pinch (Fig: 5). The EPL should be looped and plicated at the PIP in order to prevent flexion at the thumb PIP (ELK procedure8, 11). If thumb opening is deficient when wrist is flexed passively, then EPL tenodesis to extensor retinaculum or forearm fascia is done to assist with thumb opening (Fig:6).

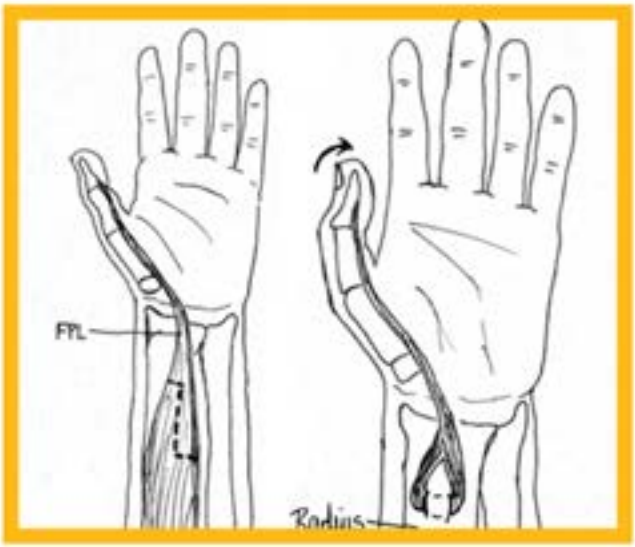

Fig 5: Flexor pollicis longus tenodesis to radius (ELK procedure and EPL tenodesis done in conjunction)

If ECRL is also present (IC: OCu 2), then, the BR is transferred to FPL to achieve active lateral pinch. The ELK procedure and the EPL tenodesis need to be done along with the BR to FPL transfer (Fig: 6).

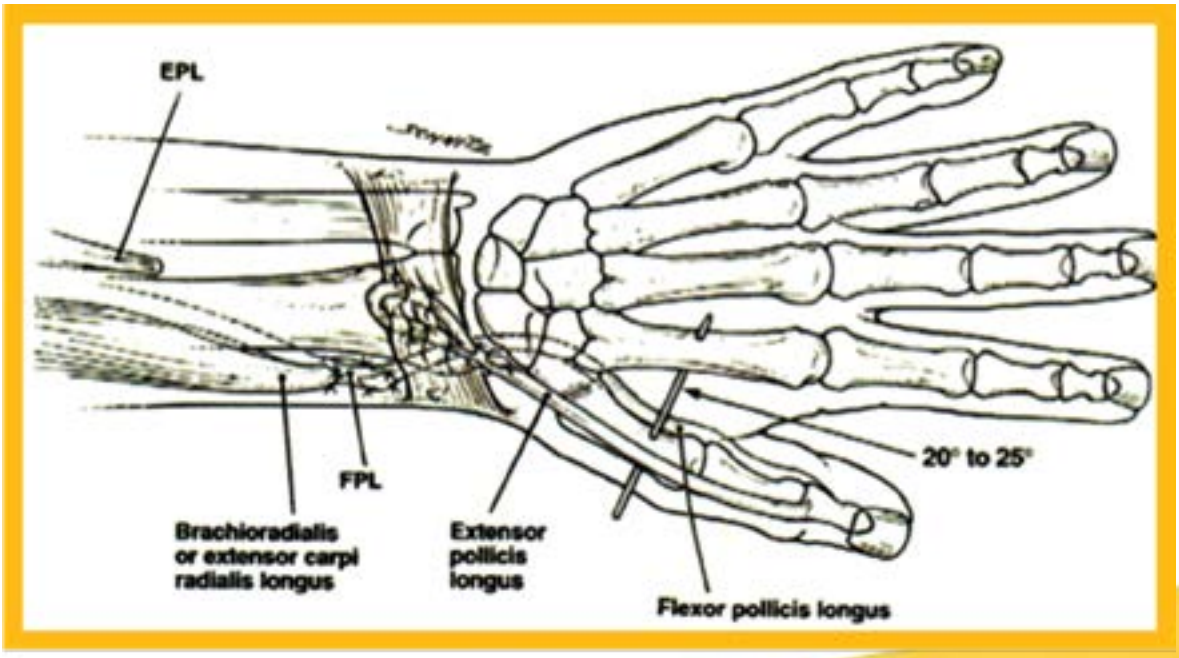

Fig 6: Brachioradialis to FPL transfer and EPL tenodesis

IF ECRB is also available– IC: OCu 3 - (usually the triceps is also active when ECRB is Gr4 or more) then apart from the BR to FPL and associated procedures, the ECRL can be transferred to the FDP slips to fingers 2 to 4 (Fig: 8). The grip would function much better if the intrinsic muscle functions can also be reproduced. The House procedure9 (Fig: 7) is ideally suited for this.

A combination of 7 procedures that can effect lateral pinch and crude grip was described by Frieden et al10. The Alphabet procedure or Advanced Balanced Combined Digital Extension Flexion Grip (ABCDEFG) is carried out in one sitting to achieve both flexion and extension phases of grip simultaneously. It consists of 1) Split FPL/ EPL (ELK) distal thumb tenodesis, 2) Reconstruction of passive interosseous function -House procedure (Fig: 7) 3) thumb CMCJ arthrodesis – using a locking 'T' plate 4) BR-FPL tendon transfer (Fig: 6) 5) ECRL-FDP slips of fingers 2 to 4 (Fig: 8) 6) EPL tenodesis (Fig: 6) 7) ECU tenodesis (Fig: 9).

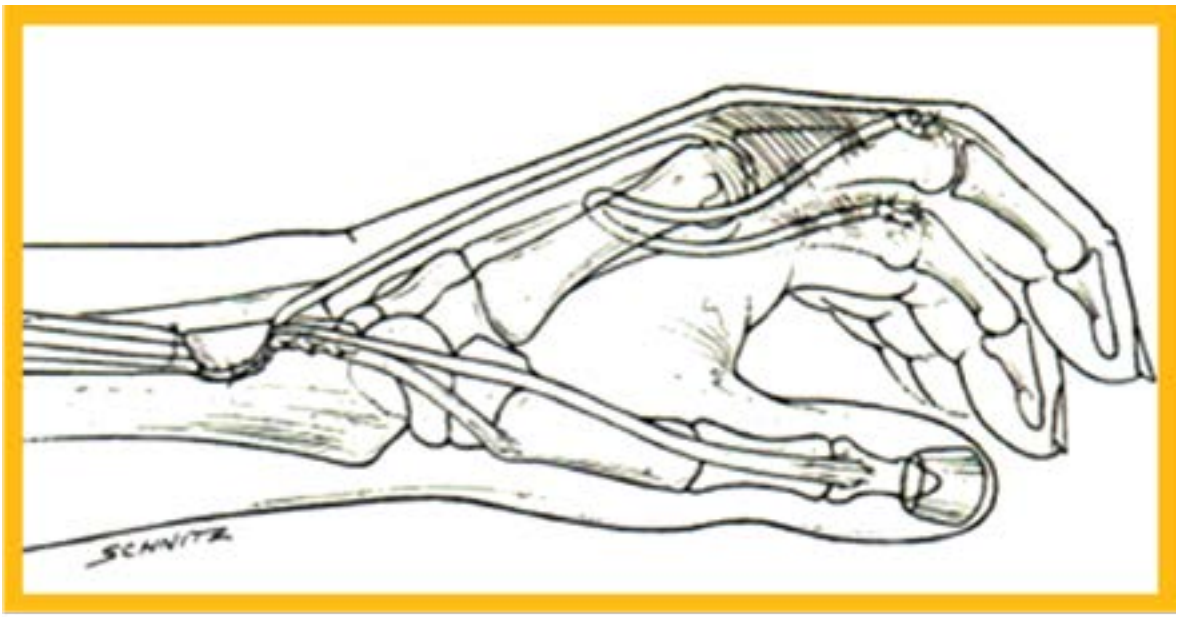

Fig: 7 House Intrinsic reconstruction procedure

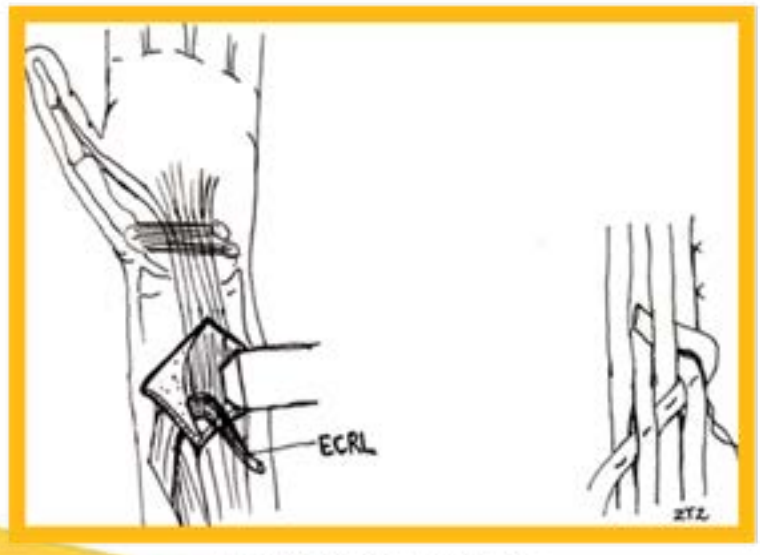

Fig: 8 ECRL to FDP transfer

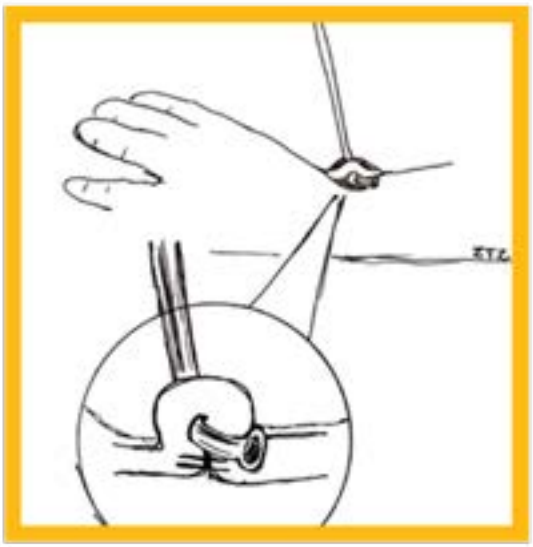

Fig: 9 ECU tenodesis

In the field of specialised cord injury rehabilitation for over 30 years, I have observed that when the level of the cord injury (last functioning normal segment) is below C7, there is already sufficient hand function to manage most activities that they want. I am yet to come across a patient with C8 level of injury with spared long flexors of the fingers (IC: OCu 8) asking for surgery to further function.

Conclusion:

With some application to detail, it is reasonably straightforward to make decisions about reconstructive hand surgery in tetraplegia. The Physiatrist with a special interest in spinal cord injury management is ideally suited to make these decisions and call on their Plastic or Hand surgery colleagues to help them with the surgical procedures. Since recovery and re-integration is not merely a function of intact anatomy, the Physiatrist's intimate knowledge of the person and his circumstances will go a long way in deciding on surgical suitability of the person and indeed what surgery will be appropriate.

Footnote:

All figures have been either taken from previously published sources or drawn by Dr Zachariah T Zachariah (my colleague at Aster Medcity, Kochi) from previously available sources. Credits for the figures are given alongside the figures or with signature within the diagrams.

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Cold call:

Rehabilitation in suspected COVID cases

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Case

A 32 year old patient with Hypoxic Ischemic Encephalopathy was transferred to Amrita from the PMR department at CMC Vellore. The patient had an alleged unsuccessful self-harm event that lead to the injury. She had a tracheostomy in situ due to associated respiratory insufficiency. She spent her first month in the ICU and once stabilized was transferred after a week in the ward. They were specifically referred for Hyperbaric Oxygen therapy, as this has been proven efficacious. The problem is currently Vellore is a COVID-19 hotspot.

Discussion

Before accepting transfer the head of the unit had to certify that the patient and party had been tested and were negative. The problem with that is it doesn't exclude contamination during the ambulance ride to Cochin. On arrival they were again tested. While a screening survey exists, this was bypassed seeing they came from a hotspot. The patient was promptly put into a quarantine ward, and the result came back negative two days later. With HIE as the primary diagnosis and the GCS 4T, it was decided that quarantine ward would be more appropriate than a room in the campus guesthouse. Though medically stable, patients like this are prone to autonomic storming. A second screening test was done a week after admission. They (patient and husband) were held up for eight more days in the ward as a measure of precaution.

The highest risk individuals in these settings are those with continued exposure to the patient and quarantined bystander for prolonged periods. My therapists fall into this category, along with the nurses and duty physicians. Interestingly there are no specific details concerning physical therapy from WHO etc. I also contacted AIIMS for guidelines, and the Ministry of Health. Contact was limited to just 10-15 minutes of Passive range of movement with chest therapy.

The therapist and I had to comply with our hospital's PPE dress code. That meant changing into scrubs, two layers of plastic footwear covers taped closed, a disposable gown, gloves taped to the gown cuffs, three layers of masks, a cap, and a second

pair of gloves to finish the set. The medical resident for the ward had the same with a full surgical hood, face shield and goggles. The concerned nurses had a similar outfit. I was told not to revisit the patient until a week of observation was over. Knowing how fast a little neglect can facilitate problems in this population, we implemented a plan to ensure all noxious stimuli (feces, urine, sputum, pressure, etc) were minimized. Despite the restrictions I ended up going into the ward thrice that week. The first time was to explain the treatment plan. The second time was to start neurostimulants and track progress. The third time was to inject botulinum for her bruxism. Being at risk during the procedure I had a hood and goggles. The ward had an exclusive ultrasound machine which facilitated getting into the correct spots.

Conclusion

Using prescribed PPE is enough for healthcare workers around inpatients suspected of having COVID 19 even when the patient is found to be negative but under quarantine. This reduces the risk of spreading the infection.

A NARRATIVE HISTORY OF PMR IN KERALA

EPISODE-2

Dr. S. Hariharan, Consultant Physiatrist, Trivandrum

(Episode 1 in the last issue of KJPMR concluded with the concept of CRRT Project (Comprehensive-Rehabilitation Research & Training Project) in a Medical College in Kerala)

CRRT Project

The Project was initiated at Trivandrum Govt. Medical College in 1967 at a time when "Rehabilitation Medicine" was yet to be conceived as a specialized discipline within the fold of medical practice and Medical education in the State of Kerala. The Medical College, Trivandrum was selected to be the recipient institution for this project research grant, after fully realizing that the example of an innovation with reference to medical care and education is to be tested most appropriately in one of the major treatment and training centers serving the state.

Background information:

Rehabilitation of the people with disabilities was a complex problem in all its aspects as far as Indian States were concerned. No definite data was available to know the exact magnitude of the population of the people with disabilities (PWDs)(at that time, instead of the terminology of PWDs, they were all simply called as handicapped or disabled persons).

Moreover, medical science, in its attempt to prolong the span of human life, was adding daily to the list of PWDs (disabled). Rough estimates indicated the existence of 10-15 million persons in India suffering from various disabilities.

Another interesting aspect was the abysmal ignorance of the people about the possibilities of rehabilitation. On the other side, the PWDs were also not aware of their hidden potentials and how to use them profitably. Instead, they were used to drift into the general trend of depending on others and /or to join the multitude of beggars, if belonging to very poor economic background.

The problems associated with the psycho- social and vocational aspects of the then PWDs were varied and many. A PWD in a family was viewed as a constant source of worry and continuous strain on the family funds. But "sympathy" towards the PWDs was abundant in our situations, yet it often used to stop mysteriously there in the mind.

Facilities for rehabilitation were appallingly inadequate. There were only very few who could advise and help the PWDs to achieve their goals. Kerala was conspicuous for the absence of rehabilitation services at the start of this project in Medical College, Trivandrum. Kerala's population in the year 1967 was around 250

lakhs and out of this roughly 8 lakhs were estimated to be disabled or handicapped in one way or the other. Even though there were 3 Medical Colleges in the State, none of them had tasted the principles of rehabilitation medicine at that time. This, therefore called for the introduction of the concepts of medical rehabilitation into our training for producing competent doctors to impart comprehensive rehabilitation care to our patients.

An Artificial Limb Center was already existing in Trivandrum Medical College from the year 1964 onwards under the control of a Mechanical Engineer and this new project envisaged upgradation of Prosthetics –Orthotic services also in a comprehensive way.

Trivandrum was (and is) the capital city of Kerala State. An initial survey in this city revealed 4651 persons with several disabilities out of a population of 3 lakhs (1967). The Trivandrum Medical College was one of the major Medical centers in South India and was the largest medical institution in Kerala State. It had a total of 1500 beds for all its treating departments including the then specialties.

The then Physiotherapy services

Before the starting of the CRRT project, there was a physiotherapy section attached to the Orthopaedic department of the Medical College Hospital. This author, when he was a third year medical student, had an accident during a NCC training session resulting in Haemarthrosis of one of the knee joints. Post aspiration of 250 ml of blood, I was referred to physiotherapy section by the then treating orthopaedic surgeon for undergoing short ware diathermy and exercises to the knee joint. The then only physiotherapist applied the SWD electrodes over my knee and went for attending to another patient. In two minutes of the application of the SWD to my knee, I had to scream with pain and jump out of the couch, throwing away the SWD electrodes because of severe burning pain. I did not know what had happened, but I got a harsh reprimand from the fat therapist because of my screaming and jumping out! I narrowly escaped from thermal burns. I never again went for physio there! This incident also had played a secondary role in my taking up the speciality of PMR as my vocation! And this also highlights the status of physiotherapy in those days.

Dreaming of Physical Medicine &Rehabilitation department

Plans for setting up of a full-scale Department of Physical Medicine and Rehabilitation was also under way when the CRRT Project was established in the college. That was the reason by which Dr. P. B. Muraleedhara Menon was deputed to USA for higher training in PMR in July 1964.

Commissioning of the CRRT Project

The CRRT Project was formally opened on 26thJune,1967 by the then Hon. Health Minister of Kerala, Mr. B Wellington, in the presence of

Mr.Joseph LaRocca and Mr.William Eschelmann, representing the United States Government. The Project was commissioned to run for five years from April 1967 to March 31, 1972. It was housed in a temporary shed located between the Medical College Post office and the Men's Hostel complex of the Medical College.

The objectives of the Project were:-

1. To develop practical methods for the total rehabilitation of persons with orthopaedic disabilities and neurological disorders.

2. To conduct a field research programme to collect adequate and pertinent data on the then existing social problems of the physically handicapped.

3. To develop teaching and training materials and techniques in the various rehabilitation disciplines such as Prosthetics - Orthotics and therapy services for the training of medical students, resident physicians, nurses and technicians and to seek ways of introducing rehabilitation concepts into the medical curriculam.

(…To be continued)

Attachment

(Front cover page of the Final Report of the CRRT Project within a Medical College.)

RECENT ACTIVITIES OF KERALA CHAPTER OF IAPMR

Kerala Chapter of Indian Association of Physical Medicine and Rehabilitation has been providing help to the needy in the COVID 2019 lock down period through Online Medical Consultation by Tele consultation, What's app video call and through online platform. In the online platform patients can take appointment using the link http://www.iapmrkeralachapter.org at their convenient time. We provide free consultations three days in a week (Tuesday, Thursday and Sunday) from 4 PM to 6 PM. Consultants have the choice of accepting and editing the appointments.

For providing online consultation, we select Physiatrists from all the 14 districts of Kerala. So patients have the freedom to choose doctors from their near areas. Some had the luck of consulting their own doctors, who had treated in the acute phase of their rehabilitation.

Online consultation

Patients throughout the State, neighboring states like Tamilnadu, Karnataka and also from Singapore and USA utilized the facility. All patients responded that it was a very helpful facility during the lock down period and all were satisfied with our doctors. Our doctors also enjoyed.

Online consultations were co-ordinated by Sri.Parameswaran (Mob:9447054905) and Sri. Krishnankutty (Mob:9447657484).

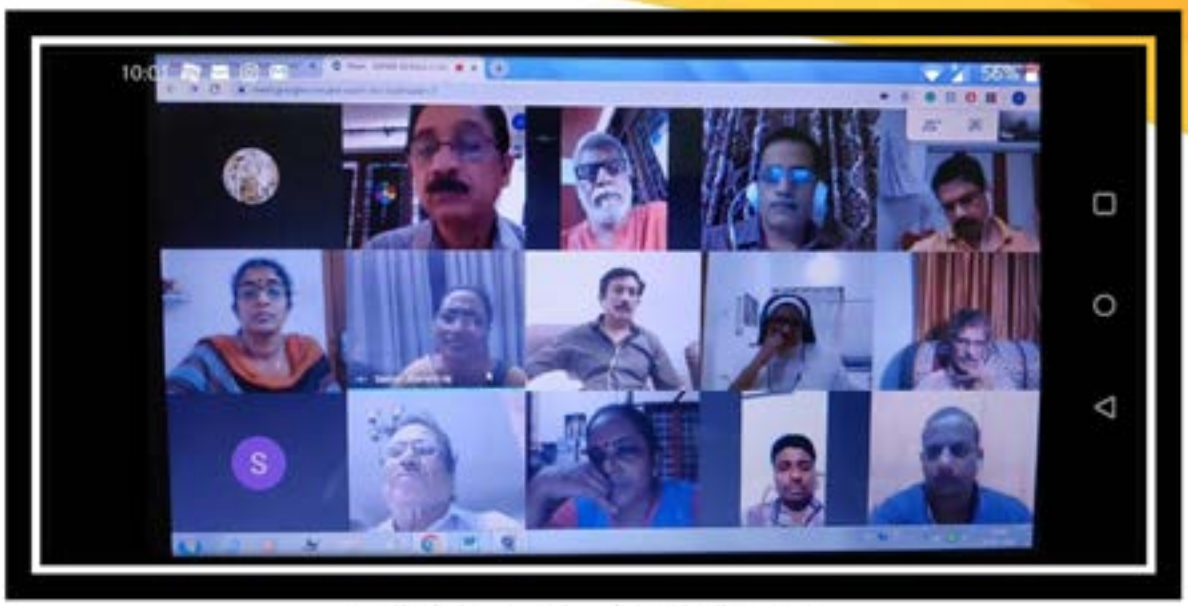
Publicized by Sri.Anil kumar

Online platform was provided and maintained by Sri.Krishnakumar CEO of Syncrayons, Technopark, Kazhakkuttam.

All are activists of CAPSULE Kerala.

Dr.U.Nandakumaran Nair helped a lot for the successful conduction of online consultation. He is the Chairman of CAPSULE Kerala.

Kerala Chapter of IAPMR expressing sincere thanks and gratitude to all the activists of CAPSULE Kerala and all Physiatrists involved in the consultation program. Without them it will not be possible for such a wonderful state wide program.



Executive meeting on Google Meet

Executive meeting was conducted on Google Meet on 24/05/2020 from 7.30PM to 9.30PM. 17 members including past presidents of our association participated in the meeting. This was the ever high attendance in the executive meeting, in the history of our association. All members took active

participation and discussed various relevant issues and reminded everyone to stay healthy in the COVID 19 Pandemic. Following decisions were taken in the meeting.

1. Conduct mid term CME 2020 as webinar.
2. 2021 Annual State Conference will be host by the Department of PM&R, Govt. Medical College, Kottayam.
3. Entrust Dr.Santhosh Babu to start You Tube channel for association.
4. Prepare and give a proposal to government regarding the Rehab issues in the post covid scenario.

Dr. Selvan P.

Secretary, Kerala Chapter of IAPMR

Members In Action

Dr. Sreekala

Bidding farewell on 30.4.20 at her office.

I have served as principal, Govt Medical college, Ernakulam from 1.7.2016 to 1.11.2019. Then I served as Special officer for new Medical colleges and retired on 30.4.2020.If you mean professional activities after 15.3.2020, I have worked as special officer for new medical colleges.

Dr Hariharan

First episode of the article "A narrative history of PMR in Kerala got published in KJPMR.. online edition.

Covid 19 incidence and subsequent lockdowns hindered the regular practice of Physiatry... not attending clinics and hospitals.

Home practice was also suspended.

After lockdown 3, slow restarting of clinical practice and attending hospitals from end of May, 2020.

Gave a webinar talk through Zoom on Rehabilitation perspectives in Covid 19 pandemic, to Physiatric club of Trivandrum, during mid May, 2020.

Attended a lot of webinars through Zoom, relating to Covid 19 and Rehabilitation (May-June 2020).

Gave a lot of tele-consultations and WhatsApp consultations to patients needing Physiatric services.

Receiving a memento from the DME on the same day in her office.

What have I done to Improve Spinal Cord Rehabilitation?

Dr. Ravi Sankaran, Associate Professor,
Dept. of Physical Medicine and Rehabilitation,
Amrita Institute of Medical Sciences .

"If you had, One shot, Or one opportunity, To seize everything you ever wanted, would you capture it, Or just let it slip?"- Eminem

PMR in a tertiary level corporate hospital can be tricky, and AIMS was already a decade old when PMR started. Services whose patients needed rehabilitation were used to directly calling a therapist. When patients asked them what PMR had to offer over a local PT, most were clueless. Unsatisfied with their answer patient's would go to Vellore or home with local therapy, ignoring bowel, bladder, spasticity etc. Naturally complications in care ensued and outcomes were suboptimal. Luckily the majority of spinal cord injury patients come through Neurosurgery. Once the operation is over surgeons have little to offer. When I joined there was no inpatient service, but the PG course started soon. Dr Surendran and George Sir managed the floor service. Dr Priyavadhana joined two years later, bringing her experience and enthusiasm. Medical Director ordered us to start a service on par with Vellore. And this is where the story begins.

In corporate healthcare where there is revenue, there is support. This comes from patients using services. The core rehabilitation services are relatively uniform throughout centres. The tricky part is no one will stay in a hospital campus for things they can get near their home.

Being marketable consists of a few steps which I'll expand on as I narrate.

-Do something new: Spasticity as we know is a big problem for these patients. To edify myself I went to AIIMS for a conference on surgical management of spasticity and met Dr. Takomi Taira. In 2014 I spent time training with him Tokyo Women's Medical College in Shinjiku. Being a surgeon his work was with Intrathecal Baclofen pumps, Selective Dorsal Rhizotomy, and Selective Peripheral Neurotomy. Having learned these procedures helped me selectively widen my lens of treatment options.

PMR by design isn't disease specific unlike other medical/surgical disciplines. As a result many of our colleagues see us as jack-of-all-trades, if at all they know we do more than 'Physio'. Having extra training allowed me to specialize, and this helped define my career

path. Medical Director assigned me the title of Senior specialist Neuro-rehabilitation then ordered me to start a dedicated neuro-rehab service. This differentiation helped referring services understand there was something more than just 'Physio' happening in PMR. Patients heard this as something more than 'Physio'.

From there our service rapidly scaled up to 30 patients at a time. Our residents who were previously not doing in-house night duty, gained this learning opportunity. With their labor we could ensure safety and quality of care. This is critical in corporate healthcare. A dedicated rehabilitation ward (Amrita Extended Medical Care Facility) was the final step to complete infrastructure. Until this time our patients were scattered across multiple wards, often exposed to very sick patients with bad infections. As we could justify it with numbers administration supported us.

-Convenience and Quality are critical: One of the problems our paraplegics faced was with orthotics. Until that point we outsourced our KAFOs. The orthotists would drop off the brace with the therapist and leave. As checkout by us wasn't happening there were problems. As PT had little understanding, care issues emerged. Despite internal opposition Surendran Sir managed to get the resources for us to make these on our own. As our own prosthetist was now making these, issues faded.

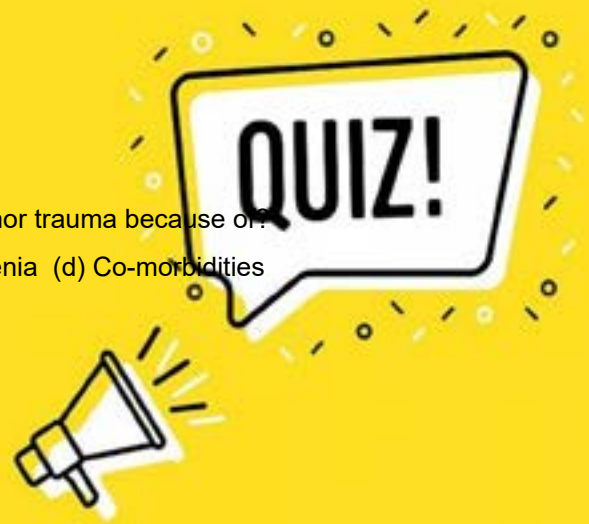
-Be unique: Our Arab patients always want faster, harder, and more intense therapy services. Our PTs have natural human limits. In order to placate both parties the next step was to invest in a robot for therapy. This started a year and a half ago. Now patients can have as much therapy as their body can handle.

-Giving back good experiences: Having run for so many years we had a day program for our old and current patients.

-How different is this from what I learned at Michigan State University PMR? On the rehab floor at Sparrow Hospital admission was always elective. As it wasn't life saving care, insurance companies would cover a maximum of two weeks of care, after which the patient was forcibly transferred to 'subacute rehabilitation'. This was basically a nursing home with therapy services. Every day was working against the clock trying to ensure the patient had some gains by discharge. Here in India, our patients stay as long as their financial situation allows.

-Meeting actual needs and felt needs/ a balancing act: A common problem is early on most patients didn't want wheelchairs, they want to walk. In the US we never set therapeutic walking as a goal for complete high paraplegics. They are trained exclusively in wheelchair mobility and often left the PMR ward in one. Knowing that most of our complete SCI patients will never go beyond this functional stage, I'm still unsure how I feel about this. Regardless in India we are meeting their felt needs with KAFOs and therapeutic walking, and this buys us time to teach skin, bowel, bladder, spasticity care.

-Team effort: For all the 'I's' you read here, we all know PMR is teamwork. When Dr Krishnan left us in 2016 for finer trappings, Dr Nittu joined us in late 2017. She's taken up the mantle of spinal cord rehabilitation, as I concentrate on developing brain rehabilitation. It takes the effort of many to produce a change, and opportunity comes in many guises. A lot of egos were bruised in the story you've read but even more patients got the care they deserve. After a while even the sensitive who got hurt came to appreciate these results. As long as your intentions are unselfish, things work out in the end.



Quiz

1. The elderly face a greater risk of SCI with relatively minor trauma because of?
   (a) Osteoporosis (b)Cervical spinal stenosis (c) Asthenia (d) Co-morbidities

2. Traumatic SCI most commonly causes _____ lesions
   (a) Lumbar (b) Thoracic (c) Sacral (d) Cervical

3. The most common lesion level in traumatic SCI is?
   (a) C4 (b) C3 (c) C6 (d) C5

4. _____ injuries are most likely to be neurologically complete?
   (a) Thoracic (b) Cervical (c) Lumbar (d) Sacral

5. The most common cause of death following SCI is ?
   (a) Respiratory disease (b) Heart disease (c) Septicemia (d) Cancer

6. The most common location of cancer in patients with SCI is?
   (a) Prostate (b) Colon (c) Pancreas (d) Lung

7. In ASIA D patients the leading cause of death is ?
   (a) Pneumonia (b) Septicemia (c) Heart disease (d) Cancer

8. In the first week post injury, maintaining the mean arterial pressure at approximately __ mm of Hg is associated with improved neurological outcomes?
   (a) 75 (b) 85 (c) 90 (d) 100

9. Prognosis for functional recovery of ambulation, ADL, & bowel & bladder function in Central Cord Syndrome is dependent on ...?
   (a) Neurological Level of Injury (b) Patient's age (c) Surgical fixation (d) Co-morbidities

10. The most common burst fracture in the Cervical spine occurs at ___ level?
    (a) C5 (b) C7 (c) C6 (d) C2

Book review-

'Pedorthic Footwear: Assessment And Treatment'

Dr. Ravi Sankaran, Associate Professor, Dept of PMR, Amrita Institute of Medical Sciences.

Books on prosthetics and orthotics are abundant, and time sadly is limited. Is this book worth the investment? It is not a good book. This is an excellent book. I am grateful to Dr Shehadad for procuring this for me in the first place. Being unable to come for the National conference prevented me from getting first-hand experience with Dr Postema, but books like this are hard to come by. So let's see why.

The other day a child with operated meningomyelocele came to my office with a medial calcaneal pressure sore as a first ever encounter. Neurosurgery referred her for footwear modification. She had been in orthotics for the past 7 years and gone through multiple sets. The newest revision led to the current problem. She had a medial T-strap which was making this worse. Like most of our patients, documentation of the exam and involved thought process was not available. Though I had ideas on what to do, I asked George Joseph Sir for guidance and got a complete plan. It took him less than 5 minutes to figure out the entire problem and suggest the best correction for the patient. I struggled to see all the angles his in-depth plan had covered so quickly. Once she left I clarified my questions with him. It made me realize I had to read again. T-straps and shank mechanics are things I don't see often. Needing to revise was not a new lesson for me, but I often got lost searching for answers or just ran out of time. Luckily now I had this book.

The corresponding chapter had ambulation goals based on level involved, expected

foot proportions, alignment, principal footwear designs and most importantly a clinical algorithm to design the AFO-Footwear combination considering shank kinematics. The shank kinematics was exactly what I needed to read. The diagrams made grasping the concepts easier. The other information helped me formulate a plan for her follow-up.

Dr Postema is the Editor along with three others. Postema authored seven of the thirty-seven chapters. In total there are fifty-four authors from seven different countries.

The authors' intention is to share knowledge of Pedorthic footwear, and to help patients benefit by enriching their healthcare workers knowledge base.

As always those hungry for knowledge are the target audience. This is an excellent resource for PGs and junior faculty/ consultants. Why? The way the book is broken up one can easily find the chapter relevant to needs of the patient sitting in front of them. The language is simple and slowly builds up on concepts from the prior chapters. The passages aren't too long. This is optimal for those whose smartphones are a continuous distraction.

There are seven sections in the book; Background knowledge, Exam/ Design aspects/ Work process models, Aspects of Pedorthic footwear, Aspects essential for patient satisfaction, Options when possibilities are limited, Foot problems in children, and lastly Foot problems in adults. The section on making your patients satisfied is something rarely seen in a book and is an excellent touch. For all the brain flexing and technical work involved in prescribing, if your patient isn't happy you won't be either. Anyone can benefit from this chapter.

What is good in this book?

As mentioned it is simple and straightforward. When I got my hands on this the weight struck me as a bit heavy, and I wondered how I would find time to read it. Once I started though half my Sunday was gone. The book pulled me in and kept me engaged for that time. The chapters are not very long, and most of the concepts are simple enough you won't struggle.

There is a relevant build up which focuses on individual patient needs. Each author gives specific advice on cases and variants.

We all sit at our teacher's feet to learn. At some point we need a place to reference information and Guru-ji Google isn't enough for expert level information. This book fits the bill.

Many books like this tend to have lengthy passages quoting the 'Evidence'. Their paragraphs may times contradict each other. This has none of that nonsense.

What is not so good?

I'm obsessed with the impact of posture on the musculoskeletal system. It is not touched on here. I'm aware it is just my own eccentricity, but this did distract me as I read the CP and sports chapters. This is not a big problem though.

Knowing this much about the book, if I lost my copy and Dr Postema offered me another copy I would tell him 'Just take my money'.

Things Patients Taught Me

Dr. Ravi Sankaran, Associate Professor,
Dept of PMR, Amrita Institute of Medical Sciences

I had my first encounter with a person having spinal cord injury during my second ICU rotation as a Medicine resident. Rounds with Dr Varghese had just ended, and I got called by the receptionist to see the newest 'gift' from the Emergency Room. I was expecting another medically unstable patient on the vent whose documents I'd peruse after ensuring the vitals were stable. It was a shock to see a perfectly conscious person in anatomical position watching TV. He related his history with a complete lack of expression. As a car mechanic he was frequently looking up on the underside of big vehicles for oil changes etc. Often he had to strain his neck holding a small flashlight in his mouth as he worked with his hands. Neck pain followed. Like many American blue collar workers, when pain comes and pills don't work they go to a chiropractor. He felt great after the first treatment and got seven more spine manipulation sessions. After the ninth he got into his car and realized he couldn't feel his legs. Attributing it to the subzero Michigan winter he went on to get his keys from his pocket, but found he was fumbling with such a simple task. That's when he realized he couldn't feel anything below his neck. Using his forehead he honked his car horn until the chiropractor came out and called an ambulance for him. Despite the clear association the latter was completely guilt free, in the eyes of the legal system. Why? The patient had signed an indemnity clause before treatment started. The MRI showed a ruptured C5-6 disc compressing the spinal cord and he went to emergency surgery soon after.

If you've read my prior entries you'll remember my IM residency had a group practice clinic. As we were being trained to be hospitalists, one half day per week was in the clinic. The next person with a spinal cord injury was in this setting. He was in his early 30's and had been quadriplegic for 25 years. As a child 'B' jumped off a diving board head first into a swimming pool that was being emptied. Surgery followed and he never regained control over his limbs or sphincters. B came to our clinic looking for medications for his severe neuropathic pain. At the outset my Medical Assistant (MA)saw all sorts of red flags. Both his parents had died, and his sole caregiver was a tacit uncle, J, who had really bad dental hygiene. B's story was just sad to hear. He begged me for medications so he 'could just lie in bed in peace'. Luckily my attending, Dr Sumer, knew how to diagnose and manage pain. Ruling out all the causes for pain in this population, she offered him Pregabalin which he promptly said was useless for him. The only drug that would let him live was Hydrocodone (a narcotic known commonly

as Vicodin) a commonly abused prescription drug.

This was our typical narcotic-seeking patient, except none of my prior ones had quadriplegia. I advocated for B and Dr Sumer let me win, that round. I got a big smile and thanks from B also. The next time he returned was a week too early, because he ran out of pain pills. He had none of the stigmata of narcotic users though, and something seemed off about his story. Diane my MA got really upset and started shouting at me about J (the uncle). Being naïve I had not associated his mouth full of misshapen caries teeth as drug abuse stigmata. I had no idea what crystal meth was, nor 'meth mouth'. This was why J rarely spoke. Anyone with a bit of street smarts would easily put two and two together. Simply put B never had pain but was procuring drugs for J, using his condition as an excuse. It turned out he was actually visiting multiple physicians in the area at the same time looking for narcotics. Diane told Dr Sumer all about this and he promptly got referred to our local Physiatrist. Outside of the Waddell's signs to detect malingering in pain, a detailed history can expose red flags.

About a year later I got transferred into a PMR residency at Lansing. Though we worked out of 3 different hospitals, our Acute Inpatient Rehabilitation service was in Sparrow hospital, and out-patient pain was in the Ingham/ McLaren Orthopedic hospital.

We learn all sorts of interesting things in medical school that evade recall until it affects someone. One of my consults was for a chronic smoker with such bad PVOD he eventually got a below knee amputation. We were consulted because he couldn't move either of his lower limbs the day after surgery. The only clue was he had an episode of hypotension on the table. It turned out he had an infarction in the Artery of Adamkiewicz. The second time I saw this was with a factory worker who came back from work one day and completely lost power in his legs after opening the front door. Being unmarried and middle aged, his only company was his small dog. Being overweight he couldn't pull his weight into his house to make a phone call for help. He laid on the threshold for about 36 hours while his dog frantically tried to help. After keeping him warm in the 4°C night, the dog ran 100 meters over to the neighbor's house and made them come to help. They of course got the ambulance and the rest of the story was rehabilitation.

I'd like to end on a happy note. Our PMR pain clinic was run by Dr Prokop. His nurse/ office manager Ms. GM had been with him for 30+ years, and he swore no one else was good as her. The catch is she had paraplegia. Sleeping in the desert one night someone ran over her with an 'illegal vehicle' made in their garage. That being the case she got no legal compensation. Luckily she already had a nursing degree. The famous Physiatrist Rene Calliet oversaw her rehabilitation. She went on to meet Dr Prokop and has been working with him since. The wheelchair hasn't prevented her from making sure Dr Prokop went to the right room with enough details to get his work done, take blood and vitals, and make residents prepare the patient rooms every morning. Like any good manager she has an eye on everything. Despite having a complete T10 lesion she lives alone in her own house, had a hydraulic jack in her van so she can enter and drive it to work. She had pet dogs and cats, and has even gone on dates with differently-abled men. Where there is a will there is a way.

'Take A Hard Look At The Mirror'

Dr. Ravi Sankaran, Associate Professor,
Dept of PMR, Amrita Institute of Medical Sciences

KJMPMR recently conducted a spinal cord injury care survey. Luckily we had a good compliance rate (73% participation) so the following information should be representative of what is actually happening in our state. I've summarized the results in the following paragraphs.

With respect to care aspects and Physiatrists in Kerala:

- 93% see at least one patient with a SCI in a year

- 26% do acute care

- 93% do subacute/ chronic care

-only 37% have access to 24 hour care for their patients

Regarding metrics used in care:

- 96% use ASIA

- 86% use FIM

- 43% use ICF

Regarding available servicesand accessibility:

- 12% felt patient care was optimal for this population

- 82% know where to send a patient if surgery is needed

- 7% felt wheelchair access through the state was optimal

- 53% know where to send a patient if they need an Intrathecal Baclofen pump

Summary

As only a few of our Physiatrists are in the tertiary sector,it is not a surprise that we aren't included in acute SCI care. This absenteeism contributes to our colleagues lack of knowledge of our role in healthcare. Interestingly, the majority of us have graduated from colleges in Kerala, where we train care for acute SCI. For those lacking access to around the clock care, these can serve as referral centres. The 37% who have access to 24 hour care, do so in the medical colleges and some PMR staffed corporate hospitals. In the majority of institutions, usually we come into play only after all the lifesaving and follow up management is done, which may take weeks or months. As we miss the first window of opportunity, helping patients regain function can be more challenging.

Metrics form an important part of care. The chronically ill will frequently 'doctor shop'. In this population this often includes many non-allopathy or sham options. Without tracking change it is hard to say what really works. Almost all our participants use ASIA and a few less use FIM. While these are great measures in this population neither directly addresses participation, or environmental factors. Naturally anyone planning for a wheelchair needs to know number of steps to enter the house, where the bathroom is etc. The normal PMR history does bring these issues into the light. Where it fails is to allow this information to be standardized so the concerned professionals can use it to improve the Quality of Life. ICF brings this to the treatment plan along with personal factors.

There is a general agreement that care is suboptimal for these patients and wheelchair access is abysmally poor. The majority know where to send a patient for surgery, but little over half on where to send patient if they want a Baclofen pump. Currently MIMS Calicut, Aster Medicity and Amrita Institute of Medical Sciences in Cochin do these. The last two mentioned are through the PMR departments. As recovery after one year is not common, developing vocational training centres is one of the best ways to give a person a sense of self worth. Any Physiatrist interested in making name for themselves could start here.

Quiz Answers

Quiz - KEY

1. (b) Motor vehicle accidents are the leading cause of traumatic SCI until age 45, when falls become the leading cause. Falls are more frequently from low heights, resulting in a cervical lesion. There is an increased frequency of cervical spinal canal stenosis, placing the elderly population at a greater risk of SCI with relatively minor trauma.
2. (d) Cervical lesions account for nearly 50% of traumatic SCI, followed by thoracic & lumbosacral lesions
3. (d) The most common lesion level is C5, followed by C4,C6 & T12
4. (a) Neurologically complete injuries are more likely to occur as a result of acts of violence, & among younger age groups. Thoracic injuries are most likely to be neurologically complete & most lower level lesions are incomplete injuries. Cervical injuries are most commonly classified as either ASIA Impairment Scale(AIS) A or D.
5. (a) Respiratory diseases are the leading cause of death following SCI, with pneumonia being the most common. Pneumonia is by far the leading cause of death for persons with tetraplegia, while heart disease, septicaemia, & suicide are more common among persons with paraplegia. The suicide rate is highest in younger patients & in persons with paraplegia.
6. (d) Lung is the most common location of cancer following traumatic SCI, followed by the bladder, prostate, & colon/rectum.
7. (c) Among persons with incomplete motor-functional (ASIA D) injuries at any neurologic level, heart disease ranks as the leading cause of death, followed by pneumonia. Heart disease is the primary cause of death in persons injured for more than 30 years & in patients over 60.
8. (b) Neurogenic shock, as a part of the spinal shock syndrome, is a direct result of a reduction in sympathetic activity below the level of injury, consists of hypotension, bradycardia, & hypothermia, & is common in the acute post injury period. Parasympathetic activity predominates, especially in persons with injuries at or above T6 level. Treatment of hypotension involves fluid resuscitation(usually 1 to 2 Litres) to produce adequate urine output of greater than 30cc/hour. In neurogenic shock, further fluid administration must proceed cautiously, as the patient is at risk for neurogenic pulmonary edema, & vasopressors are utilized. Maintenance of mean arterial pressure at approximately 85 mm of Hg during the first week post injury has been associated with improved neurological outcomes.
9. (b) Central cord syndrome generally has a favourable prognosis for functional recovery. Recovery occurs earliest & to the greatest extent in the lower extremities, followed by bowel & bladder function, proximal upper extremities, & then distal hand function. Prognosis for functional recovery of ambulation, ADL, & bowel & bladder function is dependent upon the patient's age (< or > 50 years of age), with less optimistic prognosis in older patients(>50 years) relative to younger patients.
10. (a) The most common burst fracture in the Cervical spine occurs at the C5 level. The most common thoracic spinal injury involves fracture of the T12 vertebra. A Chance fracture involves a horizontal splitting of the vertebra extending from the posterior to anterior through the spinous process, pedicles, & vertebral body. Despite the extent of vertebral damage, these fractures tend to be stable. They most commonly occur at the thoracolumbar spine(T12, L1 or L2). In Lumbar spine ,L1 burst fractures are most common.

KJPMR WANTS YOU