IAPMR

MID TERM CME 2019

Annual National Midterm CME of
Indian Association of Physical Medicine and Rehabilitation

21st - 22nd September 2019

Pre conference Workshop : 20th September 2019

Souvenir

Organised by

Department of Physical Medicine & Rehabilitation

All India Institute of Medical Sciences, Rishikesh, Uttarakhand

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All India Institute of Medical Sciences, Rishikesh, Uttarakhand

Prof. (Dr.) Ravi Kant
Patron
Director & CEO
AIIMS Rishikesh - 249203

11 September, 2019

MESSAGE

It is a pleasure to welcome you for Annual National Midterm CME 2019 of Indian Association of Physical Medicine and Rehabilitation to be held at All India Institute of Medical Sciences Rishikesh.

Our vision is to create an excellent academic and educational milieu for providing a platform for development of quality medical services with compassion and empathy. Our mission is to achieve an epitome of quality in medical education, training and research which can render International standard of quality patient care.

Theme of CME 'Trauma Rehabilitation: Search for best practices' aims to enhance and restore functional ability and quality of life of patients with physical impairments or disabilities developed due to trauma.

I am sure this CME will provide an excellent opportunity for all participants to interact and update their knowledge with latest advances in field of Trauma Rehabilitation.

I extend a warm welcome to all delegates and faculty from all over India and wish CME all success.

Ravi Kant

PROF RAVI KANT
Director & CEO
AIIMS Rishikesh

Dr R K Srivastava
Former DGHS, MOHFW
Government of India
Guest of Honor

11 September, 2019

MESSAGE

I am very glad to know that the Department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences Rishikesh is hosting the Annual National Midterm CME of Indian Association of Physical Medicine and Rehabilitation (IAPMR) from 20th to 22nd of September 2019.

As everyone is aware, Physical Medicine and Rehabilitation, aims to treat chronic ailment with physical modalities/aids and appliances and enhance and restore functional ability and quality of life to those with physical impairments or disabilities affecting the brain, spinal cord, nerves, bones, joints, ligaments, muscles, and tendons.

The theme of the CME is "Trauma Rehabilitation", addressing the emergency room management, surgical management, medical management, cardiopulmonary rehabilitation, neuro rehabilitation, robotics, prosthetic and orthotics intervention, musculoskeletal rehabilitation, pain management and cognitive rehabilitation.

I am sure that this CME will contribute to optimize the outcomes and quality of life in post trauma patients.

It is also the need of hour for all PMR services should be covered under Ayushman Bharat-PMJAY, so that all these patients can receive cashless hospitalized care like others covered under the scheme- the largest flagship insurance scheme for achieving goal 3 of universal health coverage.

I wish the organizing committee of the CME all the success in this endeavour.

(DR. R K SRIVASTAVA)

डॉ. बी.डी. अथणी
Dr. B.D. Athani
M.S.(Ortho.), DNB
Principal Consultant

सत्यमेव जयते

भारत सरकार
स्वास्थ्य सेवा महानिदेशालय
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नई दिल्ली -110 108
Government of India
Directorate General of Health Services
439-A, A-Wing, Nirman Bhawan,
New Delhi- 110108

दिनांक/Dated.....

MESSAGE

I congratulate the Department of Physical Medicine & Rehabilitation of All India Institute of Medical Sciences, Rishikesh for organizing the Annual National Midterm CME of Indian Association of Physical Medicine and Rehabilitation from 20th to 22nd September, 2019.

The exchange of new information as well as the discussion of evidence generated by research studies is crucial for the advancement of the field, the health of the patients and the development of healthcare system. Such Conferences also provide an opportunity to learn from each-other's experiences.

I am confident that this National Midterm CME with theme ***'Trauma Rehabilitation: A search for best practices'*** will increase the knowledge and competence of your Physiatrists and enable them to meet the challenges and deliver quality care to trauma patients.

I wish the National Midterm CME a grand success.

New Delhi
September 16, 2019

(Dr. B.D. Athani)

Tele: 011-23061467 Fax: 011-23062815, email: bd.athani56@nic.in

Prof. (Dr.) Manoj Kumar Gupta
Co-Patron
Dean Academics
AIIMS Rishikesh - 249203

11 September, 2019

MESSAGE

I am happy to know that Annual National Midterm CME of the Indian Association of Physical Medicine and Rehabilitation is being held at our Institute from 20th to 22nd of September, 2019.

At AIIMS Rishikesh, we aim to enhance the reputation of our country by relevant research in medical field, creating clinical excellence and social awareness in young doctors and giving bright minds of country to participate in path breaking research and giving new dimensions to medical science.

The theme of the CME 'Trauma Rehabilitation: Search for best practices' focuses on addressing a trauma patient from subacute stage itself for limiting the disability. It will certainly contribute to develop key strategy for enhancing health, functional capacity and quality of life of a trauma patient.

Hope that this CME will bring together knowledge, experience and evidence based medicine in a manner that will promote rehabilitation practices and research in the field of Trauma management.

I congratulate Prof. (Dr.) Rajalakshmi H Iyer and Dr Raj Kumar Yadav for taking the responsibility of hosting this conference and I have no doubt it would be a great success.

(DR. MANOJ KUMAR GUPTA)

Prof. (Dr.) Brahm Prakash
Co-Patron
Medical Superintendent
AIIMS Rishikesh - 249203

11 September, 2019

MESSAGE

On behalf of the All India Institute of Medical Sciences Rishikesh, I am pleased to know that the Department of Physical Medicine and Rehabilitation is Organizing the Annual National Midterm CME of Indian Association of Physical Medicine and Rehabilitation from the 20th to 22nd September 2019 with a preconference workshops on '3D Motion Analysis' and 'Simulation based emergency management in Trauma Rehabilitation' followed by the CME themed on 'Trauma Rehabilitation: Search for best practices'.

The Department of PMR has been a key catalyst to AIIMS Rishikesh in the Physiatrist supervised rehabilitation program with the amalgam of technologies like robotics, virtual reality, advanced prosthetic and orthotics, 3D printing and 3D motion analysis. The department will soon expand the rehabilitation program in other domains by initiating regenerative medicine with involvement of latest technology like Ultrasound and fluoroscopy guided interventions.

I am confident that by the active participation of delegates from all over of India, this CME will help in broadening the present understanding and knowledge of Trauma Rehabilitation.

I wish all the success.

(DR. BRAHM PRAKASH)

Dr. Sanjay Wadhwa
PRESIDENT
Indian Association of Physical Medicine and Rehabilitation
Professor, Dept. of Physical Medicine & Rehabilitation,
AIIMS, New Delhi - 110029
E-mail: iapmrpresident@gmail.com
wadhwadr@gmail.com

11 September, 2019

MESSAGE

I am very glad to know that the Department of Physical Medicine and Rehabilitation at the very prestigious All India Institute of Medical Sciences, Rishikesh is organizing Mid-Term CME Programme on behalf of the Indian Association of Physical Medicine and Rehabilitation (IAPMR) during 20 - 22 September, 2019.

This 3-day academic event provides a varied and rich feast of scientific knowledge. It begins with two Workshops on 20 September, 2019 – one on Simulation Based Workshop on Emergency Management in Trauma Rehabilitation, and another on 3D Motion Analysis. These will be followed by Continuing Medical Education Programme on 21 and 22 September, 2019. A number of important topics will be covered by the experienced Faculty during this period.

I have no doubt that the scientific presentations, deliberations, and demonstrations during this Mid-Term CME Programme will be very useful to all the participants.

I thank the Director & CEO of AIIMS, Rishikesh, Professor Ravi Kant Sir under whose Patronage this academic event is being organised, for his very valuable guidance, support and blessings. I also thank the entire Organizing Team for working hard during the past few months to organize this CME Programme.

I am sure all the participants will have very pleasant experience and feel very blessed, inspired and rejuvenated by their visit to *Dev Bhumi*, Rishikesh.

I look forward to being there in person and wish this CME Programme great success.

Prof. (Dr.) Rajalakshmi H Iyer
Professor, PMR
AIIMS Rishikesh - 249203
Organizing Chairperson

11 September, 2019

MESSAGE

I am happy to welcome all my fellow-Physiatrists and the soon-to-be-Physiatrists, to Rishikesh and to the Dept of PMR at AIIMS Rishikesh.

The Dept itself is very young, but has the support of one of the most well-equipped medical college hospitals in the country. My colleagues and I hope that all of you will enjoy the experience of the following three days.

To the PMR Residents, I would like to say that Rehabilitation Medicine is arguably the most versatile of specialties. In addition to our core competencies, it is possible to work with almost any other specialty through our expertise in Rehabilitation, from Surgery to acute care Medicine to Trauma to Internal Medicine, Cardiology, Pulmonology to Sports Medicine and Kinesiology, and all the way from Pediatrics to Geriatrics!

In a team, we get to learn from our colleagues from other specialties, but we also give back immeasurably to the team, and add tangible and intangible value to patient outcomes.

To the young Physiatrists, I say that It is time we found the courage and will to travel to new frontiers in Medicine, with enthusiasm and confidence. It is time you broke the mold and ventured into areas where no Physiatrist has gone before.

May noble and auspicious thoughts come to us from every side!

(DR. RAJALAKSHMI H IYER)

Dr Raj Kumar Yadav
Assistant Professor, PMR
AIIMS Rishikesh - 249203
Organizing Secretary

11 September, 2019

MESSAGE

Dear Delegates,

Department of Physical Medicine and Rehabilitation at All India Institute of Medical Sciences Rishikesh is privileged to organize the Annual National Midterm CME 2019 of Indian Association of Physical Medicine and Rehabilitation at the Spiritual city of India and it is a huge honour for me, on behalf of the Department to invite you all for attending this IAPMR Midterm CME.

The aim of CME is to bring all the Physiatrists and Medical professionals across the nation and the globe on this platform of innovation and academic feast of lectures and workshops. The program will include two parallel Workshops on Simulation based Emergency management in Trauma Rehabilitation and 3D Motion analysis on 20th September followed by the CME on 'Trauma Rehabilitation: Search for best practices' on 21st and 22nd September.

I am confident that with the help of participation and contribution from Physiatrists all over the Nation, this CME will be an unforgettable, fruitful and memorable experience. I am hoping this CME will also help our speciality to expand its expertise.

I am looking forward to welcome you all in the Yoga Capital of India.

(DR. RAJ KUMAR YADAV)

Speakers Abstracts

Initial management of Trauma Victim from Scene to Emergency Department

Md Quamar Azam, Professor, Head of Trauma Center

Every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. Road traffic crashes cost most countries 3% of their gross domestic product.

Trauma is time-sensitive, where delay in definitive care of a few minutes may mean the difference between life or death. Golden hour emphasizes the importance of providing definitive care to trauma patients as quickly as possible. It represents the first peak in the trimodal distribution of trauma mortality in which majority of trauma deaths occur within the first hour after the accident.

Judicious triage at scene therefore gains immense significance in reducing mortality of victims. It requires training of paramedical and rescue team. Another important step is activation of trauma system and quick transport of victims to appropriate place. In developed nations where robust system is in place like USA, Germany and Canada the hot topic is "Scoop and Run" which means shifting the patient to nearest trauma center without giving any primary care at scene. This is possible because they have significantly reduced transport time to average 7 to 9 min. The main argumentation in favor of the "scoop and run" concept in the US is based on the high occurrence of penetration injuries of thorax and abdomen caused by shooting or knife stabbing. On the other hand we practice the concept of Stay and play as practiced by Europian system wherin airway, hemorrhage pneumothorax and chest tube is inserted on the scene or advanced cardiac ambulance. Unfortunately developing nation has largely failed in delivering it.

Deaths occurring at scene or within 1 hour of arrival to the hospital account for 53% of death and are generally a consequence of severe and likely nonsurvivable injuries. Second peak of deaths occur in the first 24 hours. Twenty percent of death happen late after few days and often due to multiorgan failure or shock. An appropriate and timely care has dramatically reduced death of second and third peak.

Several studies have found that brain injury accounted for a majority of deaths, at 50%. Heart or aortic injury (17%), hemorrhage (12%), sepsis (10%), lung injury (6%), burn (3%), and liver injury (2%) accounted for the remainder.

After patients reach hospital second triage is done by nurses and junior doctors and patients are categorized as first priority (red zone), second priority (yellow zone) or third priority (green zone). Strict ATLS principle is adhered to in managing these patients. This include Airway management, breathing and circulation. Shock is managed with restricted fluid now along with early transfusion of blood and blood products. The protocol is consistent with the fact that every 3 minutes delay increases mortality by 1 percent. All patients receive conventional imaging which involve lateral C-spine, supine Chest X-ray, anteroposterior view of pelvis and e-FAST (focused assessment sonography for trauma) Select serious but hemodynamically stable polytrauma patients in our center undergo multi detector whole body CT scan yet. Due to less specificity and high time consuming of conventional imaging protocol whole body CT scan is being increasingly used with proven value. As CT scan is available in the Trauma centre, we would judiciously utilize this facility to benefit our patients. After hemodynamic stability is achieved and imaging is completed and definitive planning is done. Third triage is then done by senior surgeons involved as to which patient need urgent surgery and accordingly shifted to OT.

Recently huge emphasis is laid down by different government to save life of trauma victims. Challenges are galore but small steps is likely to bring significant cahne in the following years. We believe and propose principles of, WHO laid down in 2017.*Save LIVES: a road safety technical package* focuses on **S**peed management, **L**eadership, **I**nfrastructure design and improvement, **V**ehicle safety standards, **E**nforcement of traffic laws and post-crash Survival.

Principles of Surgical management of traumatic brain injuries

Dr Rajnish Kumar Arora,
Assoc. Prof. & Head, Neurosurgery,
AIIMS Rishikesh

Traumatic brain injury (TBI) is a significant cause of morbidity and mortality throughout the world. Globally, the incidence of TBI is increasing, driven by the proliferation of automobile use worldwide. Significant extra cranial trauma is associated with TBI in more than half of cases. In these polytrauma patients, the severity of brain injury is the strongest predictor of outcome, and patients with head injury have a threefold higher mortality rate. Numerous studies have shown that elevated ICP, even in small transient doses, is independently associated with mortality and poor outcome. Rapid evacuation of large extra-axial traumatic mass lesions in patients with declining neurological function or evidence of brainstem dysfunction is associated with improved mortality, and there are benefits of surgical management of intra parenchymal lesions. Though there are few controversies about utility of decompressive craniotomy, surgical management of TBI including ICP monitoring has a significant role in management of these patients. Given the complexity of TBI and the risks for devastating neurological sequelae, immediate access to centres with specialized medical expertise and resources is critical for a favourable outcome.

Trauma Imaging: TBI and SCI

Dr Srikumar V
Assistant Professor, Dept of PMR, AIIMS, New Delhi – 110029.

After stabilizing the trauma patient, imaging plays a crucial role in the diagnosis and management of poly-trauma patients. Depending on a quick preliminary clinical examination, relevant imaging studies are indicated to rule out injury to the brain and spine. Further, the extent and severity of the lesion is to be ascertained which guides management. The science of imaging has grown leaps and bounds in past few decades changing the scene from a basic radiography to advanced functional imaging studies. At a trauma centre, where time and resources are always at want, the decision to use appropriate imaging is based on the clinical condition, availability, speed, radiation exposure and compatibility. In a child with suspected cervical spine injury, a radiography would suffice. In an adult with suspected brain injury CT is preferred to MRI and if associated vascular injury is suspected, then a CT Angiography is indicated. However, if the patient is presenting to the centre with an old history of head injury and deteriorating neurologically, MRI would be preferred. MDCT has revolutionised spine imaging. In an adult poly trauma patient who has undergone chest and abdomen MDCT, a separate spine CT is not required. To save time, images can be reformatted with software to detect spinal injury in such a scenario. However, in an elderly patient with suspected cervical spinal cord injury, MRI is preferred to MDCT. In a person with normal MDCT but persisting neck pain and spine tenderness, MRI is required to rule out spinal ligament injuries and resulting instability if any. Thus, the right and judicious choice of imaging remains crucial and in this brief presentation, an overview of the same is dealt with.

Endocrine And Autonomic Changes Following Trauma :

Dr Koustubh Chakraborty,
Consultant, Peerless Hospitex Hospital & Research Center Kolkata

The Cranium houses the Pituitary Gland, aptly described as the "Bandmaster" of the Endocrine System, as well as its mentor, the Hypothalamus, with which, the brain controls the hormonal milieu. Thus any injury to the aforesaid regions is apprehended to result in an Endocrine dyssynchrony, and indeed, such a scenario of Hypothalamo-pituitary disorder is commonly found after Traumatic Brain Injury (TBI).

The injury to the above structures may result from :

(i). Direct Trauma
(ii). Haemorrhage
(iii). Ischaemia

including disruption of the Hypophyseal Portal Vascular system, Oedema or Increased Intracranial Pressure.

The risk-factors include –
(i). Severity of the injury (not universally agreed upon, some say 100% of patients with Acute TBI, *regardless of injury severity*, will have Acute Anterior Pituitary Dysfunction).
(ii). Diffuse Axonal Injury
(iii). Basal Skull Fracture
(iv). Injuries to the Orbito-Frontal Complex (from where prominent axonal connections to the Hypothalamus exist(even without overt damage to the Hypothalamus or Pituitary).

D[! b5	**HORMONE :**	**MANIFESTATION IN ACUTE TBI :**
Anterior Pituitary	Growth Hormone (GH)	Short stature in children Decrease of Muscle Mass, Aerobic Capacity, Energy Levels and Cognitive Performance in adults.
	Gonadotrophins	Sexual Dysfunction, Amenorrhoea, Hypogonadism Testosterone is elevated in Women and Prolactin in Men after severe TBI
	Adrenocorticotrophic Hormone (ACTH)	Adrenal Crisis ⑧ Hyponatremia, Hypotension, Myopathy, Hypoglycemia (life-threatening)
	Thyroid Stimulating Hormone (TSH)	Weight gain, Hair & Skin changes
	Prolactin	[illegible] ⑧ disruption of the ovulatory cycle, Amenorrhea & Infertility in females and Impotence in males, Inappropriate lactation (Galactorrhoea).
[illegible] Pituitary	Anti-Diuretic Hormone (ADH)	Diabetes Insipidus ⑧ Hypernatremia, Hypovolemia (both potentially life-threatening). SIADH ⑧ Excessive Natriuresis & Hyponatremia.
	Oxytocin	Deficiency ⑧ decrease in Empathy, Social & Romantic Bonding with an increase in aggression and feelings of insecurity and depression.

Immobilization Hypercalcemia

Immobilization is an inevitable consequence of Polytrauma, including Spinal Cord Injury. Apart from increasing the risks of Pressure Ulcers, Deep Venous Thrombosis and Atelectasis, loss of bone minerals leading to Hypercalcemia and Calciuria (leading to Nephrolithiasis) may be seen.

More at risk are Patients with –

- multiple fractures,
- younger age (<21 years) due to their higher rate of bone turnover,
- male gender,
- high level lesion,
- complete neurologic injury,
- prolonged immobilization, and
- dehydration.

This Hypercalcemia causes a secondary decrease in PTH levels, besides causing symptoms of abdominal pain, nausea, vomiting, malaise, polyuria, polydipsia and dehydration (which in turn potentiates the condition).

Autonomic Disturbances –

Nomenclature :

2nd Century CE : The Greek physician Galen opined that nerves were hollow tubes distributing

"animal spirits" in the body, thereby fostering concerted action, or "sympathy," of the organs.

Autonomic Disturbances, including abnormal cardiovascular control, are common consequences of Spinal Cord Injury, and sometimes, Traumatic Brain Injury, which may prove to be life-threatening.

The commonly occurring disorders are :

5 ीकार ंरा	Definition :
Neurogenic Shock	Failure of sympathetic nervous system resulting in loss of vascular tone in part of body deprived from autonomic control. Operational definition: SBP <90 mmHg in supine posture not result of low intravascular volume (blood loss, dehydration).
Bradycardia	Deviations from normal HR. Operational definition: Decrease in HR to <60 bpm. Severity: Mild ® no symptoms, SPB >90 mmHg; Moderate ® requires intervention to increase HR or maintain adequate BP; Severe® asystole.
Orthostatic Hypotension	Operational definition: Sustained decrease in BP >20 mmHg systolic or >10 mmHg diastolic occurring within 3 min when individual moves from supine to upright posture. Severity: Symptomatic (dizziness, headache, fatigue) or asymptomatic.
Autonomic Dysreflexia (AD)	Operational definition: Constellation of signs/symptoms in SCI above T6 in response to noxious or nonnoxious stimuli below injury level, including increase in BP >20 mmHg above baseline, and may include one or more of following: headache, flushing and sweating above lesion level, vasoconstriction below lesion level, or dysrhythmias. May or may not be symptomatic and can occur at any time following SCI. Severity: Mild/partial ® BP increase <40 mmHg; Moderate ® SBP rise >40 mmHg, but SBP <180 mmHg; Severe ® SBP >180 mmHg. Associated symptoms: piloerection, stuffy nose.
Sweating Disturbances – Hyperhidrosis Hypohidrosis	 Nonphysiological sweating over portion of body in response to noxious/nonnoxious stimuli, positioning, etc. Lack of sweating in denervated areas in response to rise in temperature.
Temperature Dysregulation	Poikilothermic behavior. Elevation or decrease of body temperature without signs of infection. May result from exposure to environmental temperature change. At room temperature, the body temperature may stay slightly below normal.
Paroxysmal Autonomic Instability With Dystonia (PAID) Syndrome	A complication of severe TBI, regardless of etiology, is a syndrome of marked agitation, diaphoresis, hyperthermia, hypertension, tachycardia, and tachypnea accompanied by *Hypertonia* and *Extensor Posturing*. Usually episodic, it first appears in the intensive care setting but may persist into the rehabilitation phase for weeks to months after injury in

Cardiopulmonary monitoring and ventilator care after trauma

Dr Nidhi Rawat
Assistant Professor
Department of PMR, St. Johns Medical College Hospital
Bengaluru, Karnataka, India

According to the Global Burden of Disease Study (GBD 2017), road injuries formed the fifth leading cause of early mortality in 2016. Management of brain or spinal cord injury immediately after the injury is targeted at optimizing cerebral perfusion, oxygenation and avoiding secondary insults. Secondary injuries may be due to intracranial hypertension, systemic hypotension, hypoxia, hyperpyrexia, hypocapnia and hypoglycaemia.

Indication for admission to an intensive care unit following trauma includes:

- Impaired level of consciousness
- Impaired airway protection or the need for mechanical ventilation
- Seizures
- Raised ICP
- General medical complications (hyper/hypotension, fluid and electrolyte disturbances, aspiration pneumonia, sepsis, cardiac arrhythmias, pulmonary embolism)
- Specific treatments (neurosurgical intervention, thrombolysis)

General monitoring

During neurointensive care of patients following trauma, general parameters that are regularly monitored include electrocardiography (ECG monitoring), arterial oxygen saturation (pulse oximetry,), capnography (end tidal CO_2, $PetCO_2$), blood pressure, central venous pressure (CVP), temperature, urine output, arterial blood gases, serum electrolytes and osmolality. Invasive or non-invasive cardiac output monitoring may be required in hemodynamically unstable patients who do not respond to fluid resuscitation and vasopressors.

Hemodynamic instability is common in patients after trauma. According to brain trauma foundation (2016) guidelines, hypotension is defined as SBP < 110 mm Hg. Hypotension is significantly associated with increased mortality following trauma.

Appropriately aggressive fluid administration to achieve adequate intravascular volume is the first step in resuscitating a patient with hypotension. Isotonic crystalloids, specifically normal saline (NS) solution are the fluid of choice for fluid resuscitation and volume replacement.

Hypertension, defined as SBP > 160 mm Hg or MAP > 110 mm Hg, is also a secondary systemic brain insult that can aggravate vasogenic brain edema and intracranial hypertension. However, hypertension may be a physiological response to a reduced cerebral perfusion. Consequently, and prior to ICP monitoring, hypertension should not be treated unless a cause has been excluded or treated, and SBP > 180-200 mm Hg or MAP > 110-120 mm Hg. Lowering an increased BP, as a compensatory mechanism to maintain an adequate CPP, exacerbates cerebral ischemia.

Mechanical ventilation

Most patients admitted to ICU following trauma require respiratory support because of hypoxaemia, ventilatory failure or due to treatment modalities requiring respiratory support.

The support may range from oxygen therapy by face mask, through non-invasive techniques such as continuous positive airways pressure, to full ventilatory support with endotracheal intubation.

If the patient remains hypoxaemic on high flow oxygen (15 l/min) continuous positive airways pressure (CPAP) may be used. Patients on CPAP should be cooperative, able to protect their airway, and have the strength to breathe

spontaneously and cough effectively.

Criteria for starting mechanical ventilation are difficult to define and the decision is made clinically. It is decided according to respiratory status.

Neurologic indications

Altered level of consciousness (GCS <8) /airway protection.

Brainstem dysfunction.

Intracranial hypertension.

Anticipated neurologic deterioration.

Respiratory indications

Respiratory rate >35 or <5 breaths/ minute

Exhaustion, with laboured pattern of breathing

Hypoxia - central cyanosis, SaO_2 <90% on oxygen or PaO_2 < 8kPa

Hypercarbia - $PaCO_2$ > 8kPa

Tidal volume < 5ml/kg or Vital capacity <15ml/kg

Indications for weaning

•Improving of underlying illness

•Respiratory function:

Respiratory rate < 35 breaths/minute

FiO_2 < 0.5, SaO_2 > 90%, PEEP <10 cmH_2O

Tidal volume > 5ml/kg; Vital capacity > 10 ml/kg; Minute volume < 10 l/min

• Absence of infection or fever

• Cardiovascular stability, optimal fluid balance and electrolyte replacement

Modes of weaning

• Unsupported spontaneous breathing trials. The machine support is withdrawn and a T-Piece

(or CPAP) circuit can be attached intermittently for increasing periods of time, thereby allowing the patient to gradually take over the work of breathing with shortening rest periods

• Intermittent mandatory ventilation (IMV) weaning. The ventilator delivers a preset minimum minute volume which is gradually decreased as the patient takes over more of the respiratory workload. The decreasing ventilator breaths are synchronised to the patient's own inspiratory efforts (SIMV).

• Pressure support weaning. In this mode, the patient initiates all breaths and these are 'boosted' by the ventilator. This weaning method involves gradually reducing the level of pressure support, thus making the patient responsible for an increasing amount of ventilation. Once the level of pressure support is low (5-10 cmH_2O above PEEP), a trial of T-Piece or CPAP weaning should be commenced.

Tracheostomy in the intensive care unit

The commonest indication of tracheostomy in an ICU setting is to facilitate prolonged artificial ventilation and the subsequent weaning process. It also allows effective trachea-bronchial suction in patients who are unable to clear pulmonary secretions either due to excessive secretion production or due to weakness following critical illness.

A comprehensive care plan for a mechanically ventilated patient consists of medical and nursing care which is summarized below:

1. Patient positioning:

Evidence supports the semi-recumbent positioning of ventilated patients, with the head of the bed elevated from

30◦ to 45◦, to reduce the incidence of ventilated acquired pneumonia (Bonten, 2005). All patients are usually turned every 2 h and nursed on a pressure relieving mattress. Mobilization techniques should include limb exercises.

Hygiene:

Strict hand washing and aseptic technique.

3. Eye/mouth/catheter care:

There are multiple methods of eye care such as normal saline irrigation, eye drops, taping, paraffin-based gauze, ointments, gels and polyethylene covers to prevent corneal dehydration, abrasions and infection as a result of impairment blink reflex (Dawson, 2005).

Chlorhexidine is the most commonly used cleansing agent with frequency of oral care reported at 2, 3, 4 and 12 hourly intervals

6. Nutrition:

Nasogastric tube/ parenteral nutrition

7. Encourage effective communication:

8. Assess oxygen saturation, bilateral breath sounds for adequate air movement, and respiratory rate.

Check vital signs, particularly blood pressure after a ventilator setting is changed. Mechanical ventilation increases intra-thoracic pressure on inspiration, which puts pressure on blood vessels and may reduce blood flow to the heart; as a result blood pressure may drop.

Suction patient only as needed; hyper-oxygenate the patient before and after suctioning; do not instill normal saline in the ET tube; suction for the shortest time possible and use the lowest pressure required to remove secretions.

The cuff on the endotracheal or tracheostomy tube should be appropriately inflated. Avoid high cuff pressure to prevent pressure necrosis.

Monitor arterial blood gas (ABG) after adjustments are made to ventilator settings and during weaning to ensure adequate oxygenation and acid-base balance.

Provide peptic ulcer and deep vein thrombosis prophylaxis.

9. Check ventilator settings and modes:

Check the following settings:

- Respiratory rate, the number of breaths provided by the ventilator each minute. Manually count the patient`s respiratory rate, because one may take own breaths which may be at a rate above the ventilator setting.
- Fraction of inspired oxygen (FiO2), expressed as a percentage, (room air is 21%)
- Tidal Volume (TV or VT), the volume of air inhaled with each breath, expressed in milliliters.
- Peak inspiratory pressure (PIP), the pressure needed to provide each breath. Target PIP is below 30cm H2O. High PIP may indicate a kinked tube, a need for suctioning, bronchospasm, or a lung problem such as pulmonary edema or pneumothorax.

Ventilator modes:

The mode depends on patient variables, including the indication for mechanical ventilation.

Modes including those that provide specific amounts of TV during inspiration, such as assist-control (A/C) and synchronized intermittent mandatory ventilation (SIMV); and those that provide a preset level of pressure during inspiration, such as pressure support ventilation (PSV) and airway pressure release ventilation. PSV allows spontaneously breathing patients to take their own amount of TV at their own rate. A/C and continuous mandatory ventilation provide a set TV at a set respiratory rate. SIVM delivers a set of volume at a set rate, but allows the patient to initiate their own breaths in synchrony with ventilator.

Some patients may receive adjuvant therapy, such as positive end-expiratory pressure (PEEP). With PEEP, a small of continuous pressure (generally from +5 to +10 cm H2O) is added to the airway to increase therapeutic effectiveness. In many cases, PEEP is added to reduce oxygen requirements.

Finally, determine if a capnography monitors is recording the patient's partial pressure of exhaled carbon dioxide (pCO2). Capnography, which reflects ventilation, can detect adverse respiratory events, such as tracheal tube mal-positioning, hypoventilation and ventilator circuit problem. The capnography waveform should be square; generally, the value should be in the normal pCO2 range of 35 to 45 mm Hg.

8. Facilitate sleep:

Sedation+/-

Music therapy

9. Pain management:

Pain is considered as the fifth vital sign

Tools for pain assessment: Difficult as many of these patients would be intubated or have impaired communication.

Commonly used scales are the visual analogue scale and the numeric rating scale (Jacobi et al., 2002), adult non-verbal pain scale (Odhner et al., 2003), pain assessment and intervention notation tool (Puntilloet al., 2002) and the behavioural pain scale (Payen et al., 2001).

Recommended agents are morphine and fentanyl, with morphine recommended if intermittent administration is used due to its longer duration of action, and fentanyl recommended to achieve rapid onset effect.

Patient controlled analgesia (PCA) may be used for ventilated patients who are sufficiently awake.

Non-pharmacological interventions include distraction, relaxation techniques, heat and cold treatments, massage, trans-cutaneous electric nerve stimulation and music therapy.

10. Sedation:

Continuous intravenous sedation prolongs mechanical ventilation time. Protocols incorporating daily withdrawal of sedation should be utilized which reduces ventilation time, length in intensive care and complications such as ventilator-associated pneumonia.

A number of tools determine the patient's level of anxiety and agitation and thus decide on the sedation requirements.

- Ramsay Scale (Ramsay et al., 1974); Riker Sedation-Agitation Scale (SAS) (Riker et al., 1999); The Richmond Agitation-Sedation Scale (RASS) (Sessler et al., 2001).
- Minnesota Sedation Assessment Tool

Pharmacological agents:

Benzodiazepines are recommended for their anxiolytic and amnesiac properties (Hogarth and Hall, 2004). The preferred drugs are midazolam, diazepam and lorazepam, with midazolam and diazepam recommended for rapid sedation, and lorazepam favoured for longer term use. Propofol, is advocated for situations necessitating quick arousal.

11. Delirium:

It is referred to as ICU psychosis and ICU syndrome which is linked with increased length of stay, morbidity and mortality.

Roberts et al. (2005) identified three tools to detect delirium expressly in the critical care context; the Cognitive Test for Delirium (CTD), the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC).

The drug of choice is haloperidol.

Cardiopulmonary Rehabilitation in a Trauma Setting

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In a study titled ''*Acute Rehabilitation after Trauma: Does it Really Matter*?'' published in the Journal of American College of Surgeons in December 2016, Nehra D and Nixon ZA conclusively shown among 933 trauma patients that their total functional independence measure scores improved from 63.7 to 92.2 with care at an Institutional Rehabilitation Facility (IRF). When patients discharged from an IRF were compared with the propensity score-matched control patients, rehabilitation was found to significantly increase the likelihood of discharge to home (odds ratio = 9.41; 95% CI, 6.80-13.01) and to decrease 1-year mortality (odds ratio = 0.60; 95% CI, 0.39-0.92).

In our present article we would focus on cardiopulmonary rehabilitation in the trauma setting. Since involvement of cardio-respiratory system is more likely to be present in a patient with spinal cord or traumatic brain injury, the discussions will be generally regarding that subset of patients.

1. **Common CVS complications after SCI /TBI and their management**

There may be both direct and indirect complications involving cardiovascular system in a patient of spinal cord injury and traumatic brain injury.

A. Direct

1. *Early Hypotension*: Management comprise of enough IV fluids, trendelenburg position and vasopressors (Dopamine and Phenylpherine).
2. *Orthostatic hypotension*: Managed by repeated postural changes, daily tilting session, elastic binders and elastic stockings as also Functional electrical stimulation (FES). Helpful medications include Salt tablets, Ephedrine sulphate, Fludrocortisones and Midodrine hydrochloride
3. *Bradycardia*: Prevention through pretreatment with atropine 0.1 to 1mg given intravenously 1 to 5 minutes before suctioning (if needed).
4. *Autonomic Dysreflexia (AD)*: Prompt removal of precipitating stimuli, immediately making the patient upright and loosening any clothing or constriction device are the necessary primary step. Nifedipine and nitrates are drug of choice.

B. Indirect

1. *Deep vein thrombosis (DVT)*: Treatment comprise of unfractionated (UF) Heparin or low molecular weight (LMW) Heparin with simultaneous initiation of Warfarin therapy. Anticoagulation prophylaxis for ASIA D should continue till the patient is in Hospital while that of ASIA A, B and C should be for 8 to 12 week. Alternatively inferior vena cava (IVC) filter may be placed if chemoprophylaxis is contraindicated.
2. *Pulmonary embolism*: Almost same as DVT management.
3. *Anemia*: mostly managing pressure ulcer and urinary tract infection (UTI) is sufficient.

2. **Some significant autonomic dysfunction syndromes after SCI/TBI:**

2A. *PSH/ Paroxysmal sympathetic Hyperactivity*: characterized by HTN, excessive sweating (diaphoresis), tachypnoea, tachycardia, hyperthermia etc. Seen in acute stroke, TBI, SAH etc; Treatment: Pregabalin, Gabapentin, hydration and avoid triggers.

2B. *PAID/ Paroysmal Autonomic Instability with Dystonia*: All the above plus dystonia & decerebrate posturing. Treatment: same.

2C. *POTS/Paroxysmal Orthostatic Tachycardia:* Dizziness, palpitation, tremors, syncope, sweating, hypotension; Treatment: aerobic exercise, compression stockings, increased fluid intake.

3. **Some important stages in the respiratory management after SCI and TBI**:

   A. Endotracheal intubation and ventilation.
   B. Electrical stimulation to diaphragm as alternative to ventilator support
   C. Tracheostomy and ventilation.
   D. Weaning from ventilator with tracheostomy persisting.
   E. Decannulation and management thereafter.
   F. Non invasive ventilation support.
   G. Management of concurrent pneumonia and lung secretions.
   H. Treatment of sleep disordered breathing in chronic cases.

4. **Some specific measures for management of respiratory complications after SCI and TBI**

   A. Glossopharyngeal breathing.
   B. Increasing inspiratory muscle strength.
   C. Breathing retraining

5. **Endotracheal intubation and ventilation:**

   Indications of semi-elective endotracheal/nasotracheal intubation: should be done at first sign of respiratory distress in a complete cervical SCI especially ≥ C_5 injury or when vital capacity (VC) falls downward (less than 15 ml/kg), increasing O_2 requirement, increasing respiratory rate (RR), rising PCO_2 or diminishing breath sounds.

   Ventilator settings: Tidal Volume of 15-20 ml/kg is routinely used for SCI population.

6. **Electrical stimulation as alternative of ventilator support:**

   C_3 injury usually leaves phrenic nerve intact and so diaphragmatic pacing (DP) through phrenic nerve stimulation (PNS) is a viable option. Normal mean onset latency of phrenic nerve on nerve conduction study (NCS) is 7-9 millisecond and successful pacing had been achieved with latency up to 14 millisecond. Negative pressure ventilation provided by PNS reduce barotrauma and improve cardiovascular function in comparison with positive ventilation by mechanical ventilator. Also problems with tubings & noise diminished while voice & transfer improved.

   There are three commercially available PNS systems in the world. PNS technique require thoracotomy for placement of electrodes on each phrenic nerve which are connected to radiofrequency receiver placed over anterior chest wall. LMN phrenic nerve injury can recover within 3-11 months after SCI (C_4-C_5 level) and therefore PNS usually is not implanted till 12m post injury.

   Also recently FDA approved another approach where DP is accomplished through intramuscular electrodes placement directly to diaphragm using 4 laparoscopic ports near the phrenic nerve motor point. Electrical stimulation of upper thoracic ventral roots to activate the intercostals muscles had been tried in long term management of childhood quadriplegics.

7. **Shifting to tracheostomy from endotracheal intubation:**

   Indication of Tracheostomy: Prolonged nasotracheal or endotracheal intubation may lead to subglottic stenosis or sinusitis and so it is better to shift to a comfortable option viz. tracheostomy tube (TT) for ventilator support. There are other indications for tracheostomy like: saliva aspiration causing SpO_2 below 95%, depressed cognitive function, pulmonary disease necessitating high FiO_2, uncontrolled seizures, substance abuse and presence of NG tube or Halo Ring.

Time interval between TT placement and anterior cervical stabilization operation should not be less than 1 week (better 2 week) as there would be less contamination. Also it is better to start with cuffed TT with pressure <25 cm H_2O.

Benefits of tracheostomy include easy suctioning, better pulmonary hygiene, feasibility of ambulation and easier chance to wean due to less dead space & reduced airway resistance. But complications are also there like more secretion production, colonization and difficult communication.

8. <u>Weaning from ventilator:</u>

Success of weaning from ventilator depends on neurological level of injury (for example., injuries at C_4 or below have 80% chance while that at C_2 have only 28% chance), phrenic nerve conduction, diaphragmatic needle EMG recruitment, fluroscopic evaluation of diaphragmatic excursion and evaluation of its strength by VC. Patients who achieve maximum negative inspiratory forces >40 ml H_2O & VC > 17 ml/kg are usually successful to wean.

Before weaning, all vitals i.e., HR & BP should be stable, temperature should be ≤101°F, underlying pneumonia treated, atelectesis reversed and chest x ray (CXR) must be clear. Evidence of some spontaneous respiration should be there. Ventilator parameters predicting successful weaning include an initial VC of at least 10ml/kg, maximum inspiratory pressure >30cm H_2O, FiO_2 on ventilator 25% max, PaO_2>75, PCO_2 35-45, pH 7.35-7.45 and no pressure support. Also nutritional needs should be addressed, ABG should be within normal limits, serum K+ > 4.5 mEq/L, adverse medications that affect VC (like valium) need to be stopped and patient should require minimum O_2 supplement.

Weaning protocol: SIMV or CPAP MV is preferred method for weaning. For SCI, a progressive free breathing trial via T piece in tracheostomy tube can be used. VC measurement is needed in supine position before and after trial. Place the patient on an aerosol mist through t piece with FiO_2 10%> than FiO_2 required on ventilator. Initial t tube trial should be 30 min under constant supervision and at least 3 hour rest period between trials. Pulse oximetric feedback can help in this trial. If O_2 saturation is consistently <95%, increase FiO_2 by 5%, and check VC. If however FiO2 total requirement is >15% of baseline FiO2, placing back on ventilator is a better option. Each day the difficulty quotient is increased (by increasing trial duration and upright trial) before final weaning from ventilator.

9. <u>Decannulation protocol:</u>

Decannulation criteria: Pt is ready for decannulation when secretions are minimal & easily brought up, lungs free of infection for last one week and eating orally with minimum risk of aspiration. Peak cough flow (PCF) of > 160L/min correlate with successful decannulation and is measured using peak flow meter.

Method of decannulation: T tube is plugged or capped for 72 hrs before considering decannulation. As tracheostomy mist that helps keeping secretions thinner will also be eliminated, aggressive pulmonary toilet is a must.

SCI pts after decanulation usually take help of glossopharyngeal breathing combined with nocturnal noninvasive IPPV to sustain respiration.

10. <u>Non invasive ventilator options:</u>

Compared from primary noninvasive methods to support ventilation, secondary noninvasive methods after extubation had been more beneficial in SCI population. This is because, by now there would be reversal of atelectesis and improved pulmonary compliance.

(A). Nocturnal Insp. muscle aids:

1. Negative pressure body ventilation - Iron lung, Porta lung, chest shell ventilator and various wrap style ventilators which act as a bridge to noninvasive IPPV.

2. Non invasive intermittent positive pressure ventilation - Via Mouthpiece, nasal and oral-nasal interfaces and alternating the interface or CPAP mask is better for avoiding complications.

(B). Daytime inspiratory muscle aids:

1. Body ventilation - Intermittent abdominal pressure ventilator (e.g., Exsufflation belt) which requires a 30° trunk angle from horizontal to be effective. Patient with less than 1 hr breathing tolerance prefers this in daytime.
2. Mouthpiece IPPV – Next best to IAPV, mouthpiece IPPV utilize a 15 mm angled mouthpiece. The ventilator is set for large tidal volume (TV) of 1-2 L and patient usually vary volume of air taken in from breath to breath.
3. Nasal IPPV - Most practical for nocturnal use but can be used at daytime in weak oral muscle or infants.

11. <u>Management of concurrent pneumonia and lung secretions::</u>

11A. Medications:

Bedside test of bronchial secretion with different mucolytics like acetyl cysteine, sodium bicarbonate and normal saline helps to select the suitable mucolytic that can be used with nebulisation (also known as slide test). Sucralfate have reduced chance of Ventilator Associated Pneumonia compared from Ranitidine. Anticholinergics like Ipratropium helps in short term improvement of FEV. Inhaled corticosteroid along with long acting beta agonist combined is better than any monotherapy in preventing mortality. Methylxanthines have improve diapgragmatic contractility in concurrent COPD.

11B. Rehabilitation methods to loosen secretion:

There are many methods to loosen chest secretions like: *huffing, flutter breathing, autogenic drainage, positive expiratory pressure, percussion, vibration (mechanically or by hand), percussionator or postural drainage (discussed later)*.

Huffing is a forced expiration technique where patient is taught frequent short expulsive bursts (huff/cough) after a deep breath, which assists movement of peripherally situated secretions. In *flutter breathing*, patient expires through a small pipe and a small stainless steel ball rest on the expiratory end of the pipe which is pushed upward during expiration producing PEP and falls downwards interrupting the flow. The mucous mobilizing effect is due to the widening of the airway because of increased expiratory pressure and airflow oscillation due to the oscillating ball.

Autogenic drainage involves breathing with low tidal volumes between the functional residual capacity and residual volume to mobilize secretions in small airways. This is followed by taking increasingly larger tidal volumes and forced expirations (huffing) to transport mucus to the mouth. *Positive expiratory pressure* is applied by breathing through a face mask or mouth piece with an inspiratory tube containing a one way valve and an expiratory tube containing a variable expiratory resistance. Expiratory pressures of 10 to 20 cm H_2O are maintained throughout expiration.

Mechanical percussor or a cupped hand can be used to rythmically strike (at frequency 5 Hz and for 1-5 minutes) the thoracic cage during the entire respiratory cycle to loosen mucous within the lungs.

Vibration or oscillation involves rapid shaking back and forth (not downward) on the thorax over a segment of the lung causing mucous to move toward the trachea. It can be applied manually or through the use of a mechanical vibrator (10-15 Hz up to 170 Hz and applied under a soft plastic shell to the thorax and abdomen).

- *Percussionator* is an intrapulmonary percussive ventilation which can deliver aerosolized medications while providing high frequency pulsations of pressurized air at rates of 100-300 cycles/min (2-5 Hz) in form of 'Flutter valve' directly to the airway. It is more effective than chest percussion and postural drainage.

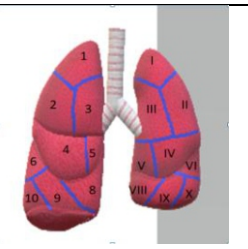
11C. Assisted cough techniques:

Those who have low cough peak flow (CPF) can get help by quad cough or mechanical insufflation exsufflation (MIE) devices.

Manually assisted coughing/ Quad cough: Open hand palms down placed below patient's rib cage between xiphoid and umbilicus. After deep breath (self/ventilator/ambu bag) the Care giver performs epigastric abdominal thrust coordinated with patient's own attempt to cough. Counter-pressure is given across the chest (pushes upward and inward) to avoid paradoxical chest expansion with other arm.

Cough Assist Mechanical Insufflation Exsufflation Device (JH Emerson Co.) eliminate the need for chest wall compression or invasive suctioning. The machine gradually applies a positive pressure to airway (insufflation) and then rapidly shifts to negetive pressure or exsufflation (+40 to -40 cm H_20 generate 10L/s exp flow stimulating cough).

11D. Postural drainage: Postural drainage is a method of removing pooled secretions of the lung by proper positioning of the patient to allow gravity to assist in movement of secretion.

			
Apical segment of right upper lobe	**Anterior segment of both upper lobe**	**Posterior segment of right upper lobe**	**Apical posterior segment of left upper lobe**
			
Medial & lateral segment of right middle lobe	**Superior & inferior segments of left lingula**	**Superior/apical segments of both lower lobes**	**Anterior basal segment of both lower lobes**
			
Lateral basal segment of right lower lobe	**Lateral basal of left lower lobe & medial basal of right lower lobe**	**Posterior basal segments of both lower lobes**	**Bronchopulmonary segments of lung**

1. **Glossopharyngeal breathing (GPB):**

GPB or air-stacking is a method of rapidly taking small gulps of air (6-9 gulps of 60-200ml each) using the tongue and pharyngeal muscles to project air past glottis into lungs. It is useful in those who have weak inspiratory muscles, low VC and even no diaphragmatic power but require intact midbrain to succeed.

2. **Treatment of sleep disordered breathing in chronic cases.**

Sleep disordered breathing (SDB) in SCI occurs mostly in tetraplegia with an overall prevalence ranging from 15% to 62%. Obstructive sleep apnoea (OSA) is the predominant form amongst SDB. Clinical suspicion arises when snoring, daytime somnolence, morning headache and cognitive disturbance starts to appear. Monitoring can be done with nocturnal pulse oximeter but polysomnography in an acreditated sleep laboratory is the gold standard for diagnosis.

Measures to control include weight reduction and other long term solutions like orthodontic splint to bring mandible and tongue forward (thus splint open hypopharynx). Short term management include supplemental oxygen, nasal CPAP and nasal BiPAP (varying IPAP and EPAP in hypercapneic patients). A 6 week programme of resistive inspiritory muscle training improves maximum inspiratory pressure (MIP) and reduce amount of desaturation during sleep.

3. **Inspiratory resistance muscle training:**

This can be accomplished by putting up an abdominal weight or using incentive spirometry at bedside against which patient inhale as deeply as possible. Patients breathe through these devices for a total of 30 minutes daily.

4. **Breathing retraining:**

13A) Diaphragmatic breathing technique involves placement of one hand over the abdomen and another on the thorax just below the clavicle. The patient then breathes deeply through the nose while distending the abdomen forward and keeping movement of the rib cage to a minimum. Small weights can be placed on the abdomen to increase resistance.

13B) *Pursed-lip breathing* during exhalation decrease dyspnea, collapse of bronchioles, accessory muscle use and increase the tidal volume, oxygenation and exercise tolerance.

13C) *Air-shifting techniques* is used to decrease microatelectasis and performed several times per hour. It involves taking a deep inspiration that is held with the glottis closed for 5 seconds, during which time the air shifts to lesser-ventilated areas of the lung. The subsequent expiration is via pursed lips.

5. **Vaccination:**

Centre for Disease Control (CDC) recommends annual influenza vaccination for SCI pts. It also recommends for onetime pneumococcal vaccine for persons 65 yrs or older. However like flu, SCI may need to be considered as one of underlying disease for mandatory pneumococcal vaccination.

Recent advances in Orthotics and Prosthetics in Management of Trauma patients

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We all know that rehabilitation starts from the site of Injury in a trauma patient and we have to make sure that the secondary complications are halted and the progression of impairment due to primary trauma is averted as soon as possible. To achieve this goal Orthotics play and important role. Further, it is important to continue to reassess the requirements as per the changing situations as the treatment progresses. Traditionally the orthotics are used in acute care in the form of cervical collars, soft foam padded splints, patient transfer boards, immobilizers for different body parts, soft supports like crepe bandages, elastic socks etc. Later in the course different types of orthotics and prosthetics are needed as per the requirements in a particular condition. There are design and material developments in specific orthotics and prosthetics to make them function better however, to be concise and focused we shall discuss only the recent advances in technologies which can impact the Orthotics and Prosthetics in trauma care.

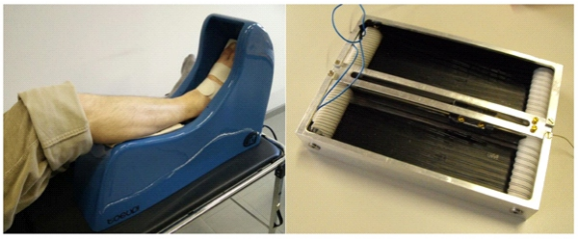
Recent Advances in materials used in Orthotics and Prosthetics in Trauma Care

The use of orthotics can start at the site of injury, during the Emergency care, in the subacute phase and in the long-term management. The Orthotics required in the acute phase may or may not be useful in chronic phase and hence are accordingly fabricated to be modular or reusable and light weight. There is consistent overlap of different devices being used for different conditions for e.g Ankle Foot Orthosis is used in Traumatic Brain injured, Spinal Cord injured, ankle and foot injuries and various other conditions therefore rather than focusing on specific conditions or orthotics we are discussing some specific technological advancements here.

1. Use of shape Memory Alloys for making Orthosis

Conventional materials used in Orthotics may pose strong limitations in versatility especially for wearable orthoses as the material characteristics are fixed and do not follow very well the dynamic changes in patient's clinical needs or disorder evolutions. Materials with unusual and nonlinear properties are being investigated as substitute for traditional materials. The shape memory alloys (SMAs) are a class of compounds that display interesting characteristics in terms of deformability, strength, weight and reliability, which are therefore good candidates for biomedical applications. A satisfactory balance between these properties gives the SMA materials the right characteristics to be employed in a number of different fields and, in particular, those related to physical rehabilitation. Among the several properties of SMA, pseudoelasticity and the shape memory effect (SME) are the most useful for physical medicine and rehabilitation applications especially the stable (quasi constant stress levels) and long (large deformability ranges) plateaux and also the possibility to modify those parameters with thermomechanical treatments can be exploited in designing a variety of devices and solutions for rehabilitation. In addition, these materials also display interesting internal friction and mechanical hysteresis characteristics, the peculiarities of SMA could be of help in applications that possess dynamic characteristics.

Many researchers are working on the use of shape memory alloys for use in rehabilitation. These materials help in imparting force or resisting movement in a dynamic fashion as desired in a situation. The most relevant experiences address biomedical problems, such as the mobilization of paralyzed hands, fingers and other segments , the support of gait (e.g., and limb repositioning . This has been elaborated further in a paper by Pittacio et al(1) which described the use of such alloys for developing actuator based ankle and knee movement and support systems for use in early mobilization and support in a bed ridden patient.



(a) (b)

Figure 1. (a) The Toe-Up! device for passive ankle mobilization of bedridden patients; (b) the shape memory alloy (SMA) actuator used to generate ankle dorsiflexion.

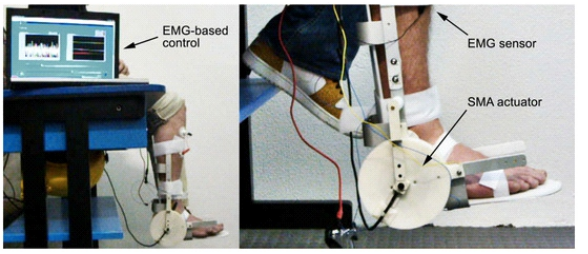
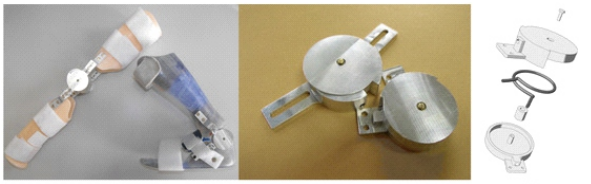
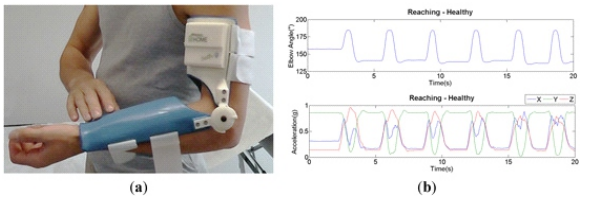


Figure 2. Two views of the EMG-controlled SMA device for assisted ankle exercise.
Further in the research paper it was demonstrated that a Compliant Orthoses for Limb Repositioning in spastic muscles can also be fabricated using these materials



(a) (b) (c)

Figure 3. (a) Examples of pseudoelastic orthoses; (b) pseudoelastic hinge prototypes; (c) a drawing of the hinge assembly with the SMA spring



(a) (b)

Figure 4. (a) A 3D-printed fully-functional prototype of a pseudoelastic sensorized orthosis; (b) example of recorded tracings for a healthy subject during a reach-forward task.

There is lot of interest building on in this area of using Shape memory Alloys (NITINOL type) in orthotics and Prosthetics and many researchers are currently working with it and we shall soon see the products in the market.

2. Designing better Orthotics and Prosthetics

Traditionally the Orthotics and Prosthetics are designed in same manner based on standard atlases. However, it may not be acceptable to the patient and hence the exploration of better designs and better function are being explored. The multidisciplinary collaborations including patients, caregivers, clinicians, engineers, designers etc have made it possible to have better designed products which not only serve the purpose but also provide aesthetic value to the patient.

Figure 5: A collar design (Head up collar) developed at Sheffield Hallam university made from phase change materials that absorb, store and release heat for optimal thermal comfort under project D4D (design for dignity) (2)

3. CAD -CAM and 3D printing Technology

The 3D printing is in use since 80's and was called rapid prototyping and additive manufacturing. The technology was used in medical field since 90's but recently it has now become a part of hospitals and clinics, The CAD CAM technology had created a lot of buzz in the field of orthotics and prosthetics since last two decades. However cost and lack of technical expertise has limited its desired growth. However, with the advent of low-cost 3D printers this technology has now got renewed attention and is now becoming cost and resource efficient. The traditional subtractive manufacturing has given way to additive manufacturing due to availability of different types of 3D printing technologies which have better applicability in the field of prosthetics and orthotics. Instead of using CNC milling technologies, now Fused Deposition modeling (FDM) and selective layer sintering (SLS) are used to print the orthotics and prosthetics. Although these technologies are promising and are revolutionizing the manufacturing of prosthetics and orthotics but high level of technical expertise and knowledge of CAM software's and 3D printing is essential to use it at point of care. A user-friendly software interface is needed so as to make it on site manufacturing facility rather than an offsite activity. At AIIMS, New Delhi we have developed a Mobile app-based 3D printing process. in collaboration with a Startup wherein the custom molded insoles are provided to patients based on foot photos taken from mobile phone using the app. The desired modifications are integrated into the computer vision model using slicer and rhino software's and a file for 3D printing generated. The FDM printer is used for making 3D printed insole base which is then lined with a soft liner and delivered to patient.

Figure 6 : App Based Measurement of Patients Foot

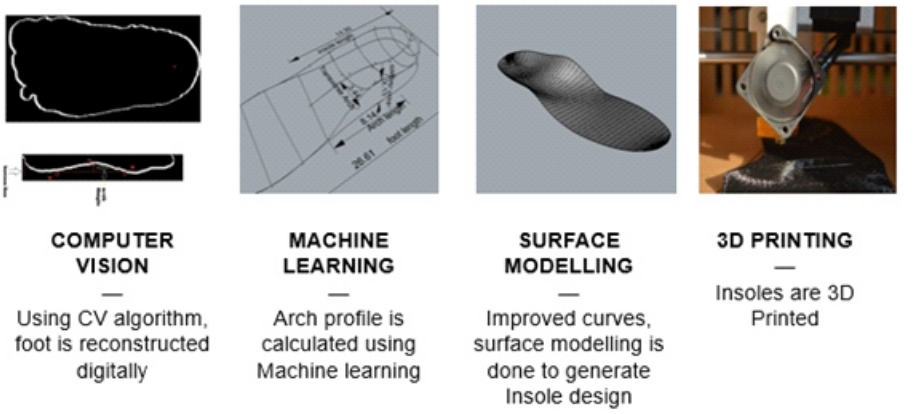


Figure 7: Process of 3D Printing of Insoles using mobile app and 3D Printing technology

Other Uses of 3D Printing

The technology is increasingly being used in manufacturing of sockets and parts for upper and lower limb prosthesis and orthotics.

Figure 8: 3D Printed Prosthesis

Further, 3D printing technology can be used for fabricating customized cranial protection devices in children and adults with craniotomy, splints for burn, casts for fractures and specific prototypes for simulating surgeries. The research work on bioprinting skin , bone, tendons etc has shown a lot of promise and soon it will find its way into trauma care. The bioprinted implants for Spinal cord Injury are also being worked upon and may help in accelerated regeneration after stem cell therapy in patients with SCI. The possibilities are endless and so are the risks (3) hence we need to keep working in this area so as to not have unrealistic expectations and get the maximum advantage of this technology in the field of PMR.

Robotics

Robotics can have huge impact on the patient management right from evacuation from site of accident to rehabilitation and long-term assistance in disability. Exoskeletal gait Robots apart from training are now being used for short term ambulation and many such devices are under development at Ekso Bionics, Berkeley, California; Argo Medical Technologies, Yokneam Illit, Israel; Rex Bionics, Auckland, New Zealand; and Vanderbilt University to name a few. Adding to this are the robotic assistants being developed(5) which can change the way robots are perceived and can be of immense use for caretakers of persons with disability. Companies like Toyota and Honda are working to develop these robots for the market.

Figure 9: A student crosses the graduation stage to receive his history and political science degree. Photograph by Steve McConnell, courtesy of UC Berkeley.

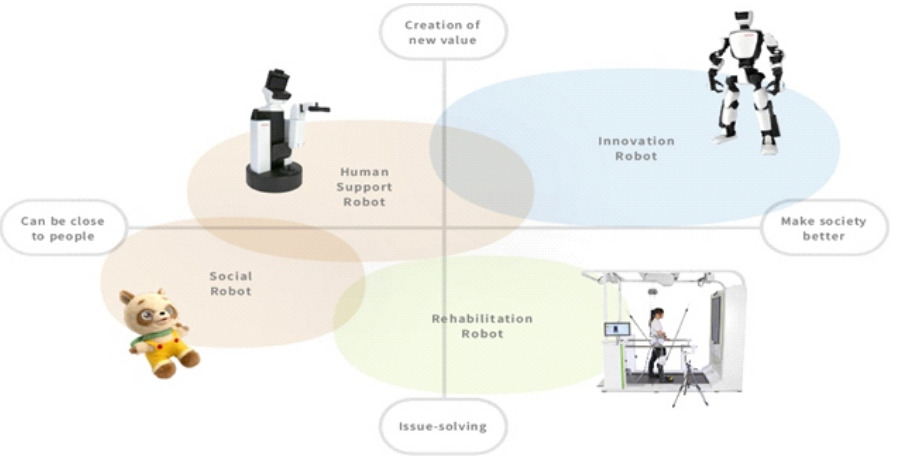


Figure 10: Partner Robot Concept of Toyota

Some technologies which are likely to have an impact on advances in prosthetics and orthotics are Brain Computer Interface, Multi-Channel FES systems, Intelligent prosthetic and orthotic control systems , Intelligent textiles for fabrication of dynamic orthotics and prosthetics. The future developments though interesting and promising need human intelligence to validate and support the technologies for rational use in rehabilitation.

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Locomotion following Spinal Cord Injury: Conventional methods to Robotics

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Abstract:

Locomotion following spinal cord injuries (SCI) is one of the major concerns for the patients and goal of management for the treating team especially in rehabilitation. It benefits the patient with SCI in the form of reducing complications like preventing pressure ulcers, reducing urinary tract related complications, combating osteoporosis, reducing spasticity, improving ROM in affected limbs, giving access to places and physical & psychological well-being. Whereas independent locomotion is difficult to attain in patients with complete SCI irrespective of underlying cause, most patients with incomplete SCI can be trained for locomotion with various rehabilitation strategies. The biggest difficulties/ complications/ co-morbidities interfering in ambulation for SCI patients are; spasticity in the lower limbs, muscle wasting, increased energy consumption with early onset fatigue, increased risk of falls & fractures and difficulty in donning-doffing of orthosis.

Locomotion and gait training strategies in rehabilitation set-up have also shown great transformation from being confined to conventional gait training 3-4 decades ago to recent advances in technology & equipments. This has caused paradigm shift in locomotion and rehabilitation following SCI. Earlier the locomotion training was confined to ambulation using short or long orthosis for the lower limbs with use of assistive devices like cane, crutches and walker for ambulation. The technology itself has transformed with time with new and light material (thermoplastics) used for these orthoses. Currently there are a lot many gait training strategies available at hand with rehabilitation team. Activity- based training, Body-Weight-Support-Treadmill-Training & Functional Electrical Stimulation separately or in combination has brought dramatic changes in the way the SCI patients can be trained for locomotion. Exoskeleton orthosis like ReWalk & Indego have given a lot of hope & enthusiasm to both SCI patients and researchers in the last decade. With introduction of hybrid exoskeleton orthosis & 3rd generation devices the locomotion training in both controlled environment as well as independent ambulation at home looks much more realistic.

Cognitive Rehabilitation in Traumatic Brain Injury

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Cognition is a broad term that refers to mental processes that include, but are not limited to, perception, reasoning, judgment, intuition, memory, attention, problem solving, executive functioning, language, visual–spatial skills, awareness, comprehension and psycho-motor speed of processing.

Attention is one of the most basic of cognitive skills and it impacts virtually all other cognitive skill sets. The basic components of orienting attention network are arousal and alertness, whereas, the executive attention processes involve information processing of a potentially higher order and include selective and divided attention.

Sensory stimuli from various systems have both physiological and experiential

features, this has been referred to as perceptual attributes or features. Perceptual features (attributes) can either be iconic (descriptive of a a physical characteristic) or symbolic (describe the functional characteristics). Categorization is a cognitive ability which is crucial and it allows for management of larger quantity of information, people classify objects into various categories.

Disturbances in executive functioning are prevalent after acquired brain injury and represent significant obstacles to social functioning, work, and rehabilitation. This can affect the ability to anticipate the effects of actions, to appreciate alternative perspectives and to recognize other people's reactions to our behaviour and modify our actions accordingly. It has been observed that as a person becomes better in representing experience cognitively, he can do so even while being physically distant (removed) from the experience itself. This has been referred to a cognitive distancing.

Comprehensive neuropsychological assessment typically involves records review, interviews, observation of behavior and application of outcome measures. Valid and reliable standardized measures are used to assess cognitive, academic, neurobehavioral and emotional functioning. Prior to the onset of cognitive rehabilitation program, it is necessary that the CNS must be metabolically optimized to properly support rehabilitation efforts and learning. Fatigue and depression have to be identified, as they can complicate cognitive function and the underlying cause has to be treated by appropriate means.

Cognitive retraining has been described under two primary categories, remediative and compensatory. Remediative rehabilitation conceptualizes that neuronal growth and synapto-genesis result from repeated exposure and repetition of stimuli through experience. The model of compensatory rehabilitation assumes that some functions cannot be restored completely due to the nature of injury. Therefore, the individual with brain injury needs to use certain (compensatory) strategies to improve functional performance.

In general, cognitive interventions follow a hierarchical order that is similar to the observed normal developmental sequences in linguistic and cognitive development. Once the individual can perform simple therapeutic tasks in the controlled environment, auditory and/or visual stimuli may be gradually introduced, moving from least to most salient and advancing in one sensory modality at a time. In case of a bottom-up approach, tasks should begin with physical activities and then gradually progress to mental activities, utilizing the concept of cognitive distance. Physical activities can include sorting by iconic features (color or size), whereas, abstract activities may include symbolic categorization (classification). Complexity is increased by adding on more objects or by increasing the time spent on the task at hand.

ATTENTION

The individual's ability to direct and maintain focus on a task over a period of time in a quiet environment is sustained attention. Physical or concrete tasks are to be initiated first. In individuals with brain injury resulting in a very poor attention, activities involving simple auditory sustained attention or vigilance tasks are initiated. The next level in the attentional hierarchy is selective attention. Once the individual is able to perform tasks consistently in a controlled environment, distractors should be introduced. Following this, more mental or abstract tasks can be implemented.

Next in the hierarchy of attention is alternating attention, which refers to the ability to alternate attention from one activity to another with the least amount of interference. Here, the activities are started with two simple physical tasks and the person is instructed to shift from one activity to the other and back. This is followed by similar activity with mental or abstract tasks. The highest level of attention is divided attention, wherein the person is able to attend to two or more different tasks simultaneously.

MEMORY

Memory is a component of cognition that entails the ability to encode, store, retain, and recall information. The process of memory has been described as in a sequence of three stages from sensory memory to short-term / working memory to long-term memory. Sensory memory is the ability to retain impressions of sensory information after the original stimuli have ended. The information that can be consciously declared to have been learned or experienced is known as declarative or explicit memory. The kinds of items deemed declarative include general knowledge or facts about the world, termed semantic memory and personal, autobiographical recollection

of experiences, termed episodic memory. The information learning only reflected by changes in future behavior as a result of the prior experience without conscious remembrance is referred to as nondeclarative or implicit memory. Procedural memory is typically divided into motor skill memory and cognitive skill or reference memory.

Patients suffering from TBI seem to be most vulnerable to the effects of interference possibly due to damage to the frontal lobes. Immediate recall appears to be largely intact following traumatic brain injury. However, when interference is imposed, memory performance is significantly affected, even a 10-second delay between stimulus presentation and response has been reported to affect recall performance.

FEATURE IDENTIFICATION

The perceptual features can be described in seven iconic and one symbolic feature. Initially training involves attending to and identifying and describing different perceptual features (iconic & symbolic) of real objects. Gradually the cognitive distance is increased. In the next level, the individual has to expand feature identification skills. This is followed by further expansion of feature identification skills through negative categorization.

CATEGORIZATION

In the next level of the cognitive training, the individual has to identify iconic and symbolic features of objects grouped together. Each sublevel is divided into two steps; activities again begin with real objects. This is followed by symbolic categorization, so as to develop the ability to categorize objects by function. Next stage is to identify whether the perceptual features are important or not important to the function of the object and provide a rationale.

EXECUTIVE FUNCTION

Three primary domains of executive functioning have been described a) planning and initiation, b) maintenance and flexibility and c) regulation and effective performance. Metacognition refers to the subjective knowledge and experience of one's own cognitive processes, which can be used to guide cognitive activity. Evidence suggests that interventions for remediation of executive functioning should incorporate metacognitive strategy training

(awareness, self-monitoring, and self-regulation), formal problem-solving intervention as they relate to daily life and strategies for emotional regulation.

COMPUTERIZED CR TRAINING

Computer-based cognitive retraining programs involve a range of activities using digital software to train and relearn various cognitive skills. A personalized training program can be developed and an immediate feedback on performance can be obtained. Some computerized programs can be self-administered at home, which can increase accessibility to training and reduce costs.

Conclusion:

Cognitive rehabilitation is an integral component of most brain injury rehabilitation centers, however, there is lot of variation in methodology worldwide. There is evidence to support the use of interventions for attention, memory, social communications skills and comprehensive (holistic) neuropsychological rehabilitation. Cognitive rehabilitation must be directed at improving patients day-to-day functioning and quality of life, these interventions must be assessed with relevant outcome measures.

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Drug Therapy in Acute Neurorehabilitation

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Physicians engaged in neurological rehabilitation constantly have to deal with aspects of primary pharmacological treatment of patients, including control of high blood pressure, anticonvulsive therapies and suitable anticoagulation treatment to reduce risk factors and secondary problems. Furthermore, neurological rehabilitation must also take into account pharmacological issues relating to restoration of brain function. This concerns the avoidance of pharmaceuticals that may interfere with brain recovery as well as the use of drugs that may have a positive effect on brain function. This presentation aims to provide a critical summary of the options available to the clinician in the pharmacological treatment of patients after acute neurological events as part of the process of the rehabilitation of brain organization and restoration of brain function, as well as discuss the avoidance of potentially negative effects of pharmacological interventions.

Inclusive elections.. Calicut experience

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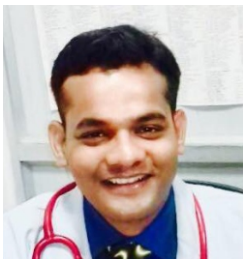
The 2019 general elctions, with the emphasis on including maximum participation of people who have been marginalized, like people with special needs and transgenders, was conducted in all earnest, with full participation of the District Administration. Sri Seeram Sambasiva Rao, the Calicut District Collector, with his dynamic team, enthusiastically supported the initiative and was able to conduct the general elactions with maximum participation from the disadvantaged groups. I was fortunate to be part of his team to render guidance as to how we could make necessary arrangements for participation by people with special needs. This paper looks into the efforts behind the successful implementation of inclusive elections in Calicut district.

Type.. platform presentation

Duration 15 minutes



DYSPHAGIA IN TRAUMATIC BRAIN INJURY

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Dysphagia or swallowing is common problem following severe traumatic brain injury. Swallowing was first described by William Harvey (1578-1657), who compared the speed and complexity of swallowing to that of the heart[1]. Swallowing motion are rapid like the pumping of heart and the bolus has to travel through chambers and valves to reach stomach. It has a crucial role in maintaining airway integrity by clearing the residue from oral cavity and pharyngeal tract. Abnormal swallowing or dysphagia may lead to dehydration, starvation, aspiration pneumonia, airway obstruction and in the worst case death.

Dysphagia is a common complication following traumatic brain injury with incidences high as 93% in patients admitted to brain injury rehabilitation wards[2].

PHYSIOLOGY OF SWALLOWING:

Swallowing is divided into 3 phases, Oral, Pharyngeal and Oesophageal phase. Oral phase is subdivided into oral preparatory and oral propulsive phase. These phases are neither discrete nor isolated from each other and may overlap in time. **Anticipation Before Swallowing:**

This includes the perception and cognition regarding nutritional materials prior to introduction to the mouth. It includes preparing the correct size of bolus for intake, keeping the bolus on a spoon/fork, or sipping from a straw or cup, instructions for feeding and the speed with which the food is presented to the mouth.

Oral Preparatory Phase:

The oral preparatory phase is a necessary step prior to the initiation of the oropharyngeal swallow. The manner in which the bolus is prepared for swallowing varies, depending on the consistency of the material. In this phase the food is ingested and is passed through the lips into the mouth by biting or manual placement. Its followed by the transport of food from anterior to the posterior oral cavity. During mastication, food is softened, and food particles are reduced in size by chewing and mixing with saliva.

The cyclic grinding motion of the jaws is coordinated with rotation of the tongue, pushing the food between the upper and lower teeth. Saliva is excreted from the salivary glands, helping to break down the food and stimulate the taste buds. The physical consistency of the food is monitored continuously by oral mechanoreceptors.

Oral Propulsive Phase:

This phase begins once the bolus has been prepared and is ready to be transported posteriorly into the pharynx. The tongue pushes upward and forward in the mouth, contacting the anterior portion of the hard palate. The area of tongue-palate contact expands backward, propelling the small portion of the triturated food through the faucial arches and into the pharynx. When a large enough bolus has been prepared, a swallow is initiated. The pharyngeal phase of swallowing follows immediately. With liquids the onset of the pharyngeal phase is more rapid after oral propulsion.

Pharyngeal phase:

When appropriate sensory input reaches the medullary central pattern generator for swallowing, a complex motor sequence is elicited to propel a bolus through the pharynx, around the larynx, through the upper oesophageal sphincter (UES) containing the cricopharyngeus, and into the oesophagus, all within a duration of approximately one second in healthy adult humans.

When the pharyngeal phase is initiated, respiration ceases and the palatopharyngeal isthmus closes to seal off the nasopharynx, preventing entry of the bolus into the nasal cavity. The larynx closes by adduction of the vocal folds and

anterior tilting of the arytenoid cartilages to meet the epiglottic petiole. At nearly the same time, the hyoid bone is elevated and pulled forward by the suprahyoid muscles. In turn, the hyoid bone and supralaryngeal muscles pull the larynx superiorly and anteriorly. The cricopharyngeus muscle relaxes, becoming compliant and allowing the UES to open (96). The tongue moves backward and downward, pushing the bolus through the pharynx like a plunger. The epi- glottis inverts, deflecting the bolus around the larynx and away from the airway. The pharyngeal constrictors contract sequentially with a peristaltic wave from top to bottom, clearing the pharynx of residue, following the tongue's downward motion. Following the passage of the bolus into the esophagus, the larynx opens, the UES closes, and the cricopharyngeus muscle resumes its tonic contraction, sealing the UES (3).

Oesophageal phase:

The wave of pharyngeal constriction that cleared the bolus into the oesophagus continues throughout the oesophagus as a primary peristaltic wave that propels the bolus through the lower oesophageal sphincter (LES) and into the stomach. Oesophageal clearance is assisted by gravity but also requires relaxation of the LES.

Post-TBI dysphagia is caused and influenced by a number of factors. These include oropharyngeal neuromuscular and sensory deficits, cognitive-communication, and behavioural impairments, [4,5] physical injury to the head and neck regions, medications [4], other concomitant injuries and prolonged endotracheal ventilation [6]. Tracheostomies, while not causing dysphagia on their own also influence it [7].

Cognitive-Communication and Behavioural Issues

Studies have shown that the most common factor influencing swallowing function is reduced cognition, followed by motor control impairments. In patients with normal or near normal swallowing physiology, these cognitive communication and behavioural issues actually cause or worsen the dysphagia(8). The cognitive-communication, behavioural issues that influence the ability to safely eat and drink occur across multiple domains, creating challenges for the patients attempting to swallow safely and influencing how dysphagia is assessed and managed.

Low alertness level can also slow the triggering of the pharyngeal swallow reflex. (8). Such patients may also slow down the rate of food intake which places them at risk of malnutrition and dehydration. Disordered sensory perception in some patients may result in difficulty registering the fact that the food remains in their mouth. The absence of an automatically triggered swallow risks choking if they start to speak.

Memory issues may result in patients forgetting about the food consistencies (5,8), or when they ate last. Such deficits can make it hard for the patients to be independent in skills such as appropriate diet selection and meal planning. Agitated patients are at the risk of choking or aspirating if outbursts occurred during mealtimes. This is particularly important when the patient also has impaired swallowing physiology.

Motor features:

The most common post traumatic brain injury oropharyngeal motor deficit are thought to be reduced range and control of the tongue moments (9) In isolation or in combination with the deficit such as delayed or absent pharyngeal swallow (9). Aspiration is very common, presented in 38- 63% of the patients (9,10). Also less common observed deficits include decreased laryngeal elevation, reduced base of tongue retraction, decreased pharyngeal peristalsis, prolonged pharyngeal transit time, prolonged oral transit time, unilateral pharyngeal paralysis, absent or weak reflexive or voluntary cough, cricopharyngeal dysfunction and primitive oral reflexes (biting, rooting and pursing (9,10). Abnormal facial muscle tone can produce hypertonicity, hypotonicity, reduced contraction of the oppositional muscles and/or facial asymmetry.

Mechanical Causes of Dysphagia Physical Damage to Head and Neck

Trauma patients often have concomitant injuries to head and neck. Injuries to the jaw interferes with chewing, injuries to neck may impair laryngeal closure and cricopharyngeal opening. These further complicates the management.

Prolonged Endotracheal intubation

Prolonged Endotracheal intubation subjects the patient to risk of silent aspiration and overt aspiration. However this risk is transient and dysphagia resolves in 2-5 days post extubation. There are multiple factors responsible for this, prolonged contact of the ETT with chemo- and/or mechanoreceptors in the pharyngeal and laryngeal mucosae, critical for triggering the swallowing reflex [11].Physical injury including vocal fold ulceration and laryngeal edema and impaired laryngeal elevation and/or closure may impede swallowing function [6]. Medications such as sedatives required for intubation may also temporarily depress the swallowing reflex.

Tracheostomy

Long term tracheostomies can cause physical injuries like tracheostenosis, tracheomalacia, and granuloma. Tracheostomies per se do not impair hyoid bone movement or laryngeal excursion during swallowing, therefore to say whether tracheostomy is directly involved in dysphagia is controversial. Instead, the severe illness necessitating the tracheostomy, whether neurological or not, and/or high dose medications [4] such as sedatives and neuromuscular blocking agents cause dysphagia, not the tracheostomy itself. Tracheotomised patients with TBI are likely to be dysphagic because of their neurological impairment, medications [4], intercurrent medical co-morbidities [7], or a combination of these factors. Thus, even when a patient with TBI is decannulated, they are highly likely to remain dysphagic and at risk of aspiration.

PRDICTORS OF DYSPHAGIA RESOLUTION IN TBI:

There have been numerous studies to determine the factors that influence early resolution of dysphagia. It has been found that the greatest swallowing improvement occurs in the first 6 months after the injury, with more gradual improvement after this time. The factors that influence recovery include baseline DRS score, Rancho Los Amigos scale, tongue control impairment, the absence of gag reflex and increase in duration of pharyngeal delay time. (12)

ASSESMENT

Keeping in mind the multifactorial nature of post TBI dysphagia evaluation should consist of a detailed description of the complaint, complete medical history, and a physical examination of the peripheral deglutitory motor and sensory system, including trial swallows under observation. Instrumental diagnostic studies, including video fluorography, manometry, electromyography, and fibreoptic endoscopy, are indicated in selected cases.

BESSIDE ASSESSMENT

HISTORY

Common complaints are a sensation of food sticking in the throat, difficulty in initiating swallowing, coughing or choking spells associated with eating, drooling or difficulty clearing oral secretions, weight loss, change in diet or eating habits, episodes of aspiration pneumonia, and symptoms referable to gastroesophageal reflux. Difficulties swallowing solids and liquids should be contrasted and compared. A thorough premorbid and current medical history including the nature and severity of TBI are obtained. Patients should be noted for level of alertness and responsiveness, positioning, nasogastric tube/ gastrostomy tube, duration of intubation and respiratory status.

Current prescription and non-prescription medications should be listed. Those that have side effects of sedation, muscle weakness, drying of mucous membranes, disorientation, or dyskinesia may contribute to dysphagia. Anticholinergic and psychoactive medications are specially noted. Imaging studies are useful for understanding structural changes of the airway and food pathway as well as the brain. Relevant laboratory studies may include important evidence for infection, nutritional deficiency, connective tissue disease, or muscle inflammation.

EXAMINATION

Cranial nerves should be assessed carefully. The respiratory system is examined for signs of obstruction or restriction such as tachypnoea, stridor, use of accessory muscles paradoxical motion of the chest wall, or laboured breathing. The hyoid bone and laryngeal cartilages are palpated carefully and gently mobilized. Facial sensation is checked bilaterally.

COGNITIVE-COMMUNICATION/ BEHAVIOURAL ASSESSMENT:

This is informally assessed at the bedside. From the history taking, basic expressive and receptive language issues can be judged as well as memory and orientation defects. Further oromotor assessment helps with patients ability to attend, follow and sequence instructions(8).

OROMOTOR ASSESSMENT:

This assesses the oral structures and their functions (e.g., symmetry, sensation), the cranial nerves involved in swallowing, oral hygiene, dentition and, if appropriate, an oral food and/or fluid trial of varying consistencies. In case of any deficits, instrumental assessments can be undertaken. The muscles of the face, mouth, and neck are examined beginning with the muscles of facial expression, carefully comparing movement of the two sides of the face for signs of asymmetric weakness. The masseter and temporalis muscles are palpated as the patient bites and chews. Movements of the lower jaw are assessed in three directions of movement, observing and noting any clicking of temporomandibular joint, pain, weakness, and/or asymmetry. Atrophy, weakness, and fasciculations of the tongue should be noted. Each side of the pharynx is stimulated to elicit gag reflexes, observing whether the soft palate and pharyngeal walls contract briskly and symmetrically. The presence of primitive reflexes associated with chewing and swallowing (such as the sucking, biting, or snout reflexes) should be noted.

BEDSIDE ASSESSMENT OF SWALLOWING:

The bedside swallowing evaluation (BSE) is a screening examination that includes observing the patient eating and drinking (13). The purpose of a BSE is to determine whether a patient shows signs and symptoms of dysphagia or aspiration and whether the patient is suitable for instrumental examination and further clinical assessment. Although being a useful tool, it carries risks for the patient. The ideal candidate for this test is one who follows commands and has voluntary cough reflex. Potable water or ice chips being the safest are usually used of this test. After ingesting a small volume, ¼-1 teaspoon of water/ice chips, the examiner observes and palpates neck for swallow and laryngeal elevation.

Clinical signs and symptoms of overt aspiration include coughing, choking, gurgling, wet or hoarse vocal quality, throat clearing, and stridor following the swallow. More subtle signs of aspiration include teary eyes or sniffling. The examiner can observe chewing and feel for the laryngeal elevation with crushed ice. Once it has been determined that the patient adequately elevates the larynx and that there is an adequate protective cough, other substances with varying textures and consistencies can be tried. The mouth is examined for an residual food.

INSTRUMENTAL ASSESSMENT:

These can include videofluoroscopic swallow study (VFSS) (modified barium swallow), fibreoptic endoscopic evaluation of swallowing (FEES), fibreoptic endoscopic evaluation of swallowing with sensory testing (FEESST), cervical auscultation, pharyngeal manometry, pulse oximetry and electromyography [14]. VFSS and FEES are the most relevant instrumental assessments for patients following TBI. If a patient is tracheotomised, blue dye tests may also be used to screen for aspiration.

VIDEOFLUROSCOPIC SWALLOW STUDY

It is considered the gold standard for evaluation of oral or pharyngeal dysphagia. It assesses the speed and coordination of movements during chewing and swallowing in the oral cavity, tongue base, pharynx, hyoid, larynx and cricopharyngeal region. It provides information on the transit time and amount, aetiology and type of aspiration. Trialing different consistencies, viscosities and volumes of food and fluid allows optimization of the patient's swallowing regime. VFSS can assess other management approaches where appropriate. If sensory issues are suspected, modifying bolus temperature, taste and carbonation(15).

Limitations of the VFSS include concerns for radiation exposure and need to modify food consistency with barium. Advantages include viewing the entire swallow from the oral cavity to the oesophagus (even to the stomach); viewing aspiration before, during, and after the swallow; and viewing the physiologic effects of rehabilitation

techniques in detail can be trialed to determine if these strategies assist with bolus detection and improve swallow safety.

FIBER-OPTIC ENDOSCOPIC EVALUATION OF SWALLOWING (FEES) and FIBER-OPTIC ENDOSCOPIC EVALUATION OF SWALLOWING WITH SENSORY TESTING (FEESST)

This test was first described by Langmore et al (16). The examiner passes a flexible scope through the nose to the level of soft palate to view hypopharynx, larynx and proximal trachea during swallowing. Both techniques are effective tools for assessing dysphagia, detecting aspiration and trialing management strategies in patients with TBI. FEESST can also tests laryngopharyngeal sensory function. The benefits of using FEES are multiple, including its simplicity of use at the bedside (16) and in ventilated patients (17). Barium contrast is not required, improving patient compliance with food and fluid trials. Disadvantages of FEES include patient discomfort, laryngospasm, the inability to observe the oral cavity, tongue base movement, pharyngeal wall contraction and degree of laryngeal elevation or cricopharyngeal opening during swallowing.

BLUE DYE TEST:

This test involves placing drops of blue dye on a patient's tongue and periodic tracheal suctioning, noting blue-stained secretions suggestive of aspiration [18]. The Modified Evans Blue Dye Test uses blue dyed food and fluid instead [18]. This test is simple and economical way of screening patients with tracheostomy for aspiration.

MANAGEMENT OF DYSPAGIA

Post TBI dysphagia is different from other neurogenic dysphagia and the multifactorial nature calls for patient specific treatment and management. This includes taking into account their neuromuscular, cognitive-communicative and behavioural skills.

In patients with low responsiveness sensory stimulation (tactile, olfactory, gustatory, auditory and visual) to has been suggested to improve patient responsivity [5,19]. More frequent, smaller meals may be recommended if alertness fluctuates during the day [8]. Environment distractions have to be curbed, feeding in a quiet room with curtains drawn, away from noise can help. Identification and minimization of triggers which lead to physical outburst decreases chances of aspiration during feeding. Patient is given small amount of food with minimum utensils at one time.

STRATEGIES TARGETING SWALLOW PHYSIOLOGY POSTURAL ADJUSTMENT

Postures including chin down, head rotation to the damaged side, head tilt to the stronger side, or lying down may be trialed [15]. These postures aim to improve airway protection or redirect food toward the stronger side of the pharynx. Patient however needs to have sufficient behavioural and cognitive-communicative skills.

COMPENSATORY SWALLOWING MANOUEVRES

These manoeuvres provide an 'immediate but only transient approach to the underlying physiologic deficit. [20]. The manoeuvres include supra glottic swallow, super supraglottic swallow, Mendelson's manoeuvre, Masako manoeuvre and the effortful swallow.

The supraglottic swallow functions to close the vocal folds before and during the swallow [21] and clear bolus residue from the airway post-swallow [22]. An effortful breath hold with the super-supraglottic swallow aims to close the airway before and during the swallow [21]. The supraglottic and super-supraglottic swallows are recommended in patients with reduced airway closure and/ or a delayed pharyngeal swallow [21]. The Mendelsohn manoeuvre aims to increase submental muscle activation, hyoid movement and the duration of cricopharyngeal sphincter opening [15]. Masako manoeuvre involves the patient holding their tongue between their front teeth in an anterior position while swallowing [23]. It increases posterior pharyngeal wall movement during swallowing which is helpful for patients with reduced base of tongue retraction (24). It is intended as a saliva swallowing exercise (i.e., no bolus) to strengthen pharyngeal muscles.

INCREASED SENSORY INPUT

Modification of the bolus temperature, taste or carbonation, allowing self- feeding (hand to mouth movement may provide additional sensory input), applying downward pressure on the tongue when feeding with a spoon, thermal/tactile stimulation (vertically rubbing the faucial arches with a cold laryngeal mirror) and a presenting a bolus that requires chewing are all techniques that can be tried to assist with bolus detection and improve swallow safety (15).

Reducing food/fluid intake volume and speed can help prevent pharyngeal pooling and aspiration in patients with delayed or weak pharyngeal swallows [25]. However in come patients, small volume of bolus may not trigger the swallowing reflex. Thus it has to be clearly patient specific. Thickening liquids slows the flow of the liquid through the pharynx and may help avoid aspiration [26]. Softened or pureed foods are recommended if a patient has difficulty manipulating challenging food consistencies [26] such as hard, chewy or crumbly foods or foods with dual consistencies (e.g., soup containing solid vegetable pieces).

OROMOTOR EXERCISE PROGRAMME

Oromotor exercises such as range of movement and strength exercises are advised for management of dysphagia however the studies are not conclusive of its benefits. The Shaker Head Lift is not a direct swallowing task, but rather requires the patient to repeatedly raise their head and hold from a supine position. The aim is to increase cricopharyngeal opening 'by strengthening suprahyoid musculature with resulting increased hyolaryngeal excursion' [27], thereby eliminating dysphagic symptoms. Strengthening exercises for patients who display hypertonia or rigidity are contraindicated as it may increase tone, discomfort and further reduce the range of movement.

Surface Electromyography Biofeedback (sEMG) is an adjunctive therapy tool that can increase motor learning via biofeedback during dysphagia treatment tasks. (28). Neuromuscular Electrical Stimulation (NMES) applies an electrical current to stimulate motor and/or sensory nerves or nerve endings. The purported aims of transcutaneous NMES are to enhance movement by increasing muscle contraction' [27] to improve function by strengthening the swallowing musculature or by stimulating the sensory pathways relevant to swallowing, or both. [29] and to re-educate patients to use their pharyngeal muscles in the throat for patterned activity to initiate or re-establish swallowing.

ORAL HYGIENE

Hygiene is required, as excessive colonization of microorganisms in the oral cavity can contribute to respiratory infections [30]. Implementation of an oral care program to maintain and improve oral health reduced the risk of pneumonia in an aged care population.

TEAM APPROACH

A multidisciplinary team approach to dysphagia management involving speech pathologists, physiotherapists, dietitians and nursing staff resulted in improved weight and caloric intake. Involvement of the patient, family and caregivers, is also critical to ensuring that management strategies generalize to functional settings, such as the home [31]. Family education programs must explain dysphagia and provide training in feeding techniques and management , which improves compliance and strategies in home environment.

CONCLUSION

Dysphagia following traumatic brain injury is a common complication and is associated with increased morbidity. A multidisciplinary team approach, individualised to every patient, that incorporates the contributory and causative cognitive-communication, behavioural, physiological and pharmacological factors is essential for the management of dysphagic patients. Given the scarcity of evidence for many traditional forms of dysphagia management, regular monitoring and assessment of therapeutic strategies for individuals is recommended to maximize efficacy and avoid unwanted outcomes.

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Bladder Management of Trauma Patients

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Introduction: Bladder Dysfunctions are common sequelae of trauma patients. Physical Medicine& Rehabilitation has got immense role in the management of Bladder Dysfunction following Trauma particularly Spinal cord injury(SCI), Traumatic Brain Injury(TBI),and Polytrauma(#Pelvis is common in Polytrauma patients causing Bladder Neck injury are well recognized consequences.)

Background: In the practice of PMR, voiding disorders are usually a result of neurologic conditions, such as SCI, CVA/TBI, MS or Dementia. Incontinence and urinary retention can cause social embarrassment and added morbidity as UTI, Stone or Renal Injury.

Patho-physiology: Control of bladder functions involves the Somatic efferent as well as Autonomic Sympathetic& Parasympathetic systems. Lesion of Peripheral Nerves or Sacral Micturation Centre causes Detrusor Areflexia :- Lesion may affect Conus Medularis, Cauda equina & S2-S4 Peripheral Nerve, common cause of Sacral lesions are trauma. Lession of Spinal cord or Brain stem below pontine micturation centre but above sacral micturation centre lead to uninhibited bladder contraction with uncordinated sphincteric activitis. Suprasacral lessions associated with the group of Neurogenic Bladder problems caused by SCI by trauma with lession below the Pontine micturation centre have both detrusor hyper reflexia & sphincter dyssynergia. Central control of micturition is performed by three areas, i.e. sacral micturition center, the pontine micturition center, the cerebral cortex. The sacral micturition center is located at S2-S4 level and is responsible for bladder contraction. The pontine micturition center act as a central relay and act as a external sphincter relaxation with bladder contraction. the cerebral cortex plays an inhibitory role in relation to the sacral micturition center.

Epidemiology: The incidence of neurogenic bladder dysfunction depends on primary causes. Estimates of the incidence of the TBI patients are 33%-60%. Onset of neurogenic bladder disorder in male:female ration 1.6% to 8.5%.

Goal: The goal of bladder rehabilitation is to have balanced bladder.

Rehabilitation Management:

1) Physical examination of the patient for incontinence includes cognitive, neural, musculoskeletal or pelvic assessment. This is because both voluntary and involuntary control of voiding involves the central and peripheral nervous system.

2) Diagnostic considerations – investigation – along with routine procedures such as Urinanalysis and C/S to rule out infection, 24-hour creatinine clearance and residual urine volume, radiography and ultrasonography – plain radiography of the urinary tract, bladder and kidneys is used in conjunction with USG to determine the presence of radio-opaque calculi. Excretory urography or intravenous pyelography may be used to visualization of the collecting system. Isotope studies (e.g. technetium 99m, DMSA) are used for evaluation of renal cortex function.

The prime investigation is very much required is URODYNAMIC STUDY to classify detrusor hyper-reflexia, detrusor areflexia. Sphincter EMG with video urodynamic study is required to see detrusor sphincter dyssynergia. It is particularly useful for detection of sites of bladder outlet obstruction & DSD.

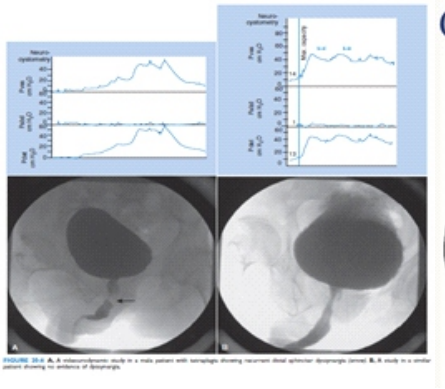


Fig: Video-urodynamic study showing DSD

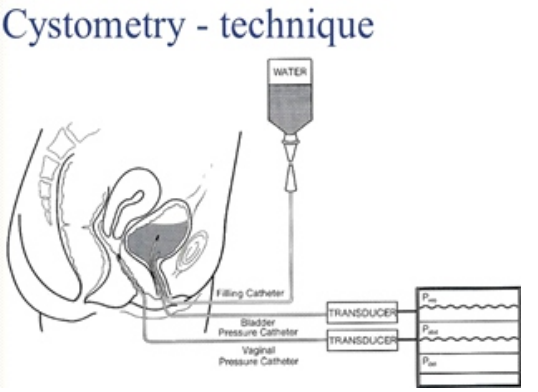


Fig: Cystometry

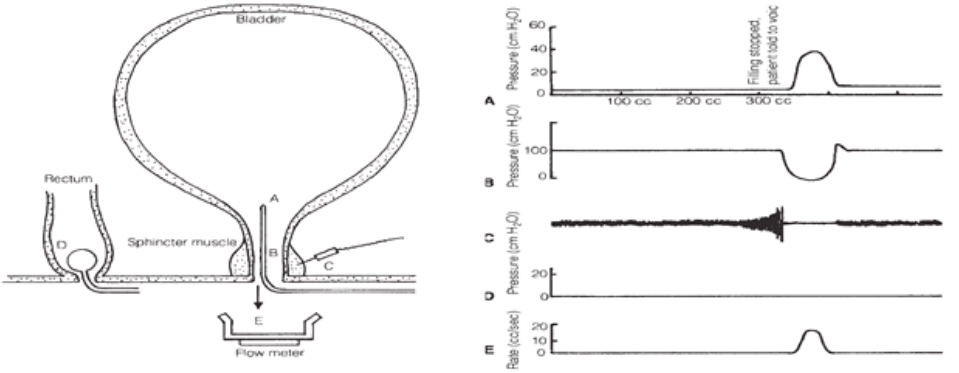


Fig: Urodynamic Study

CYSTOMETRY is the measurement of bladder volume and intravesical pressure during filling and storage phases, for the purpose of evaluating detrusor function.

Definition of neurogenic bladder: loss of normal neurological control of bladder is commonly referred as neurogenic bladder, injury above T12 the neurogenic bladder is affected in two ways, Spastic (Reflex Bladder) and Flaccid (Non-Reflex Bladder)

Classification:

Neurogenic bladder may be classified as 1..Hald Bradley(Neurotopographic),2.Functional, 3.Mader-basher, 4. Bors Commar/ neuroanatomic, 5. Lapides, 6. International continence society, 7. Krane.

Urodynamic classification:

- Detrusor hyperreflexia

1. Coordinated sphincters
2. Striated sphincter dyssenergia
3. Smooth sphincter dyssenergia
4. Non relaxing smooth sphincter

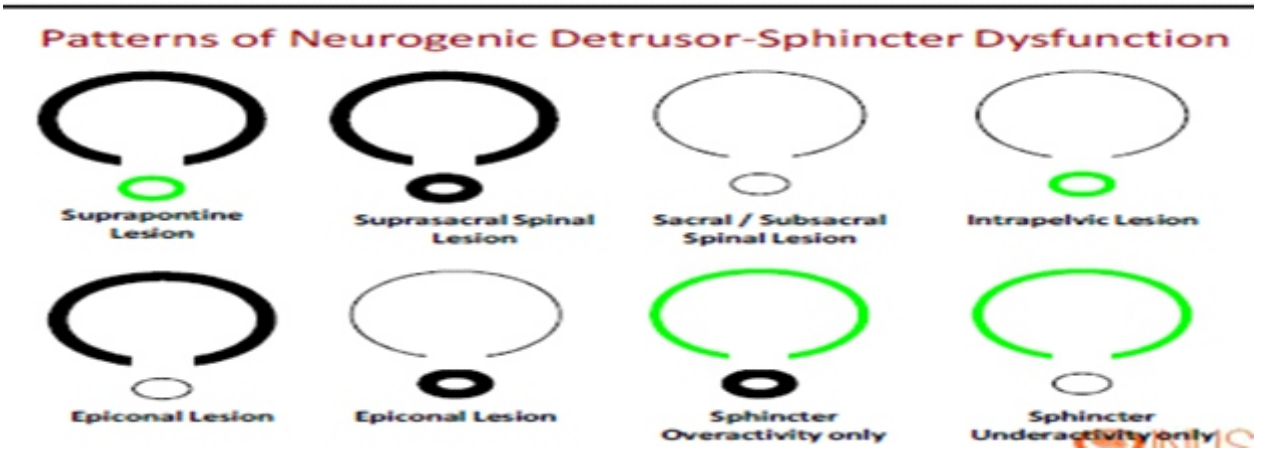
- Detrusor areflexia

1. Coordinated sphincters
2. Striated sphincter dyssenergia
3. Smooth sphincter dyssenergia
4. Non relaxing smooth sphincter

Mader-Basher classification:

- Supra Pontine
  - Bladder – Overactive
  - Sphincter - Normo Active

- Spinal –
  - Bladder – Overactive
  - Sphincter – Overactive
- Lumbo Sacral
  - v Bladder – Overactive
  - v Sphincter – Under- Active
  - · Bladder – Under Active
  - · Sphincter – Overactive
  - ü Bladder – Under- Active
  - ü Sphincter – Normo Active
- Sub Sacral
  - Bladder – Under- Active
  - Sphincter – Under- Active
- Sphincter Only
  - § Bladder – Normo Active
  - § Sphincter – Overactive
  - Bladder – Normo Active
  - Sphincter – Underactive



Bladder Management in acute phase of SCI:

- Rehabilitation of management of neurogenic bladder in early acute phase of SCI an indwelling catheter to be inserted using lignocaine gel, once patient has stabilized consider to change intermittent catheterization 4 to 6 times in 24 hours.
- Latex free catheter is used .
- For long term management – CIC & condom drainage.

BEHAVIORAL TREATMENT: Behavioural treatment which includes facilitative techniques and maneuvers.

- § Suprapubic bladder tapping (10-30 secs)
  - o Indicated for urinary retention in SCI with preserved upper limb function
  - o Stroking or pinching perineal skin, suprapubic jabbing or tapping cause mechanical stretch of bladder wall and lead to contraction
  - o Used with condom catheters.
- § Scissoring action of fingers in the rectum
- § Timed voiding
  - o Indication :
    - § Detrusor overactivity with urgency

        - § Involuntary leakage and sphincter weakness
    - Not suitable - Dementia or other cognitive disorder
    - Monitor fluid intake and patient education
- § Pelvic floor exercises
- § Biofeedback
- § Crede or Valsalva Manoeuvre
    - Indication - Areflexia and denervation of the pelvic floor (infrasacral lesions).
    - most effective in women because even the partially paralyzed pelvic floor descends with straining, and the bladder neck opens.
    - Over time the pelvic floor descent increases as paralyzed muscles atrophy and stretch, and the patient complains of worsening stress incontinence.
    - In men, complete flaccidity of the pelvic floor can allow emptying by straining.
    - In Crede manoeuvre, the attendant mechanically pushes urine out of the bladder in patients with tetraplegia. Abdominal wall must be relaxed and can cause ureteric reflux.
    - Complication-hemorrhoids, rectal prolapse, hernia.
    - Contraindication-DSD, vesicoureteral reflux
- § Anal Stretch Voiding
    - Indication - Paraplegic with spastic pelvic floor
    - Method - Relaxation of the pelvic floor by stretching the anal sphincter with a gloved digit and then emptying the bladder by the Valsalva manoeuvre.
    - Requirement - Transfer to the toilet, absence of anal pain sensation and adequate ability to generate intra-abdominal force.
    - Can induce reflex bowel activity - Bowel incontinence.

Collecting Devices:

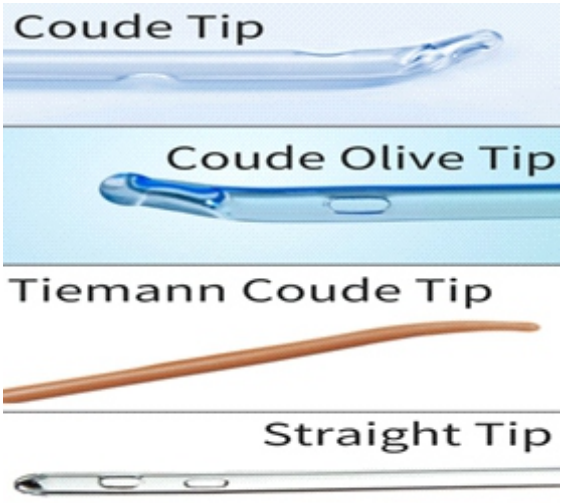


Fig: Various Catheter tips

Fig: Catheter bag placement

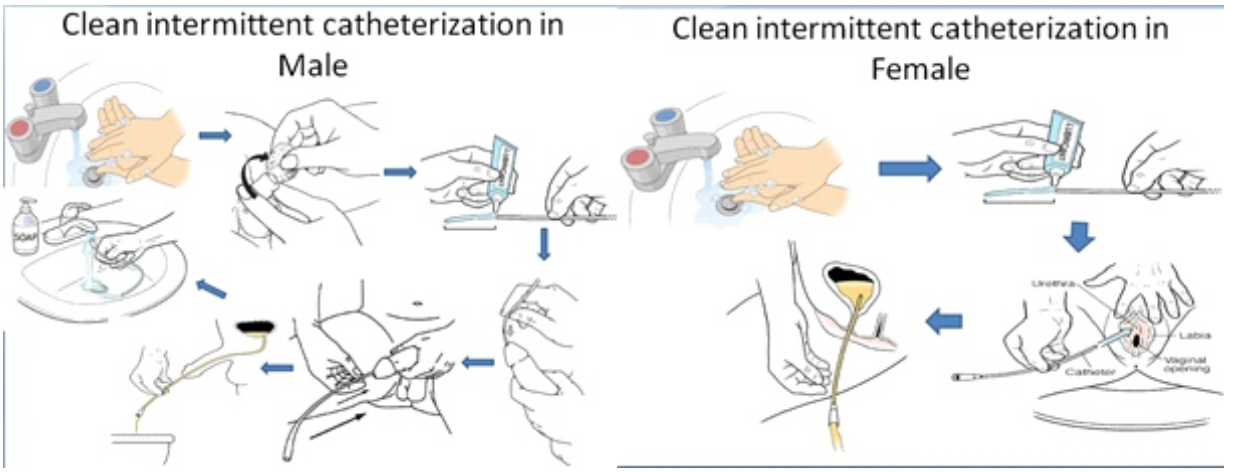
- Suprapubic catheter - Less cumbersome for participation in sexual activity
- External condom catheter - In men with intact sacral micturition reflex
    - Complication—penile skin break down
- Diapers

Indewlling catheter:

- Indications---
- Cervical injuries with poor hand function
- Men who can't wear condom catheter
- Urethral diverticulum,
- Principles---
  - Fluids at least 2 liters per day
  - Catheter taped to abdomen
  - Cleaning urethral meatus twice a day
  - Drainage bag below level of bladder
  - Changing catheter 2-4 weeks
- Complications-
  - Bladder stones
  - Hematuria
  - Bacteremia
  - Meatal erosions
  - Penile scrotal fistulas
  - Epididymitis

Intermittent catheterization:

- Principles –
  - Restrict fluids to 2 liters
  - Catheterize every 4-6 hours
- Complications—
  - Urethral trauma
  - Epididymitis
  - Urethral stricture
  - Hydronephrosis
  - Vesicoureteral reflux
- Contra-indications –
  - Women with adductor spasticity
  - Urethral false passage
  - Poor hand-eye coordination
  - Poor cognition
  - Poor motivation



Pharmacological Management :

For detrusor over activity:

- Anticholinergics:
  - Oxybutinin- 5 mg QDS or 15 mg SR once or twice daily
  - Propantheline- 15 to 30 mg TDS
  - Hyoscyamine - 0.125 to 0.25 mg TDS or QDS
  - Terodiline
  - Tolterodine (4 mg daily),
  - Darifenacin (7.5 to 15 mg OD), Solifenacin (5 to10 mg OD);
  - Trospium (20 mg BD or 60 mg SR OD)
  - TCA- Imipramine
- Intravesical agents:
  - Oxybutinin (anticholinergic and anesthetic)
  - Botulinum toxin type A- cystoscopic injection as 200 units in 30 sites in the bladder wall reduces or abolishes detrusor overactivity for 6 to 9 months.
  - Capsaicin (C fiber neurotoxin), Resiniferatoxin (RTX)
- Others- intrathecal baclofen, PG inhibitors, Desmopresin acetate (MS)

For Retention

Bladder cause

- Ø Bethanechol chloride (not to be used in DSD, bladder outlet obstruction)
- Ø Under investigation-
  - Ø Intravesical PG F2alpha
  - Ø Narcotic antagonists

Sphincter cause :

- v Alpha adrenergic blocking agents-
  - v Phenoxybenzamine - 10 to 30 mg OD
  - v Prazosin, Doxazosin, Terazosin
  - v Tamsulosin- 0.4 to 0.8 mg OD
  - v Silodosin- 4 to 8 mg OD
- v Others: Baclofen, diazepam, dantrolene

For Stress incontinence

- Alpha adrenergic agonists-
  - Ephedrine, phenylpropanolamine
  - Mirabegron (β3- adrenergic receptors)
- Duloxetine (off-label use).
- Estrogen supplementation
- Periurethral collagen injection

Surgery:

- To increase capacity:
  - Bladder augmentation
    - Most common type---clam cystoplasty
    - Indications-
      - Inability to tolerate drugs
      - Severe detrusor hyperreflexia
      - Recurrent UTI
      - Autonomic dysreflexia
      - Continued upper tract deterioration

        - Serum creatinine clearance < 2 mg/dl
    - Complications –
        - Mucus in urine
        - Osteomalacia
        - Cancer
  - Bladder augmentation with Continent Catheterizable Stoma
  - Urinary Diversion
  - Denervation Procedures
- To increase contractility:
  - Electrical Stimulation
- To increase outlet resistance:
  - Urethral bulking agents
    - Teflon, Hyaluronic acid, autologus fat, bovine cartilage and hydroxy -appetite.
  - External compressive procedures
    - Autologus fascial sling procedure, more recently synthetic(mesh) sling are now gold standard for the treatment of uncomplicated stress incontinence .
- To decrease outlet resistance:
  - Sphincterotomy
  - Urethral Stents
  - o Metabolic changes--hypochloremic metabolic alkalosis (stomach), hyponatremia, hypochloremia, hyperkalemia (jejunum), hyperchloremic acidosis (ileum, colon)

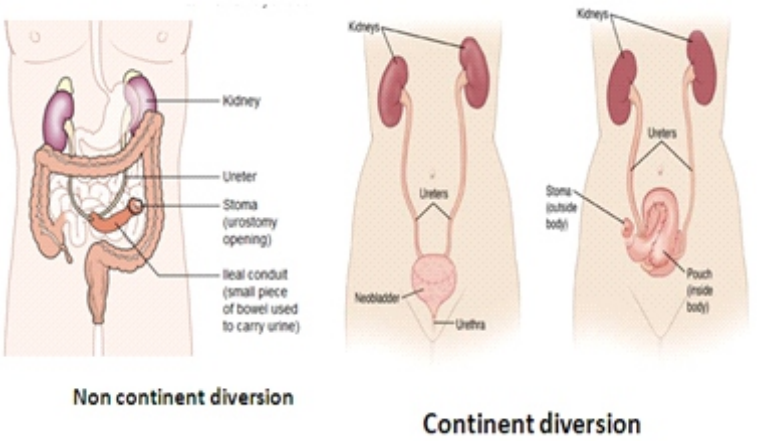


Fig: Diversions

Fig: Bladder augmentatation

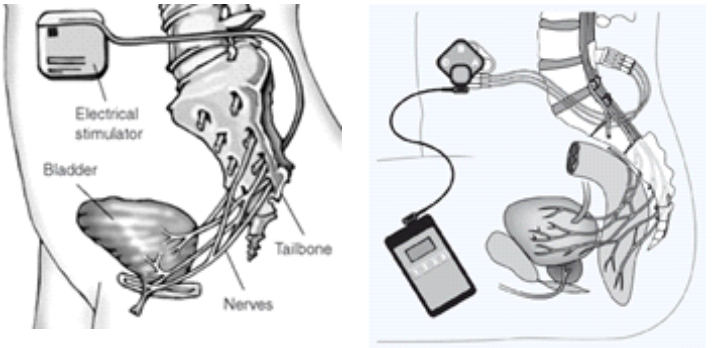


Fig: Electro evacuation

Complications of neurogenic bladder:

- Bacteriuria
- Autonomic Dysreflexia
- Hypercalciuria and stone formation (8% SCI)
- Lower urinary tract changes – Trabeculation, Sacculation, Diverticula
- Ureteric Reflux and upper tract dilatation
- Bladder carcinoma (prevalence is higher in SCI)

Pattern of bladder dysfunctions in TBI :

1. Uninhibited overactive bladder.
2. Poor perception of bladder fullness.
3. Poor sphincteric control.
4. Persistence of urinary incontinence in post TBI cases carries important prognostic significance.

Implications for rehabilitation of bladder in TBI

1. Persisting urinary incontinence in post TBI patients.
2. Urethral stricture.
3. Gaining urinary continence in post TBI patients.
4. Goal setting offer.

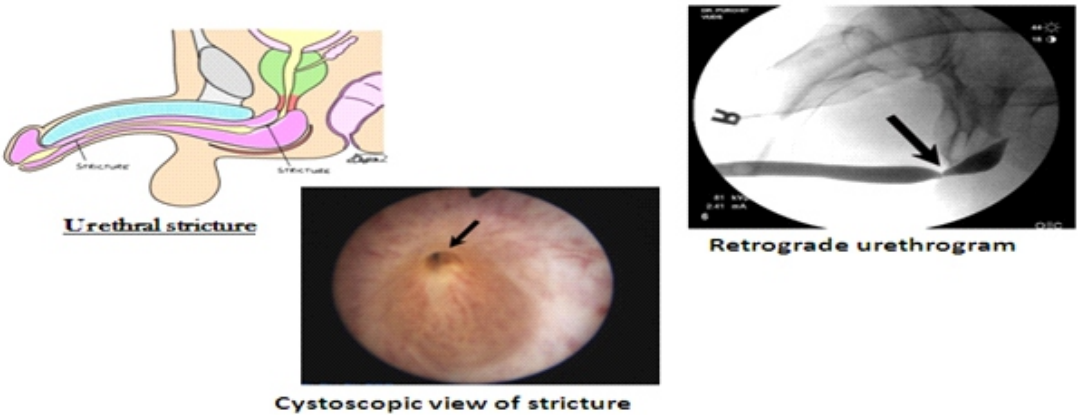


Fig: urethral stricture

- Bladder management approaches:
- The management programme includes three main interventions
    1. Fluid management
    2. Establishment of micturation schedule
    3. Use of a behavioral approach based on positive enforcement.
- Determining when to initiate programme :
    - During acute stage of recovery in ICU in TBI patients
    - Use of an indwelling catheter (Foley's catheter) to control urinary output.
        - About 70% patient using indwelling catheter developed UTI.
        - So when patient's condition is stable, indwelling catheter should be removed and bladder retraining programme will be initiated.
- The programme should start when the person's cognitive functioning approx level 5 in the Racho-Los-Amigos scale(RALS).
- Planning of bladder management programme :
    - Fluid management: 2 primary guideline should be followed :
        - Overhydration during morning and early afternoon.

- Restriction of fluid intake after 7 PM. Amount of fluid needed 2500ml . 1300 ml during day (7AM to 3PM), 1000ml during late afternoon and early evening(3PM to 7PM) and 200ml at night(7PM to 7AM)

- Micturation schedule -With the use of a chart posted in patient's room

Figure 1. Micturition Schedule

Date		7A	9A	11A	1P	3P	5P	7P	9P	11P	3A	Comments
	Void											
	Incontinent											
	Positive reinforcement											
	Void											
	Incontinent											
	Positive reinforcement											
	Void											
	Incontinent											
	Positive reinforcement											

Form should be used at scheduled intervals.

- Behavioural approach:
  - The major and most important long term benefits – higher self esteems , higher motivation and better chances for positive rehabilitation outcome, profit the individual who has TBI.

Bladder in polytrauma

- Pelvic # are common in polytrauma patients.
- Bladder neck injury are well recgnized consequences in pelvic # related to trauma of lower urinary tract.
- Types of injury of prostate and bladder neck
  - Typical type 1 : anterior midline rupture of prostate,prostatic urethra and bladder neck.
  - Atypical type 2 : Transverse rupture of bladder neck and of the membranous urethra with sequestration of prostate.
  - Atypical type 3 : Avulsion of anterior aspect of prostate.

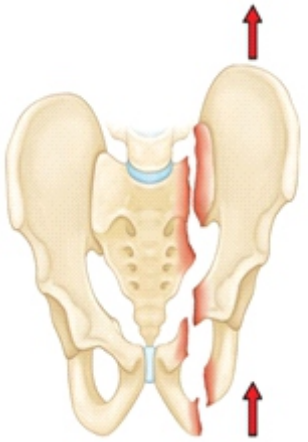


Fig: # Pelvis

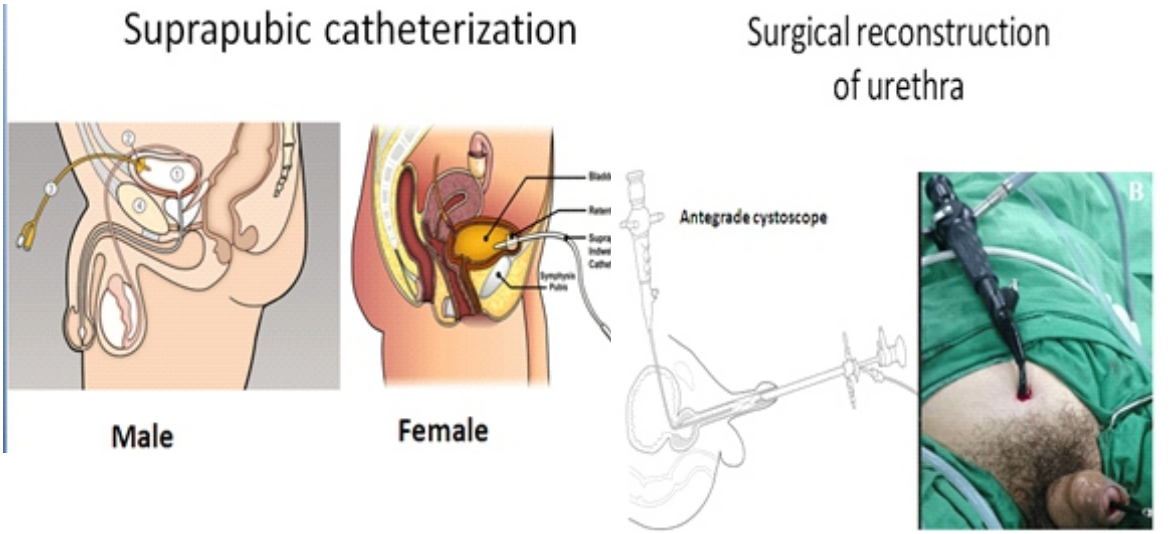
cystogram - intraperitoneal bladder rupture

CT cystogram extraperitoneal bladder rupture

Fig: Rupture urethra in # Pelvis

Bladder management approaches in # Pelvis :

- Initial management to the urethra : Suprapubic urinary diversion and delayed primary repair have been adapted in many centers.
- Urine diverted through a standard suprapubic catheter introduced using an open or radiological techniques.
- Subsequently after delay of 6 to 8 wks Antegrade cystoscopy is performed through catheter .
- If patient can void, the tube can be removed and the patient observed for formation of stricture .
- If a stricture is present delayed end to end repair can be undertaken. The two ends of divided urethra have been replaced by method using fluoroscopic and endoscopic guidance, primary realignment is regaining some favor.
- Simultaneous Antegrade and retrograde urethroscopy through suprapubic site can be employed.
- Once alignment have been achieved a urethral catheter/stent is passed to maintain position and left in situ for 4 to 6 wks. While healing occurs.



Prognosis and conclusion:

- The greatest threat to patient with neurogenic bladder is progressive renal damage e.g. pyelonephritis, calculi , hydronephrosis.
- Advance in the management of neurogenic bladder with better follow-up at regular interval have substantially improved the out look for long term survival.

PRINCIPLES OF SURGICAL MANAGEMENT OF SPINAL CORD INJURY

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AIIMS Rishikesh

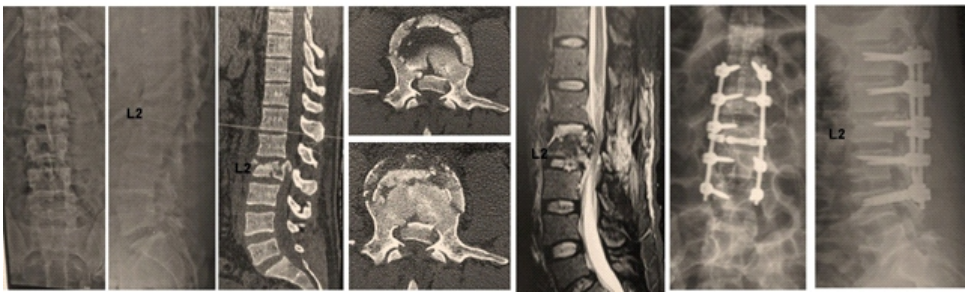
Abstract:

Spinal cord injury is a potentially disabling condition that has a profound impact on a personal and societal level. As per report of the International Conference (Spinal Injuries Management, New Delhi, 1995), the incidence of spinal injury was estimated at 15 new cases per million per year in India, and its incidence is on the rise.

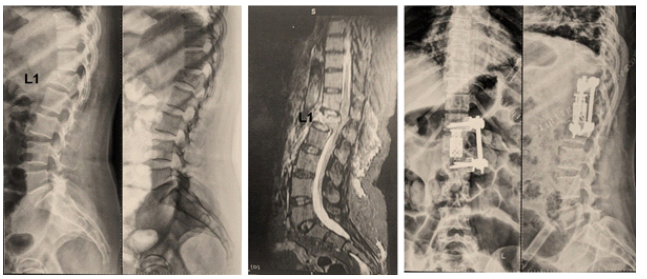
The management of patients with SCI has drastically evolved over the past century because of increasing knowledge on injury mechanisms, disease pathophysiology, and the role of surgery.

Surgical intervention is often advocated to (a) decompress the neural elements in cases of neurologic deficit; (b) prevent possible late neurologic injury in unstable fractures; (c) correct and prevent deformity that could result in chronic axial (back) pain or neurologic loss; and (d) provide for early mobilization, thus avoiding the complications of prolonged bed rest. Anterior (ventral), posterior (dorsal), and combined anterior and posterior approaches can be used to treat SCI and traumatic spinal instability. The surgical approach selected may depend on the fracture pattern, the neurologic status of the patient and the individual preference of the surgeon.

There, however, remain controversial areas surrounding management strategies for the treatment of SCI, including the use of corticosteroids, role of magnetic resonance imaging, optimal timing of surgery, approach, anticoagulation prophylaxis and rehabilitation. This lack of consensus has prevented the standardization of care of patients with SCI. Managing the complications, such as bowel and bladder dysfunction, pressure sores and infections, as well as physical and vocational rehabilitation is key to address all facets of the patient's injury experience.



34-year male sustained Burst fracture L2 with paraplegia (AIS A) following fall from height, managed by posterior decompression and instrumentation



45-year female sustained Burst fracture L1 with paraplegia (AIS B) following RTA, underwent anterior decompression and Anterior Instrumentation

Sports Injury Rehabilitation: Principles and Practices

Dr. Joy Singh Akoijam
Professor and HODs,
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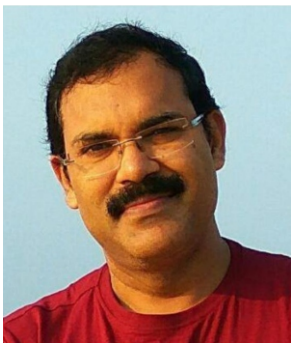
Abstract:

Injury among elite sportspersons is unavoidable and it may even cost the career of the sportspersons if their rehabilitation management is inadequate. Injury causes structural instability, proprioceptive deficit, decrease neuromuscular control leading to functional instability. The sequence of events starting from immobilisation or disuse of a part or whole body leads to decrease in general and sports specific fitness which ultimately leads to decrease in performance.

Few additions specific for sports injury rehabilitation are; a) adequate counselling about the injury and its consequences, b) localise rest, c) minimise period of rest in commensuration of the physiological healing time of the tissue involved, d) continue activities of the non-injured body parts that will maintain and improve their strength, endurance and balance, e) early mobilization, f) consideration of both concentric and eccentric strengthening of muscles, provision for isokinetic and plyometric in strength training, g) incorporation of appropriate open and closed kinetic chain activities during the recovery phase and thereafter, h) neuromuscular control training involving proprioception, body balance and muscle control training from the very beginning, i) sports specific fitness and skill training and j) return to sports after fulfilling specific general and sports specific fitness criteria and psychological recovery.

Rehabilitation program and the sportsperson must be continuously monitored and re-evaluated during the recovery phase as setbacks are common and can require modification of the rehabilitation plan. Generally, return to sports participation is achieved when the injury area is no longer painful; when there is normal flexibility, strength and proprioception and when sports specific mechanics and skills are achieved and reproducible. Continuous motivation of the injured sportsperson throughout the rehabilitation process and complete psychological recovery is important in achieving successful return to sports.



Post-Operative Rehabilitation of Musculoskeletal Injuries

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Postoperative rehabilitation is a systematic process adopted after surgery which helps in early detection and management of complications and fastens the recovery process to pre-injury state. In a case of musculoskeletal injury, a surgeon thinks about wound healing and bone union whereas a Physiatrist consider the patient as a whole and thinks in terms of functional recovery. Postoperative rehabilitation of musculoskeletal injury plays an important role in overall functional recovery of the patients. It is divided into 3 phases.

Phase-I: Immediate Post Operative(Post-anesthetic phase)
Phase- II: Intermediate phase (Hospital stay phase)
Phase- III: Convalescent phase(After discharge to full recovery)

Objectives of Phase I & II

- Homeostasis
- Treatment of pain
- Prevention & early detection of complications

Immediate Post-Operative Phase

Most of the dreaded complications are observed in the 1st phase. Acute pulmonary problems and cardiovascular problems should be given immediate attention. Strict observation of bleeding from the operative site, excessive drain amount and fluid management should be carried out. Continuous monitoring of vital signs and proper follow up of postoperative instructions can prevent lots of complications of this phase. Discharge from the recovery should be after complete stabilization of cardiovascular, pulmonary and neurological functions which usually takes 4-6 hours. Any instability of vital conditions noted beyond that period, the patient should be referred to intensive care units.

A) Monitoring

- Vital signs- pulse, BP, Respiration rate, Temperature recorded every 15-30 min.
- ECG
- Fluid balance (Fluid intake and urine output measurement)
- Peripheral pulse, distal neurological status evaluation

B) Respiratory Care: Oxygen with mask, tracheal suction, ventilator support if required

C) Position in bed and mobilization:

- Special position on bed if required (Limb abduction in hip surgery, Limb elevation on Braun splint)
- DVT prevention mechanically (Intermittent calf compression).
- Care of the drainage tube.
- Limb elevation to reduce post surgical oedema.
- Skin traction, Halter's traction after soft tissue release.

D) Medication:

Antibiotics, Analgesics, sedatives, H_2blockers are routine medications in this phase. Pre-operative medications of particular patients like anti Diabetics, antihypertensive, preoperative steroids should be resume as soon as possible.

E) Lab. Tests and Imaging: To detect or exclude Post-Op complications.

Phase- II: Intermediate phase

Starts with a complete recovery from anesthesia and lasts for the rest of the hospital stay. Rehabilitation in the second phase done with following objectives.

Care of the wound:

Epithelialisation starts at 48 hours. The dressing can be removed 3-4 days after the operation. Wet dressing should be removed earlier and changed. Symptoms and signs of infection should be looked for, which if present compression, removal of a few stitches and daily dressing with a swab for Culture and sensitivity should be done. Removal of sutures usually done after 2-3 weeks of musculoskeletal surgery. Tensile strength of wound minimal during the first 5 days, then rapid between 5^{th} to 20^{th} day then slows down.

Management of drain

Open or close drains are used to drain fluids or blood that may collect in the wound or cavity created by surgical procedure which may be potential cause of complications. Drain tube should come out throw separate incision to minimize the risk of wound infection.The optimal time of drain removal after surgery is still unknown. As per WHO surgical site infection prevention guidelines[1], drain is left in place untill drain amount is less than 30 ml in 24 hours. Open Penrose drains should be avoided to avoid ascending infection and development of a sinus tract when kept for a long period.

Postoperative Pulmonary care

Pulmonary care is important for an elderly patient undergoing musculoskeletal surgery. Functional residual capacity (FRC) and vital capacity (VC) decrease after long-duration major surgery down to 40% of the Pre-Op. Level. They go up slowly to 60-70% by 6^{th} -7^{th} day and to normal Pre-Op. Level after that. The changes are accentuated by obesity, heavy smoking or Pre-existing lung diseases especially in the elderly.

Prevention-

Pre-operative and post-operative Physiotherapy advised preventing atelectasis in the elderly. Treatment of any Pre-existing pulmonary diseases, adequate hydration of patient done to avoid hypovolaemia and later on atelectasis and infection. Use of epidural block or local analgesia in patients with COPD to relieve pain and permits effective respiratory muscle functions.

Postoperative pain:

The severity of postoperative pain depends on the following factors-

- Duration of surgery.
- Degree of Operative trauma
- Type of incision.
- The magnitude of intra-operative retraction.
- Factors related to the patient: Anxiety, Fear, Physical and cultural characteristics.

Complications of Pain- Continuous post-operative pain may cause vasospasm, Hypertension which may cause CVA, MI or bleeding.

Management of Post-Operative pain:

Counseling to the patient, analgesics, parenteral opioids, anxiolytic agents is used to reduce post-operative pain. Epidural analgesia may be preferred for prolong surgery. A selective nerve block is an alternative to reduce pain[2,3].

Surgical site infections- Early detection is important to prevent the spread of infection. Early findings include redness, delayed healing, fever, increased Pain & Tenderness, erythema & Swelling, purulent discharge.

Management

- Make sure that all appropriate doses of antibiotics are given post-operatively
- Monitor vital signs- Temperature chart, pulse rate
- Laboratory parameters- Hb, DC,TLC, ESR, CRP
- Good nutrition, use of supplements if needed
- Monitor blood glucose in diabetic patients
- Educate patients

Skincare issues

A pressure ulcer is a localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction

Pressure ulcer prevention

Offload heals and monitor bony prominences. Keep skin dry. Straight linen, no crease on the bed. Change of posture every 2 hours. Care full observation of pressure bearing areas in predisposed individuals.

Compartment syndrome

Application of tight plaster cast, moist dressing, ill-fitting braces is the important cause of compartment syndrome in the hospital ward. If not identified and treated immediately leads to Permanent nerve damage, Tissue necrosis, Muscle death ultimately land in amputation Diagnosis by 5 p's of compartment syndrome 1. Pain – early sign 2. Pallor 3. Paresthesia 4. Paralysis 5. Pulselessness- late sign. Ultrasound can be used to measure compartment fascia flattening pressure and compare with healthy side for early diagnosis of the condition[4]. Compartment syndrome is an EMERGENCY, muscle necrosis can occur within 4hours. Avoid hypotension, capillary perfusion pressure as possible to be maintained. Remove bandages, splint, cast if possible & maintain extremity at heart level, elevating will reduce capillary perfusion.

Fat embolism:

Manifestations can develop 24-72 hours after trauma, especially long bone fractures. Pulmonary dysfunction is the earliest to manifest - Leads to respiratory failure in 10% of cases - tachypnea, dyspnea, cyanosis, hypoxemia. Nonpalpable petechial rash in chest, axilla, conjunctiva, and neck -rash can appear 24-36 hours and disappear in 1 week.

Management: High flow rate of oxygen to support good arterial oxygenation. IV fluids are given to help prevent shock that can exacerbate lung injury. Albumin- restores blood volume and binds with fatty acids that can decrease injury to the lung.

Deep Vein Thrombosis

DVT is the formation of a thrombus within a deep vein, most commonly in the thigh or calf. More common in the thigh after hip surgery & calf after knee surgery. Lower extremity DVT can be symptomatic or asymptomatic. Positive Homan's sign, tenderness, erythema/discoloration, warmth, swelling and pain when standing or walking are prominent features. DVT prophylaxis should be initiated as soon as detected.

Pulmonary Embolism

Blockage in one or more arteries in the lung commonly caused by blood clots traveling to the lungs from another part

of the body (legs). Knee and hip replacement surgery are one of the leading problems for blood clots. More common within the first 72 hours after surgery. Sudden onset, worse with exertion. Chest pain- worse with deep breath or exertion, no relief with rest. Anxiety, Excessive sweating, Tachycardia, tachypnea, palpitations, dizziness, and hemoptysis are prominent features. Ventilator support should be provided to avoid mortality.

External fixator / POP cast

- Avoid soiling of POP cast
- proper pin site care & pin tract dressing

monitor for signs of infection, pin loosening

Phase-III: Convalescent Phase

The primary objective of this phase is to achieve full mobility to pre-injury state and near-normal functional recovery.

* Increase ROM
* Improve muscle strength
* Aid proprioception
* Mobilise patient
* Educate patient and family members
* Facilitate normal recovery processes

Strengthening Exercise program:

Strengthening of Glutei, Quadriceps, Hamstrings and Gastrosoleus muscles improve mobility. Empower the patient to take responsibility for their rehabilitation & remind them to complete their exercises at least three times a day. The following therapeutic methods may be followed to improve the strength and mobility of the patients:

Continuous passive motion(CPM):

* Move the joint slowly and continuously through a controlled range of motion
* maintain & increases JROM
* prevention of joint stiffness, adhesions, and contractures.
* reduction of pain

Mobilisation

* Improves joint range of motion
* Relieves pain
* Improves functions

Manipulation:

* Useful for surgeries in and around the joints
* The high-velocity small-amplitude thrust given at the end range.
* Relief pain &improves mobility

Exercise on Isokinetic apparatus

* Dynamic exercises where the velocity of muscle shortening or lengthening & angular limb velocity is predetermined & constant by a rate-limiting device. Selective isolation of single muscle or opposite muscle groups for strengthening. Uniplanar and open-chain motions of a single joint possible. Improve muscle performance in later stages of rehabilitation[5]

Faradic stimulation

A short-duration current (less than 10ms) used for stimulating innervated muscles. The repetition rate of impulses is usually 50-100 per sec. Prevents wasting and improves the strength of muscles like quadriceps[6] and muscles used in tendon transfers[7].

* Facilitation of muscle contraction
* Re-education of muscle action
* Training a new muscle action
* Neuropraxia of motor nerve
* Improve venous and lymphatic drainage
* Prevention and loosening of adhesions

High voltage pulsed galvanic current

Frequency and intensity can be varied from 0-500 v. Help in reducing tissue edema, muscle spasm, and pain. Helps in muscle stimulation and improves joint mobility.

Transcutaneous Electrical Nerve Stimulations, Interferential therapy are electrical modalities mostly used for relief of chronic postoperative pain, absorption of exudates thereby relieving of edema.

Actinotherapy

Infrared radiation & laser therapy

These modalities help in acceleration of healing, improvement of circulation and reduce edema. The low-level laser has proven successful in stimulating the production of collagen in wound healing[8]. These modalities also help in relieving chronic pain and muscle spasm.

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PERIPHERAL NERVE INJURY

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Central nervous system and peripheral nervous system are commonly affected during various trauma incidents. Physical trauma is most common cause of PNI. Vasculitis, tumour and bleeding disorders also cause PNI.

In trauma; Due to overshadowing of concurring injuries to both the systems Peripheral nerve injuries (PNI) are often a challenge to diagnose. Still being underdiagnosed these PNI have an important impact on overall prognosis of a trauma victim and its future rehabilitative outcome. Physiatrist with expertise in musculoskeletal disorders and electrodiagnosis are ideally positioned to diagnose PNI. PNI can cause drastic impairment of activity of daily living.

Pathogenesis

During the first few hours chromatolysis and swelling takes place in the cell body and nucleus. Oedema and swelling then continues in the axonal stump for the first few days. Within two to three days Wallerian degeneration commences which involves axonal and myelin disintegration both in an antergrade and retrograde direction. Antegrade wallerian degeneration then continues with Schwann cells and macrophage infiltration to remove cell debris, leaving only the basement membrane for about 3-6 weeks. Schwann cells then start to proliferate and organize guiding the axonal sprouts between the basement membranes of the two nerve ends. Nerve regeneration then begins on the columns of Schwann cells called Bunger bands. The proximal intact axon then sprouts a growth cone. The lamellipodia and filopodia cytoplasmic extensions allow the axon to explore the new environment and help in guiding the repair. Actin found in the axon allows elongation, within the tube. Growth continues at the restricted rate of 1-3 mm/day but simultaneously scar tissue interferes with growth.

Classification of nerve injuries

Seddon,	Sunderland,	Description
Neuropraxia,	I	Focal conduction block without damage
Axonotmesis,	II,	Axon damage with Wallerian degeneration with intact supporting structure
Neurotmesis,	III	Damage to axon and endoneurium
	IV	Damage to perineurium and endoneurium
	V	Damage to axon and supporting structures

Evaluation

Evaluation of neuropathies begins with a detailed history of symptoms, functional impairments, medical comorbidities, and family history. This should be followed by detailed clinical examination. Manual muscle charting of different muscle must be done according to. Areas of altered sensation must be identified. Gait analysis is also an important aspect.

Diagnostic test

Imaging

Radiograph of injury site must be taken to rule out fracture or spur. High-resolution ultrasound and MRI can accurately assess the physical integrity of the nerve immediately after injury and provide valuable information

for surgical decision making. Intraneural and perineural injuries also can be identified with both of these techniques.

Electrodiagnostic Studies

Electrodiagnostic studies (nerve conduction velocity and electromyography) quantify and refine what is learned after a thorough physical examination and are useful in detecting, characterizing, and assessing the severity of PNI.

Sensory nerve conduction studies assess the number of axons excited and the speed of conduction of the axons. The amplitude, measured from baseline to peak, correlates with the number of axons excited, and a decrement usually suggests axon loss. Motor nerve conduction studies assess the amplitude of the compound muscle action potential (CMAP), distal latency, and conduction velocity with proximal and distal stimulation sites. Reduction in CMAP usually reflects axon loss.

Needle electromyography (EMG) is typically normal in purely demyelinating processes; however, when axonal involvement positive waves and fibrillation potentials are seen, ongoing axon loss and denervation of the sampled muscle are indicated. If the denervating process is slow, collateral sprouting can keep pace with the axon loss, and little spontaneous activity may be appreciated. In that setting voluntary motor unit changes occur, reflecting the process of collateral sprouting reinnervating affected motor units. Initially decreased recruitment is seen as the motor units are lost. As collateral sprouting begins, the motor unit shows increased duration and polyphasia as a result of the dyssynchronous conduction along poorly myelinated, immature sprouts. As the remodeled motor unit matures, an increase in motor unit amplitude is seen. Proximal and distal muscles in the upper and lower limbs, as well as clinically weak muscles, should be evaluated.

Upper Limb Peripheral Nerve Injury

Brachial Plexus injury

The brachial plexus arises from C5–C8 and T1 ventral rami. Trauma is the most common cause of brachial plexus injury. Traumatic injuries usually affect multiple trunks or cords, or even avulsion injuries to the roots and individual nerves.

Median nerve injury

It is most common PNI in upper limb. Usually median nerve compression occur at three sites. Carpal tunnel syndrome (CTS) is most common followed by pronator and Anterior interosseous syndrome. In rare cases nerve may be entrapped at medial epicondyle by ligament of struthers or bony spur.

Anterior interosseous injury is a purely motor syndrome resulting in weakness of flexion of the interphalangeal joint of the thumb and distal interphalangeal joints of the index and middle fingers. This can be assessed by asking the patient to make the “OK” sign. Because of weakness of the flexors of the distal joints of the fingers, they will substitute with a key pinch.

Pronator syndrome occurs when the median nerve is compressed as it passes between the two heads of the pronator teres, a fascial band from the flexor digitorum superficialis, or the biceps aponeurosis. Patients present with pain and paresthesias in the first three fingers of the hand, often mimicking CTS. There will also be involvement of the skin over the thenar eminence, which is usually spared in CTS. Nocturnal awakening as a result of pain is a common feature of CTS but not of pronator syndrome. Weakness and easy fatigue can be seen in all the muscles innervated by the median nerve, except for the pronator teres, which is innervated proximal to the site of entrapment.

The typical presentation of CTS includes paresthesias and numbness of the second and third digits and variably the thumb and lateral fourth digits, although often the patient will have more diffuse complaints of the entire hand being numb. Usually the thenar eminence will be spared any sensory abnormalities because the palmar cutaneous

branch comes off proximal to the carpal tunnel. Symptoms are classically worse at night, causing nocturnal wakening, and relieved by flicking the hands and placing them in a dependent position. Other exacerbating activities include driving or holding objects, such as a telephone, book, or steering wheel, with a flexed or extended wrist. A Phalen sign reproduces paresthesias in the second and third fingers by holding the wrist in a flexed position by pressing the dorsum of both hands together for 30 to 60 seconds.

Ulnar nerve injury

Patients with UNE typically present with dysesthesia and sensory change over the ulnar aspect of the hand. In contrast to CTS, patients less frequently report that the entire hand feels numb. Patients might also report pain or discomfort over the medial aspect of the forearm. As the disease advances, patients report loss of dexterity and grip strength and difficulty with eating and dressing. Examination reveals altered sensation in the ulnar distribution of the hand, including the segment from wrist to proximal interphalangeal joints, with sparing of the medial forearm.

Ulnar neuropathy at the wrist (UNW) is rare compared with UNE and CTS and has a more varied presentation. The nerve in the hand and wrist has four sites of potential injury. When the nerve is compressed within the Guyon canal, the patient has altered sensation in the fourth and fifth digits, with sparing of the dorsal ulnar region of the hand, and weakness of all the ulnar innervated hand muscles. The superficial sensory branch arises just distal to Guyon canal so that with injury distal and medial to the canal, the same pattern of weakness will be present but without sensory loss. With a more distal injury, usually related to a penetrating wound or a ganglion, there is sparing of hypothenar musculature and sensation, with weakness in the interossei. On rare occasions there can be injury to the superficial sensory branch only, leading to sensory loss without weakness.

Radial nerve injury at the Spiral Groove

Radial injury at the spiral groove typically presents with wrist drop and inability to extend the fingers. Extension of the elbow is usually spared because the triceps is innervated before the spiral groove. Elbow flexion might be mildly weak as a result of involvement of the brachioradialis. Median and ulnar innervated muscles should be strong; however, finger abduction can falsely appear weak unless the metacarpophalangeal joints of the hand are held in passive extension. In radial nerve injury in the region of the spiral groove of the humerus, sensation is abnormal in the lateral aspect of the dorsum of the hand and the dorsum of digits one through four. The brachioradialis reflex is diminished or absent, whereas the triceps and biceps reflexes are spared.

Posterior Interosseous nerve injury (Radial nerve)

The most common cause of posterior interosseous neuropathy (PIN) is entrapment at the arcade of Frohse (also known as supinator syndrome). Weakness is seen in the finger extensors and the extensor carpi ulnaris. The brachioradialis and radial wrist extensors are spared. When the patient is asked to extend the wrist, radial deviation is seen. The supinator muscle is variably affected. Sensation in the radial distribution is spared because the posterior interosseous nerve has no sensory fibers.

Lower Limb Nerve Injuries

Femoral nerve injury

Femoral neuropathy presents with unilateral thigh weakness and numbness of the anterior thigh and leg. Often a sensation of instability around the knee and buckling, with particular difficulty with stairs and inclines, is noted. The patellar reflex can be depressed or absent. If the nerve is compressed within the pelvis, hip flexion can also be affected. Adduction and abduction of the thigh should be normal, as should knee flexion and strength around the ankle. Pain with extension of the hip (the so-called reverse leg raise) can be seen with femoral nerve injury. Sensory changes are seen in the anterior thigh and medial lower leg in the saphenous nerve distribution.

Meralgia paresthetica

Meralgia paresthetica (Lateral femoral cutaneous nerve of thigh) is usually benign and self-limiting and improves

with conservative treatment over a few months. Eliminating any exacerbating factors, such as tight clothing or tool belts, and weight loss will often resolve the symptoms. When painful paresthesia is present, topical agents such as capsaicin cream and Lidoderm patches can be helpful.

Obturator nerve injury

Obturator neuropathy will present with loss of sensation of the medial thigh and weakness of adduction and internal rotation of the hip. A circumducted gait may be appreciated.

Fibular (Peroneal) nerve injury

Fibular neuropathy is the most common nerve injury in the lower extremity. The most striking clinical finding is weakness of ankle dorsiflexion. In severe injury complete foot drop can result in a steppage gait, which allows the patient to clear the toe during the swing phase of gain. With more subtle weakness, premature foot flat or "foot slap" can be seen after heel strike on the affected side. Often the deep fibular branch is more affected than the superficial branch, with foot eversion less impaired. Sensation is diminished in the lower two thirds of the lateral leg and dorsum of the foot. A Tinel sign may be produced by tapping over the common fibular nerve as it courses around the fibular neck.z

Tibial and Plantar nerve injury

Proximal tibial neuropathies are unusual but can occur with injury to the popliteal space or with space-occupying lesions such as Baker cysts or hemorrhage. Blunt trauma or fracture of the distal femur of proximal tibia can also damage the nerve at this level. Lesions at this level would result in weakness of plantar flexion and inversion of the ankle, as well as sensory abnormalities in the sole of foot and sural nerve distribution. Midshaft injuries are very uncommon as the nerve is well protected in the posterior compartment, and in the absence of trauma would raise suspicion for a space-occupying lesion.

Lesions at the ankle occurring under the flexor retinaculum are referred to as tarsal tunnel syndrome. The compression can involve any of the three terminal branches. Most cases are idiopathic, but other causes include ankle trauma, arthritis, deformity of the heel, talocalcaneal coalition, vascular compression, and masses such as ganglion cysts or lipomas. Typical presentation of tarsal tunnel syndrome includes paresthesias and pain in the sole of the foot and heel, exacerbated by standing and walking. Physical examination might reveal sensory loss in the lateral or medial plantar distribution, although it will often spare the heel. A Tinel sign might be elicited by percussion over the flexor retinaculum at the medial malleolus. The interdigital nerves can become entrapped under the intermetatarsal ligament and form a Morton neuroma with chronic compression. These most commonly form in the second and third intermetatarsal spaces.

Management of PNI

Prevention is ideal. Especially instances where it can be avoided like wrong or tight plaster of paris application, wrong injection techniques or unguided injections

In all PNI proper positioning with orthoses should be done to stabilize affected joints and improve function. Range-of-motion exercises are important to reduce contractures and recovery of motor function.

Orthosis in upper limb PNI play pivotal role in improving prognosis. Orthosis can be static or dynamic. Aeroplane splint, cock up splint, posterior elbow splint are used in brachial plexus injury, radial nerve injury and anterior interosseous injury respectively. In Carpal Tunnel syndrome, wrist should be splinted in 0 to 5 degrees of extension. The splint is worn at night and as tolerated during the day

In Femoral nerve injuries patient can be trained to activate the gluteal muscles and/or plantar flexors in stance phase to augment weakened knee extension. With mild to moderate weakness, an ankle-foot orthosis with dorsiflexion stop can create an extension moment at the knee to compensate for quadriceps weakness. If the weakness is severe, knee-ankle-foot orthosis may be indicated; however, these are often poorly tolerated. A walker to keep the ground reaction force anterior to the knee's axis of rotation during stance is often more functional.

Choice for electrical stimulation is usually based on clinical examination and duration.

Initially Nonsteroidal anti inflammatory drugs are used. Medication management is appropriate for neuropathic pain, which can be prominent. Local corticosteroid in carpal tunnel or hydrodilatation are useful in mild to moderate carpal tunnel syndrome and meralgia paraesthetica.

If a mass lesion is present, surgical exploration is usually required. Surgical treatment can consist of neurolysis or primary nerve repair. Tendon or nerve grafting and transfer can be used if there is no improvement or if there is a plateau in recovery.

Ergonomics changes are another important aspect of management of PNI. they are important aspects of management and prevention of reoccurrence of disease.

Platelet-Rich Plasma (PRP) Injection in Osteoarthritis Knee

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Osteoarthritis (OA) is the most common degenerative joint disorder, has significant impact on the society as it is a major cause of pain and disability and is detrimental to the quality of life. Mean age of active population is increasing continuously. Many non-invasive treatment options have been recommended to relieve symptoms. Intraarticular (IA) steroid injections have short term effects on reducing pain and disability and but has got negative effects on knee structures. The intra-articular injections of hyaluronic acid (HA) has shown favourable results in many studies but because of cost and recurrence of symptoms has not been widely prescribed in clinical practice. None of these are considered ideal, **as these do not change the natural course of the disease**. Platelet-rich plasma (PRP) is an autologous blood product that contains an increased concentration of platelets and is used in different degenerative conditions. Studies have shown positive benefits of autologous PRP in OA Knee.

But there is a lack of clarity regarding the number and frequency of injections for proper effectiveness as well as the ideal treatment for different stages of OA(from cartilage injury to advanced OA). We did a study in our Institute with the aim to see the effectiveness of intraarticular PRP injections in different stages of OA of the knee and to explore the ideal number of PRP injections required for different stages of OA. It was hypothesized that treatment with PRP would lead to improvements in knee scores due to the release of Growth Factors and bioactive molecules that would possibly affect the degenerated knee.

Patients with different stages of knee OA were included. One group receiving one intraarticular (IA) dose of PRP; another group receiving three doses of intraarticular PRP two weeks apart. Each group was subdivided into two groups: early OA (Kellgren–Lawrence grade I & II) and advanced OA (Kellgren–Lawrence grade III &IV). The patients were evaluated before the injection and at the 3,6,9,12-month followed up using EQ-VAS, WOMAC,SF-36scores. Adverse events and patients' satisfaction were recorded. In all patients standard exercise protocol and therapeutic life style changes were advised.

There was a statistically significant improvement. The knee scores of the patients treated with three PRP injections were significantly better than those patients of other group with one injection. **Multiple injections of PRP is more effective, more so in case of early OA.**

Keywords: Knee osteoarthritis, Hyaluronic acid, Intraarticular injection,, Platelet-rich plasma

Management of hyperglycemia in trauma patients

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Abstract: Hyperglycemia both due to diabetes mellitus and stress is a common accompaniment of critical patients. Hyperglycemia in trauma patients as in other critical ill patients is harbing off hyper-metabolic response to stress and seems to be an entity in its own rather than a simple marker. There are conflicting results over the glycemic control in this subset of patients. Earlier studies have shown that strict glycemic control improves the outcome. It is however found in other studies that a strict blood sugar control portends mortality as well. In nutshell we can say that both uncontrolled hyperglycemia and too strict a glycemic control is increasing the mortality in hospital state. Etiology of hyperglycemia in trauma patients is multifactorial. Activation of sympathetic system and heightened adrenergic drive in these patients contribute to hyperglycemia. Hypothalamus and pituitary are equally responsible for activating sympatho-adrenal system in injured patients stress response leads to high concentration of counter regulatory hormones viz catacolamines, glucocorticoids, growth hormones and metabolic pathways are directed towards glucose generation via gluconeogenesis and glycogenolysis. Insulin resistance is responsible of poor disposal of glucose in trauma patients. Yanda Muri and colleagues found a correlation between level of blood sugar at the time of admission and patient outcome. Patient admitted in trauma ICU were divided into 3 groups based on admission glucose levels. They found higher mortality in patients who had moderate glycemia (more that 200mg/dl) and mild hyperglycemia (>135mg/dl) as opposed to those who had blood sugar (< 135mg/dl). This high mortality is seen across the group of trauma patients like traumatic brain injury in burn patients and poly-trauma. Young and associates found that in traumatic brain injury that had a Glasgow coma scale (GCS) 4-10 had adverse outcome if blood sugar was more than 200mg/dl at the time of admission against to those who had less than 200mg/dl. Studies by Bochicchio and associates examined the impact of blood sugar control on the outcome of these patients. They stratified blood glucose level into low (less than and equal to 150mg/dl), medium (150-219mg/dl) and high (more than and equal to 220mg/dl). The patients were further stratified into 6 blood glucose categories (all low, all medium, all high) and improving worsening and highly variable. In the post intervention phase a strict blood sugar control was maintained (100-150mg/dl). Mortality was significantly higher in the group which had high blood sugar worsening and highly variable groups both during 24 months intervention and subsequent 24 post intervention group. It can be concluded that a level of hyperglycemia is directly correlated with mortality.

Treatment of hyperglycemia in traumatic patients or otherwise acute care setting is largely dependent on judicious use of regular insulin. Intermediate and long acting insulin is not recommended for these patients. Blood sugar should be controlled to the extent that it should be fairly controlled for optimum clinical outcome but not at the cost of hypoglycemia which itself carries a bad prognosis.

Keywords: Hyperglycemia, hypoglycemia, trauma, insulin resistance

Trauma Rehabilitation

Dr Henry Prakash,
Professor, PMR, CMC Vellore
Perspective from a tertiary level care center regarding
Trauma rehabilitation:

In past few decades with the better understanding of the science of medicine and advanced technologies we are able to save a lot of lives following trauma. Question is whether we are only able to add years to life or life to years! and what are the cost implication for the individuals and for our nation as a whole. A large number of our trauma patients will have complex range of impairments and disabilities, with physical, cognitive, emotional, social and behavioral problems. These require more prolonged input from a multidisciplinary team with expertise, a few will require specialist rehabilitation interventions. In the developed nations specialist rehabilitation is embedded in their trauma care pathways, without this component, there is bound to be an increase in morbidity, mortality and major implications in the cost effectiveness their health care systems.

Hyper-acute and acute rehabilitation, however, has been less ventured into, in our country. The way forward is to get involved in the very early stages, for trauma patients who have been stepped down from ERs, critical care or high dependency units, who still are medically unstable. It's time to venture into this gold mine for the physiatrist in our country, especially those who work in tertiary care centers. For the initial rehabilitation prescription, assessment of the acute patient and identifying the complications and the process of addressing them has to be carried out. This prescription should become active within 48 hours of the admission. Once the patient is stable and is ready to be mobilized in the gym, specialist rehabilitation plan can be drawn out to reduce complications and maximize their independence in ADL and mobility.

There is enough evidence and experience to prove that early inpatient rehabilitation pathway does improve outcomes and reduces morbidity and mortality. In a recent paper the only factor associated with a higher likely hood of discharge home was, an early inpatient rehabilitation care, with an OR of 9.41(95%CI, 6.80-13.01; $p<0.001$).

Here is a chance of bringing out the clinical acumen and skill of a physiatrist. The role of the physiatrist in an hyperacute or acute care rehabilitation set up is different from their role in an inpatient rehabilitation facility, in the later the role is one of a team leader. In the Hyperacute phase as a clinician one is able to medically manage the patient and understand the potential limitation of the paramedical colleague and is able to guide and instruct them to carry out their processes safely.

Along with these pathways there is an recent armamentarium of pharmacological and non-pharmacological interventions, the evidence of which we shall discuss during the talk on 21st September.

With the emerging trauma care centers in many of our states we need to actively get involved in planning pathways for these trauma patients and prove that we as a clinician are at par with our other clinical colleagues and bring about a significant change in the lives of our patients.

Pain Management in Trauma Patient

Dr Navita Vyas
Consultant Physiatrist
Specialist : Pain Medicine and Palliative Care
Kokilaben Dhirubhai Ambani Hospital and Research Centre, Mumbai

Pain in trauma has a role similar to the double-edged sword. On one hand, pain is a good indicator to determine the severity and type of injury. On other hand, pain can induce secondary medical complications and it may lead to further deterioration of the patient. Therefore, knowing how to manage pain in trauma patients is an important part of systemic approach .

Complaint of pain is one of the most prevalent conditions among trauma patients in the emergency room settings. Pain management of the elderly and children is especially challenging because these patients often present with multiple chronic medical conditions or heightened anxiety, respectively Trauma patients, also, report low satisfaction with their pain management. In addition, management of trauma patients has been one of the most resource-intensive medical care performed in resource challenged emergency room settings. Traumatic injuries vary in severity from isolated limb fracture to life-threatening multiple bone and soft tissue injuries. Provision of adequate analgesia is a vital component of any system of trauma management that will require: adequate assessment of age-specific pharmacologic pain management; identification of adequate analgesic to relieve moderate to severe pain; cognizance of serious adverse effects of pain medications and weighing that against their benefits, and regularly reassessing the patients and re-evaluating their pain management regimen.

The talk will cover the principles of Analgesia,, adjuvants and minimally invasive procedures performed in trauma patients to manage pain in emergency sertings

Podium Presentation

Comparative Study Between Two Techniques Of Fenestration Of Flexor Retinaculum In Patients With Carpal Tunnel Syndrome

Arnab Roy, Rajesh Pramanik, Aniketa Banerjee

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy of the upper extremity. There are various treatment methods to manage this condition including USG guided fenestration of flexor retinaculum.

AIMS & OBJECTIVES: To assess and compare the effects of two techniques of fenestration of flexor retinaculum in CTS .

STUDY DESIGN: RCT.

SAMPLE SIZE: 56 patients(28 in each arm)

STUDY DURATION: 15months.

STUDY PLACE: Dept. of PMR; IPGMER & SSKMH

INCLUSION CRITERA:

Clinically and electrophysiologically(NCS) confirmed. Failed to conservative treatments.

Age 18–65years.

VAS>3.

Unwilling for surgery.

EXCLUSION CRITERIA:

Previous surgical intervention.

Bilateral and secondary CTS.

Bleeding diathesis.

Other local neuropathy.

Unstable medical condition.

Contraindications of steroid injections.

Corticosteroid injection in last 3months.

METHODS & MATERIALS:

56 patients with primary CTS were randomized into two groups. In both the groups, USG guided hydrodissection followed by fenestration of flexor retinaculum were done. In first group fenestration was done just lateral(2-3 mm approx) to the course of median nerve and in second group, it was done along the course of median nerve at the compression site over the nerve. Pain and function assessed with VAS and Boston carpal tunnel syndrome questionnaire(BCTQ).

RESULT: Statistically significant reduction in VAS and symptoms and functional improvement according to BCTQ detected over time in both groups.

CONCLUSION: Both techniques have good clinical effects on CTS with superiority of fenestration at the compression site over the nerve.

Keywords:Carpal tunnel syndrome, hydrodissection, fenestration, flexor retinaculum.

Comparative Efficacy Between Fluoroscopy Guided Ganglion Impar Block And Local Infiltration With Methylprednisolone In Treatment Of Coccydynia.

Dr Dibyendu Dutta ,Dr Rajesh Pramanik, Dr Debayan Ghorai

Background: The ganglion impar is a solitary retroperitoneal sympathetic ganglia located at the level of the sacrococcygeal junction innervates the perineum, distal rectum, distal vagina, distal urethra, and anus.Coccydynia is a painful condition that may be related to trauma , childbirth or without any identifiable cause

Objective:local infiltration of steroid and guided ganglion impar block both are well established treatment for coccydynia. My aim is to study which one is better in coccydynia .

Methodology: Institutional Ethics committe clearance taken.41 patients were selected in each groups who satisfy our inclusion criteria.A RCT was done in Department of PMR, IPGME&R, Kolkata over 18 months recruiting 82 adult patients of clinically and radiologically proven coccydynia. All the patients were divided into two groups.In group A ,patients received local steroid infiltration and in group B, patients with ganglion impar block were kept and did follow up on 0, 2, 6 weeks with the help of VAS.

Inclusion criteria_Clinically coccydynia ,Age _18 yrs

Exclusion criteria _ Diabetis, Fracture,Spicules,Pregnancy,Thrombocytopenia ,Active anti coagulant theraphy,Hematological malignancy

Result:Statistically significant improvement of VAS and Owestry Disability Index

were seen in both the groups in visit 1 and 2 , but in visit 3 patient with ganglion impar block were more symptom free than local infiltration of steroid.

Efficacy Of Local Autologous Platelet Rich Plasma In Treatment Of Pressure Ulcer In Spinal Cord Injury Patients

Dr. Gurpreet Singh[1] Dr. Diganta Borah[2] Dr. Geetika Khanna[3]

1. PGT, Department of PMR, VMMC & Safdarjung Hospital, New Delhi

2. Professor, Department of PMR, VMMC & Safdarjung Hospital, New Delhi

3. Director Professor, CIO laboratory, VMMC & Safdarjung Hospital, New Delhi

INTRODUCTION: Spinal cord injury (SCI) is a catastrophic event in one's life with worldwide prevalence of 236-1298 cases per million. Pressure ulcer (PrU) is one of the most common complications of SCI with incidence varying from 25-66%. Platelet-rich plasma (PRP) dressing is considered to be an advanced wound therapy.

OBJECTIVE: To assess the efficacy of PRP in the management of PrU and to compare with that in patients treated with hydrogel.

METHODS: In this prospective interventional randomized comparative study, patients of SCI with sacral PrU of grade III/IV were enrolled. Thirty two enrolled patients were randomized into 2 groups: hydrogel dressing (group I) and PRP dressing (group II). Assessment was done using volumetric change, histopathological changes, Pressure Ulcer Scale for Healing (PUSH), percentage of healing area and healing rate.

RESULTS: Among 32 patients, 25 were male and 7 females. 15 were in group I and 17 in group II. Baseline area for group I was 51.32±59.86 and for group II was 35.09±29.87, which decreased to 24.32±33.25 and 16.15±21.85 in 6 weeks respectively. PUSH baseline & 6 week values for group I and II were 14.87±2.29 & 10.08±2.02 and 14.76±2.19 & 8.47±2.96 respectively. There was also significant increase in percentage of healing area, healing rate in group II as compared to group I. Significant biopsy changes were also documented in group II.

CONCLUSION: In the treatment of pressure ulcer, PRP is an effective option .

Treatment Of Lumbar Spinal Stenosis With Epidural Steroid Injections- A Prospective Randomized Controlled Trial

Mohit Saristava

BACKGROUND AND AIMS: Degenerative lumbar spinal stenosis (DLSS) is a common source of pain and disability in the elderly population. Epidural steroid injections are often used to treat lumbosacral radiculopathy in DLSS. There is paucity of clinical trials comparing caudal epidural steroid injections plus local anaesthetics with conservative treatment. The aim of this study was to compare the effects of conservative treatment and caudal epidural steroid injection with physical therapy in patients of DLSS (grade A and B).

METHODS: A single blinded randomized controlled trial was conducted from January 2016-August 2017 and patients fulfilling the inclusion criteria were enrolled after written informed consent. The Trial was registered under the Clinical Trial Registry of India (CTRI No:

REF/2017/07/014741). Patients were randomized in two groups – 32 in Intervention Group A (caudal epidural steroid injection with physical therapy) and 32 in Control Group B (physical therapy only). The outcome was assessed by Numerical Pain Rating Scale (NPRS), Oswestry Disability Index (ODI),

standing tolerance test and walking tolerance test at 3,6,12 and 24 weeks. **RESULTS:** Significant improvement in NPRS and ODI was observed at 3,6 and 12 weeks (Group A >>Group B). Equivocal effect in NPRS and ODI was seen at 24 weeks (Group A~ Group B). Improvement in

mean standing time and mean claudication distance was seen at each follow up from baseline (Group A>>Group B). **CONCLUSION:** Epidural steroid administration with physical therapy improved pain, physical ability and claudication distance (>200 metres) at 12 weeks aiding an early return to routine activities.

Effectiveness Of Transforaminal Epidural Steroid Injection In Lumbar Spinal Canal Stenosis Due To Prolapsed Intervertebral Disc With Neurogenic Claudication

Pranesh Mondal, R Pramanik, F Kamal, A Middya, A Banerjee

Background: Lumbar spinal canal stenosis due to prolapsed intervertebral disc causing neurogenic claudication is managed by both conservative and transforaminal epidural steroid injection(TFESI). But there is lack of evidences regarding efficacy of TFESI over conservative therapy.

Objectives: To assess improvement of pain, Swiss spinal stenosis score(SSS) & neurogenic claudication distance after intervention and compare between two groups.

Study design: Parallel group open label Randomized controlled trial
Sample size: 98
Study period: 18 months
Study place: Dept of PMR, IPGMER, Kolkata
Parameter: Leg pain(VAS), SSS and neurogenic claudication distance
Assessment: Baseline, 1 month & 3 months after intervention

Inclusion criteria:

Age:18-65 years
Symptoms >6wks and clinically neurogenic claudication
MRI: at least moderate canal stenosis at L4-L5 &L5-S1
VAS ≥5
Mentally sound

Exclusion criteria:

Radiologic spinal stenosis without Neurogenic claudication
Red Flag sign
Lumbar Spine Instability
H/O previous lumbosacral surgery and epidural steroid injections within 6months.
Dynamic/postural radiculopathy attributable to foraminal stenosis.
Unstable medical conditions
Contraindications of steroid injections

Methods: After approval of ethics committee and obtaining written informed consent, computer generated randomization was done until equal numbers of patients in both group. First group received conservative therapy only and second group received both conservative and TFESI.

Results: Statistically significant improvement was seen for second group in both follow-up regarding VAS, SSS and walking distance.

Conclusion: TFESI is more effective than conservative management in lumbar spinal stenosis with neurogenic claudication.

Keyword: Neurogenic claudication, Lumbar spinal stenosis, Transforaminal epidural steroid injection

Bedside Brain Sonography findings in Stroke Survivors with Decompressive Craniectomy in a Rehabilitation setting –A Descriptive Study".

Riya Fernandes

Background

Brain sonography can be used in patients post craneiectomy to assess brain parenchyma. Its non-invasive nature, lower cost, accessibility make it an effective monitoring method. There is scant literature on brain sonography in stroke rehabilitation settings.

Objectives:

To identify secondary brain changes with bedside brain ultrasonography in post stroke patients with craniectomy undergoing rehabilitation and to correlate lesions detected on sonography with functional outcome scores.

Methods:

Twenty patients who satisfied the inclusion criteria were included in the study from October 2017- July 2019. Post-operative CT Brain findings were noted, neurological and functional status were documented at admission and discharge. Bedside brain ultrasound findings was performed at admission and discharge, with parameters as ventricular size, mid-line, focal lesions and brain edema. Comparisons of outcome measure scores-Glasgow outcome scale (GCS), Scandinavian Stroke Scale (SSS) modified Rankin Scale (mRS), Barthel index between individuals with and without a described finding were made.

Results:

Among the twenty patients, mean age was 50 (32 -65) years. Mean hospital stay duration was 23 days. Mean GCS, SSS, Barthel Index at admission and discharge were 11 and 12; 16 and 24; 2 and 33 respectively. Five patients had ventriculomegaly and 3 had pseudomeningocole. One patient had focal intraparenchymal hyperechogenicity in affected frontal lobe. Mean Barthel index at discharge for patients with ventriculomegaly was 21 and those without sonographic lesion was 34.

Conclusions:

Patients with ventriculomegaly had lower functional outcome scores not reaching statistical significance. Bedside brain sonography can be used as a useful screening neuro-imaging tool for physiatrists managing patients with stroke.

Presenter: Dr Ria Sabrene Fernandes

Guide: Dr Kurian Zachariah

Functional outcomes following Hypoxic ischemic encephalopathy – A case series

Sameer Deo

Background: Hypoxic ischemic encephalopathy (HIE) most often results from insults such as cardiac arrest, vascular catastrophe, poisoning, or head trauma. While many expire without recovering awareness, there are a number of survivors with variable degrees of residual disability.

Objective: To describe clinical and functional outcomes following inpatient rehabilitation in persons with Hypoxic ischemic encephalopathy.

Methods: Hospital records and discharge summaries of persons diagnosed with HIE from 2017 to 2019, and admitted for rehabilitation in the department of PM&R in a tertiary hospital in South India, were reviewed. Laboratory parameters and clinical presentations were recorded. Functional status at admission and discharge were assessed with the Disability Rating Scale (DRS) and the Glasgow Outcome Scale – Extended (GOS-E).

Results:

Three consecutive patients were diagnosed with HIE in the study period. Their ages ranged from 19 to 61 years with the mean age being 43 years. The duration of rehabilitation stay ranged from 40 to 120 days with a mean of 67 days.

Mean DRS score at admission and discharge were 21 and 9 respectively

Mean GOS-E scores at admission and discharge were 2 and 4 respectively.

All three patients had a history of cardiac arrest followed by return of spontaneous circulation secondary to cardiopulmonary resuscitation.

Common clinical features were lack of awareness, seizures, autonomic dysfunction and spasticity.

Positioning, splinting and pharmacotherapy were commonly employed with clinical improvement.

Conclusions:

Functional improvement was noted with inpatient rehabilitation for HIE survivors. Intensive rehabilitation with prevention of complications secondary to HIE improve functional outcomes.

To Evaluate the effect of Intra-articular Platelet Rich Plasma(PRP)on Knee articular cartilage thickness by Musculoskeletal ultrasound in patients with Grade I and II Osteoarthritis of Knee.

Dr.K.Sathish[1], Dr.K.Premalatha[2], Dr.B.Jeyanthi[3], Dr.A.Rajakumar[4]
1.Post Graduate. 2 & 3 Senior Resident. 4. Director&HOD.
GIRM, Madras Medical College, Chennai.

Abstract :

Aim :

To evaluate the change in the thickness of the Knee articular cartilage by Musculoskeletal ultrasound following Intra articular injection of PRP in Grade I and II Osteoarthritis of Knee.

Objectives :

To assess the thickness of knee articular cartilage by Musculoskeletal ultrasound following Intra articular injection of PRP in the study population.

Materials and Methods :

Sample size of 50 is considered from patients attending OPD with knee pain, that included patients with Grade I & II osteoarthritis Knee.

8 Bucket centrifuge upto 5000 RPM is used to separate PRP. 3 sittings of Intra articular PRP is given at a regular intervals of 4 weeks.

Conventional B Mode ultrasound with High frequency linear array transducer is used to measure the thickness of articular cartilage,3months after third sitting of Intra articular PRP.

Noyes grading scale was used to grade the articular cartilage damage.

Results and Discussion:

Analysis of the data revealed the average thickness of knee articular cartilage following 3 sittings of PRP, increased from 1.99mm to 3.15mm and 1.63 to 2.77 in Grade I and II OA Knee respectively.

To the best of our knowledge this is the first study of this kind.

Conclusion :

The results obtained from this study indicate that the Intra articular PRP in Grade I and II OA knee has significant increase in thickness of knee articular cartilage.

Effects of Genicular nerve block in advanced osteoarthritis of knee.

Dr Subhadeep Batabyal, PGT(MD), Dr Saumen kumar De,
Asst. Prof, Prof. R.N.Haldar, Prof.& HOD
Dept. of PMR, IPGME&R, Kolkata.

Osteoarthritis of knee joint being a degenerative joint disease involves articular cartilage, subchondral bone, synovial tissue and joint capsule resulting in stiffness, swelling and pain.

Conservative treatment plays the major key role. If conservative treatment fails, Total Knee Replacement (TKR) is traditionally considered but may have multiple peri operative morbidities.

In addition many patients are not appropriate surgical candidates and others simply do not want to undergo surgery.

Thus intervention on genicular nerves in the form of Genicular Nerve Block emerged as the successful alternative to surgery for effective management of chronic knee pain.

Patients included for genicular nerve block were those with grade 3 & 4 primary OA knee of 40-80 years age group, poorly responding to initial conservative treatment and unwilling or contraindicated for surgical management with VAS score >5 for pain.

Patients with prior knee surgery, secondary osteoarthritis, uncontrolled systemic comorbidities, intra- articular steroid injection or viscosupplementation within last 3 months were excluded.

Procedure was performed by musculoskeletal USG guidance for identifying bony landmarks and corresponding genicular nerves. Targeted genicular nerves were superolateral (SL), superomedial (SM) and inferomedial (IM).

Block was given with a mixture of inj. Lignocaine 2%, inj. Bupivacaine 0.25% and inj. Depotmethylprednisolone(40 mg).

Baseline and follow up assessments were done regarding basic parameters like VAS pain score & WOMAC score in terms of 0, 1, 4 & 12 weeks.

Regarding our experience in case of Genicular Nerve Block, the patients had significant pain relief and improvement in knee functions throughout the follow up period of 3 months with significant p value of <0.05.

Multiple studies are supporting the evidence of beneficial effects of Genicular nerve block and symptomatic improvement in patients of advanced OA knee.

Incidence and characteristics of heterotopic ossification after spinal cord injury: a single institution study in India Structured Abstract

Sushil Chug

Study Design:

This was a single- centre, retrospective, descriptive, hospital-based study in persons with spinal cord injuries (SCI) patients.

Objectives:

To study the incidence and characteristics of heterotopic ossification (HO) after SCI.

Setting:

The inpatient services of the Department of Physical Medicine and Rehabilitation of a tertiary care institute in India between January 2001 and December 2017.

Methods:

Medical records of all consecutive patients with diagnosis of SCI in the age group of 15–60 years were reviewed for presence of HO (diagnosed by clinical signs, laboratory investigations (ALP, ESR and X-rays) and characteristics of HO. R-Ver 3.4.2 was used for analysis and correlations. Results were considered significant at $P < 0.05$.

Results:

A total of 303 patients satisfied inclusion criteria. Nineteen individuals (6.3%) had developed HO. Seven (37%) were diagnosed within 3 months of SCI. 12 (63%) patients developed unilateral HO. The most common site for HO was hip joint (73%). A significant association was found between presence of a pressure ulcer and development of HO ($P = 0.01$).

Conclusion:

The incidence of HO was 6.3% in our institution and the hip joint is the most common site. Due to presence of limited treatment options it is important to diagnose HO early in patients with SCI based on clinical features and later confirmed with laboratory tests and imaging.

Keywords: Heterotopic ossification, Spinal cord injury

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Poster Presentation

Outcomes Of Locomotor Training In Spinal Cord Injury Patients Who Reported At Rehabilitation Research And State Spinal Injury Centre, Jaipur

Anurag Ranga, Dr Mrinal Joshi, Priyanka Sharma

Objective- To describe the outcomes of locomotor training on restoration of walking and activities of daily living in spinal cord injury patients.

Method- This hospital based observational descriptive study was conducted at rehabilitation research and state spinal injury centre, by dept. of Physical Medicine and Rehabilitation (PM&R), Jaipur. A total of 29 patients were included in this study of age group between 18-57 years and neurological level ranging from D_{10} to L_1. Intensive locomotor training including step training using body weight support concomitantly with regular physiotherapy was given to patients with therapy sessions of 1-2 hour a day and 5-6 times a week. The main outcome measures were – WISCI (walking Index in Spinal Cord Injury) and FIM (Functional Independence Measure).

Results- After the locomotor training and physiotherapy all the included patients showed a significant improvement in both the WISCI Score ($p < 0.01$) and FIM Score ($p < 0.01$). There was significant correlation between number of locomotor training days with improvement in WISCI score ($p = 0.013$).

Conclusion- India is a large country with limited resources that requires minimum amount of therapy which gives maximum outcome. So this study is a pioneer study in India which shows the requirement of appropriate amount of locomotor training with maximum outcome. Locomotor training is an important treatment to improve the walking ability and functional outcome of spinal cord injury patients. Larger controlled studies are still required to determine the optimal timing and protocol design for the maximal efficacy of locomotor training in SCI patients.

A rare case of compression of radial nerve in haemophiliac patient : case report

Himanshu Agrawal[1], Mrinal Joshi[2]
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Department of PMR SMS medical college , Jaipur

Abstract : We present a case report of 28 yr old severe haemophiliac male patients with factor VIII level less than 1% with no history of trauma, who has episode of spontaneous bleeding in his left forearm leading to reduced wrist extension and sensory loss on dorsum of his forearm. We searched literature and found very few cases in past reporting any entrapment of radial nerve. On MRI radial nerve entrapment seen in hematoma locate on his dorsum of forearm. We also discussed about the management and further complication.

Rehabilitation Challenges Of A Case Of Transtibial Amputation Due To Neuropathic Foot Of Hmsn Etiology In A Young Female-a Case Report

1)Dr.S.Padma Rani -PG
2)Dr.K.Chitrarasu-Assistant professor
3)Dr.K.JawaharRajaratinam-Associate Professor
4)Dr.P.Thirunavukkarasu-Professor and HOD &GUIDE
Department of Physical Medicine and Rehabilitation,
Government Kilpauk Medical college, Chennai.

INTRODUCTION- Hereditary motor sensory neuropathy are a group of hereditary progressive disorders that cause neuronal degeneration either via hypertrophic demyelinated nerves or complete atrophy of motor and sensory peripheral nerves.The insensate foot is prone to develop ulcerations and trophic changes which in turn lead to amputation

OBJECTIVES- To observe the outcome of trial of Silicon heel pad cushion with MCR insole in a custom made therapeutic footwear as an alternative to conventional weight relieving orthosis for the purpose of effective load transmission &even distribution of plantar pressure and off loading of footin an effective way in a concomitant right transtibial amputation due to neuropathic joint and trophic soft tissue repeated non healing ulcerations with left foot hammer toes /calcaneal deformity due to HMSN in a young female as a case report in a tertiary health care centre

MATERIALS AND METHODS-

NEUROPATHIC FOOT EVALUATION- LEFT FOOT

1) Heel pad thickness-measured by musculoskeletal ultrasound
2) Dynamic foot pressure measurement
3) Sensation over foot
4) medio lateral stability
5) Trial heel loading
6) Nerve conduction study
7) X ray left ankle jt with foot –AP&Oblique

RIGHT FOOT-Transtibial endoskeletal prosthesis with PTB socket with soft insert with multi axis foot

DISCUSSION- The possibility of orthotic consideration of silicon heel cup with MCR insole in custom made shoe Vs conventional weight relieving caliper is worked out by analyzing the data collected from the patient's heel pad thickness and the dynamic foot pressure measurements with the normative values .Since the data falls within the normal values the possibility of considering conventional weight relieving orthosis deferred.

CONCLUSION- Though the walking speed and single limb stance duration and medio lateral stability improved with silicon heel cup along with custom made shoe with MCR insole which resulted in effective load transmission of body weight over the neuropathic foot &increased patient's level of comfortability and confidence of independent walking ,yet the patient requires periodic follow up for assessing skin breakdown /heel pad thickness /foot pressure/trophic changes.Since the study period is short, the possibility of enhancing patient's compliance to use silicon insole with periodic follow up to avoid weight relieving caliper is considered,though it is of real concern.

Tracheoesophageal fistula masquerading as dysphagia in Traumatic tetraplegia- A case report

Dr. Rahul Sharma, Dr. Raj Kumar Yadav, Dr. Osama Neyaz, Dr. Suvrat Gupta

INTRODUCTION: Dysphagia is common in acute cervical spinal cord injury. Risk factors being spine position, spinal shock, gastric reflux, gastroparesis, anterior cervical spinal surgery, tracheostomy, ventilator dependence and Nasogastric tube. To the best of our knowledge Tracheoesophageal fistula as a cause for aspiration in acute cervical spinal cord injury has not been reported so far.

Case description:

A 26-year-old male with Traumatic tetraplegia with C5 over C6 spondylolisthesis (Neurological level of injury-C4, ASIA-A) with neurogenic bladder and bowel. Multiple swallow trials were unsuccessful in view of Nasogastric tube removal. In swallow trial food particles were coming out from tracheostomy tube. An Upper Gastrointestinal endoscopy revealed Tracheoesophageal fistula (1*0.8 cm) 1 cm below the Upper gastro oesophageal junction. Percutaneous endoscopic gastrostomy performed and clinical improvement noted.

Conclusion:

After ruling out the common causes of dysphagia, it was imperative to think of a rare cause. This illustrates the importance of clinical vigilance which allows prompt and correct diagnosis and hence better patient management and outcome. It was a diagnostic and rehabilitative challenge to manage this rare presentation.

A Combined Prosthetic And Orthotic Principles Device For A Patient With Post Polio Residual Paralysis And Transtibial Amputation In A Same Right Lower Limb.

1.DR.T.RAJAN,2,DR.A.RAJAKUMAR,
1.POSTGRADUATE, 2,PROFESSOR&HOD.

INTRODUCTION; mr.murugan 54/M,known case of 1.postpolio Residual Paralysis Right Lowerlimb(50 Years),2,transtibial Amputation Right Lower Limb 2 Years Back Due To Rta, 3 United Right Neck Of Femur Fracture 1 Year Back Due To RTA

OBJECTIVES; He has a right paralytic limb with transtibial amputee. He requires a BK prosthesis and also he has weakness of quadriceps which requires an orthosis to stabilize his knee joint.

METHODOLOGY;case Study & Designing a New Ideal Device Combined Prosthetic and Orthotic Principles

FINDINGS; For this patient, a BK PROSTHESIS +KAFO is the required, desirable and appropriate product.So a BK prosthesis is extended upward and connected to thigh corset, by means of external knee joints on either sides. A supra- patellar pad is given for knee stability and the anterior wall of the TOTAL SURFACE BEARING(TSB) socket acts and compensates the functions of the infra- patellar pad. By this product the amputated part is compensated by providing a prosthesis and the affected segment is also stabilized.

The pelvic straps (silesian belt) is given as an added stability.
Since the nof fracture was united ,just softened the area ,
We provided soft padding to the innerside wall of the lateral side of thigh corset

CONCLUSION; final prosthetic and orthotic device contains **silesian belt-thigh corset with soft padding lateral side-external knee joint with droplock-TSB socket-suprapatellar pad-exoskeleton shank piece-PUF foot-footwear.patient walking good without gait abnormality**

A COMBINED PROSTHETIC AND ORTHOTIC PRINCIPLES DEVICE FOR A PATIENT WITH POST POLIO RESIDUAL PARALYSIS AND TRANSTIBIAL AMPUTATION IN A SAME RIGHT LOWER LIMB.

AUTHORS;1.DR.T.RAJAN,2,DR.A.RAJAKUMAR,
1.POSTGRADUATE, 2,PROFESSOR&HOD.

INTRODUCTION; mr.murugan 54/M,known case of 1.POSTPOLIO RESIDUAL PARALYSIS RIGHT LOWERLIMB(50 YEARS),2,TRANSTIBIAL AMPUTATION RIGHT LOWER LIMB 2 YEARS BACK DUE TO RTA,3 UNITED RIGHT NECK OF FEMUR FRACTURE 1 YEAR BACK DUE TO RTA

OBJECTIVES; He has a right paralytic limb with transtibial amputee. He requires a BK prosthesis and also he has weakness of quadriceps which requires an orthosis to stabilize his knee joint.

METHODOLOGY;CASE STUDY & DESIGNING A NEW IDEAL DEVICE COMBINED PROSTHETIC AND ORTHOTIC PRINCIPLES

FINDINGS; For this patient, a BK PROSTHESIS +KAFO is the required, desirable and appropriate product.So a BK prosthesis is extended upward and connected to thigh corset, by means of external knee joints on either sides. A supra- patellar pad is given for knee stability and the anterior wall of the TOTAL SURFACE BEARING(TSB) socket acts and compensates the functions of the infra- patellar pad. By this product the amputated part is compensated by providing a prosthesis and the affected segment is also stabilized.

The pelvic straps (silesian belt) is given as an added stability.

Since the nof fracture was united ,just softened the area ,

We provided soft padding to the innerside wall of the lateral side of thigh corset

CONCLUSION; final prosthetic and orthotic device contains **silesian belt-thigh corset with soft padding lateral side-external knee joint with droplock-TSB socket-suprapatellar pad-exoskeleton shank piece-PUF foot-footwear.patient walking good without gait abnormality**

Cerebrovascular Accident due to Autonomic Dysreflexia in a Young person with Spinal Cord Injury

Sameer Deo

Abstract:

Autonomic dysreflexia is a life threatening medical emergency which occurs as a consequence of uncontrolled sympathetic activity in patients with spinal cord injury at or above T6. Autonomic dysreflexia is common in spinal cord injuries involving the cervical and high thoracic region. However, the occurrence of a cerebrovascular accident due to autonomic dysreflexia is very rare.

The case report highlights this rare, yet severe complication in a young man with an incomplete traumatic cervical spinal cord injury following autonomic dysreflexia.

Scientific Programme

Workshop on Simulation Based Emergency Management in Trauma Rehabilitation

Venue: Medical Education Cell, Level 2, Academic Block

20th September 2019

Time	Session	Faculty (AIIMS Rishikesh)
08:30-09:00	Registration & Pre Test	
09:00-09:30	**Airway Obstruction and Management**	Dr Ankita Kabi
09:30-10:00	**Airway Intervention**	Dr Ashutosh Kaushal
10:00-10:30	**Emergency Cricothyrotomy and Tracheostomy**	Dr Sanjay Agrawal
10:30-11:00	**Oxygen Therapy**	Dr Nishit Govil
11:00-11:30	Tea break	
11:30-13:00	**Hands on**	
13:00-14:00	Lunch	
14:00-14:30	**Mechanical Ventilator –assembly and pre-use check**	Dr Poonam Arora
14:30-15:00	**Basic Modes of Mechanical ventilation**	Dr Bharat B Bhardwaj
15:00-15:30	**Management of Patient on Mechanical Ventilation**	Dr Debendra K Tripathy
15:30-15:45	Tea Break	
15:45-16:15	**Non Invasive Ventilation**	Dr Subodh Kumar
16:15-16:45	**General care of a Patient on Ventilator (including alarms and basic trouble shooting)**	Dr Mridul Dhar
16:45-17:00	**Post Test & Valedictory**	

Workshop on 3D Motion (Gait) Analysis

Venue: 3D Motion Analysis & VR Lab, Level 4, Hospital Block

20th September 2019

Time	Topic	Speaker
09:00 – 10:00	Introduction to Normal and abnormal gait	Dr. Henry Prakash
10:00 – 11:00	Kinematics & Kinetics during gait analysis	Dr. Henry Prakash
11:00 – 11:20	Tea break	
11:20 – 01:00 (50 min. BTS gait system & 50 min P walk/G walk)	Introduction to BTS system: Set-up, Anthropometric data, calibration, Marker placement/ P walk/ G walk/Nirvana - Demo	Dr. Osama Neyaz Mr. Michele Coluccini Dr. Vinay Kanaujia
01:00 – 01: 40	Lunch Break	
01:40 – 03: 30	Gait Analysis and data collection – Demo	Dr Osama Neyaz Mr. Michele Coluccini
03: 30 - 03:50	Tea break	
03:50 – 05: 00	Principles of data interpretation	Dr. Henry Prakash Mr. Michele Coluccini

PLATFORM PRESENTATION

21st September 2019

3:20 – 3:30	Efficacy Of Local Autologous Platelet Rich Plasma In Treatment Of Pressure Ulcer In Spinal Cord Injury Patients	Dr Gurpreet Singh
3:30 – 3:40	Bedside Brain Sonography Findings In Stroke Survivors With Decompressive Craniectomy In A Rehabilitation Setting –A Descriptive Study	Dr Ria Sabrene Fernandes
3:40 – 3:50	Functional Outcomes Following Hypoxic Ischemic Encephalopathy – A Case Series	Dr Sameer Ravindra Deo
3:50 – 4:00	Incidence And Characteristics Of Heterotopic Ossification After Spinal Cord Injury: A Single Institution Study In India	Dr Sushil Chugh

22ND September 2019

11:15 – 11:25	Comparative Study Between Two Techniques Of Fenestration Of Flexor Retinaculum In Patients With Carpal Tunnel Syndrome	Dr Arnab Roy
11:25 – 11:35	Comparative Efficacy Between Fluoroscopy Guided Ganglion Impar Block And Local Infiltration With Methylprednisolone In Treatment Of Coccydynia	Dr Dibyendu Dutta
11:35 – 11:45	To Evaluate The Effect Of Intra-Articular Platelet Rich Plasma (PRP) On Knee Articular Cartilage Thickness By Musculoskeletal Ultrasound In Patients With Grade I And II Osteoarthritis Of Knee	Dr K. Sathish
11:45 – 11:55	Treatment Of Lumbar Spinal Stenosis With Epidural Steroid Injections- A Prospective Randomized Controlled Trial	Dr Mohit K Srivastava
11:55 – 12:05	Effectiveness Of Transforaminal Epidural Steroid Injection In Lumbar Spinal Canal Stenosis Due To Prolapsed Intervertebral Disc With Neurogenic Claudication	Dr Pranesh Mondal
12:05 – 12:15	Effects Of Genicular Nerve Block In Advanced Osteoarthritis Of Knee	Dr Subhadeep Batabyal

POSTER PRESENTATION

Outcomes Of Locomotor Training In Spinal Cord Injury Patients Who Reported At Rehabilitation Research And State Spinal Injury Centre	Dr Anurag Ranga
A Rare Case Of Compression Of Radial Nerve In Haemophiliac Patient: Case Report	Dr Himanshu Agrawal
Tracheoesophageal fistula masquerading as dysphagia in Traumatic tetraplegia- A case report	Dr Rahul Sharma
Clinical And Functional Outcomes Of Patients With Osmotic Demyelination Syndrome With Rehabilitation	Dr Ria Sabrene Fernandes
Cerebrovascular Accident Due To Autonomic Dysreflexia In A Young Person With Spinal Cord Injury	Dr Sameer Ravindra Deo
Rehabilitation Challenges Of A Case Of Transtibial Amputation Due To Neuropathic Foot Of Hmsn Etiology In A Young Female- A Case Report	Dr S. Padma Rani
Sports Injuries among Participants of Kerala Public Service Commission Police Physical Test 2019	Dr Sunand Kumar N N
A Combined Prosthetic And Orthotic Principles Device For A Patient With Post-Polio Residual Paralysis And Transtibial Amputation In A Same Right Lower Limb	Dr T. Rajan

Scientific Program
Venue – Mini Auditorium, Level 3, Academic Block
21st September 2019

Time	Topic	Speaker
08:15 – 08:45	Registration & Breakfast	
08:45 – 10:00	Session 1: Chairpersons Dr R. K. Srivastava, Ex DGHS, MOHFW Dr Sanjay Wadhwa, Professor, AIIMS Delhi Dr Sudhir Saxena, Head Radiology, AIIMS Rishikesh	
08:45 – 09:10	Initial management of a Trauma patient – Scene to ER	Dr Quamar Azam, Head Trauma Surgery, AIIMS Rishikesh
09:10 – 09:35	Principles of Surgical management of TBI	Dr Rajnish Kumar Arora, Head Neurosurgery AIIMS Rishikesh
09:35 – 10:00	Trauma Imaging	Dr Srikumar V. AIIMS Delhi
10:00 – 11:15	Session 2: Chairpersons Dr Joy Singh Akoijam, Professor & Head PMR, RIMS Imphal Dr Henry Prakash, Professor, CMC Vellore Dr Subodh Kumar, Head Emergency Medicine, AIIMS Rishikesh	
10:00 – 10:25	Autonomic & Metabolic derangements after TBI, SCI	Dr Koustubh Chakraborty. Peerless Hospitex Hospital & Research Center Kolkata.
10:25 – 10:50	Cardio-pulmonary monitoring & Ventilatory care	Dr Nidhi Rawat St Johns Medical College
10:50 – 11:15	Medical management of Diabetes in a trauma patient	Dr Ravikant, Head Diabetes & Metabolism
11:15 – 12:30	Session 3: Chairpersons Dr Rajendra Sharma, Professor & Head PMR, Dr RML Hospital Delhi Dr Ajay Gupta, Professor, Safdarjung Hospital Delhi Dr Anil Kumar Gupta, Professor & Head PMR, KGMU Lucknow	
11:15 – 11:40	Recent Advances in Trauma Rehabilitation	Dr Henry Prakash CMC Vellore
11:40 – 12:05	Recent Advances P & O management of Trauma pt.	Dr Gita Handa AIIMS Delhi
12:05 – 12:30	Ambulation following SCI: Conventional methods to Robotics	Dr Anupam Gupta NIMHANS
12:30 – 01:15	Inauguration	
01:15 – 02:15	Lunch	
02:15 – 03:05	Session 4: Chairpersons Dr B. D. Athani, Principal Consultant & Ex DGHS, MOHFW Dr Anupam Gupta, Professor & Head PMR, NIMHANS Bengaluru Dr Niraj Kumar, Head Neurology, AIIMS Rishikesh	
02:15 – 02:40	Cognitive Rehabilitation	Dr Naveen BP NIMHANS
02:40 – 03:05	Pharmacotherapy in Acute Neurorehab	Dr Abhishek Srivastav KDAH
03:05 – 04:00	Session 5: Chairpersons Dr V. K. Gupta, Consultant, LHMC Delhi Dr Harshanand Popalwar, Assist. Prof., Safdarjung Hospital Delhi Dr Shipra Chaudhary, Assist. Prof., Dr RML Hospital Delhi	
03:05 – 03:20	Inclusive elections.. Calicut experience	Dr Sooraj Rajagopal
03:20 – 04:00	***Paper session***	
04:00 – 04:15	Tea break	
04:15 – 06:00	Session 6: Chairpersons Dr Mrinal Joshi, Director, RRC & Senior Prof., SMS Medical Col. Jaipur Dr Gita Handa, Professor, AIIMS Delhi Dr Sanjay Pandey, Assoc. Prof., AIIMS Patna	

04:15 – 04:40	Dysphagia management	Dr Siddharth Rai SGPGI
04:40 – 05:05	Bladder Management of a Trauma case	Dr M M Biswas S N P Hospital Kolkata
05:05 – 06:00	***Panel discussion on PMR Ayushman Bharat Packages*** **Panelist:** Dr. R. K. Srivastava, Dr. Sanjay Wadhwa, Dr Raj Kr. Yadav **Moderator: Dr Shweta Jain**	
06:00 – 07:00	***Executive Committee Meeting***	
7:30 onwards	***Gala Dinner*** ***Palm Resorts, Raiwala***	

22nd September 2019

Time	Topic	Speaker
08:30 – 08:55	Breakfast	
08:55 – 10:10	Session 7: Chairpersons Dr S. Y. Kothari, Professor, AIIMS Bhopal Dr Ambar Ballav, Consultant, NILD Kolkata Dr K Surendran, CL. Professor, AIMS Kochi Dr Navita Purohit, Consultant, KDAH Mumbai	
08:55 – 09:20	Principles of Surgical management of SCI	Dr Pankaj Kandwal, Head Orthopedics AIIMS Rishikesh
09:20 – 09:45	Sports Injury Rehabilitation	Dr Joy Singh Akoijam RIMS Imphal
09:45 – 10:10	Post-operative rehabilitation of Musculoskeletal Injuries	Dr P K Sahoo SVNIRTAR Cuttack
10:10 – 11:15	Session 8: Chairpersons Dr R. N. Haldar, Professor, SSKM Hospital Kolkata Dr S. L. Yadav, Professor, AIIMS Delhi Dr. Muralidharan P. C., Asst. Prof., GMC Kotayyam Dr Abhishek Srivastava, Consultant, KDAH Mumbai	
10:10 – 10:35	Peripheral Nerve Injury Rehabilitation	Dr Ravi Gaur AIIMS Jodhpur
10:35 – 11:00	Pain Management in Trauma Patient	Dr Navita Purohit KDAH
11:00 – 11:15	Platelet-Rich Plasma (PRP) Injection In Osteoarthritis Knee	Dr Saumen Kumar De
11:15 – 12:15	Session 9: Chairpersons Dr B. Ramachandran, Consultant, PMR Dr V. S. Gogia, Addl. Prof., Dr RML IMS Lucknow Dr Ajit Kumar, Assoc. Prof Pain Medicine, AIIMS Rishikesh	
11:15 – 12:15	***Paper session***	
12:15 – 1:45	Session 10: Chairpersons Dr Sanjay Agarwal, Head Anesthesia, AIIMS Rishikesh Dr Minakshi Dhar, Head Internal Medicine, AIIMS Rishikesh	
12:15 – 12:45	Cardiopulmonary Rehabilitation	Dr Jaydeep Nandi
12:45 – 01:45	Case Scenario based discussion on Diabetes	Dr Rajalakshmi H Iyer, Professor, AIIMS Rishikesh
01:45 – 02:00	Valedictory session	
02:00 onwards	Lunch	

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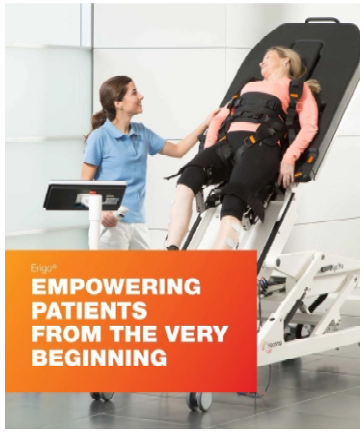

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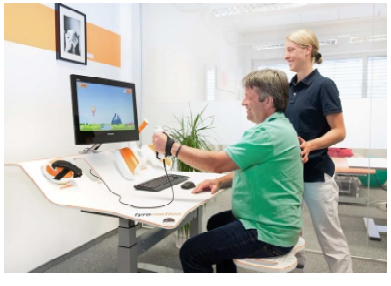

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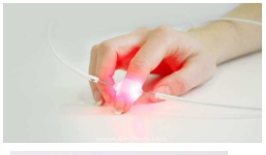
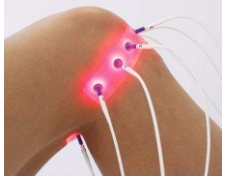
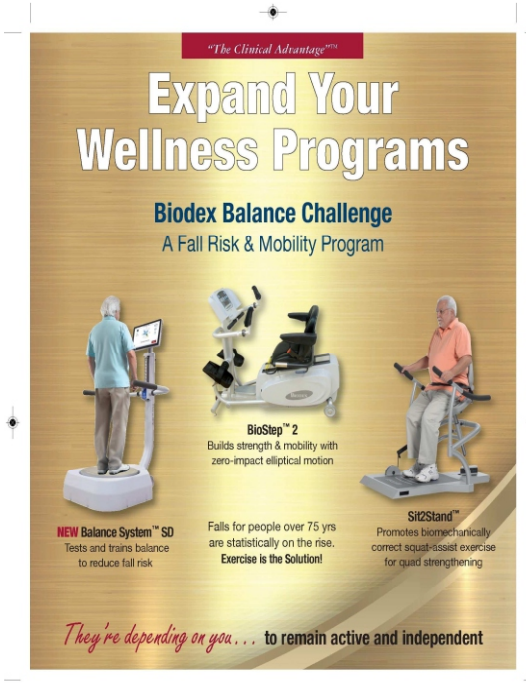




GERMAN TOUCH LASER THERPAY: LASERNEEDLE

MULTI CHAMBER CRYOTHERAPY SYSTEM: MECOTEC WHOLE BODY CRYOTHERAPY-110^0



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deep-acting effect...
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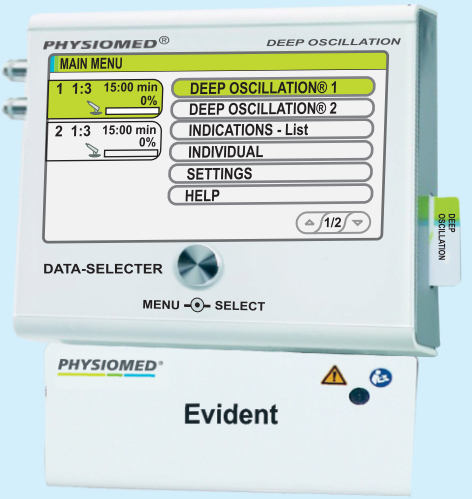

PRE & POST OPERATIVE THERAPY
- Swellings and Oedema
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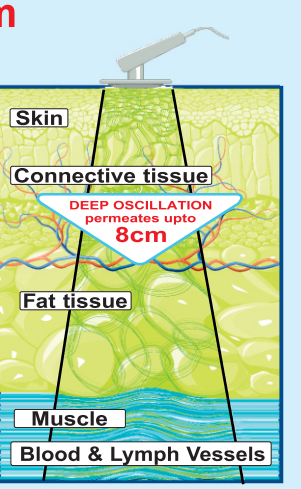


DEEP OSCILLATION For Acute, Subacute & Long Term Rehabilitation

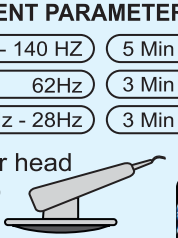
faster Regeneration after surgery, Trauma and in neurological indications- in Pain, Oedema, Inflammation

example HEAD TRAUMA video animation guidelines for treatment

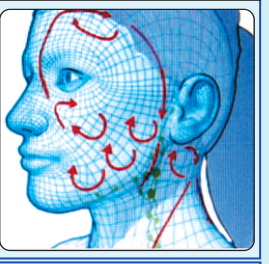
1. TREATMENT PARAMETERS

1	100 HZ - 140 HZ	5 Min
2	62Hz	3 Min
3	15Hz - 28Hz	3 Min

Oscillator head (9.5 cm)



3. Special decongesting treatments for the head throat neck and terminus region.



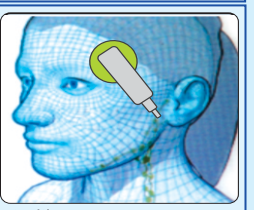
2. Objectives

- The primary Treatment goals of DEEP OSCILLATION is cerebral decongestion

Instructions

- Treatment in the acute state daily up to 6 weeks, 3 time per week thereafter

4. The speed of Movement depends on the frequency of used.



Treatment with pressure

Treatment without pressure

Treatment with **Hand Applicator**

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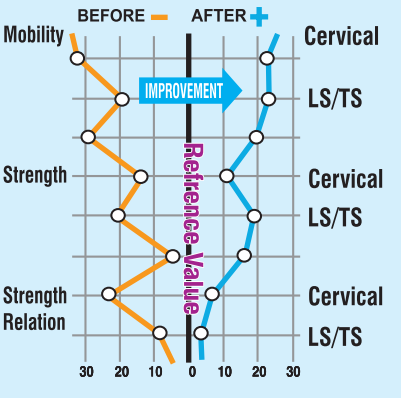
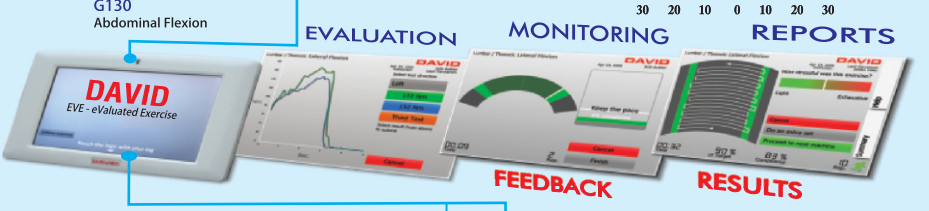
Whole Body Concept with EVE Professional

DAVID

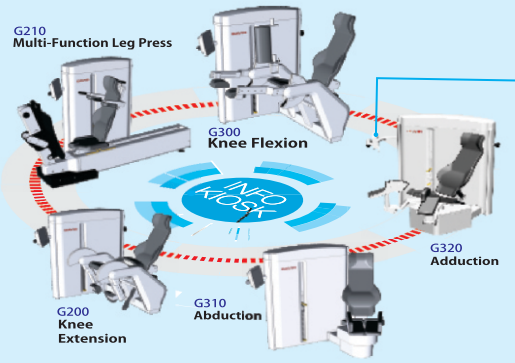
Spine Concept

Spine Profile



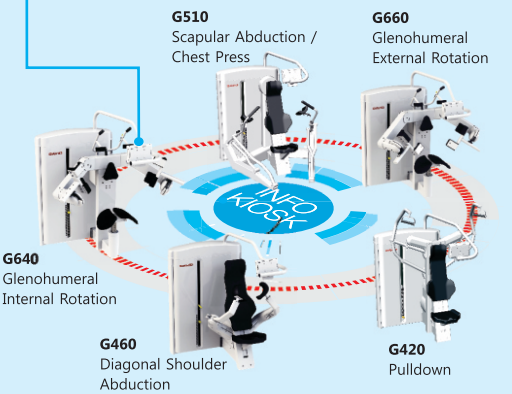


Hip & Knee Concept



- * ***EVALUATE*** Strenght & Mobility
- * ***DIAGNOSE*** Compare Strenght, Mobility & Strenght with Reference Values
- * ***TRAINING PROGRAM*** Safe treatment & Training program for Strengthening

Shoulder Concept



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