



Indian
Spinal Injuries
Centre



**International spine
& spinal injuries conference**

20th - 25th November
New Delhi, India

Souvenir



www.isiconline.org

In Acute Spinal Cord Injuries, Surviving is not enough.....

Rx **SOLU - MEDROL** ACT-O-VIAL
(methylprednisolone sodium succinate 500gm & 1gm)

... Because life is about living

Timely administration within the critical time window of 3 - 8 hours prevents:

- ... Post traumatic ischaemia
- ... Destruction of neuronal & microvascular membranes
- ... Improves neurological recovery

NASCIS III redefined the time window for management of spinal cord injury

RECOMMENDATION:

Patients initiated on treatment within:

- ... 3hrs of injury: maintenance therapy with SOLU - MEDROL for 24 hrs
- ... 3 - 8 hrs of injury: maintenance therapy with SOLU - MEDROL for 48hrs



DOSAGE:

30mg/kg bolus followed by 5.4 mg/kg for 23 hrs for patients initiated within 3 hrs of injury. For patients initiated on treatment after 3 - 8 hrs of injury, the infusion of 5.4 mg/kg/hr recommended for 48 hrs

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ISSICON 2002
International spine
& spinal injuries conference
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Souvenir

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Indian
Spinal Injuries
Centre



DR. ASHOK KUMAR WALIA

MINISTER OF HEALTH, URBAN
DEVELOPMENT, LAND AND BUILDING,
GOVT OF NATIONAL CAPITAL TERRITORY OF DELHI,
DELHI SECRETARIAT, LP ESTATE, NEW DELHI-110002

Date : 13-11-2002



MESSAGE

Spinal Injuries is one of the most devastating calamity that can afflict mankind. While the developed countries have been able to successfully accept the challenge, in the developing countries these people are often neglected. Hence, it is very appropriate that Indian Spinal Injuries Centre is organizing International Spine & Spinal Conference (ISSICON-02). Delegates from all over Asia and faculty from all over the world will get together to focus attention on spinal injuries, one of the most difficult medical problems. I am sure the deliberations at this conference and the pre and post-conference workshops will be very thought provoking and will come out with an ideal model for management of spinal injuries in developing countries.

I am told that a Spinal Cord Society has also been formed to focus attention in this field. I am sure that this society will help in channelising and focusing the activities of all personnel and organizations for the benefit of the people.

I welcome all delegates and faculty members and wish the organizers all success in their endeavour.

DR. A. K. Walia

Minister of Health,
Urban Development, Land and Building,
Govt. of National Capital Territory of Delhi,
Delhi Secretariat, LP Estate, New Delhi-110002



MESSAGE

It is a great pleasure to host the International Spine and Spinal Injuries Conference (ISSICON 2002), the plans of which started immediately after the successful ISSICON 2000.

Indian Spinal Injuries Centre is recognized as the tertiary level centre for the management of spinal injuries, by the Government of India. Indian Spinal Injuries Centre is also helping the Government to set up four regional centres at Mohali, Bareilly, Cuttack and Jabalpur. Hence, it is most appropriate that Indian Spinal Injuries Centre should be the hub of academic activities in this field in the country and this part of the world.

We would like to extend a warm welcome to the faculty and the delegates who have gathered here from all parts of the world. We hope that the conference and the workshops would bring out new ideas in management of this difficult problem, will help in the dissipation of these ideas and will inspire many young minds to work further, so as to overcome this challenge.

With regards,

Major H.P.S. Ahluwalia
Chairman,
Indian Spinal Injuries Centre, New Delhi



MESSAGE

Spinal cord medicine continues to be one of the fascinating parts of patient care. The "old idea" of comprehensive management has proved to be the best option and best practice. More than 50 years of history have given ample evidence that this is indeed the best approach. Reeducation of a patient with multiple failures so that he can take his place back in his family and his society has been and still is achieved most properly with a comprehensive structured care. In this approach also the urological management has proved its value. Not too long ago the main cause of death was urologically related. Now this seems to be ancient history already. However let us not forget that the good result did not come out of nowhere but was the gain won by hard and continuous work. One can be very confident that if care would loose the activity level it now has achieved, complications are just a street corner away. A wonderful evolution in the last decades has been the spread of the knowledge and of the care around the world. More and more regions and countries are opening comprehensive care facilities. The ISSICON-2002 symposium is a nice example of effort to make proper care after spinal cord lesion known to all. The inclusion of a workshop on two specific topics including one on urology is very good indeed. I wish for all participating in this event that they will gain in knowledge and confidence to further spread the good care to their local situation and their own patients.

Prof. JJ Wyndaele MD, DSc, PHD
Honorary Secretary
The International Spinal Cord Society



MESSAGE

Ever since Sir Ludwig Guttman and Sir George Bedbrook revolutionized spinal injury management during the Second World War, the developed countries have been able to set up good facilities for management of these ailments. India and other developing countries were late to start work in this field. However, in the last two decades, there has been substantial interest shown in this field and various specialized Centres have come up in these countries.

These countries share common problems like limited resources, lack of a barrier free environment etc. Hence, a common forum for discussing these problems and coming out with a model system for management of these ailments in developing countries is most vital.

International Spine and Spinal Injuries Conference (ISSICON) has been one such forum for the countries of the region. ISSICON 2000 had been a success and this inspired us to plan for this conference regularly.

We are grateful to International Spinal Cord Society for having extended their patronage. I am sure they will continue to support us in our future endeavours.

We welcome all delegates and faculty members who have taken time off from their busy schedule and gathered here from all parts of the world. I hope ISSICON 2002 will be able to come up to their expectations.

With regards,

Air Marshal A. S. Chahal
Director General, (Emeritus), ISIC, New Delhi



MESSAGE

With the technological development, the medical science is undergoing a radical reform. The speciality of spinal surgery has made great progress in the world, in the treatment programme for the disabled people, following spinal cord injuries. In India the Spinal Injury Management Programme has not yet been developed well.

Indian Spinal Injuries Centre (ISIC) during the last half a decade has established itself as a Centre of excellence in the South-Asian region. The Government of India has also recognised the institute as a Premier Centre in the Spinal Injury Management Programme.

International Spine and Spinal Injuries Conference (ISSICON-02) is an important landmark in the development of Spine Management in India.

It is a happy occasssion that ISIC has taken a lead to hold this mega event.

A handwritten signature in black ink, appearing to read 'Dr. A. K. Mukherjee', written in a cursive style.

Dr.A.K.Mukherjee
Director, ISIC, New Delhi

From the Editor's Desk

Come October and it is Conference time in India. Various National and International Conferences are held at venues across the country between October to February. So, what is the importance of an International Conference on Spine and Spinal Injuries?

Even though spinal injuries may not have an incidence as high as some of the other ailments, it has one of the most devastating physical, psychosocial and economic consequences not only to the patient, but also to the whole family. The management of spinal injuries requires, perhaps, the most complex, sophisticated and expensive protocol, involving a multi-disciplinary team and a huge infrastructure. It still continues to have the most unanswered questions as compared to any other ailment. The amount of research being done in this field is phenomenal. In other forums of Orthopaedics, Neurosurgery, Neurology and Physiatry, the topic of Spinal Injuries is usually given a back seat and loses its importance to other ailments which have a better outcome with lesser inputs. Also many of the contemporary protocols are for developed countries and there is an urgent need to modify and standardize them to the requirements of developing countries. This is where the importance of this meet lies.

The success of ISSICON 2000 encouraged us to make ISSICON a regular, yearly feature. The theme of this years conference is spinal cord injuries. We plan to have a different theme, in the subsequent yearly conferences. We have tried to cover all topics in the scientific programme and workshops. We have parallel sessions on surgical and rehabilitation management, in order to provide a wider option to the delegates. A splendid array of paper presentations will be very much illuminating. We assure you that we will put in every effort to make this event an academic feast.

Delhi is a tourist's paradise with many heritage sites. The climate in November is very pleasant. The hospitality of the city is well known, as you shall surely witness, while participating in the conference.

As the organising secretary of ISSICON 2002, and the editor of the souvenir it is my obligation to thank the whole team at ISIC who have made this event a reality.

First and foremost, I would like to place on record my debt to Maj. H. P. S. Ahluwalia, FRGS, Padmabhushan, Padmashri and Arjuna Awardee, Chairman, ISIC. His achievements constantly inspire us everyday to reach out and grasp the impossible. His indomitable spirit gives us the courage to reach within and conquer the Everests in our mind.

Air Marshal Chahal, Director General (Emeritus), ISIC, has always been the shining beacon of light, guiding us through the troubled waters of our times. I shall always remain grateful to him. I am deeply indebted to Dr. Mukherjee, Director General, ISIC, for his support and guidance. I thank Dr. Kame for his benevolent attitude towards all the activities of this institute, including this conference. This conference would never have seen the light of day if not for the contributions of Dr. Bajaj, Dr. Sunil Katoch, Dr. K. Das and Mr. Uthaman. I also wish to express my gratitude to all the members of the organization committee who have spent numerous busy days and sleepless nights in preparation of the event. A special mention of Dr. Prem Yohannan and Ms. Ishika Ahluwalia for their work in the compilation and publication of the souvenir.

I would fail in my duties if I do not mention the enormous contribution of the secretarial staff who have shown their mettle in times of stress. I consider my self fortunate for being part of such a dedicated team of hardworkers.

Lastly, I would like to thank the whole staff of ISIC for their contributions towards this mega event.

All of us are glad that you are here and we welcome you, and thank you for your kind participation. I am sure that we shall not leave any stone unturned to make this conference a grand success. Hope to see you again at ISSICON 2003.



Dr. H.S. Chhabra, Organising Secretary, ISSICON 2002

ISSICON 2002 Programme

Friday, 22nd November 2002

Session – I

Plenary Session	Chairpersons - Prof. Balu Sankaran, Sr. Consultant Orthopaedic Surgeon, St. Stephens Hospital, New Delhi. - Prof. P. S. Maini, Head of Department, Orthopaedics, Sir Ganga Ram Hospital, New Delhi.
09:00 – 09:45 hrs	SPINAL CORD SOCIETY ORATION Management of Spinal Cord Injury – The Indian Perspective Air Marshal A. S. Chahal, Director General (Emeritus), ISIC
09:45 – 10:15 hrs	Management of Acute Spinal Cord Injuries - Dr. Douglas Brown, Director, Victoria Spinal Cord Service, Heidelberg, Australia
10:15 – 10:35 hrs	Rehabilitation of Paraplegics - Dr. N. K. Reebye, Physiatrist, Vancouver, Canada
10:35 – 10:50 hrs	Break

Session – II (Hall-A)

FREE PAPER SESSION (GOLD MEDAL AWARD) Acute & Surgical Spinal Cord Injury Management

• Chairperson	Air Marshal A. S. Chahal, Director General (Emeritus), ISIC
• Co-chairperson	Dr. Arvind Jayaswal, Additional Professor Orthopaedics, AIIMS
10:50 – 11:00 hrs	Changing epidemiological patterns of spinal injury in the last two decades - Dr. B. H. Mahesh, Sr. Resident, AIIMS, New Delhi
11:00 – 11:10 hrs	Biomechanics of spine - Prof. G. P. Pal, Head of Anatomy, Modern Dental College & Research Centre, Indore, Madhya Pradesh
11:10 – 11:20 hrs	Modified Frankel's Criteria: Study of 298 Acute Lower Cervical cord Injuries - Dr. Arvind V. Bhawe, Associate Prof. & Spine Surgeon, Bhawe Hospital, Pune, Maharashtra
11:20 – 11:30 hrs	Spinal cord Injury during earthquake 2001 - Dr. Tejas Thakkar, Orthopaedic Surgeon, Paraplegia Centre, Ahmedabad, Gujarat, India
11:30 – 11:40 hrs	Thoracolumbar Spinal Injuries – Conservative Vs. Operative Management - Dr. Navnendra Mathur, Department of PM & R, SMS Medical College & Hospital, Jaipur, Rajasthan
11:40 – 11:50 hrs	Experience in Spine Fusion in relieving symptoms, complication & overall result in various spine diseases - Lt. Col. H. C. Talan, Base Hospital, Delhi Cantt., New Delhi
11:50 – 12:00 hrs	Early Surgery in Paraplegia due to Thoracolumbar injuries - Dr. Arvind V. Bhawe, Associate Prof. & Spine Surgeon, Bhawe Hospital, Pune, Maharashtra
12:00 – 12:10 hrs	Anterior Stabilization with Titanium Mesh – Bone Graft Composite in Thoracolumbar Fractures – A Mid Term Review - Dr. K. Kailash, SRMC & RI, Chennai, Tamilnadu
12:10 – 12:20 hrs	Outcome of Management of Thoracolumbar Injuries by Short Segment Global Fusion - Dr. Abrar Ahmed, Sr. Resident, AIIMS, New Delhi
12:20 – 12:30 hrs	Short Term Analysis of the Outcome of Transpedicular Instrumentation in Unstable Thoracolumbar Fractures - Dr. T. Senthil Nathan, SRMC & RI, Chennai, Tamilnadu

12:30 – 12:40 hrs	Conservative Vs. Operative Management of Cervical Spine Injuries - Dr. Vaibhav M. Punjabi, B. J. Medical College & Civil Hospital, Ahmedabad, Gujarat
12:40 – 12:50 hrs	Thoracolumbar Injury Treated by Decompression and Instrumentation - Dr. Dilip K. Pethani, B. J. Medical College & Civil Hospital, Ahmedabad, Gujarat
12:50 – 13:00 hrs	Lateral Retropharyngeal Approach To Upper Cervical Spine – an alternative to the transoral approach - Dr. Prem Yohannan, Sr. Resident, ISIC, New Delhi

Session – III (Hall – B)

Free Paper Session (Gold Medal Award) Rehabilitation Management

• Chairpersons	- Dr. Nitin K. Reebye, Physiatrist, Canada - Dr. Meena Midha, Physiatrist, USA
10:50 – 11:00 hrs	Tetraplegic upper limb care in acute phase - Md. Ehsunul Ambia, OT, Bangladesh
11:00 – 11:10 hrs	Techniques to improve / maximize feeding skills in tetraplegic patients: Occupational Therapy Approaches - Md. Abul Kashem Shapon, Occupational Therapist, CRP, Dhaka, Bangladesh.
11:10 – 11:20 hrs	Analytical assessment of bladder rehabilitation on spinal cord injury patients - Dr. Roop Singh, Lecturer, Pt. B. D. Sharma, PGIMS, Rohtak, Haryana
11:20 – 11:30 hrs	Severely Hyperreflexic Bladder, Role of Post Sacral selective Rhizotomy - Dr. R. K. Shimpi, Consultant Uro-Surgeon & Andrologist, Jahangir Hospital & Medical Centre, Pune, Maharashtra
11:30 – 11:40 hrs	Medical Complications in Subjects with Non Traumatic Spinal Cord Injury - Dr. Maheswarappa BM, Sr. Resident - NIMHANS, Bangalore, Karnataka
11:40 – 11:50 hrs	Maximizing the role of the half way Transit Hostel in the Centre for the Rehabilitation of Paralyzed, Bangladesh - Dr. Sohrab Hossain, Dhaka, Bangladesh
11:50 – 12:00 hrs	A Novel Concept: Paraplegia Safari - Dr. M. M. Prabhakar, Director, Paraplegia Centre, Ahmedabad, Gujarat, India
12:00 – 12:10 hrs	Assessment of Sexual Functions after Spinal Cord Injury in Indian Patients - Dr. Roop Singh, Lecturer, Pt. B. D. Sharma, PGIMS, Rohtak, Haryana
12:10 – 12:20 hrs	Occupational therapy approaches at CRP - Md. Ehsunul Ambia, OT, CRP, Dhaka, Bangladesh
12:20 – 12:30 hrs	Principle of Orthotics in Spinal Cord Lesion Management - Mr. Praveen Shukla, Orthotist, ISIC, New Delhi
12:30 – 12:40 hrs	Protocol for Bladder Management at ISIC - Dr. Vikram Sharma, Urologist ISIC, New Delhi
12:40 – 12:50 hrs	Recreational Therapy at ISIC - Ms. Mini Vazhkala, Peer Counsellor, ISIC, New Delhi
13:00 – 14:00 hrs	Break

Session – IV

• Chairperson	Mr. Gerry Towns, Neurosurgeon, Leeds, UK
• Co-chairperson	Dr. A. K. Singh, Director, CIO, Safdarjung Hospital, New Delhi

- 14:00 – 14:30 hrs Anterior Cord Injury and Fixation – The Dutch Experience
- Dr. Wee Fu Tan, Consultant Neurosurgeon, Holland
- 14:30 – 15:00 hrs Good Practice in the Treatment of Acute Traumatic Spinal Cord Injury – Timing & Methods for Surgical Treatment of the Vertebral Injury
- Dr. Patrick Kluger, Consultant Spine Surgeon, Stoke Mandeville Hospital, UK
- 15:00 – 15:15 hrs Break

Session – V (Hall – A)
(Sponsored by Rehabilitation Council of India)

- Chairperson **Maj. HPS Ahluwalia, Chairman, Indian Spinal Injuries Centre**
- 15:15 – 15:30 hrs Experience of Setting up of a Spinal Injury Centre in Nepal
- Dr. Anil Shreshtha, Orthopaedic Surgeon, Nepal
- 15:30 – 15:50 hrs Disability Scenario in India
- Dr. A.K. Mukherjee, Director General, ISIC, New Delhi
- 15:50-16:05 hrs Rehabilitation services in India – Role of Rehabilitation Council
- Mr. J.P. Singh, Member Secretary, Rehabilitation Council of India
- 16:05 – 16:25hrs. Role of Hydrotherapy in spinal Cord Injury
- Dr. Macorini Riccardo, Physiatrist, Italy

Session – VI (Hall – B)

- Chairperson **Dr. S. M. Tuli, Sr. Consultant Orthopaedic Surgeon, VIMHANS, New Delhi**
- Co-chairperson **Dr. Wee Fu Tan, Consultant Neurosurgeon, Holland**
- 15:15 – 15:40 hrs Lumbar End Plate Fractures Mimicking Disc Prolapse
- Dr. Arvind Jayaswal, Addl. Professor Orthopaedics, AIIMS, New Delhi
- 15:40 – 16:05 hrs Pitfalls in Posterior Higher Cervical Spine Surgery
- Dr. Sharad Shashank Kale, Assistant Professor, Neurosurgery, AIIMS, New Delhi
- 16:05-16:25 hrs Fusion in Spinal Surgery
- Dr. Shankar Acharya, Spine Surgeon, Sir Ganga Ram Hospital, New Delhi

Session – VII

- 16:25-17:30 hrs Inauguration Ceremony, Chief Guest
- Dr. A. K. Walia – Hon'ble Health Minister of Delhi

Saturday, 23rd November 2002

Session – VIII (Hall – A)

- Chairperson **Dr. S. K. Kame, Sr. Consultant Orthopaedic Surgeon, ISIC**
- 09:00 – 09:20 hrs Cervical Spine Injury due to fall while Carrying a Heavy Load on the Head
- Dr. Faziul Hoque, CRP, Dhaka, Bangladesh
- 09:20 – 10:20 hrs Classification of Spinal Cord Injury as it relates to Functional Outcome
- Dr. Meena Midha, Physiatrist, USA

Session IX (Hall – B)

- Chairperson **Dr. Julio Gallego, Consultant Neurosurgeon, Memphis**
- Co-Chairperson **Prof. Mazhar Hussain, Head of Department Neurosurgery, King George Medical College, Lucknow**
- 09:00-09:25 hrs C1-C2 Transarticular fixation
- Dr. Sathish R., Consultant Neurosurgeon, Sri Satya Sai Institute of Medical Sciences
- 09:25-09:50 hrs Pitfalls in Anterior Cervical Fixation Surgery
- Dr. K. Sridhar, Consultant Neurosurgeon, Malar Hospital, Chennai, Tamilnadu

- 09:- 50 hrs Radiological Approach to Trauma
- Dr. Rajesh Kapoor, Consultant Radiologist, Diwan Chand Satyapal Aggarwal Radiology Centre, New Delhi

Session X (Hall – A)

(Sponsored by Medtronic)

- Chairperson **Maj. Gen. Dr. S. K. Venkatraman, Sr. Consultant Neurology, Mata Chanan Devi Hospital, New Delhi**
- 10:20 – 10:45 hrs Management of Spasticity
- Dr. Douglas Brown, Director, Victoria Spinal Cord Service, Australia
- 10:45 – 11:00 hrs Baclofen Pump in the Management of Spasticity
- Dr. H.S. Chhabra, Addl. Medical Director, ISIC, New Delhi
- 11:00 – 11:15 hrs Break

Session – XI (Hall A)

- Chairperson **Dr. A. K. Mukherjee, Director General, ISIC, New Delhi**
- 11:15 – 11:40 hrs Ventilatory management of SCI
- Dr. P. K. Mangla, Chest Specialist, ISIC, New Delhi
- 11:40 - 12:05 hrs Management of Medical Emergencies in Spinal Cord Injuries
- Dr. S. Wadhwa, Deptt. of Physical Medicine & Rehabilitation, AIIMS, New Delhi
- 12:05 – 12:30 hrs Prevention and Management of Pressure Sores
- Dr. Sunil Katoch, Consultant Orthopaedic Surgeon, ISIC, New Delhi
- 12:30 – 13:00hrs. Management of Neuropathic Pain
- Dr. Vipul Mody, Physiatrist, USA

Session – XII (Hall B)

- Chairperson **Dr. A. D. Sehgal, Director, Sehgal Nursing Home, New Delhi**
- Co-chairperson **Col. V. S. Madan, Sr. Consultant Neurosurgery, Sir Ganga Ram Hospital, New Delhi**
- 11:15 – 11:40 hrs Reconstruction of Tetraplegic Hand
- Dr. H.N. Bajaj, Sr. Consultant Orthopaedic Surgeon, ISIC, New Delhi
- 11:40 – 12:05 hrs Thoracic Pedicle Screw Fixation
- Dr. H.S. Chhabra, Additional Medical Director, ISIC, New Delhi
- 12:05 - 12:30 hrs Management of Higher Cervical Spine Injuries
- Prof. Mazhar Hussain, Head of Neurosurgery, King George Medical College, Lucknow, U. P.
- 12:30 – 13:00 hrs Management of Post Traumatic Syringomyelia
- Prof. A.K. Singh, Head of Neurosurgery, G B Pant Hospital, New Delhi
- 13:00-14:00 hrs Break

Session XIII (Hall A)

- Chairperson **Air Marshal A. S. Chahal, Director General (Emeritus), ISIC**
- 14:00 – 14:25 hrs Hp 184 – New Therapy for Spinal Cord Injury
- Dr. Vipul Mody, Physiatrist, USA
- 14:25 – 14:50 hrs Sleep Disordered Breathing in SCI patients
- Dr. Douglas Brown, Director, Victoria Spinal Cord Service, Australia

Session -XIV (Hall B)

- Chairperson **Dr. B.K. Dhaon, Head of Orthopaedics Department, LNJP Hospital, New Delhi**
- 14:00 - 14:30 hrs Management of Thoracolumbar Fractures using Kluger Device
- Dr. Patrick Kluger, Consultant Spine Surgeon, Stoke Mandeville Hospital, UK

- 14:30 - 14:50 hrs Recent Trends in Surgical Management for Subaxial Cervical Spinal Cord Injury
- Col. P. K. Sahoo, Sr. Advisor in Surgery, Army Hospital, Delhi Cantt., New Delhi
- 14:50 - 15:10 hrs **Break**

Session - XV (Hall - A)

Free paper Session

- Chairperson **Dr. Patrick Kluger, Consultant Spine Surgeon, Stoke Mandeville Hospital, UK**
- Co-chairperson **Mr. Jake Timothy, Neurosurgeon, Leeds, UK**
- 15:10 - 15:25 hrs Protocol for Evaluation of Basic Status of Spinal Cord Injury Patients
- **Dr. (Capt) Dilip Sinha, Patna Medical College, Bihar**
- 15:25 - 15:35 hrs Services at RSIC, Cuttack
- **Sh. R. N. Das, Chief Physiotherapist, Regional Spinal Injury Centre, Cuttack, Orissa**
- 15:35 - 15:50 hrs Anterior Cervical Stabilization with Synthes Locking Screws & Plates
- **Col. Dr. Prakash Singh, Department of Neurosurgery, Delhi Cant. R & R Hospital, New Delhi**
- 15:50 - 16:00 hrs Conservative Vs. Surgical Treatment - Comparative analysis of outcome of patients in thoracolumbar fractures
- **Dr. Praseon Shamsery, Sr. Resident, AIIMS, New Delhi**
- 16:00 - 16:15 hrs Role of delayed anterior Decompression in Thoracolumbar fractures
- **Dr. K. Das, Jr. Consultant, ISIC, New Delhi**
- 16:15 - 16:30 hrs Regional Spinal Injury Network: the first year's experience
- **Maggie Muldoon, Administrator, John Grooms Overseas, Ireland**
- 16:30 - 16:40 hrs Ergonomical consideration for SCI patients in home
- **Mr. Vijay Batra, Occupational Therapist, ISIC, New Delhi**
- 16:40 - 16:50 hrs Home evaluation in Spinal Cord Injury patients
- **Ms. Meenakshi Batra, Occupational Therapist, Institute of Physically Handicapped, New Delhi**
- 16:50 - 17:00 hrs Low Back Pain - A problem solving approach to Icon game communities
- **Mr. S. Mohan Sunder BPT, Head of the Physiotherapy Deptt., Mata College of Physiotherapy, Tamilnadu**
- 17:00 hrs **Meeting of Spinal Cord Society**
- 18:00-19:00 hrs **Cultural Programme**
- 19:00 hrs **Cocktail Dinner**

Sunday, 24th November 2002

Session - XVI

- Chairperson **Prof. V. S. Mehta, Head of Neurosurgery, AIIMS, New Delhi**
- 09:00 - 09:20 hrs Skip Laminectomy - A Minimally Invasive Technique for Posterior Cervical Decompression
- **Mr. Jake Timothy, Neurosurgeon, Leeds, UK**
- 09:20 - 09:45 hrs The development of a New Occipito-cervico - Thoracic Implant
- **Mr. Gerry Towns, Neurosurgeon, Leeds, UK**
- 09:45 - 10:20 hrs The Future of Spine Surgery
- **Dr. Julio Gallego, Orthopaedic Surgeon, Memphis, USA**
- 10:20 - 10:45 hrs Anterior Trans-sternal Approach to Upper Dorsal Spine
- **Dr. P. S. Bawa, Director, Mata Chanan Devi Hospital, New Delhi**
- 10:45-11:05 hrs **Break**

Session - XVII

- Chairperson **Prof. A. K. Hemal, Department of Urology, AIIMS, New Delhi**
- 11:30 - 12:00 hrs Diagnosis of Lower Urinary Tract Dysfunction
- **Dr. Jean Jacques Wyndaele, Secretary, International Spinal Cord Society, Belgium**
- 12:00 - 12:30 hrs Surgical Management of Neurogenic Bladder
- **Mr. Gurpreet Singh, Urologist, UK**
- 12:30 - 13:00 hrs Panel Discussion: Management of Neurogenic Bladder
Panelists
- **Air Marshal A. S. Chahal, Dr. Jean Jacques Wyndaele, Mr. Gurpreet Singh, Dr. Dinesh Suman, Prof. A. K. Hemal**
- 13:00-14:00 hrs **Break**

Session - XVIII (Hall - A)

- 14:00 - 15:00 hrs Panel Discussion - Challenges in Rehabilitation of Spinal Injuries in the Developing Countries.
Panelists
- **Dr. A. K. Mukherjee, Dr. Jean Jacques Wyndaele, Prof. U. Singh, Dr. Meena Midha, Dr. Vipul Mody, Dr. H. C. Goel**

Session XIX (Hall B)

- Chairperson **Prof. P. K. Dave, Director, AIIMS, New Delhi**
- Co-Chairperson **Prof. A. K. Singh, Head of Neurosurgery Department, G. B. Pant Hospital, New Delhi**
- 14:00-14:20 hrs Traumatic Cranio Vertebral Junction Injuries
- **Dr. Rana Patir, Sr. Consultant Neurosurgeon, Sir Ganga Ram Hospital, New Delhi**
- 14:20-14:45 hrs Anterior Cervical Fixation
- **Prof. Raj Bahadur, Head of Deptt. Orthopaedics & Medical Superintendent, Chandigarh Medical College, Chandigarh, Punjab**
- 14:45-15:00 hrs Management of Cervical Spine Cord Injury with no skeletal abnormality
- **Dr. V. Jaiswal, Consultant Neurosurgeon, ISIC, New Delhi**
- 15:00 - 15:15 hrs Thoracolumbar Spinal Injuries - Rationale for management
- **Dr. Yash Gulati, Consultant Orthopaedic Surgeon, Apollo Hospital, New Delhi**

Session XX (Hall A)

- Chairperson **-Dr. Jean Jacques Wyndaele, Secretary, International Spinal Cord Society, Belgium**
- Co-Chairperson **Prof. U. Singh, Head of Department of Physical Medicine & Rehabilitation, AIIMS, New Delhi**
- 15:00 - 15:30 hrs Sexual Management of Spinal Cord Injured Patients
- **Dr. Dinesh Suman, Urologist, ISIC, New Delhi**
- 15:30 - 15:50 hrs Sexual Rehabilitation of Male SCI Patients - Modalities of Treatment for Infertility and Impotence: A single Centre Experience
- **Dr. Vijay Kulkarni, Consultant Andrologist, Mumbai**

Session XXI (Hall - B)

- 15:15 - 15:50 hrs Panel discussion - Surgical Management of Spinal Injuries
Panelists
- **Dr. Air Marshal A. S. Chahal, Mr. Gerry Towns, Mr. Jake Timothy, Dr. Arvind Jayaswal, Dr. Raj Bahadur, Dr. H. N. Bajaj, Dr. H. S. Chhabra**
- 15:50 - 16:10 hrs **Break**
- 16:10 - 16:40 hrs Valedictory Function

WORKSHOP - FUNDAMENTALS ON SPINAL FIXATION

(Sponsored by Medtronic)

November 20th - 21st, 2002

20th November 2002			
9:00 - 9:30	Presentation of Case for Live Demonstration of Surgery .	10:00 - 13:20	Indications, Surgical Technique and Types of Posterior Cervical fixation - Dr. Satish, SAM, Satya Sat Hospital, Bangalore
9:30 - 12:30	Live Demonstration of Surgery - Guest <i>Faculties</i> - Dr. Wee Fu Tan, Consultant Neurosurgeon Holland & Dr. Julio Gallego, Consultant Neurosurgeon, Memphis, USA	10:20 - 10:40	Cervical Disc Prosthesis, Indications and Surgical Techniques - Dr. Julio Gallego, Memphis, USA
12:30 - 13:30	Lunch	10:40 - 11:00	Tea Break
13:30 - 14:00	Cervical Disc Prosthesis, Indications and Surgical Techniques - Dr. Wee fu Tan, Consultant Neurosurgeon, Holland	11:10 - 12:30	Hands on Workshop: Anterior and Posterior Cervical Fixation.
14:00 - 14:30	Wet Trials on Cervical Disc Replacement - Dr. Wee Fu Tan, Consultant Neurosurgeon, Holland .	12:30 - 1:1:30	Lunch
14:30-15:00	Discussion	13:30 - 13:55	Anterior Fixation of the Thoracolumbar Spine - Dr. A. Jayaswal, AIIMS, New Delhi.
15:00 - 17:00	Live Demonstration of Surgery	13:55 - 14:20	Thoracic Pedicle Screws: Indications and Surgical Technique - Dr. H. S. Chhabra, ISIC, New Delhi.
21st November, 2002			
9:00 - 9:20	Anatomy and Biomechanics of the Cervical Spine - Dr. A. K. Singh HoD Neurosurgery, G. B. Pant Hospital	14:20 - 14:50	Management of Spondylolysthesi - Dr. Julio Gallego, Memphis, USA
9:20 - 9:40	Management of Upper Cervical Spine Injuries - Dr. Mazhar Hussain, FAD Neurosurgery-King George, Medical College, Lucknow.	14:50 - 15:10	Tea Break
9:40 - 10:00	Anterior Cervical Decompression & Fixation in Lower Cervical Spine injuries - Dr. H. S. Chhabra, Indian Spinal Injuries Centre, New Delhi.	15:10 - 15:43	Management of Complex Deformities - Dr. Sajan Hegde, Apollo Hospital, Chennai.
		15:40 - 16:00	Fixation in Pott's Spine - Dr. H. N. Bajaj, Sr. Consultant Orthopaedic Surgeon, New Delhi.
		15:40 - 17:10	Hands on Workshop: Thoracolumbar Fixation

POST-CONFERENCE WORKSHOP ON BLADDER MANAGEMENT IN SPINAL INJURIES

November 25th, 2002

• Chairpersons			
	Prof. Jean Jacques Wyndaele- Secretary, International Spinal Cord Society, Belgium		
	Mr. Gurpreet Singh - Urologist, UK		
9:00 - 9:20	Introduction - Mr. Gurpreet Singh Urologist, UK	11,15 - 1,2,15	Demonstration of Video Urodynamics & Clean Intermittent Catheterization
9:20 - 9:45.	Neuroanatomy of the Bladder. - Dr. Vikram Sharma, Urologist ISIC, New Delhi	12.15 - 1-.00.	- Lunch
9:45 -10:15	Evaluation of the Neuropathic bladder - Dr. Jean Jacques Wyndaele, Secretary, International Spinal Cord. Society, Belgium	1.00 - 1.30	Conservative Management of Neurogenic Bladder - - Dr. Jean Jacques Wyndaele, Secretary, International Spinal Cord Society, Belgium .
10:20-10.50	Urodynamics and its application to the Neurogenic Bladder. - Mr. Gurpreet Singh, Urologist, UK .	1.30 - 2.00	Surgical Management of Neurogenic Bladder - Mr. Gurpreet Singh, Urologist, UK .
10:50 - 11,15	Coffee and discussion	2.00 - 5.00	Live Surgery - Mr. Gurpreet Singh, Urologist, UK

POST-CONFERENCE. WORKSHOP ON SPINAL FIXATION

(Sponsored by Depuy AcroMed -Johnson & Johnson)

November 25th, 2002

8:00 - 9:00	Registration	14:45 - 15:10	Stabilizing Thoracolumbar Injuries -Changing Concepts - Dr. Arvind Jayaswal, Addl. Professor, AIIMS, New Delhi
9:00 - 9:15	Presentation of Case for Live Demonstration of Surgery.	15:10 - 15:30	Anterior Fixation in Thoracolumbar Fractures -The ISIC Experience - Dr. H. N. Bajaj, Sr. Consultant Orthopaedic Surgeon, ISIC, New Delhi
9:15 - 13:00	Live Demonstration of Surgery - Guest Faculty - Dr. Arvind Jayaswal, Addl. Professor, AIIMS, New Delhi.	15:30 - 15:45	Delayed Decompression in Management of Spinal Injuries - Dr. H. S. Chhabra, Addl. Medical Director, ISIC New Delhi
13:00 - 14:00	Lunch	15:45 - 16:00	TEA
14:00.- 14:25	Traumatic Cranio Vertebral Junction Anomalies - Dr. Sharad Shashank Kale, Assistant Professor, Neurosurgery, AIIMS, New Delhi	16:00 - 17:00	Hands on Workshop - Moss Miami System
14:25- 14:45	Posterior Cervical Fixation in Spinal Injuries - Dr. Shankar Acharya, Spine . Surgeon, Sir Ganga Ram Hospital, New Delhi		

Session I

Spinal Cord Society Oration

Management of Spinal Injury - The Indian Perspective

Air Marshal A.S. Chahal, Director General (Emeritus), ISIC

Introduction - Spinal Cord Injury had been described as "An ailment not to be treated". This dictum had been more or less valid till the second world war when Sir Ludwig Guttman in UK and Sir George Bedbrook in Australia revolutionized Spinal Injury Management and showed that these people can lead a near normal life style from the wheelchair. However, in India the same situation continued till quite late. After the Indo Pak War of 1965, I was detailed by Government of India under as a Senior Colombo Plan Fellowship to Australia, with a view to setup a modern Spinal Injuries Services for the Arm forces. This was a difficult job but fortunately in 1971 the Indo-Pak conflict in November, December was responsible for about 100 Spinal Cord Injuries. I got full support from the seniors and cooperation from my colleagues to set up a 100-bedded spinal cord centre at Kirkee, Pune. This Centre has since treated and rehabilitated about 2000 soldiers and their families up to December 2001.

I felt the need for establishing a paraplegic home to take care of those who had no family support or facilities in their homes. Some of them could not lead a wheelchair life in the mountains or deserts of India. Today, this paraplegics home is one of the finest institution in Asia where a paraplegic soldiers can lead a healthy life and look forward to years of happiness.

There have been no proper epidemiological studies in India on Spinal Cord Injuries but estimates suggest that the incidence would be 20 per million population. We had also done a pilot study under the inspire project in collaboration with National Institute on Disability and Rehabilitation Research Ministry of Education, USA. The findings suggested that most of these patients are in the young active age group and males are more often predisposed. Fall from height was the main mode of injury, though road traffic accidents are catching up in urban areas and you just need to travel on the congested city roads to understand the reason. The majority of the patients have a family income of less than Rs.5000/- (USD 100) per month. The first aid at site of accident/injury is poorly developed in India. In big cities facilities are coming up as for example the centralized accident and trauma services (CATS) in Delhi. Indian Spinal Injuries Centre has a trained team for first aid and evacuation and is making an endeavour to train various agencies like CATS and traffic Police.

Patients are often not properly evacuated from the site of accident. The main mode of transfer remains by road and often the vehicles are ill equipped to meet any emergencies. In the Western Countries paraplegics are evacuated from the site of accident by helicopters. In India a few lucky fellows get this facility as large majority are only evacuated to the nearest hospital by road. The initial management is often in a primary or secondary level centre with inadequate facilities and knowledge about spinal injury management. The patients reach the definitive institutions late and hence generally are not candidates for therapies like high doze methyl prednisolone management. Indian Spinal Injuries Centre along with Rehabilitation Council of India is trying to spread the message about the importance of reaching definitive institutions early and training medical and Para-medical staff dealing with such patients at primary and secondary level Centres. Many high tetraplegics can't reach the definitive institutions. The ventilatory management of such patients is developed only in limited institutions. The support facilities once ventilatory dependent patients go back home are also limited but some of our patients have done well despite this. MRI and CT Scan facilities are now freely available in big cities. However, X-ray still remains the gold standard in smaller cities and towns. Facilities for Arterial Blood Gas Monitoring are existent only in cities. Uro-dynamics are not routinely done.

Conservative management remained the main stay of treatment in the early years of spinal injury management, however patients were required to have a prolonged period of bed rest and stay in the hospital. They were also predisposed to a higher incidence of complications. However, in many cervical spinal injuries the patients can still be managed conservatively and mobilized early with a halo device, which is now freely available at least in big cities. The surgical management is more commonly used now. It results in early stabilization and mobilization, thus, reducing the complications. It is also good for the morale of the patients, achieve decompression and the normal anatomy of the canal can be restored, especially keeping in mind that some of the future regeneration therapies would require a patent canal as a pre-condition.

Harrington Instrumentation remains the gold standard for the surgical management of thoracic and thoraco lumbar injuries. Pedicle screw fixation and other newer techniques offer the advantage of a tri columnar fixation. Anterior decompression and fixation with Zee plate and screw rods constructs are other newer innovations in this field.

In the cervical spine, posterior stabilization is mainly through inter-spinous wiring and lateral mass plates. Anterior decompression and stabilization with various plates like H plate, Casper plate and titanium locking screw plate are other surgical procedures in the cervical spine. The aim of stabilization of spinal injuries with paraplegia is to mobilize these

patients within seven to ten days of surgery. This has reduced the period and the cost of hospitalization. It has cut down the complications of bedsores urinary infection and deformities thus the surgical intervention at the right time has cut down the rehabilitation of these patients from months to weeks.

In 1970 when I was trained in Australia Sir George Bedbrook was very strict and followed conservative resumes of two hour returning of the patients to prevent bed sores it took 10-12 weeks for the spine to be stable before the patient could be mobilize and sent to rehabilitation department. In India we felt the need for modernizing our approach the stabilize the spine by surgical method and progress early rehabilitation in these patients.

There is a lack of facility in the form of total care required for this disability. It is being established in Lucknow, Bhubneshwar, Chandigarh and Jabalpur with the help of AISPO from Italy. However to achieve success it is the responsibility of the medical profession / medical administrator to have trained team in this field available in medical schools / hospital where tertiary care is provided.

One of the main goals of management of spinal injuries is prevention of complications. These patients are prone to numerous acute, sub-acute and chronic complications like paralytic illness, aspiration, respiratory arrest, deep vein thrombosis, chest infection, lung collapse, metabolic derangements, urinary tract infections, renal failure, bed sores etc. A proper comprehensive rehabilitation and patient-family education is vital to reduce the incidence of these complications.

Spinal injury management requires a multi-disciplinary team approach in management. The spinal injury consultant is the leader and the key member of the team. He follows the patient from day one to the discharge and then the follow-up.

Proper nursing care is very vital for prevention of complications like bedsores, urinary tract infections etc. The nurses need to have a close interaction with the patients and are involved in various managements like bladder and bowel management. They often are the intermediaries between the patients and the doctor.

Physiotherapists and Occupational Therapists are other important members of the team and they deal with active and passive mobilization and training of activities of daily living, wheelchair use, transfers etc. respectively.

Orthotists are required for various braces, calipers and ADL devices. The Social Worker has also a very important function in sorting out patient problems, which may be logistical or financial. They are also involved in home care services and often the intermediaries between the patients and the doctors or Para-medical staff.

Peer Counselors have a very definite role since the patients take their word more easily than that of other personnel because they can identify the peer counselors with themselves. In our set up the Peer counselors are also involved in sexual counseling. Spinal injury is perhaps one of the most devastating calamities that can afflict mankind. It is not only the patient but also the entire family, which is totally disturbed psychosocial hence psychologists and psychiatrists have a big role to play in the psychosocial rehabilitation of the spinal cord injured.

Since very often the spinal injured can't pursue the same career that they were in before the injury, vocational counselors have a very important role in the vocational rehabilitation. The Social Workers also help the spinal injured in availing the various benefits provided by the Government towards very soft loans, job reservations and reservations in allotment of STD booths, petrol pumps etc.

Sexual Counseling is done by the Urologists, Peer Counselors and Nurses, (in the case of female patients). This very important area is often neglected in developing countries. In countries like India, discussing about sex openly is a taboo and hence this important aspect of rehabilitation often suffers.

Equally important is the aspect of fertility, especially since most of these patients are in the young sexually active age groups who have still not completed their families. Though there have been some examples in this field in our country but we need to work further in order to cover this important aspect.

The family plays a very vital role and is the pillar of strength for the patients. The joint family system still strongly prevalent in the rural areas of India helps the patients in getting back into the main stream of the society.

Before the patient is discharged, a team of social worker and occupational therapist often need to visit the patient's home in order to suggest home modifications. The team also follows the patient later as part of the home care services.

Developing countries like India do not have a favourable infrastructure for people on wheelchair. The buses, the trains, the shopping malls, the entertainment areas and offices are often not barrier free and accessible. This provides a major hindrance in the successful integration of the spinal injured into the society. The Equal Opportunities Bill of 1995 was a landmark where these issues amongst others to empower people with disabilities were considered. It is the implementation of this bill, which will substantially benefit the people with disabilities.

The dictum "Prevention is better than Cure" holds especially true for spinal injuries. Hence, we have to focus attention also in this area. This would require a big coordinated effort involving public awareness, legislation and enforcement.

I think that the scope of work in this field is so extensive that all of us can make a notable contribution in our lifetime.

ABSTRACTS

Acute Spinal Cord Injury

Dr. Douglas Brown, Director, Victoria Spinal Cord Services, Heidelberg, Australia

Spinal cord injury is devastating. All attempts must be made from the moment of the accident to minimise spinal cord damage and to prevent complications in order that the potential for rehabilitation may be optimised. Maintenance of vertebral column alignment, when moving a patient, is important to prevent damage to the spinal cord from fractured vertebrae. Many patients have more than one vertebral column injury and, therefore, may have more than one level of spinal cord damage. There is controversy regarding the use of medication to prevent metabolic deterioration as a number of patients have irreversible cord damage from the initial impact.

Prevention of complications is very important as they can be fatal.

Respiratory failure is common in tetraplegics, even in those who will not ultimately be ventilator dependent. Early adequate management is crucial. There is a very high proportion of deep venous thrombosis and pulmonary embolism with a high death rate. Prophylaxis reduces this to less than 0.5%. Peptic ulceration is also very common and can be reduced by medical prophylaxis. Intra-abdominal injury may be silent and therefore diagnostic interventions are necessary in all patients where intra-abdominal injury is a possibility.

The early phase of hospitalisation after acute spinal cord injury is an opportunity for the treating staff to develop a therapeutic relationship with the patient and family in order that their fears and ignorance may be allayed. This relationship is the foundation upon which future rehabilitation is established.

Rehabilitation of Paraplegics A Canadian (British Columbia) Perspective.

Dr. Nitin K. Reebye, Physiatrist, Vancouver, Canada

This presentation will briefly describe common causes, incidence, prevalence and various aspects of rehabilitation of spinal cord injuries in North America.

Rehabilitation of persons with spinal cord injury is a complex task.

In British Columbia this challenge is taken at many levels. First, the plight of the spinal cord injured patients is understood in the context of medical, physical, and psychosocial environment. Second, rehabilitation process focuses on individual goals for patients from a multidisciplinary perspective. Third, each patient's unique strengths are recognized and facilitated. Lastly, these patients are seen as potential contributors to society rather than a burden on the health system. Overall, patients are supported and helped to achieve their own personal goals.

Outstanding contribution has been made by the G.F.Strong rehabilitation unit, Vancouver, B.C. Canada; described in this presentation. The province of British Columbia also has produced proud leaders such as Rick Hansen who set an example by their role modeling under adverse condition. Rick Hansen foundation raised millions of dollars wholly dedicated to spinal cord research.

Thus, the BC experience will be described in the spirit of providing hope and direction to new budding programs for the spinal cord injury patients.

Session II

Changing Epidemiological Pattern of Thoracolumbar Trauma in Last Decade

Dr. B. H. Mahesh

Dr. Abrar, Dr. Praseon Shamsheery, Dr. Arvind Jayaswal

Department of Orthopaedics, All India Institute of Medical Sciences, New Delhi

44 patients of unstable thoracolumbar fractures with minimum of two years follow-up were evaluated with special emphasis on clinico-epidemiological factors affecting the final functional outcome. A comparative analysis of the data was done with a study done at AIIMS (1994) and with few other studies which were available in Indian medical literature. Decreasing male to female ratio with rising incidence of injuries to females was found, indicating more outdoor and active behaviour in females. Though fall from height remained the leading cause of spinal injuries, there is a rising trend of road accidents and violence related injuries. 46% of our patients were transported to the hospital utilizing ambulance services as compared to 8.8% of the patients in 1994, series indicating better transportation services. Average transfer rate of 3.4 times per person prior to admission to the hospital is still very high though showing marginal decrease as compared to previous series of 3.8 times. There was definite correlation between the number of transfers and final neurological recovery with patient having one transfer recovering completely at one year and the patients having more than five transfers failed to show any improvement. 42.3% of the patients admitted to the hospital within 2 days of injury showed significant neurological improvement. There was no correlation between neurological recovery at one year and those patients who were admitted later than 2 days after injury.

Biomechanics of Thoraco-lumbar Spine

Prof. G P Pal

Head, Department of Anatomy, Modern Dental College, Indore

The orientation of the superior articular processes in the thoracic vertebrae differs from their counterparts in the lumbar vertebrae. The present study was undertaken to investigate the possible mechanisms for the change from a posterolaterally facing superior articular surface in the thoracic region to a postero-medially facing curved articular surface in the lumbar region. The material for the study consisted of dry, macerated bones of 44 adult human vertebral columns. The orientation of the superior articular process and its relation to the mamillary tubercle was examined from the T9 to the L5 vertebrae, in each spinal column. An abrupt change from the thoracic to the lumbar type of articular process was observed in 3 columns. 41 (93%) columns showed a gradual change extending over 2 to 3 successive vertebrae. The present study suggests that the change in the orientation of the superior articular process, from the coronal to the sagittal plane, occurs due to the change in the direction of the weight transmission through the zygapophyseal joints at the thoraco-lumbar junction. It was observed that the gradual sagittalization of the superior articular process in the transitional zone brought it close to the mamillary tubercle, which eventually fused with it. Thus, the study suggests that the characteristic postero-medially facing concave superior articular process of the lumbar vertebrae may be formed because of the fusion of the articular process and the mamillary tubercle.

Modified Frankel's Criteria: A Study of 298 Acute Cervical Cord Injuries.

Dr Arvind V Bhave

Bhave Hospital, 48, PIE, Pune Satara Road, Pune.

Prof. Takemitsu, Prof. Umeta, Spinal Injuries Centre, Fukuoka, Japan.

Neurologic Outcome of 298 acute lower cervical cord injuries were studied and followed up from 1990 to 1998.

To evaluate the neurological deficit in detail we have subdivided the Frankel's B,C and D grades into further subtypes.

The study presents the following features:

1. Further classification of the Frankel's System based on long term neurological outcome.
2. A relationship could be established on the basis of neurological picture and MRI images.

In the cases having no bony injury, conservative treatment was instituted and no difference in the outcome was observed.

The Extent of low signal intensity area on T1 images of MRI suggests severity of paralysis and hence the final outcome.

Spinal Cord Injury During Earthquake 2001.

Dr. Tejas.H.Thakkar

Dr. M.M. Prabhakar

Orthopaedic Department, Civil Hospital, Ahmedabad, Asarwa, Pin Code 380016, India

26 January, 2001 Republic Day. A day which changed many lives. On this day Kutch-Gujarat felt a devastating earthquake of 6.9 on the Richter's scale. India has not suffered an earthquake of this magnitude in the last 180 years. During this earthquake about 1.66 lakhs people were injured out of which about 720 patients were of spinal cord injury (partial & complete). 13,800 people died. During this period, we had treated about 108 patients of complete spinal cord injury, of which 78 patients were treated at our Institute and the other 30 were transferred to our Centre for rehabilitation.

Out of the 78 patients, we had treated 62 patients by operative methods and 16 by conservative techniques due to medical unfitness or poor local condition. Out of the 62 patients, 54 were operated with only posterior decompression and stabilization with either pedicular screws or Hartshill's rectangle with sublaminar wires. 6 were operated with anterior decompression, grafting and posterior fixation and 2 patients of cervical spine injury were operated with only anterior decompression and fusion. After operation, all the patients were taught Physiotherapy, given occupational therapy, vocational training as well as psycho-sexual rehabilitation. They had been given free aids from the workshop and tricycles & wheel chairs through N.G.Os and department of Social Justice and Empowerment. At the end of 15 months post-operative period, 32 patients had achieved Frankel's D,E grade (51.7% of operated patients). Lastly, after doing 4 survey by Paraplegia Safari* (Follow-up programme) up to August, 2002, we have noticed that 60% patients are recovering and they have become independent. For ambulation and activities of daily living, around 40% of the patents need community based rehabilitation.

* See session III, A Novel concept - Paraplegia Safari, Dr. M. M. Prabhakar, Dr. Tejas Thakkar.

Thoraco-lumbar Spinal Injuries: Conservative Vs Operative Management.

Dr Navnendra Mathur

Dr Mohd. Ayaz, Dr Chandan Preet Kaur, Dr Rajeshwari Jindal, Dr Abhishek Srivastava
Physical Medicine and Rehabilitation, SMS Medical College and Hospital, Jaipur

Management of Thoraco-lumbar spinal injury is a controversial subject. We have studied 60 cases of Thoraco-lumbar spinal injuries, 30 managed conservatively and 30 by double distraction Harrington's rod fixation with or without laminectomy. The duration of hospital stay, neurological recovery and complications were compared. Majority of the patients were males & in the 21-40 years age group, belonging to the low socio-economic strata, and having sustained the injury as a result of a fall. T12 and L1 vertebrae were the common sites of injury. The average follow-up was for 17.4 months in the conservative group and 20.8 months in the operative group. Hospital stay and neurological recovery was the same in both the groups. Surgery helps in reducing the long term complications like backache and pressure sores.

The Experience of Spinal Fusion in Armed Forces Personnel.

Lt Col H C Talan

Officer's Accomodation, Base Hospital, Delhi Cantt

Aim: To study the role of spine fusion in relieving symptoms, complications and the overall result in various spinal diseases.

Material and Methods: 48 patients admitted in the hospital were subjected to surgery since 1996. There were 32 cases of traumatic spinal injury, 4 cases of tumour, 6 cases of Tuberculosis of spine, 4 cases with degenerative spine disease and 2 cases of scoliosis. The patients were predominantly male. The commonest age group was the 30-40 years group. Lumbar spine fusion was done in 48 cases. The types of bone grafts used were surgibone, Iliac bone, rib graft, and, in one case, fibula. In 38 cases various types of instrumentation was used. In 10 cases, spine fusion was done without instrumentation.

Results: These patients were followed up for 2 to 7 years. Spine fusion could be achieved better with instrumentation. In the series without instrumentation, failure of fusion was seen in 6 cases while only 3 cases developed pseudoarthrosis in the instrumented series. Instrument loosening & persistent backache, was recorded in 3 cases.

Discussion: We have found anterior spine fusion more reliable in the cervical and dorsal spine, while in the lumbar spine, posterolateral bone grafting with instrumentation is an equally good surgical option. We feel that long term follow-

up and a large series is required to predict the final outcome in spinal fusion.

Conclusion: Spinal Arthrodesis remains the mainstay for surgical treatment of instability, degenerative and the surgical correction of deformities in congenital and posttraumatic disease. The biomechanics of fusion and the assessment of the fusion by bone healing techniques have been studied in various centers. Recently, the biologic enhancement of fusion, the use of gene therapy along with minimally invasive spinal surgery has been used for spinal arthrodesis.

Early Surgery in Paraplegia Due to Thoraco-Lumbar Injuries

Dr Arvind V Bhave

Bhave Hospital, 48, PIE, Pune Satara Road, Pune.

Early surgical stabilization with decompression was found to be the most satisfactory modality of treatment.

Material: 36 paraplegics from burst fractures or dislocations at the thoraco-lumbar level were studied in two groups-operative and non-operative.

Method: The non-operative group (12 patients) was treated by conservative methods of traction, manipulation and rehabilitation. The operated group (24 patients) underwent early decompression and stabilization with various instrumentations like Harrington's rods with sublaminar wiring, Steffi plates, Moss-Miami and anterior grafting with vertebral body cages.

Results: 35 out of 36 patients recovered by at least one grade (Frankel's) with useful motor power, against only 3 patients in the non-operated group.

The patients of the operated group did not have any complications like bedsores, DVT, or pneumonia. The rehabilitation was easier in the operated group.

Conclusion: We recommend early decompression and stabilization of the paraplegia due to thoraco-lumbar injuries.(Burst fractures, dislocations)

Anterior Stabilization with Titanium Mesh - Bone Graft Composite in Thoracolumbar Fractures - A Mid Term Review

Dr K K Kailash, D' Ortho, MCh Ortho.

Mr. S K Tucker, FRCS (Orth), Consultant Spine Surgeon.

Royal National Orthopaedic Hospital, Stanmore, London, United Kingdom.

Spinal Injuries are a common occurrence these days. 1.7% to 1.4% of the spinal fractures are burst fractures according to published literature and nearly 30% of these have associated neurological injuries. The treatment of these injuries have been varied.

Patients with Thoracolumbar fractures treated at the Spinal Injuries Unit at the Royal National Orthopaedic Hospital, Stanmore, London, over a period of seven years were recruited for this study, based on the following eligibility criteria:

- Should have had a Thoracolumbar burst fracture,
- Should have had an anterior stabilization with Titanium Mesh- Bone Graft composite.
- Should have had a minimum follow-up of at least two years.

25 patients, who were treated surgically by means of an anterior decompression/ corpectomy and anterior stabilization with Titanium Surgical Mesh filled with bone grafts, were reviewed retrospectively. The review consisted of a clinical assessment, imaging studies in the form of X Rays and CT scans, both, during the pre- and post-operative periods, one, two and five years following injury.

Our radiologist assessed the fusion rate by comparing the bone densities within the cage and the subjacent normal bone. The review showed that titanium Mesh bone graft composite offers excellent biomechanical stability in the post operative period, permitting progressive maturation of the fusion mass.

Outcome of Management of Thoracolumbar Injuries by Short Segment Global Fusion

Dr. Abrar Ahmed

Dr. Mahesh, Dr. Praseon Shamsbery

Department of Orthopaedics, All India Institute of Medical Sciences, New Delhi

This prospective study comprises 36 patients with thoracolumbar spine fractures treated with short segment fusion and instrumental spinal stabilization, with a minimal follow-up of two years. There were 20 males and 6 female patients (M:F 5:1) with average age of 26.7 years (range 18 years - 48 years). Fall from height was the causative factor in 20 patients and 16 patients were involved in road traffic accidents. Two column instability was seen in 20 patients while in the remaining 16 patients three column involvement was seen. Anterior decompression, instrumentation, and interbody fusion using vertical titanium mesh cages were done in 20 patients. Remaining 10 patients underwent posterior and posterolateral decompression and transforaminal interbody fusion using cage with posterior instrumentation. At 1 year follow-up out of 17 Frankel's Grade A patient, nine patients improved to Grade C, six to Grade D and one to Grade B. 10 Grade B patients improved to Grade C and out of 5 Grade C, 3 patient improved to Grade D while remaining 4 Grade D patients showed good evidence of fusion at 2 years of follow-up. Overall short segment fusion using instrumentation showed good results in correction of deformity, maintaining and improvement of existing neurological function, excellent fusion rate and preservation of remaining motion segments.

Short term Analysis of the Outcome of Transpedicular Instrumentation in Unstable Thoracolumbar Fractures

Dr. T. Senthil Nathen

Dr. Karthik Kailash, Dr. Mohan Kumar, Prof. SSK. Marthandam

B 203, DBS Subhashree Apt., Mount Poonamallee Road, Porur, Chennai

Introduction : Thoracolumbar spine fracture has become one of the common traumatic injuries of the spine with the advent of high velocity injuries.

Material & Methods : 45 patients who sustained Thoracolumbar spine fractures underwent transpedicular screw fixation at Sri Ramachandra Medical College & RI (DU), Chennai, and were analysed over a period of three years with regards to the outcome, both clinically and radiologically.

Results : A modified scoring system was adapted to evaluate our results. Out of the 45 patients 10 patients (22.2%) had excellent results, 29 patients (64.4%) had good results and 6 patients (13.4%) had poor results. Complications included deep-seated infection, faulty screw placement, Bursitis, and implant loosening/breakage.

Conclusion : Transpedicular screw fixation provides satisfactory outcome with regards to pain relief and early mobilization of the patients when used appropriately.

Conservative vs Operative Results of Cervical Spine Injuries

Dr. Vaibhav M. Punjabi

Department of Orthopaedics, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat.

The operative versus conservative management of closed fracture to cervical spine remains controversial. There is a retrospective study of 500 patients randomly - 250 patients treated conservatively and 250 patients treated operatively by anterior fusion and strut bone grafting only, or with titanium mesh cage, or with cage and plating. All patients were treated and followed up between January 1997 to May 2002 for a period of minimum 7 months to maximum of 5 years. In conservative group long traction was continued for 6-8 weeks. In operative group anterior approach was used. The injury-surgery interval was 7 days on an average. Fusion was done using tri-cortical iliac bone grafts. While available, anterior instrumentation was used. Neurological assessment was done based on Frankel's grading, fusion grading and stability criteria. 45% patients belonged to 20-40 years age group and 76% patients were male. Vehicular accidents accounted for 49% injuries. Commonest level of injury was C5-6 (42%). Overall mortality was almost same in both groups. Overall neurological improvement was 26.4% in conservative and 28.8% in operative group. Complications were much less in the operated group. The ultimate neurological and functional outcome of cervical spine traumatic injuries was probably decided at the time of injury itself rather than by choosing operative or conservative treatment, although, any obvious cord compression when relieved resulted in better final outcome. Surgery is not necessary for neurological improvement but for decompression,

early stabilization, mobilization, to prevent graft extrusion, better fusion, correction of deformity and may obviate the need for posterior surgery.

Thoracolumbar Injuries Treated by Decompression and Instrumentation

Dr. Dilip K Pathani,

MS, Assistant Professor in Orthopaedic Surgery, BJ Medical College and Civil Hospital, Ahmedabad

Fractures and dislocations of spine are serious injuries occurring most commonly in young people. This is a retrospective study of 1000 patients who were treated and followed up at our hospital from January 1996 to June 2002. All injuries studied were traumatic and involved the thoracolumbar region. The commonest mode of injury was a fall from height. Follow-up was from a period of 8 months to 6 years. The mean injury surgery interval was 8 days. All the patients were treated with anterior decompression, titanium mesh cage/ autogenous strut graft and anterior titanium plate OR posteriorly by decompression and fixation by Steffee/ Hartshill's instrumentation. The radiographic assessment in the lateral plane (Cobb's technique) demonstrated a significant restoration from an initial angle of -15.6° (kyphosis) to $+0.4^{\circ}$ (lordosis). At follow-up re-examination, a mean difference of 10.1° from the post operative angle was found. Compared to the post operative a mean improvement of 6.1° was noted at follow-up examination. An overall improvement of 47% was noted 23% by two Grades and 17% by three grades using the Frankel's Classification. There was improvement by a single Grade in 7% of the patients while 53 % patients showed no improvement. Early decompression and stabilization with instrumentation gives good results and decreases the complications associated with the conservative management.

Lateral Retropharyngeal Approach To Upper Cervical Spine - an alternative to the transoral approach

Dr. Prem Yohannan

Sr. Resident, ISIC

The anterior approach to the highest cervical spine is difficult due to the complex regional anatomy, the proximity of vital structures and the obstruction caused by the anatomical position of the mandible. Besides, a lot of dissection is required in order to achieve an adequate exposure of the C1, C2 and C3 vertebrae. Even the most veteran of spinal surgeons approach the highest cervical spine with considerable caution. In contrast, the approach to the lower cervical spine is relatively easy and passes through well defined anatomical planes. The trans mandibular tongue splitting approach is fraught with complications. Post operatively, morbidity is high. A tracheostomy is essential for this approach.

An alternative to the trans oral approach has been used successfully in three cases of high cervical lesions. The advantages and disadvantages of the conventional approaches and the Lateral Retropharyngeal Approach are discussed.

Session III

Tetraplegic Upper Limb Care In Acute Phase - Occupational Therapy Approaches At C.R.P.

Md. Ehsunul Ambia, OT, Bangladesh

Introduction: Problems in upper limb (mainly pain and joint restriction) are most common for tetraplegic patients during their acute phase, specially those in traction bed. Problems and deformities arises according to their neurological level and become a barrier for the therapists who work in the rehabilitation phase.

Situation: The Occupational Therapy Department of the Centre for the Rehabilitation of the Paralyzed (CRP) is playing a vital role to prevent all sorts of complication in upper limb. The patient's care-giver works as cotherapist. Preventive measures are being taken by Occupational Therapists in the form of providing splints, appropriate positioning and active and passive movement. The client and the client's family members are welcomed while designing the treatment program. Initially functional splints are provided to all tetraplegic patients. After the confirmation of whether the case is a complete or incomplete lesion, the therapist continues functional splinting only for complete C4 neurological level patient. In case there is inflammation in the wrist or MCP joints then a resting splint is provided. For complete C5, C6 and C7 neurological

level the therapist provides a tenodesis belt to achieve tenodesis grip. Along with this, ranging joints and positioning the limbs are very important measures. To ensure success of the treatment, multidisciplinary involvement is essential.

Recommendation: Besides the therapeutic intervention, it is essential to educate all hospital members and the client's family members who are involved in patient care about upper limb protection techniques.

Techniques to Improve/Maximize Feeding Skills in Tetraplegic Patients Occupational Therapy Approaches

Abul Kashem Shapon, Occupational Therapist
Centre for the Rehabilitation of the Paralyzed, Savar, Dhaka, Bangladesh

This paper describes the techniques that have been practiced to maximize feeding skills in tetraplegic patients during Occupational Therapy approaches at CRP.

Occupational Therapy has recently been introduced in the health care system in Bangladesh. Occupational Therapy provides services to people to maximize functional independence through therapeutic exercise, purposeful activities, special equipment, skills training, and environmental modification. The Centre for the Rehabilitation of the Paralyzed (CRP) is an organization which aims to provide complete rehabilitation services. It was founded in 1979 and continues to be the only centre of its kind in Bangladesh. Tetraplegia is paralysis of the four limbs and trunk musculature. Various techniques are used under biomechanical and rehabilitative approaches according to acute phase, active phase and rehabilitation phase. After the diagnosis of tetraplegia is confirmed the treatment is started with positioning of extremities, providing tenodesis belt to develop tenodesis grip, cock up splint to maintain the position of upper extremities. Therapeutic exercises, graded activities, muscle strengthening exercises and developing tenodesis grip are included. Along with physical abilities whatever the person can achieve the rehabilitative approach is used, combined with different types of assistive devices eg. Cock up splint, feeding belt, spoon with modified handle.

Often patients have potential, but due to the family structure and cultural issues in our sub continent patients are unable to utilize their potential because the carer has a tendency to help the patient and the patient, in turn, has a tendency to receive help from the carer. To overcome that, motivation is given by the counselor at CRP. After discharge, patients performances are followed up during the home visit programme. The Multidisciplinary Team (MDT) approach is used in overall rehabilitation.

Analytical Assessment of Bladder Rehabilitation Protocol in Spinal Cord Injury Patients.

Dr Roop Singh
Lecturer, Department of Orthopaedic Surgery, Pt B D Sharmu PGIMS, Rohtak.

For a better urological outcome, bladder management protocol in spinal Cord Injury (SCI) patients requires constant surveillance. 50 SCI patients (38 Males and 12 females) were analysed for urological problems and outcome after injury. Urinary complications occurring in those patients included:

Urinary tract infection	(28%)	Urethral Stricture	(12%)
Urethral Abscess	(8%)	Urethral false passage	(4%)
Urethral discharge	(24%)	Urethral fistula	(16%)
Paraphimosis	(24%)	Epididymo-orchitis	(8%)
Lithiasis	(4%)	Haematuria	(8%)
Incontinance	(12%)		

Few peculiar observations were made like frequent blocked catheters, difficulty in removal of catheters, and the passage of amorphous material in the urine. Staph aureus was the most common offending agent in infections. Urinary tract infections were more common in patients with bedsores. We have found that although medical morbidity and urological outcome among SCI patients depends on many uncontrollable management variables, these can be minimized by sufficient emptying of bladder, plenty of fluids by mouth, aseptic catheterization, changing the urinary medium and by the proper placement of the catheter.

Severely Hyperreflexic Bladder

Role of Post Sacral Selective Rhizotomy

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Department of Urology, Uro-Andrology Clinic, Abbas Chambers 1, M.G. Road, Pune, Maharashtra

Introduction : Upper tract deterioration seen commonly in Neurologic Bladder can be prevented by ensuring low pressure, large capacity bladder with minimal residual urine. In severely uninhibited bladders when pharmacotherapy fails, Post sacral selective Rhizotomy achieves a flaccid, low pressure, large capacity bladder and the Electro-stimulation of the Anterior Sacral roots (S2-3-4) helps in the emptying of the bladder.

Aim : The aim of the present study was to evaluate the persistence of initial results of Post Sacral Rhizotomy is achieving the low pressure, large capacity bladder.

Material and methods : Six patients in the age group of 24-48 years operated between March 1992 and October 1995 with severe inhibited bladder who were followed up till March 2002 (one patient lost in the follow-up) are included in the present study. In all these patients before surgery the uro-dynamic and radiological evaluation revealed a small capacity (75-150ml) non compliant bladder with two of them showing V-U reflex. Post Sacral selective Rhizotomy of Sacral roots S2-3-4 was performed extradurally. In two patients Ext Sphincterotomy was done for External sphincter dyssynergia. The patients were followed up initially at 3-6 months and later on at 1 year. All these patients are on CIC 3-4 times/day.

Result : The procedure was well tolerated by all the individuals and only two complained of constipation. The Urodynamic and Radiological evaluation at one month follow-up showed increased capacity to the extent of 375-775 (Mean 530ml), which gradually reduced to 300-550ml. (Mean 440 ml) without upper tract deterioration. This residual Urine volume remained at 80-140ml (mean 107ml.)

Conclusion : In a selected group of patients with severe detrusor hyperreflexia, this procedure considerably reduces the morbidity and urological complications and thus improves the life style. The results are long lasting.

Medical Complications in Subjects with Non-traumatic Myelopathy

Dr. B.M. Maheswarappa

A.B. Taly, K.P.S. Nair, Jeevan Kumar, Kalaivani, S.Rao, T. Murali

National Institute of Mental Health & Neuro Sciences, Deemed University, Bangalore

Several medical complications are observed during the rehabilitation phase of patients with spinal cord disorders. While 30 to 50% of patients have non traumatic myelopathies, data on such patients is minimal. The objective of this study was to document the medical complications occurring during inpatient rehabilitation of subjects with Non-traumatic myelopathies (NTM).

Study design: Prospective between 1st January 1995 to 31st December 1999.

Setting: Inpatient rehabilitation unit of a tertiary hospital for Neurology, Neurosurgery and Psychiatry in South India.

Method: All complications requiring medical consultation, investigation and treatment and/or resulting in absence from a scheduled therapy session, were documented. Clinical evaluation was done according to International standards for neurological assessment of Spinal Cord Injury. Disability was quantified using the Barthel Index.

Results: During the period of study, 297 subjects (154 men and 143 women) with NT-SCI underwent inpatient rehabilitation. Number of medical complications in each patient varied from 0-17 (6.3 ± 3.7). Overall, 59 different medical complications were observed in the study population. Common among them were urinary tract infection (182), spasticity (169), pressure ulcer (85), pain (149), urinary incontinence (147), depression (114), constipation (92), contractures (52) and sleep disturbance (39). Sixteen patients required transfer to acute care facility and there were four deaths. Number of medical complications correlated positively with the duration of stay (Pearson's correlation co-efficient $r=0.5$, $p<0.01$) and negatively with Barthel Index at admission ($r=-0.2$, $p<0.05$) Barthel index at discharge correlated negatively with number of medical complications ($r=-0.2$, $p<0.05$)

Conclusions : Medical complications are frequent among subjects with non-traumatic spinal cord injury. People with more severe disability at the time of admission, have more number of complications. Subjects with more number of complications have more disability at discharge. Awareness and vigilance among medical professionals, and educating the patients and care-givers may have significant effects on the cost effectiveness and the successful implementation of a rehabilitation program.

Maximizing the Role of the Half way Transit Hostel in the Centre For the Rehabilitation of the Paralysed, Bangladesh.

Dr Sohrab Hossain

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In response to its research on in-patient satisfaction with in patient services, the Centre for the Rehabilitation of the Paralysed has upgraded and developed the work on this half-way transit hostel to more adequately prepare spinal cord injured patients for return to the community.

The 20-bedded hostel replicates an environment similar to the patients home and patients stay with family on embers from 2 week or more in the transit hostel before returning home.

A need assessment is carried out with the patient and carer/s and identifies patient priorities. Areas assessed also include physical well being, mobility, functional activity independence, communication and empowerment, psychological well being and preparations for community integration e.g. home adaptation. A daily timetable is planned according to patient led priorities and involves named members of the multi-disciplinary team including physiotherapists, occupational therapists, counselor, vocational training personnel and others. New Vocational skills being learnt are put into practice e.g. running a shop, poultry rearing. Plans for further vocational training are made, where necessary. A strong emphasis is put on social aspects of integration.

Patients are encouraged to participate in social functions e.g. poetry and group discussions. Ex-patients help motivate patients reach their full potential. Discharge home is followed up by members of the multi disciplinary team. Therapists have been added to this home visiting team on a regular basis and follow-up recommendations for maintenance of physical well being and accessibility issues. To date a higher level of patient satisfaction is being noted with particular improvements in patient morale and self efficacy prior to discharge home. Home visits have recorded a promising level of maintenance in the community.

A Novel Concept: Paraplegia Safari

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Director

Dr. Tejas Thakkar

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After the patients of paraplegia and quadriplegia were discharged from the hospital, it was observed that it was very difficult for them to come for follow-up due to problems of finance, and extreme physical handicap, hence follow-up rate was very poor. The data gained from postal follow-up was equally poor, as majority of the patients were from villages and illiterate. Therefore, it was felt that an attempt to visit the patient's residence and to do on spot follow-up would be of a great help. Taking a clue from Denis Burkitt's "Tumor Safari Concept", a concept of Paraplegia Safari evolved. In this programme a team made up of an Orthopedic Surgeon, Physiotherapist, Occupational Therapist, Orthotist/Prosthetist and Medical Social worker visit the rehabilitated discharged patients at their own living place. From 1984 to November 2000, 45 Safari Programme has been conducted in which 447 patients have been benefited. After the earthquake in January 2002, 4 Paraplegia Safaris were conducted up to June 2002, in which 292 patients were covered. 99 patients were paraplegics. These patients are helped on the spot in form of need of medical treatment, orthotic (new, repair, replacement) and vocational guidance. Those patients, who require admission for their problems, are helped to come back to Paraplegia Centre. The team also sought to educate the public about the hazards and safety measures for prevention of accidents. This programme helped us to learn about the paraplegic patient's problems, the relation with the family and society and also the status of aids in their village milieu. Here we present our experience with the Safari Programme which is unique and one of its kind in India.

Assessment of Sexual Function after Spinal Cord Injury in Indian Patients.

Dr Roop Singh

Lecturer, Department of Orthopaedic Surgery, Pt B D Sharma PGIMS, Rohtak

A prospective study was done to assess the magnitude of problem of sexual function in Spinal Cord Injury (SCI) patients with a view to achieve better management and rehabilitation. 100 patients of SCI (both sexes) with neurological

deficit, who reported sexual experience both before and after injury were selected for the study. A study specific 42-item questionnaire was prepared and the rating was done after an interview on a scale, which measured the "Integrated Index of Sexual Functions (IISF)". Our observations showed a decrease in sexual activity and satisfaction after SCI, but no decrease in desire in the majority of the patients. Complications such as bed sores, uncontrolled bladder, flexor spasms, back pain and urinary tract infections are usually responsible for the decline. The Quality of relationship with the partner does not change since the majority of the patients had a cordial relationship even after SCI and only 6% desired a divorce. 38% patients were not satisfied with the treatment, rehabilitation and education given to them about sexual functions, and stressed for a more comprehensive sexual rehabilitation programme. The mean value of IISF in the study was 80.08. The reliability coefficient calculated by Cronbach's formula was 0.73%, making the study fairly reliable. The IISF study was an attempt to assess sexual functions in an integrated form, taking into consideration the social and medical factors.

Occupational Therapy Approaches At C.R.P.

Md. Ehsunul Ambia
OT, Bangladesh

Introduction: Problems in upper limb (mainly pain and joint restriction) are most common for tetraplegic patients during their acute phase, specially those in traction bed . Those problems and deformities arises according to their neurological level and become a barrier for the therapists who work in the rehabilitation phase.

Situation: The Occupational Therapy Department of the Centre for the Rehabilitation of the Paralyzed (CRP) is playing a vital role to prevent all sorts of complication in upper limb where the patient's carer is working as cotherapist. Preventive measures are being taken by Occupational Therapists by providing splints, appropriate positioning and by active and passive movement. The client and the client's family members are welcomed while designing the treatment program. Initially functional splints are provided to all tetraplegic patients. After the conformation of whether the case is a complete or incomplete lesion, the therapist continue functional splint only for complete C4 neurological level patient. In case there is inflammation in the wrist or MCP joints then a resting splint is provided. For complete C5, C6 and C7 neurological level the therapist provides a tenodesis belt to achieve tenodesis grip. Along with this, ranging joints and positioning the limbs are very important measures. To ensure success of the treatment multidisciplinary involvement is essential.

Recommendation: Besides the therapeutic intervention it is essential to educate all hospital members and the client's family members who are involved in patient care about upper limb protection techniques. Suggestions are welcome so we can develop our program.

Principles of Orthotics in Spinal Cord Lesion Management

Praveen Shukla
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Various orthoses have been used in spinal cord lesions (SCL) to immobilize the injured part in varying degrees, while the reparative process takes place. The use of appropriate orthoses in SCL could definitely improve the prognosis and rehabilitative care. The Orthotist is supposed to determine the critical dimensions and adjust the orthosis to suit the level of the lesion. The prescription of a specialized orthosis depends on the level and extent of the lesion. Also, the proper selection of material to be used to make an orthosis depends on the degree of immobilization required and obviously the socio-economic status of the patient.

The main aim of Orthotic treatment in acute as well as chronic rehabilitation is basically preventive, supportive and corrective. While prescribing a certain Orthosis in SCL, one should know its positive as well as negative effects. Total contact spinal support are more preferably used, instead of traction bracing as they provide the maximum degree of immobilization. The effects of various Orthotic combinations on the energy expenditure in SCI patients is an important criteria for the prescription. The bulkier the Orthosis, more will be the energy- expenditure, throughout the gait cycle. The newer materials now available have brought revolutionary changes in the field of Orthotics.

Bladder Management Protocol at ISIC

Dr. Vikram Sharma, Urologist, ISIC

Introduction: Bladder related complications have remained one of the leading causes of morbidity and mortality in patients with Spinal Cord Injury (SCI). However, with our increased understanding of the urodynamics of the lower urinary tract along with the enhanced investigative modalities available, it has become possible to standardize a protocol for bladder management in patients with SCI.

Materials and Methods: 1000 patient records and urology profiles were reviewed to chart incidence of urinary tract infection and other urological complications in patients admitted to ISIC with SCI. Our early management tended to lean more towards indwelling Foley's catheterization while in more recent times we have shifted over to Clean Intermittent Catheterization. The results of both modalities in incidence of UTI and other urological complications will be presented briefly followed by goals of bladder management ending with a description of the protocol followed at ISIC for immediate and long term bladder management.

Results: The results from the study showed that there were significantly more urinary system complications in those using indwelling catheters (urethral and suprapubic) than in those not using indwelling catheters (i.e., using intermittent catheters and spontaneous bladder emptying). The intermittent catheterisation group had a significantly lower complication rate than the indwelling urethral catheter group in terms of UTI, bladder stones, long term urethral complications etc.

The time after injury at which urinary system complications started to occur was also noted. It was found that the greater percentage of complications seen with indwelling catheters, compared with other methods, only emerges six to twenty years after injury, i.e., following long-term use.

Conclusion: In conclusion, our experience supports the use of intermittent catheterisation as the safest bladder management method, with indwelling urethral catheterisation carrying the most risk in terms of urinary system complications. A well established and a clearly laid out bladder management protocol can go a long way in improving the quality of life of a patient with SCI in all aspects; social, economic and logistic.

Recreational Therapy at ISIC

Ms. Mini Vazhkala, Peer Counsellor, ISIC

Recreational activities provide opportunities for social interaction, fun, health and fitness in addition to bringing cheer and happiness in life.

For a person with locomotor impairment, in addition to above mentioned aspects, sports and recreational activities have therapeutic value as well. These activities also act as rehabilitation interventions since they help in regaining lost muscle power, improve balance and equilibrium and develop neuromuscular coordination.

Therefore, as far as fun, health and happiness in life are concerned there is no difference between the abled and disabled. Yet, till recently most of us have been sceptical of such ideas which encouraged the physically challenged person to perform sports and recreational activities. But now, such attitudes are a part of the past.

In the developed countries sports and recreation activities are introduced in the lives of disabled people right from the onset of the disability. In India, some of the non governmental organisations are engaged in the organisation of sports for the disabled at the national and international level, and deal with these programmes in a way that sometimes is more efficient than the governmental organizations.

Here in the hospital, we would like to give the same opportunities to patients, who have injuries of the Spinal Cord. When a patient arrives, they are very anxious and worried to face the reality. For this reason they tend to close themselves up and refuse, at the beginning, to come out and interact with people.

The family member also have to face the same burden, and the outcome of this situation is often a mixture of feelings of sadness, helplessness, anger, guilt, and so on. This is the most common reaction, that has its roots in the circumstance of a dramatic problem that can not be changed. It is said that "time and tide waits for none". In everybody's life there are moments of sorrow and moments of joy; and the life will end, sooner or later. For this reason it is most important to keep sharing with other people.

Most of the people with spinal injury do not believe that it is still possible to perform activities and enjoy leisure times. It is our duty to make them understand that they have every possibility of enjoying moments of happiness.

Session IV

Anterior Cord Injury and Fixation - The Dutch Experience

Dr. Wee Fu Tan, Consultant Neurosurgeon, Holland

Good Practice in the Treatment of Acute Traumatic Spinal Cord Injury

Timing and Methods for Surgical Treatment of the Vertebral Injury

Dr. Patrick J. Kluger, *Arzt für Orthopädie, Surgeon for Trauma and Orthopaedics (GMC),
Consultant Surgeon in Spinal Injuries National Spinal Injuries Centre, Stoke Mandeville Hospital*

Introduction : Only about 30% of all surgically treated traumatic lesions to the vertebral column cause a substantial damage of the spinal cord or of the cauda equina. In these cases, specific considerations must be made in timing and in selection of surgical methods in order to achieve the best possible functional outcome, and to allow the early start of a specific rehabilitation programme.

Premises : There is no clinical evidence, and no clinical evidence can be expected in the foreseeable future, that surgical treatment of a spinal injury with SCI would, generally, improve the neurological outcome. On the other hand, no evidence shows surgery as statistically deteriorating the neurological outcome of SCI. Previous studies, showing adverse effects of surgical treatment in SCI, are not valid any more, as they investigated outcome after surgical methods which are long since obsolete, such as laminectomy without fixation.

Results from experimental animal studies suggest that early decompression in incomplete lesions enhances neurological recovery. A significant relationship was found between the extent of recovery and the duration of cord compression, but the time windows of only minutes up to a few hours, where the removal of encroaching material was found to be beneficial, is rarely applicable in clinical practice.

In initially complete lesions, the chance of substantial neurologic recovery is extremely low, but a chance of recovery can only be fully excluded if an anatomical transection of the cord is proven. MRI studies can not demonstrate complete transections in all cases with full certainty.

Because a full neurologic assessment is not possible at the moment of injury, some of the cases appearing complete at admission, may have been progressing to completeness since the accident.

Apart from cases with complete transection of the cord, the neurological prognosis of a transverse lesion is not precisely predictable, and, in the acute phase, the neural deficit of every individual case must be understood as persistent.

Timing : As already pointed out, the hope of an improved neurologic outcome can hardly dictate immediate surgical intervention. There is one exemption largely accepted:

The progressive paralysis with findings of a persistent compression or stretching of the spinal cord by fragments, by displacement, or by haematoma.

The neurological deterioration is a proof of the insufficiency of the conservative means of treatment and immediate surgical action is required.

Vice versa, an ongoing neurological improvement should, when possible, postpone the surgical intervention. The surgical procedure carries the theoretical risk of causing a local oedema, which could be responsible for a halt in the process of improvement, postoperatively.

If there is a plateau in the neurological deficit with continuous compression or stretching of the neural structures, and once the decision for surgery is to be made in principle, premises above should be considered. In doing so, the questions to be answered, on timing, will be:

“What are the reasons for postponing the intervention?” rather than “Why operating in urgency?”

The more there is a persisting encroachment of the spinal canal, and the better the chance for further neurological recovery is (i.e. in incomplete SCI, and sacral sparing), the more difficult it will be to find reasons for postponing the intervention.

Apart from these neurological views, the timing for surgery is directed by general aspects.

Unstable spinal injuries carry the risk of further neural damage during transportation, nursing, or other surgical procedures. An unstable spinal injury in polytraumatised patients or in patients with low compliance by intoxication, by age, or by mental disorders, should be stabilised with high priority.

In every severe injury to the thoracic spine, a lung contusion must be anticipated, and an ARDS can develop, usually after 48 to 36 hours. It is beneficial if the spine is stabilised before long-term ventilation, and positioning and pulmonary physiotherapy are of vital importance.

After more than 10 days, correction of traumatic deformities become increasingly difficult, and more invasive methods must be used. Therefore, surgical reduction and stabilisation should be undertaken within the first week after injury, wherever possible and whenever indicated.

In staged procedures, after initial fixation, the secondary anterior bone fusion should be done within 6 weeks at the latest. The extrinsic stability provided by spinal implants lasts for 6-8 months, and it is limited by fatigue failure of the implant itself, or by its loosening in the bone. In patients with poor bone quality, or with the exertion of unusual high loads on the immobilising construct (e.g. ankylosing spondylitis), an even earlier loss of the primary stability must be expected.

Methods : Out of the wide scale of procedures in spine surgery, versatile and efficient methods must be selected for the acute treatment, and a uniform protocol should be established, according to the type and localisation of the injury. The selection of methods must be applicable in the acute phase of an injury, as minimally invasive as possible, and the methods have to be effective and fast in achieving the goals of anatomical re-alignment, including decompression of the spinal canal, and fixation. Due to the possible need of emergency interventions, every surgeon on call in the unit must be able to perform these procedures. Therefore, some methods which are used only in small numbers, or only by singular surgeons of the team, are less preferable, i.e. endoscopic methods.

SCI patients have even greater demands on certain qualities in the surgical treatment of their vertebral injury, than ambulatory ones:

A high level of primary stability must be achieved. The rehabilitation programme should start as early as possible, and there should be no restrictions, for instance in sitting, which is not allowed in some fixation methods of the lower lumbar spine, for several weeks. Without sitting, the paraplegic patient would remain bed-bound, and he could not become independent in managing his paralysed bladder and bowels, nor could he learn to dress or undress, or to clean the lower parts of the body.

Additional external immobilisation by an orthosis should be avoided, wherever possible. Halo-vests, full contact body braces and, even worse, casts, carry a high risk of pressure sores in SCI patients and they hinder seriously the rehabilitation progress. Solely a soft or a stiff cervical collar may be acceptable for some weeks if this helps to avoid an additional posterior approach in anteriorly fixed dislocation injuries to the cervical spines.

An anatomical alignment of the spine, without loss of correction, is paramount in SCI patients, especially in the cervical and in the lumbar spine. The mechanisms for spontaneous compensation of malalignments are less available to our patients. Firstly, the muscle control for active compensating efforts is impaired, but there are other specific aspects, too:

A compensating hyper-lordosis of the cervical spine locks rotational movements of crucial importance to the tetraplegic, and wheelchair-bound people cannot over-extend their hips in order to compensate a kyphotic deformity in the thoraco-lumbar or lumbar region.

In Good Practice, no segmental loss of lordosis should occur in the cervical and in the lumbar spine, and in the thoracic and in the thoraco-lumbar region acceptable degrees of posttraumatic deformity do not exceed 35 and 20 degrees COBB, respectively.

The preservation of motion segments is of utmost importance in SCI patients. The sacrifice of mobile segments by long instrumentations cannot be compensated by an SCI patient, as by an ambulatory one. To put on his or her trousers, socks and shoes for instance, the SCI patient has to extremely bend forward, whereas the ambulatory patient just lifts and bends his or her leg. If a wheelchair user tilts backwards in his or her chair, he/she needs to rotate quickly and extensively in his or her thoracic spine, to prevent a fall on his/her back or head. This does not need consideration in ambulatory patients, where multilevel fixations of the thoracic spine may be well tolerated. In the cervical spine, the preservation of as many mobile segments as possible, in an optimal alignment, is an issue of crucial importance in SCI patients. Apart from the cervical spine, the tetraplegic has not much to move voluntarily, and the spine's mobility is largely utilised by these patients: for balance in the chair, for operating mouth sticks, for the use of devices for environmental control, and so on.

The spinal surgery in the acute phase after SCI must usually explore the spinal canal for decompression, and for microsurgical treatment of damaged neural tissues, such as suturing of dural tears and repositioning of prolapsed filaments. In the thoracic and in the lumbar spine, both tasks together can only be fulfilled via posterior approaches, as the vast majority of dural tears occur on the posterior aspect of the cord. In the cervical region, due to the anatomy of the vertebral artery, reduction or removal of vertebral body fragments compressing the cord from the front cannot be performed via a posterior approach.

The closed reduction of traumatic malalignments is routinely possible in the cervical, less frequent in the lumbar, and rarely possible in the thoracic spine. Therefore, posterior exposure for achievement of an anatomical reduction of major displacements is rarely needed in the cervical spine, but frequently in the lumbar and nearly always in the thoracic spine.

In the following, a list of methods (pre-op immobilisation / procedure / post-op immobilisation) is given-for-the different injuries of the vertebral column, which have proven to meet the specific demands in SCI patients, as mentioned above, over the last 20 years. These methods can be used as a framework for good practice when surgical treatment of the underlying vertebral injury in SCI patients is considered in the acute phase.

Injuries C0-T2:

1. **Fractures of occipital condyles / occipito-cervical disruptions in adults:** Skull traction. Fusion and instrumentation Occiput-C1. If Jefferson fracture concomitant: Fusion CO-C2 (Magerl screws C1-2).
No orthosis.

2. **C1 Jefferson fractures:** Skull traction. Clamp Fixation with lateral 'mass screws and connecting rod. No orthosis / soft collar 4 weeks.

3. **C2-Dens fractures Anderson II:** Philadelphia collar./ Minerva orthosis. 1 - 2 Boehler screws. 1 screw: Philadelphia collar ./ Minerva orthosis 4 weeks; 2 screws: No orthosis.

4. **C2-Dens fractures Anderson 3:** Skull traction. Anterior fixation Mini - T-plate ./ posterior fusion C1-2 (Magerl screws) T-plate: Philadelphia collar 4 wks, C1-2 fusion: No orthosis.

5. **C2 Hangman fractures Effendi II /III:** Skull traction, Pedicle screws C2 (Judet) ./ anterior interbody fusion + plate fixation C2-3.
No orthosis.

Burst and wedge fractures C2 to T2 (AO classification A and B)

Skull traction. Anterior decompression (discectomy(ies) / + corpectomy) and fusion with autogenic graft and plate fixation.

AO A: No orthosis, AO B: Soft collar / Philadelphia collar 4-6 wks.

6. **Fracture dislocations C3 to T1 (AO classification C):** Closed reduction by skull traction (AO C in T1-2 irreducible by skull traction). If reduction successful: anterior decompression (s. above) and interbody fusion with autogenic graft and plate fixation. If attempt of closed reduction fails: posterior open reduction, posterior tension band fixation, anterior decompression and interbody fusion with plate fixation in same anaesthesia.

Anterior fixations: Philadelphia collar 4-6 wks, Posterior-anterior fixations: No orthosis.

Special cases cervical spine

1. **Fractures in ankylosing spondylitis (Bechterew-Struempell-Marie):** In situ immobilisation with cushions, head support; skull traction extremely dangerous! Posterior + anterior instrumentation, if possible in same anaesthesia, always posterior first with V-shaped interlaminar resection, to allow correction of disease-related deformity and to make anterior approach accessible.

No orthosis.

2. **Fractures through the base of cervical pedicles and through lamina (fracture en separation):** Skull traction, preferably by Halo / Trippi-Wells, to control rotation. If f.e.s is bilateral, anterior interbody fusion with plate fixation of both affected (dislocated) segments. In cases of monolateral f.e.s., generally only one segment is dislocated and may be fused.

No orthosis in 2-segmental fusion, Philadelphia collar 6 weeks in single level fusion.

Injuries to the trunk spine (T2 - S1)

1. **Injuries T2 to T5 (AO A,B,C):** Postural reduction. Posterior open reduction, decompression via mini-cototransversectomy, and fixation with Fixateur Interne (pedicle screws 1 above, 1 below). Interbody fusion of injured motion segments) with autogenic graft via mini - costo-transversectomy. In children / patients with pedicle diameter less 4mm: hook fixation (2 above, 2 below), bony fusion is restricted to injured motion segment(s). If non-fused motion segments are fixed by instrumentation, implant removal is obligatory.

No orthosis.

2. **Injuries T5 to L2 (AO A,B,C):** Postural reduction. Posterior open reduction and fixation with Fixateur Interne (pedicle screws 1 above, 1 below), decompression via mini - costo-transversectomy (T5-T1 l) or via inter-laminotomy / laminectomy (T12 - L2), secondary (0-6 weeks) interbody fusion via intercostal mini-thoracotomy (endoscopically optional), if post-op imaging leads to anticipation of late loss of correction with non-acceptable outcome (see 4.3). If non-fused motion segments are fixed by instrumentation, implant removal is obligatory.

No orthosis.

3. **Injuries to L2 - L5 (AO A,B,C):** Postural reduction. Posterior open reduction and fixation with Fixateur Interne (pedicle screws 1 above, 1 below), decompression via inter-laminotomy / laminectomy, secondary (0-6 weeks) non-instrumented interbody fusion via retroperitoneal minimal invasive approach (Mini - ALIF), if post-op imaging leads to anticipation of late loss of correction with non-acceptable outcome (see 4.3). If non-fused motion segments are fixed by instrumentation, implant removal is obligatory. No orthosis.

Special cases trunk spine

1. **Chance fractures:** Postural reduction. Posterior open reduction and fixation with Fixateur interne (Pedicle screw 1 above, one below), in children or patients with pedicle diameter less 4mm: compressive hook fixation (1 above, 1 below).

No fusion. Implant removal obligatory.

No orthosis.

2. Fractures in cases of ankylosing spondylitis : In situ immobilisation with cushions, no postural reduction! Posterior open reduction with corrective interlaminar resection and fixation with Fixateur Interne (Pedicule screws 2+ above, 2+ below), anterior grafting and additional screw-rod instrumentation as a staged procedure. No mobilisation between stages.

No orthosis.

3. Sacral fractures : Bed rest, no postural reduction. Posterior open decompression and revision of sacral roots, no forced reduction. Fixation with Fixateur Interne LS to Ileum, with cross-link. Posterior grafting over Os sacrum. Implant removal obligatory.

No orthosis.

Session V

The Experience of Setting up a Spinal Injury Rehabilitation Centre in Nepal

Dr. Anil Shreshtha, Orthopaedic Surgeon, Nepal

Nepal is known around the world for its mountains, but its steep landscape is responsible for a disproportionate number of head and spinal injuries, with porters slipping off precipitous trails and women and children, in particular, falling while collecting tree fodder or while following livestock on cliffs. With the spread of the road network, there is a sharp increase in spinal trauma from highway accidents. Injuries are also on the rise from construction and industrial activity.

Nepal is one of the most under reached countries in the world in terms of medical and public health facilities, and until now there has been no centre to cater to the specialised needs of those with head and spinal cord injury. Support and access to care and rehabilitation has been meagre, if at all available.

Injury to the spinal cord is one of the most grievous kinds of bodily damage. It affects the use of limbs and other organs, and drastically reduces the quality of life of the victim. It tends to leave the injured and their families in deep despair, and the poorer the family the harder it is to cope with the additional burden. The kind of understanding, care and long term support required by the victims is very difficult to provide when most of the victims are part of the peasantry.

The scale of these challenges relating to grievous and often irreversible spinal cord injury often leads to a fatalistic mindset among families and caregivers alike. On humanitarian and practical grounds, it is necessary to reject this attitude, and to concentrate on improving the quality of life of those who have suffered these injuries.

It is to address the silent cry of the spinally injured that the Spinal Injury Sangha Nepal was organized in the fall of 2001. The Sangha (society) has now established a Rehabilitation facility at Jorpati, Kathmandu, in collaboration with the Nepal Disabled Association. Opened on 7 April 2002 by Sir Edmund Hillary, the Spinal Injury Rehabilitation Center has begun to help patients with spinal cord injuries.

Spinal Injury in Nepal

Given the poor state of medical and health services for the population at large, spinal cord injury victims and their families do what they can to cope in villages and accident sites. To begin with, there are no dedicated rescue facilities. The transport of victims to hospitals, when it does take place, is over rough terrain and tends to compound the injury to the spinal cord.

While rescue and transport are wholly inadequate, there are now hospitals in the country that do cater to the spinally injured. Even those fortunate to receive treatment, however, have missed specialized rehabilitation support. Without such support, including physiotherapy and occupational therapy, the quality of life of the victim is significantly reduced, leading to further, ongoing complications and issues.

The Rehabilitation Center

The Spinal Injury Rehabilitation Center at Jorpati, Kathmandu, is the first activity of the Spinal Injury Sangha (SIS) Nepal, a registered non profit society set up in late 2001. The founding members of the SIS represent a cross section of prominent and socially conscious individuals from Nepali society. The Sangha was the idea of the founding chairman, who suffered from a broken back in a trekking accident in August 2000 and managed to recover completely over the course of the next year. Of the many challenges that need to be addressed, a rehabilitation facility was considered the most urgent. The Center's services complement the work already being done by hospitals, and focus on ensuring that patients receive specialized care, support and counseling. Even with the limited resources at hand, the Center has concentrated on providing patients with the skills and knowledge to remain active and able, to the best of their abilities, given the nature of their

injuries. The Center makes it possible for patients and their families to eventually return home and enjoy a reasonable quality of life.

Since its establishment eight months back, the Centre has provided treatment to 28 patients of which only three were from the Kathmandu Valley and the rest from other parts of the country. 68 percent were male and more than 71 percent were between the age of 16 and 40 years. As perhaps was expected for a country that is both mountainous as well as materially 'poor' where there is a lot of hardwork to be performed, the major cause of spinal cord injury was seen to be fall from height, either from trees while collecting tree fodder, from trails, or cliffsides. Out of the 28 patients, 20 of them arrived at the Center more than a month after the accident and some as late as five months. Among them, 12 had deep pressure sores. Our experience shows that the spinal injury as a whole has received low priority in the public health and medical sector of Nepal, and there is a clear need to bring about a transformation.

Conclusion : While we have succeeded with the short term goal of setting up of a Rehabilitation Center with basic facilities in a country that did not have such a facility, the Spinal Injury Sangha also has medium and long term goals. These include, firstly, ensuring that the Rehabilitation Center provides the best possible care to its patients, including in the area of physio and occupational therapy, as well as help with psychological counselling, support for community rehabilitation and so on. Most immediately, the Center has to be expanded so that it can take fifty patients, which we feel would reflect the present day immediate needs of the populace. While doing all this, the focus of the SIS during this next year is to ensure long term financial sustainability of the Rehabilitation Center. For the first year, the Center will have run through short term funds, but the goal is to have a corpus fund that will provide back up even while there is a continuous campaign for fund raising from governments, the private sector, as well as from international sources. The SIS also hopes to collaborate with organisations in the South Asian region as well as overseas, in mutual support in various areas, including patient care, sharing of expertise and personnel, research, and so on.

We are motivated to improve the quality of service and expand the number of personnel serving at the center. At the same time, it is reasonable to predict that before long we will have to open up care centers in different parts of the country for activities beyond the running of a center in Kathmandu Valley. Overall, the goal is also to make the Nepali Medical and public health community, policy makers, as well as the public at large aware of the high incidence of spinal injury in the country and the challenge of providing recuperative and rehabilitative care to these patients.

Disability Scenario in India

Dr. A.K.Mukherjee, Director General, ISIC

India has entered the new millennium with great achievement in all fronts. While the socio-economic development has shown a positive growth, the number of injuries is increasing from industrial, agricultural and road traffic accidents. Injuries in the vertebra and spinal cord are one of the most difficult problems in the terms of Rehabilitation Programme. This type of injury produces severe disability to individual.

WHO has recognized a system for quantification of the disability arising out of diseases and injuries. This system (DALY) has been well received at global level. In India the load in terms of DALY is the second highest in the world. Spinal cord injuries have been given the highest percentage in terms of severity in disability; besides it occurs in relatively younger age group male who forms a productive population in the society.

During the next two decades, the problems of the spinal cord injury patients will be further aggravated. WHO has predicted that by 2020 the road traffic accident rates will cause the major disability globally. Keeping these facts in mind, there is a need for formulating a comprehensive plan of action for rehabilitation of spinal injury patients.

Rehabilitation Services in India - Role of RCI

Dr. J.P. Singh, Member Secretary, RCI

Though throughout the world no precise estimates of the disability are available, according to the United Nation about 10% of the human race is suffering from one disability or the other. The Indian population today stands at more than one billion and thus the persons with disabilities are approximately 100 millions.

The role of Rehabilitation Council of India is to regulate and monitor the training programmes for the 16 categories of professionals as per the RCI Act of 1992 needed for providing rehabilitation services to persons with disabilities. The Council has been developing syllabi and other regulatory mechanism for regulating the 16 categories of professionals and accordingly the Council has developed over 80 types of training programmes at different levels (Certificate level to MPhil level).

In this regard the Council has come out with a Manpower report indicating the requirement of total trained manpower in the field of disability from top to gross root levels. As per the Manpower Report, it was estimated that approximately 3,62,300 persons were required to be trained in the 9th plan to serve only 10% of the disabled population. The responsibility of developing trained manpower is increasing day by day after enactment of Persons with disability Act of 1995. At present 160 training institutions (including Universities, National Institutions and NGOs) recognised by the Council are developing trained manpower to the tune of nearly 3200 per year. The professionals coming out from these institutions are being registered in the Central Rehabilitation Register of the Council and so far more than 21,000 professionals and personnel are registered with the Council.

Prevention of disability is of equal importance. India has a large network of Primary Health Centres under the Ministry of Health. However, at present medical courses do not include the component of disabilities. Therefore, to compensate for this gap, RCI has undertaken a programme of training of over 30,000 PHC doctors in disability management. The programme is already being implemented in 21 states and more than 9,000 PHC doctors have already been oriented.

To meet the growing need of trained teacher, the Council has launched the B.Ed. Special Education programme through distance mode in collaboration with M.P. Bhoj (Open) University, Bhopal. Every year more than 1,500 special teachers will be trained under this programme.

As regards training of professionals to serve the spinal cord injury patients, the Council is taking necessary steps to train enough number of professionals like Prosthetics and Orthotics, Rehabilitation Psychologists, Clinical Psychologists, Rehabilitation Social Workers, CBR Workers etc., to meet their needs. In collaboration with ISIC, a number of short term training programmes and camps have been organized for the rehabilitation of spinal cord injured patients.

Role of Hydrotherapy in Spinal Cord Injury

Dr. Macorini Riccardo,

Physiatrist, Italy

Water covers 70 % of the earth's surface and the human body is mostly made of water. Water is the base for life and its properties can be used for therapeutic purpose. The idea of using water to cure illness and preserve Health dates back as far as ancient Greece. Physical properties of water have a very useful therapeutic value. Into the water bio-mechanical movements and physical sensations are different and the whole body reacts in a different way compared to the condition on dry.

The key-word of hydrotherapy treatment can be "adaptation" to a new environment: WATER. The approach of rehabilitation into water is completely different from the one in dry HYDROTHERAPY SECTIONS Hydrotherapy sessions organisation and safety:

- swimming pool
- hot water (29 -30C)
- trained staff
- total assistance to the patient (in the pool - dress room and showers)

NEVER LEAVE THE PATIENT ALONE!!!

Hydrotherapy treatment length

- Each sessions should be of no more than 45 min
- Two or three times per week
- Working with specific therapeutic plan - timetable and goals

Hydrotherapy rehabilitation plan

- should be discussed with the patient
- with detailed goals (medium and long term)
- therapeutic activities into water are different from sport or aquatic games

Hydrotherapist-patients interaction

- a one to one: severe patients as paraplegic - aemiplegic patients.
- b one physiotherapist with a small group of patient (no more than 5): less severe pathologies (back-school - group of patients with similar pathologies as leg and arm fractures)

Once into the water our body experiences new sensations and adaptive mechanisms

The human body moves from an environment of "air and weight" to "water and weightless". This process modifies our perception of the external environment as well as the "adaptation process": the adaptation of our body to it. ONCE INTO THE WATER. "Freedom" from weight - floating. "A new equilibrium has to be found in the vertical as well in the lying position". You can experience sensorial changes: how you see - ear and in the cutaneous sensitivity. The person in his

whole and not only the body are involved the water experience: motor - sensorial - psychological - social spheres are touched. These are the reasons why during training physiotherapist that will deal with hydrotherapy should spend a lot of time experiencing on their own movements into the water and sensations. It can be useless to try to make the patient execute in the pool the same exercises he is used to do in the dry. At least these exercises must be adapted to the new environment and characteristics (as its natural resistance to movements).

HYDROTHERAPY: REHABILITATION INTO WATER

- A global experience
- Adaptation
- Specificity
- Speed depending exercises
- Timing
- Prevention
- Symmetry of movements

SPECIFICITY OF TREATMENT

- To get the patient used to water and immersion and get good therapeutic results the therapist has to study specific exercises aimed at emphasising water physical characteristics and human body reactions.
- It can be absolutely useless to try to make the patient execute in the pool the same exercises he is used to do in the dry.
- The therapists should first experience on himself the new experience of physical exercise into water.

SPEED-DEPENDING EXERCISES

Thanks to no-weight conditions joints movements can be done without pain and the range of joint movement can be improved with **LOW SPEED**

Increasing movements speed - water resistance increases too as the muscular job but the job will be not so hard as in a dry constant thanks to the support of water (buoyancy force). We call this kind of physical work: **REGAIN** of muscles strength **TIMING**

Hydrotherapy treatment allows an early start of rehabilitative activities for a patient because of:

- **WEIGHTLESSNESS CONDITIONS**
- **GRADUATED GAINING OF STRENGTH**

Practical examples

- a) artro-prosthesis
- b) joints mobilisation

PREVENTION

Hydrotherapy offers the benefits of:

- non-impact training
- training using the resistance the patient will choose
- no danger of fall

SYMMETRY OF MOVEMENTS

The physical pain causes a form of **COMPENSATION** of the healthy parts of the body: on the long this can create a big stress on sane parts, inflammation and pain.

Hydrotherapy allows symmetry of movements:

- no **STRESS** on the healthy parts of the body
- **OPTIMISATION** of the movements of the injured part

HYDROTHERAPY TREATMENT

Patient evaluation:

- physical examination
- psychological considerations

Physical examination:

WHEN TO AVOID HYDROTHERAPY

- Serious cardiac incompensation
- Acute or instable cardiac ischemia
- Myocardium heart-stroke
- Instable angina
- High risk arrhythmia
- Congenital cardiopathy

- Cardiomyopathy
- Acute cardiac phlogosis
- Pericarditis
- Myocarditis
- Endocarditis
- Acute arterial hypertension
- Phlebitis
- Pulmonary infections
- Chronic otitis
- Bowel incontinence

Physical examination:

WHEN SERIOUS ADDITIONAL EVALUATION REQUESTED

- Epilepsy
- Serious deglutition problems
- Urinary incontinence

CONDITION THAT CAN DETERMINE MOMENTARY SUSPENCTION

- Dermal infections (mycosis - eczema - verruca)
- Infective congiuntivitis
- Dermal eruption not cicratised
- Open tympanum
- Infectious disease
- Wound maceration or bleeding

Other investigations:

PATIENT'S CLINICAL HYSTORY

- Kind of trauma or illness and main consequences
- Surgical interventions
- Mobility after and before traumatic event
- Incurred complications
- Other illness
- Other treatment or rehabilitation already experienced

PSYCOLOGICAL EVALUATION

- Patient's situation before and after the trauma
- Level of independence in day life activities
- Level of autonomy
- Possibility of relative's or others in the therapy
- Personal relation with water

Investigation from the therapist:

The therapist should evaluate the patient from a bio-mechanical point of view:

- joint-movement and functionality
- muscular activity
- ambulation
- postural problems

PERIODICAL EXAMINATIONS OF THE PATIENTS SHOULD BE SCHEDULED IN ORDER ALSO TO EVALUATE IMPROVEMENT IN PHYSICAL AND PSICOLOGICAL CONDITIONS

- Once into the water:

Make the patient self-confident and relaxed

- even patients used to pool feel insecure when starting the new therapy
- aquatic environment is new
- what is going to happen?
- past negative experience

WHAT TO DO

- Welcome the patient
- Speak to him
- Maintain a constant contact

- Transmit relaxation
- Talk to the patient and relatives

HYDROKINESYOTHERAPY IN VESTIBULAR DISORDERS

The main aim of the vestibular system is to plan adequate tonic control of the posture - harmonic movement of the body into the surrounding environment according to the detected gravity force

HYDROKINESYOTHERAPY IN VESTIBULAR DISORDERS

Modulation of exercises at different level of immersion induces different effects on body posture and motion control modulating the relationship between vestibular detection of gravity and body perception of relative gravity

HYDROKINESYOTHERAPY IN VESTIBULAR DISORDERS

Water rehabilitation impacts on vestibular disorders at two level:

- reorganisation of tonic contractions and posture control
- re-structuration of the relationship between gravity detection and motion control

SPINAL CORD INJURIES AND HYDROTHERAPY

With the application of hydrotherapy principles we work on the peripheral nervous system as well on the emotional and psychological sphere:

- muscles relaxation is promoted
- spasticity is decreased
- residual movements are increased
- strength of muscles capabilities is improved
- vital capacity is improved with respiratory training
- muscles work and gross joints movement is promoted

SPINAL CORD INJURIES AND HYDROTHERAPY

NO PAIN: exercises can be executed till the patient experience a WELLNESS feeling.

NO TRAUMA: water as "SOFT TREATMENT"

NO FEAR: the patients is not worried of falls and feel pain

NO COMPLICATION: trauma - inflammation

NO DRUGS: no pain - no complication = no drugs

NO DRUGS= no complication from drugs

SPINAL CORD INJURIES AND HYDROTHERAPY

Trough hydrotherapy treatment we show to patients into the water what are the potentiality of their residual capacities: "if I can do one movement into the water I might be able to do it even in dry".

SPINAL CORID INJURIES AND HYDROTHERAPY

Multi-factorial pathologies that involve motion - sensitive and psychological reactions: trough hydrotherapy we try to give motion - sensitive and psychological therapeutical answers to the need these pathologies create.

Session VI

Lumbar End Plate Fractures Mimicking Disc Prolapse

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Pitfalls in Poster Higher Cervical Spine Surgery

Dr. Sharad Shashank Kale, Assitant Professor, Neuroserery, AIIMS, New Delhi

Bone Grafts for Spinal Fusion

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The use of bone graft in Orthopedic procedures is well established. It is used for augmenting bony fusion in many varied situations. Arthroplasty of joints has reduced the need for arthrodesis in limb bones with varying success.

In Spinal conditions however arthrodesis across motion segments still remains the main stay of management. Most of the procedures of the Spine necessitate the use of Bone Grafts. The common procedures in which they are used are as follows.

- (i) Spine deformity: Large quantities of bone grafts are required following corrective surgery. In children both autografts and allografts are extensively used for fusion following correction both posteriorly and anteriorly.
- (ii) Spine Trauma: In Cervical, thoracic & lumbar trauma bone graft blocks anteriorly and cancellous grafts posteriorly are routinely used.
- (iii) Spine Infection: Following debridement in Tuberculosis rib grafts, Iliac crest grafts are used
- (iv) Spine Tumors: For reconstruction after tumor removal, bone grafts are main stay of treatment along with stabilization.
- (v) Degenerative Spine: In Spondylolisthesis and other degenerative conditions fusion with bone grafts is routinely required

The majority of bone grafts used are autogenous grafts. This is because it has maximum available biologic potential with no immunologic risk. Allografts are used for fusion either alone or to augment fusion.

We describe the results and morbidity of 103 cases, spinal fusion where autograft and or allograft (formalinised preserved) has been used and discuss the complications.

Session VIII

Cervical Spinal Cord Injury Due to Fall While Carrying Heavy Load on Head

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Centre for the Rehabilitation of the Paralyzed (CRP), Dhaka, Bangladesh

Study design: Retrospective analysis of data collected from patients file at a specialised spinal injury rehabilitation centre.

Objectives: To investigate the characteristics of cervical spinal cord injury as a result of fall while carrying heavy load on head.

Setting: Centre for the Rehabilitation of the Paralyzed (CRP), Savar, Dhaka, Bangladesh.

Method: The records of all patients with cervical spinal cord injury admitted to the CRP between January 1999 and June 2002 were studied in respect of incidence, aetiology, demography and mechanism of injury.

Result: Three hundred and sixty nine patients with cervical spinal cord injury admitted to the CRP for the three and a half year period and 90 (24%) as a result of fall while carrying heavy load on head. In this study it has been found that fall while carrying heavy load on head is a main cause of cervical spinal cord injury in Bangladesh. Other major causes are road traffic accident 88 (23%), fall from height 80 (21%) and fall of heavy objects on head and neck 50 (13%). All patients were male and 70% are between the age of 21 to 40 years. Eighty one percent of patients carried 50 kilograms and more weight. Fifty percent patients presented with complete cord damage (ASIA impairment scale A). Fall while carrying heavy load on head although a commonly observed cause of cervical spinal cord injury in Bangladesh, has not been mentioned in the literature before.

Conclusion: Although the mechanism of injury is not clear, the exact description of the accident and sustaining injury is interesting because it leads to localised damage to the neck with high morbidity without any body trauma

Classification of Spinal Cord Injury as it relates to Functional Outcome

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International standard for neurological classification of spinal cord injury (2000) and ASIA Classification together with neurological recovery and functional outcome at each level will be reviewed. Functional outcome after spinal cord injury differs with the level of injury and other factors, including completeness of injury, age at injury and associated comorbidities. Certain activities of daily living and self-care with assistance of equipment can be performed independently, depending on the level of the injury. During spinal cord injury rehabilitation, goals are to decrease disability, improve function and prevent complications such as spasticity, contractures, pressure sores, deep vein thrombosis, autonomic

dysreflexia, atelectasis/pneumonia. It is important to manage pain, bowel and bladder issues.

Questions to be answered in the case of Rehabilitation of a spinal injury patient

- What outcome can be expected after spinal cord injury?
- What extent of recovery can be anticipated after SCI?
- What activity can be performed independently?
- What equipment and assistance will be required?
- What degree of productivity and community reintegration can be achieved?

Functional Goals

- Functional goals are a realistic expectation of activities that a person with Spinal Cord Injury eventually should be able to do, with a particular Level of Injury.
- The purpose of setting functional goals, is to offer the greatest opportunity for the individual to achieve maximum independence.

C1-3 LEVEL

- Movement** : Neck Control
- Functional Ability** : Able to direct care
- Orthotic** : Mainly Prophylactic, used to avoid contractures
- Equipment Need** : Wheelchairs - Two
Power recline/or tilt wheelchair with head/chin or breath control, vent tray.
Full electric bed With Trendelenburg feature & side rails.
- Additional Equipment** : Environmental Control Unit, Emergency call system, a speaker phone, an electric page turner, an automatic door opener, computer, Portable Respirator, Special Transport
- Vocational/Avocational goals** : Administrative work with the aid of the ECU; Further education opportunities depend primarily on the level of education.

C4Level LEVEL

The highest level of injury consistent with life without respirator

- Movement** : Shoulder Shrug
- Functional Ability** : Able to direct care
- Orthotic** : Mainly Prophylactic used to avoid contractures
- Equipment Needs** : Wheelchairs: Two with power recline/or tilt with head chin or breath control.
Full electric bed with trendelenburg feature & side rails.
- Additional Equipment** : Environmental Control Unit
Lap board, Electric typewriter and page turner, Tape recorder, Special transport
- Vocational /Avocational goals** : Administrative work with the aid of the ECU; Further education opportunities depend primarily on the level of education

C5 LEVEL

The highest level of injury who can drive with shoulder operation

- Movement** : Good shoulder control elbow flexion, supination
- Functional Goals** : With set up or with help of equipment feeding, grooming, upper body dressing.
- Bowel/Bladder** : Total assistance
- Orthotic** : Mobile Arm Support initially, Power tenodesis, Long opponens Brace, Universal cuff
- Equipment Needs** : Wheelchairs - Two
Power recline/or tilt wheelchair with arm driven control.
Manual lightweight with hand-rim modification.
Hospital Bed
- Additional Equipment** : Environmental Control Unit, Lap board, Electric typewriter and page turner are optional, Special transport .
- Vocational/Avocational** : Administrative work , further education, Board games, Card games; Spectator sports, Arts and Crafts.

C6 LEVEL

- Movement** : Good wrist extension
Pronation
Tenodesis grip
- Functional Goals** : Feeding, Grooming, Dressing with/without equipment or minimal assist.
Transfer some assist to independently to bed and mat, Drive car with hand controls.

Bowel/Bladder	: Some to total assistance
Orthotic	: Wrist driven flexor hinge-initially.
Equipment Needs	: Standard wheelchair with vertical projections Electric Wheelchair with hand controls for long distance travel.
Additional Equipment	: Hand controlled car-optional Van with hydraulic lift
Vocational/ A vocational	: Administrative, further educational, Indoors-Board Games, Outdoors-Javelin, Shot-putt, Swimming (back stroke), Archery, Gardening

C7 LEVEL

Movement	: Elbow extension, Finger flexion/ extension, Wrist flexion,
Functional Goals	: Total independence, Drive car with hand control, can do push-ups and grab and release
Vocational/Avocational	: Any type of sedentary job that does not require optimum finger strength.
Equipment Needs	: Standard wheelchair
Orthotic	: Wrist driven flexor hinge orthosis, initially short opponens orthosis
Additional Equipment	: Hand controlled car optional

C8-T1 LEVEL

The patients are totally independent at wheelchair level with normal upper extremities.

- They can drive a car with manual control.
- Can have a job away from home requiring self transportation.
- C8-T1 Level lesion: patient lacks trunk muscle support for full sitting balance.
- Intercostal and abdominal muscles are present to supplement diaphragmatic breathing.
- Are able to balance their wheelchair on the rear wheels (do Wheelies)

T2-L1 (Thoracic Paraplegia)

- These patients have additional muscle(upper intercostals and abdominal) which increases respiratory reserve to supplement diaphragmatic breathing and trunk balance.
- These individuals may be provided with orthosis for standing, but should not be expected to walk because of excessive energy demand.

AMBULATION

- **Community** : Uses ambulation as primary mode of mobility.
- **Household** : Walks within the house with relative independence; uses wheelchair as primary mobility in community.
- **Exercise** : Requires considerable assistance, or excessive energy expenditure for ambulation.
- **Non-ambulatory** : Uses wheelchair entirely.

AMBULATION DEPENDS ON

- Neurological Level of Injury.
- Completeness of Injury
- Age of the patient.
- Energy expenditure.
- Associated injury.

Requirement for community ambulation:

Good pelvic control, hip flexors and functional quadriceps muscle, and presence of proprioception at the hip and ankles,

Ref: Hussey and Stauffer 1973

BENEFIT OF AMBULATION:

- Overcome functional barriers.
- Increased self-esteem.
- Improved cardio-pulmonary reserve.

Orthotic Devices:

- Hip- Knee-Ankle -Foot Orthoses.
- Parawalker
- Scott-Craig Orthosis.
- Ankle -foot Orthosis
- Functional Electric Stimulation.

Session IX

C1-C2 Transarticular Fixation

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Pitfalls (And Complications) in Anterior Cervical Spine Fixation

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Anterior fixation of the cervical spine is recommended in situations where the cervical spine is unstable due to disease, or where, the spine will be made unstable at surgery. The advantages of anterior stabilisation include immediate stability of the spinal column, improved rates of fusion, decreased rates of pseudoarthrosis and graft extrusion, and a resultant early mobilisation of the patient.

Pitfalls in anterior stabilisation of the cervical spine are due to either implant related factors, patient related factors and / or factors arising at surgery. Implant failure may occur with screw pullout, implant pullout, screw breakage, etc. These have generally reduced following the introduction and use of mono-cortical locking plate systems and their improved variations. Poor patient conditions that may cause complications include osteopenia and porosis, inflammatory processes affecting the bodies e.g. in tuberculosis, small size of the bodies in the pediatric population, and in the inherent anatomical variations at either end of the cervical spine. Intra-operative problems in fixation generally arise when strict principles of anterior fixation are not adhered to, or when lack of experience does not allow the surgeon to innovate when faced with an implant related or patient related problem.

The advantages of anterior cervical plate fixation far outweigh the possible pitfalls and complications. Most of the latter can be avoided with proper patient and implant selection and with adherence to basic principles of anterior cervical fixation.

Radiological Approach to Trauma

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Session X

Management of Spasticity in SCI Patients

Dr. Douglas Brown, Director, Victoria Spinal Cord Service, Australia

While mild spasticity can be helpful, severe spasticity has a significant detrimental impact on the patient's quality of life and independence. It also leads to a range of complications which themselves lead to further deterioration. The neurological paths to spasticity are complex, polysynaptic and provide many points for intervention with a variety of neurotransmitters, both excitatory and inhibitory being involved. The first step is to remove nociceptive stimuli that will increase spasticity; this is followed by full range of joint movement and muscle stretches. A range of drugs are available and are very helpful in decreasing spasms and to a lesser degree tone. More complex interventions including the implantation of an intrathecal pump and the delivery of intrathecal medications. Surgical interventions also include peripheral neurotomies, dorsal root rhizotomies and cord stimulators. Sometimes treatment of an expanding cyst of the spinal cord will improve spasticity management.

With this range of treatments available, most patients can attain satisfactory control of spasm, but a few patients remain quite disabled.

Aggressive management of moderate and severe spasticity must be undertaken as early as possible in order to prevent the longer-term complications of contracture, decubiti and hygiene problems. In addition, these complications also decrease quality of life of the patient by decreasing social interaction, mobility and lead to prolonged periods of hospitalisation.

Intrathecal Baclofen Pump Therapy

Dr. H.S. Chhabra

Addl. Medical Director, ISIC, New Delhi

Spasticity of cerebral or spinal origin could be due to various conditions like Spinal Cord Injuries, Multiple Sclerosis, Cerebral Palsy, Traumatic Brain Injury, Stroke Anoxia etc. Spasticity limits the functional capacity of the patients thus leading to inactivity which predisposes the patient to decubitus ulcers, cardiovascular problems, thrombophlebitis, respiratory infections, contractures, osteoporosis, bladder and bowel problems mashing off residual motor power etc. The first line of management of Spasticity is the removal of irritating stimuli and good rehabilitation. Oral drugs, injection therapy, orthopaedic surgery and Neurosurgery are other modes for treatment. Intrathecal Baclofen Therapy is used mainly for multi segmental Spasticity and has the advantage of delivering the drugs directly to the CSF in doses at least 100 times lower than the oral dose and with potential for substantially fewer systemic side effects since the drug bypasses the blood / brain barrier.

The inclusion criteria for Intrathecal Baclofen therapy are severe Spasticity, enough body mass to support the system, appropriate, agreed-upon goals and motivated patients / family. Infection and allergy to baclofen are exclusion criteria for the therapy. All patients are put through screening test where a bolus dose of 50 mcg is administered through lumbar puncture test. If the patient does not have positive response the bolus may be increased to 75 mcg and than to 100 mcg.

Patients with 1 point drop of Asworth scale for Spasticity of cerebral origin and 2 point drop for Spasticity of spinal origin are a suitable candidate for intrathecal baclofen pump therapy.

The baclofen pump infuses drug at a programmed rate. The catheter delivers the drug to the intrathecal space. The programmer provides non-invasive adjustment of rate, mode and pattern of infusion. The pump is placed subcutaneously in the abdominal wall and the catheter is placed intrathecally. The catheter is then connected to the pump through a tubing tunneled subcutaneously. Post operative dose is titrated through the programmer. The pump is refilled every 2-3 months as an outpatient procedure.

Session XI

Ventilatory Management of SCI

Dr. P.K.Mangla, *Chest Specialist, ISIC, New Delhi*

Any centre taking care of patients with injured spine needs the state of art Intensive Care Unit. It should have advanced ventilators, preferably one ventilator for each bed. C1 C2 injuries need life-long Ventilatory support. Patients having C4 fibers intact can be weaned-off over a period of time as and when diaphragm is able to generate desired tidal volume. Even patient with upper thoracic injuries require ventilatory support because of extension of cord oedema. Early tracheostomy is advised in case patients develop lung collapse due to mucus plug obstruction. This usually happens because patient is unable to cough. These patients need higher tidal volume (15ml. per kg. body weight) to compensate for the loss of chest wall compliance. Initial settings, complications and weaning strategy will be discussed in detail.

Management of Medical Emergencies in Spinal Cord Injuries

Dr. S. Wadhwa, *Department of Physical Medicine and Rehabilitation, AIIMS*

Prevention and Management of Decubitus Ulcers

Dr. Sunil Katoch

Senior Consultant

Dr. H. N. Bajaj

Head, Department of Orthopaedic Surgery, ISIC, New Delhi

In the Indian scenario, decubitus ulcers continue to be a major problem in SCI patients. Patient education and two hourly turning are the most important steps in prevention. Surgical treatment is expensive and entails careful selection of patients, improvement of general conditions, correction of anorexia and hypoalbuminemia. Proper positioning of low residual diet and the correct timing of surgery contribute to a favourable outcome. Surgery entails the use of flaps according to the region. The tensor fascia lata flap is dependable for trochanteric & ischial sores while the gluteus maximus and transverse back flap give good results for sacral decubitus ulcers. We have treated 66 decubitus ulcers in 54 patients with these techniques. In 58 ulcers primary healing occurred while the remaining needed secondary procedures. We routinely emphasize the importance of prevention at all levels at the Indian Spinal Injuries Centre.

Management of Neuropathic Pain

Dr. Vipul Mody, M.D.

Director of Clinical Research, Aventis Pharmaceuticals

1. Overview: Pain & SCI

- The Scope of the Problem
- Classification of Pain in Spinal Cord Injury
- Assessment Tools of Pain.

2. Scope of the Problem

- 4 of 5 people with SCI report chronic pain
- One third report pain that interferes with activity or affects their quality of life
- One third report treatment of pain is more important to them than finding the cure for spinal cord injury
- Studies consistently reveal pain is under treated (All populations)
- Pain is second leading cause people go to a doctor

Classification of Pain In SCI

- Bryce and Ragnarsson, 2000
- 15 categories
- Based on level of pain
 - Above the level
 - At the level
 - Below the level
- Sub-grouped
 - Nociceptive
 - Neuropathic
- Sub-typed based on etiology

Bryce / Ragnarsson Classification

Type	Level	Sub-group	Etiology
1	Above	Nociceptive	Mechanical / Musculoskeletal
2	Above	Nociceptive	A.D. Headache
3	Above	Nociceptive	Other
4	Above	Neuropathic	Compressive Neuropathy
5	Above	Neuropathic	Other
6	At level	Nociceptive	Mechanical / Musculoskeletal
7	At level	Nociceptive	Visceral
8	At level	Neuropathic	Central
9	At level	Neuropathic	Radicular
10	At level	Neuropathic	Compressive Neuropathy
11	At level	Neuropathic	CRPS (RSD)
12	Below level	Nociceptive	Mechanical / Musculoskeletal
13	Below level	Nociceptive	Visceral
14	Below level	Neuropathic	Central
15	Below level	Neuropathic	Other

3. Pain Assessment

- Difficult to Quantify
- Personal Experience
- Inherently Subjective
- Influenced by
 - Culture
 - Psychological State such as Depression
 - Prior Experiences
- Each pain has unique qualities

Pain Assessment Tools

- Visual Analogue Scale (0-5 or 0-10)
- Wong-Baker Visual Faces Scale

- Verbal scale (none, mild, moderate, severe)
- University of Colorado Pain Assessment Guide
- McGill Pain Questionnaire (Melzak)
- Patient Comfort Assessment Guide
- Genesis Pain Assessment Tool
- Many others

Pain Assessment Tools - Qualities

- Clinical Use vs. Research Use
 - Subjective vs. Quantitative
 - Self Rated
 - Reliable
 - Ease of understanding and implementation

McGill Pain Questionnaire

- Three Major Measures
 - Pain Rating Index based on two numerical values that can be assigned to each word descriptor
 - The Number of Words chosen
 - Pain Present Intensity (0-5 scale)

Treatments for Neuropathic Pain

NSAIDs

Tricyclic antidepressants (TCAs)

Tramadol HCl

Anticonvulsants

Antiarrhythmics

SSRIs

Sports cream

Topical capsaicin

Transderm clonidine

Lidocaine cream

Antispasticity Meds

1. Tricyclic antidepressants

- Nortriptyline, desipramine, amitriptyline, imipramine
- Therapeutic dose range 25-150 mg/day, mostly given at night
- Takes several weeks for relief of pain to occur
- Side effects as dry eyes, weight gain, urinary retention and constipation

2. Anticonvulsants

- Phenytoin, Carbamazepine, Gabapentin, Valproic acid
- Gabapentin most effective at dosage of 900-1200 mg/day
- Topiramate has been studied to treat diabetic neuropathy

3. Topical agents

- Capsaicin cream, lidocaine gel
- Pain relief in very small percentage of patients
- Preferred in patients taking a large number of medications to avoid drug interactions

Tramadol Hydrochloride

- Acts in two ways as – an opioid agonist and as an activator of monoaminergic spinal inhibition of pain.
- Recent double blind placebo controlled study showed reduction of pain intensity and greater pain relief in patients taking an average dose of 210 mg/day

5. Antiarrhythmic agents

- Mexiletine produces pain relief in patients with chronic neuropathy.
- Too many side effects thus poor compliance

Acute Spinal Cord Injury

- Pain arises from soft tissues, ligaments, joints, muscles, skin trauma, bony elements such as fracture/dislocations, nerve root and spinal cord damage.
- This pain usually resolves within weeks to months of injury.

Chronic Spinal Cord Injury

- 90% of persons with SCI report troublesome delayed pain.
- 2/3 of them report that the pain is stable and "controlled".
- Most of the neuropathic syndromes develop within 6 months of injury.

Pain Prevalence by Location of Injury

- Cauda Equina Injury has highest probability of developing a chronic pain syndrome.
- Cervical Cord Injuries have the lowest probability of developing a chronic pain syndrome.

Central Spinal Cord Pain

Pain is usually described as: burning, tingling, squeezing, gripping, constant, intense, sharp, shooting, stabbing, and occurring in waves. Usually felt at or below the level of injury.

- Segmental - at or near the level of injury
- Phantom - perceived below the level of injury

An uncommon variant may occur in the perineal area

- Sensation of a large mass in the rectum or of sitting on a hot fire.
- It is usually severe and unrelenting and responds poorly to intervention.

Session XII

Reconstruction of the Hand in Tetraplegia

Dr. H.N. Bajaj, Head, Department of Orthopaedic Surgery, ISIC, New Delhi

Tetraplegia is a devastating blow that can befall anyone. Impaired hand function prevents such patients from achieving independence in activities of daily living. Upto 20 years ago the general opinion was that the arm and hand of the tetraplegic could not be improved by surgery. However, over time surgical principles of treatment have evolved, which permits improvement in hand function. As yet, lesions above the C5 level remain the greatest challenge, as no reconstruction can be done. For C5-C6 lesions procedures are available, including Functional Electrical Stimulation. For lesion at C7, C8, reconstructive surgery can provide good results. In this presentation, we discuss our approach and results in 10 patients who have had reconstructive procedures.

Thoracic Pedicle Screws in Trauma

Dr. H. S. Chhabra, Addl. Medical Director

Purpose of Study: There have been few reported studies on the use of thoracic pedicle screws in trauma. Although pedicle screw based constructs are known to provide the most rigid form of posterior fixation, the potential catastrophic complications associated with thoracic pedicle screw insertion, such as spinal cord, nerve root or great vessel injury have made their use somewhat controversial. The purpose of the study was to assess the utilization of thoracic pedicle screws in trauma.

Methods used: The outcome of fifteen patients with thoracic spine injury due to dislocation, fracture dislocation or burst fracture treated surgically by thoracic pedicle screw instrumentation was compared with fifteen patients treated by hook rod construct.

Summary of Findings: Pedicle screws being the only implant to provide segmental, three-column fixation of the spine, gave the best grip on the spine and was hence useful in reduction maneuvers. The use of pedicle screws resulted in easier and better reduction as compared to those treated with hook rod construct. Relatively fewer levels required instrumentation when pedicle screws were used. This allowed bone graft to be concentrated the fractured level and reduced operative time and blood loss. Unlike hooks or wires, pedicle screws could be placed in levels that had sustained laminar, spinous process or transverse process fractures. Pedicle screws could also be used in levels with anterior vertebral body comminution.

Relationship Between Findings and Existing Knowledge: Even though there is a potential for catastrophic complications with thoracic pedicle screw instrumentation like spinal cord, nerve root or great vessel injury, no such complications were noted. A good preoperative assessment helps in reducing this complication rate. It is an exacting technique with less tolerance for error but with a steeper learning curve.

Overall Significance of Findings: Since pedicle screw instrumentation has a better outcome and is a safe technique in experienced hands, its use is recommended in thoracic spine trauma.

Management of Higher Cervical Spine Injury

Prof Mazhar Hussain

Professor and Head, Department of Neurosurgery, King George's Medical College, CSM Medical University, Lucknow.

The so-called Upper Cervical Spine comprises of the foramen magnum, occipital condyles, atlas, axis, C-3 vertebra with all their ligaments, and the enclosed medulla and the lower cranial nerves. Upper Cervical Spine is involved in about 25% of patients with cervical trauma and the axis is the commonly involved vertebra. The male: female ratio is 4:1. The reason for the relatively low frequency of neurological involvement in patients with C1,2 and 3 vertebrae fracture dislocations is due to the fact that 25 to 40% of individuals sustaining this injury die at the scene of the accident.

Craniocervical ligaments give stability and wide range of movements to the upper cervical spine. The tectorial membrane and the alar ligaments provide atlanto-occipital stability. Atlanto-axial articulation is largely dependent on the transverse ligament. Craniocervical articulation derives minimal stability from the apical ligament, atlanto-occipital membrane and articular facet capsules.

No doubt, the congenital anomalies and the various inflammatory and neoplastic diseases make the upper spine vulnerable to instability after trauma. The unique anatomy and biomechanics of the Upper Cervical Spine is also one of the most important predisposing factors for instability in the region.

Diagnosis: It is not possible to make a diagnosis purely on the basis of the clinical picture, but, it is of some value in localizing the site of the lesion.

- Suboccipital and upper neck pain.
- Brain stem signs- Inter nuclear ophthalmoplegia, down beat nystagmus, discrete pyramidal involvement and lower cranial nerves involvement.
- Upper spinal cord involvement in the form of hemiparesis, paraparesis, quadriparesis, and Brown-Sequard's syndrome.

Roentgenogram is the most useful investigation, as it is non-time consuming and can be done at the bedside of the patient. Lateral X-ray film is the single most important film for the initial evaluation, as it can detect a lot of Upper Cervical Injuries like dens fracture, atlanto-axial dislocation, atlanto-occipital dislocation, and C2, C3 body fractures and dislocations. The accuracy increases to 100% when the antero-posterior open mouth odontoid and flexion, extension radiographs are obtained.

Radiological criteria for instability of Upper Cervical Spine:

1. Predental space >3mm in adults and >5mm in children.
2. Overlap of C1 over C2 on AP X-ray film >6.9mm.
3. Rupture of the transverse ligament on MRI.
4. Dens Type II fracture with dislocation.
5. C2-C3 X axis translation >3mm.
6. Flexion Extension range >11 degrees.
7. Loss of facet contact >50%
8. Loss of facet parallelism.
9. Interspinous widening.

Complex fractures of the condyles or combination fractures of the atlas and axis missed on X-rays can be diagnosed with perfection on CT scan. 3D reformatting image is a great advantage but has the drawback of appearance of pseudofractures.

Management: All suspected cervical spine injuries should be considered unstable until proven otherwise and are to be managed accordingly. The spinal cord injury management protocol applied in other spinal injuries is to be followed. Immobilization of the spine and the correction of the neurogenic shock are the two most important factors which prevent secondary injury to the cord.

Types of Fractures and their Management: Definitive treatments of different fractures and dislocations of the upper cervical spine are individualized and discussed separately.

1. Occipitoatlantal dislocation: Distraction of the spine in the hyperflexed state of neck leads to disruption of the ligaments and dislocation of this joint. Cranium may displace anteriorly or posteriorly and are managed by reduction and posterior fusion. Traction is to be avoided in occiput-C1-C2 longitudinal dislocation.
2. Condylar fracture: This fracture exclusively involves the condyle or may extend into the skull base. These are managed by semi-rigid collar or halo-vest orthosis.
3. Jefferson's fracture: It is a fracture at four sites in the ring of atlas, leading to lateral displacement of the lateral masses of C1 vertebra. This is managed by rigid external fixation. Posterior surgical fusion is required in cases of transverse ligament disruption.

4. Axis Fracture: These are divided into three types:
 - a) **Odontoid fracture - Three sub-types:**
 - Type I - The tip of the odontoid is fractured. It is a stable fracture and is managed by cervical collar.
 - Type II - It is the most common fracture occurring at the site of synchondrosis. It is best treated by trans-odontoid screw fixation. Posterior C1-C2 fusion is another option in the case of transverse ligament disruption.
 - Type III - The fracture line passes through the body of C2. It is a stable fracture and is immobilized in a Halo-vest orthosis.
 - b) **Hangman's Fracture:** Broadly speaking, this is a bilateral fracture of the pars interarticularis. It is classified into three types:
 - Type I - It is an isolated fracture of the ring of the axis with minimum displacement of the body of C2.
 - Type II - This is the displacement of the anterior fragment with the disruption of the disc space below the axis.
 - Type III - Defined as displacement of the anterior fragment with the body of the axis in a flexed position, in conjunction with C2 C3 facet dislocation.

The majority are stable fractures and is managed by external immobilization. Surgical treatment is indicated in unstable fractures in the form of C2-C3 interbody fusion and dorsal C1-C3 fusion.
 - c) **Miscellaneous fractures:** Spinous process, lamina, body, pedicle and lateral mass fractures. They are treated by external immobilization.
5. Atlantoaxial dislocation(AAD)
6. Combination of fracture
7. C2-C3 dislocation or combination

Management of Post Traumatic Syringomyelia

Prof. A.K. Singh, Head of Neurosurgery, GB Pant Hospital, New Delhi

Cervical spine is a unique dynamic unit that functions to contain, support & protect the cervical spinal cord & carries out complex motion of head over trunk.

Cervical spine as is well known comprises of cervical vertebrae, intervertebral discs & the spinal ligaments. The cervical vertebra comprises of a vertebral body & a neural arch. The vertebral body is a cylindrical mass of cancellous bone surrounded by a thin shell of cortical bone with cartilaginous end plates at its superior & inferior aspect. Neural arch consists of paired transverse processes, paired superior & inferior articular processes & a spinous process. The superior & inferior articular processes of two adjacent vertebra forms the facet joint, which is oriented approximately 45° to the horizontal plane. The vertebral body through outer cortical shell & central cancellous core transmits the compressive load. The end plates resist the compressive loading. The intervertebral discs constitute approximately 20-33% of entire height of vertebral column & is the important part of the motion segment. It comprises of centrally located loose & translucent network of fine fibrous strands that lie in mucoproteinous gel which is surrounded by fibrous concentric laminated bands arranged in definite pattern. Normal disc shows phenomenon of creep & relaxation that is lost in degenerated disc so that the latter has less capability to withstand shock & to distribute the load uniformly over the entire end plate. The spinal ligaments allow various physiological motions & fixed postural attitude, at the same time, protecting the cord by limiting excessive motion within a limit.

Based on kinematics & clinical uniqueness cervical spine can be grouped into upper (C0-C1-C2), middle (C2-C5) & lower (C5-T1). Biomechanics is the study of the effect of physical forces on biological systems & as such incorporates theories & principles from many engineering, bioengineering & mechanical fields. Kinematics is the motion characteristics of cervical spine including under normal & pathological conditions.

In the upper cervical spine various movements are possible like combined flexion & extension – 25°, flexion being restricted by foramen magnum & dens while extension by tectorial membrane. Axial rotation at C0-C1 is 5° & is restricted by concave facets of atlas & alar ligaments. Between C1-C2 axial rotation is 40° due to convex orientation of lateral masses & absence of ligamentum flavum. Translational movements between C0-C1 are minimal but occurs up to 2-3mm between dens & C1.

In the middle & lower cervical spine, C5-C6 interspace has maximum range of movements, while in lateral bending & in axial rotation caudal spine shows less movements. A maximum translational movement under physiological limits has been found to be 2.7mm but 3.5mm is the upper limit radiologically.

Session XIII

A Clinically-Based Approach for Improving Long- Established Spinal Cord Injury New Therapies In SCI

Dr. Vipul Mody, MD, Director of Clinical Research, Aventis Pharmaceuticals, Bridgewater NJ

Techniques of Modifying the course of SCI

Widely used

- Acute treatment with steroids
- Rehabilitation center treatment

- Spinal decompression and stabilization
- Syringomyelic cyst surgery
- Peripheral nerve bridging is emerging?

In/ post-trials

- HP184, GM-1, 4-AP, theophylline, AIT-082
- Fetal spinal cord, activated macrophage, porcine fetal neural stem cell, fetal OEG, various other cell transplant approaches ± growth factor cocktails
- Human mucosal autografts
- Alternating current/stimulation
- Peripheral nerve bridging in transection and other TSCI

DEXANABINOL (HU-211)

- NMDA Receptor Antagonist
- Currently in phase II
- Phase I study demonstrated good tolerability
- Also in Phase III for cerebral ischemia and head trauma

Tirilazad (Freedox)

- A novel 21 aminosteroid antioxidants
- Effective in animal models of brain and spinal cord injury
- A double blind placebo, randomized study with 499 patients with either two days of treatment with Tirilazad or Methylprednisolone.
- Clinical trial result disappointing

Neotrofin (leteprenim;AIT082)

- Analog of hypoxanthine
- Orally active nerve growth factor (NGF)
- In March 2001 phase II trial initiated in SCI

New/refined treatment in development: Phase II /III

- Sygen (GM-1) and other nerve growth factor agonists
- NIL-A (FKBP neuroimmunophilin ligand)
- Porcine spinal cord cell transplant
- 4-AP (fampridine/Neurelan; K⁺ blocker)

Treatment in development: early/uncontrolled and/or animal trials

- Antibody therapy, e.g. M1, IN-1, Copaxone
- Anti-inflammatory interventions, e.g. hypertonic saline, nitrogen mustard, gabexate mesilate
- Bacterial toxins, e.g. C3, to inhibit Rho; PDE4 inhibitors
- Caspase inhibitors (zVAD.fmk, zDEVD.fmk, Bcl2 gene, CEP 4143)
- Delivery systems/immunostimulation: gene therapy, autologous macrophage transplant
- Embryonic stem / adult / Schwann / OEG cell transplants
- Inosine & analogs, genetically modified fibroblasts, chondroitinase ABC

Treatment in development: surgery and rehabilitation

- Hyperbaric oxygen therapy
- Neural prostheses; spinal cord/electrical stimulation
- Omentum transplantation
- Peripheral nerve bridging/transplants
- Shark embryo cell transplants
- Supported locomotor training, e.g. treadmill

- Ulnar to sciatic nerve bridging

HP184 : Preclinical Pharmacology Preview

K⁺ channel and use-dependent Na⁺ channel blocker - in vitro & in vivo
neuroprotective in arterial occlusion, anti-convulsant instead of pro-convulsant
enhances conduction velocity (potential surrogate marker)
decreases neuropathic pain
decreased hyperreflexic bladder contraction
improves locomotion in SCI model after established injury; - myelin (staining)

Sleep Disordered Breathing

Dr. Douglas Brown, Director, Victoria Spinal Cord Service, Australia

Sleep disordered breathing has been found to be overly represented in chronic spinal cord injured patients compared with the general population. It is not known what predisposes to this nor when the early phases of the disorder appear. Because the natural history of sleep disordered breathing in spinal cord injuries is not known we undertook to study acute tetraplegic patients from shortly after their initial admission. It is well known that acute tetraplegic patients suffer respiratory failure and a significant component of this is mechanical. The possibility of sleep disorder breathing being part of this respiratory failure had never been explored when we undertook the study amongst our acute patients. Thirty patients were enrolled into the study and sleep studies were undertaken at frequent intervals. Analysis of the episodes of apnoea and hypopnoea showed that sleep disordered breathing is common in acute spinal cord injury occurring in an early phase post trauma and reaching a peak prevalence at approximately 3 months; thereafter there is often clinical impairment. At this stage it is not known whether the development of sleep disordered breathing in early spinal cord injury foretells the long term development of this disorder.

Session XIV

Management of Thoracolumbar Fractures using Kluger Device

Dr. Patrick Kluger, Consultant Spine Surgeon, Stoke Mandeville Hospital, UK

Recent Trends in Surgical Management for Subaxial Cervical Spinal Cord Injury

*Dr. (Col.) P.K. Sahoo, Senior Advisor in Surgery & Neurosurgery
Army Hospital (R&R), Delhi Cantt, Delhi.*

A retrospective analysis of sixty patients with cervical spinal cord injury operated during July 1997 to June 2002 was carried out. 54 (90%) were male and 6 were female patients. Amongst them 45 (75%) were in the age group 21 - 40 years. 36 (60%) sustained injury by vehicular accident and 24 due to fall, wrestling, boxing, obstacle crossing, terrorist activities, cattle and camel hits. All patients presented with evidence of post traumatic cervical spinal cord injury and were evaluated with Frankel's neurological grade at admission. 6 patients presented with Grade A, 2 with Grade B, 36 with Grade C, 16 with Grade D neurological deficit as per Frankel's classification.

Plain radiography, computerized tomography (CT) Scan and Magnetic Resonance Imaging (MRI) of cervical spine revealed disc prolapse in 20, anterior thecal compression due to burst/compression fracture in 28 and dislocation in 12 patients. Cord contusion and haematoma in 8 and complete cord transection in 6 patients were detected in MRI.

Anterior Cervical Microdiscectomy (ACD) and bone grafting in 10, discectomy bone grafting and plating in 10, corpectomy and bone grafting in 12, corpectomy, bone grafting and plating in 16, post fusion was carried out in 9 and reduction, discectomy and anterior cervical plating was carried out in 3 patients.

Outcome was evaluated again with Frankel's scale. There were 26 patients with grade E, 25 grade D, 6 patients did not show any recovery and two patients died. Recovery was rewarding in patients with initial incomplete spinal cord injury.

Session XV

Protocol for Evaluation of Basic Status of Spinal Cord Injury Patients

Dr (Capt) Dilip Kumar Sinha, Patna Medical College Hospital

Customarily a patient of spinal cord injury is described as per the distal most surviving part of the cord. A SCI lesion may be a complete or an incomplete injury.

Dr. Frankel classified the injuries into five categories-A, B, C, D and E. A is the most severe injury while E is normal in motor and sensory function.

The American Spinal Injury Association described the motor and sensory levels in the numerical form. A normal person has a score of 224. On paper I may appear simple to calculate, but it does not assess the morbidity of the patient at any given time.

The spinal cord injury is not in itself fatal, but the complications of the neurologic injury is. Once a patient develops a complication, the morbidity increases. As such, the morbidity of a spinal cord injury patient depends on the different complications that he develops. It is generally expected that the morbidity of cervical cord injury patients will be higher than that of thoraco-lumbar injury patients. But patients with high Thoracic injuries can develop chest infection, pressure sores and urinary tract infections. A cervical cord injury patient without any complication is more likely to survive and be rehabilitated than a thoraco-lumbar injury patient with multiple complications.

The total morbidity of any SCI patient is dependant on the associated injuries or complications in the Respiratory, Genito-urinary, Gastro-intestinal systems and skin. At any time when the SCI patient is being evaluated, proper evaluation of these four systems is a must.

Keeping this view in mind, a separate system of evaluation was developed at the Patna Medical College. The Respiratory, Genito-urinary, Gastro-intestinal systems and skin were divided into 5 identifiable groups ranging from Critical to Normal Status. The most Critical condition was given 0 points and the normal state was given 10 points.

Thus the basal status, or the Morbidity status could be graded against a numerical value of 10.

Applicability of this evaluation method: Whenever a patient was admitted to the spinal cord injury ward of Patna Medical College, he was evaluated using this scoring system. In every case the score gave us a clear idea about the physical status of the patient. We have used this evaluation method on more than 3000 patients and have found it easy to follow, reproducible and comprehensive.

Services at RSIC, Cuttack.

R.N. Das, Regional Spinal Injury Centre Cuttack

Regional Spinal Injury Centre is functioning for more than a year at S.C.B. Medical College Hospital, Cuttack, Orissa. It receives approximately 250 patients a year, out of which 80% are Quadriplegics and rest are Paraplegics. 70% of these persons are daily labourers. Emphasis has been given to prevent pressure sore, maintenance of personal hygiene, Bladder and Bowel care as well as self rehabilitation. Most of the patients are managed conservatively. In ward all the patients are provided with Air Circulatory bed initially followed by side changing by Madras Pillow Method. Patients having first and second stage pressure sores are generally treated with Ice therapy. The third and fourth stages require additional Eu-sol lotion dressing. Physiotherapy and occupational therapy are given to patients who are stable. Vocational training and social services are provided during their hospital stay. Patients do stay in a transit house at least a week before he/she goes home. During this period all hospital services are discontinued. Patients are discharged with advice of self ADL and family education. Intermittent Catheterisation and manual evacuation of bowel are taught to the patient during transit house stay. Wheelchair or tricycles are provided to the eligible patients at the time of discharge. C.B.R. workers visit the patients every month where self care in family is emphasized. Cases with complications are again brought back to the centre for further management.

Anterior Cervical Stabilization with Synthes Locking Plate & Screws

Col. Prakash Singh, Department of Neurosurgery Army Hospital (R&R), Delhi Cantt, Delhi.

During a period of 3 years Synthes anterior cervical locking screws and plates were used in 40 cases of sub axial cervical pathologies. 28 were traumatic, 5 were tubercular, 3 of spondylotic myelopathy, 2 of OPLL and one each of vertebral haemangioma and malignant tumor. 26 were male and 14 were females. Their age varied from 21 to 65 years. All were evaluated clinically and radiologically. X-ray cervical spine and MRI were done in all cases. CT Scan was done if considered mandatory. Cervical spine was exposed through a transverse incision for one level plating and through longitudinal incision for two or three level plating. Iliac bone graft was used in all cases. Single level plating was done in 24 cases, two level in 12 and 3 level in 4 cases. Post operatively 7 patients developed dysphagia which resolved over 2-3 days in 6 cases but required removal of plate in one case. 10 patients experienced graft site pain. In one case subluxation reoccurred and needed posterior fusion. 32 patients were followed up for a period of 6 months. 95% achieved and maintained good alignment. All patient achieved good fusion. Our results show that Synthes anterior cervical locking screw and plate achieves good alignment and fusion in instability of sub axial spine without any significant morbidity.

Conservative vs Surgical Treatment

Comparative Analysis of Outcome of Patients in Thoracolumbar Fractures

Dr. Praseon Shamsbery,

Dr. Abrar Ahmed, Dr. Mahesh, Dr. Arvind Jayaswal.

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This prospective study comprises 53 cases of unstable thoracolumbar fractures treated by operative and non-operative means with a minimum follow-up of two years (range 24-39 months). 34 patients underwent surgical treatment while 20 patients were treated conservatively. Average injury to surgery interval was 14.8 days (range 3-36 days). Posterior decompression, instrumentation - mostly pedicular screw fixation with or without interbody fusion utilizing cages was done in 28 cases. Anterior decompression, corpectomy, stabilization and cage fixation was done in 6 burst fractures, average 14.2° (92%) of kyphosis correction was achieved in posterior group while 9.3° of kyphosis correction was obtained in anterior group. In ten patients, in which cage was not used they had 2.9° of loss of correction while there was 1.2° loss of correction at two year utilizing cages. 55.4% of patients treated surgically had shown functional neurological recovery while in conservative group only 46.7% of the patients showed evidence of neurological recovery. There was 66.7% incidence of pressure sores in conservatively treated group as compared to 21.1% incidence in surgically treated (majority of which had reported 1 wk after injury) group. Early and good surgical decompression and stabilization was found to improve the chances of neurological recovery, and early rehabilitation was helpful in reducing the incidence of complications, immobilization period and hospital stay.

Delayed Anterior Decompression in Thoracolumbar Injuries

Dr. K. Das

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The study examines benefits of delayed anterior spinal decompression in thoracolumbar (T11-L2) fractures of the spine with plateaued neurological recovery.

The study was carried out on patients admitted to the centre from the period of May 1997 - September 2002. The total number of patients were 72 of which 41 underwent anterior thoracolumbar decompression (27 of the patients had stabilization and the rest 14 patients were only decompressed and bone grafted).

Follow-up and examination was carried out 1- 19 months following surgeries.

Postoperative neurological improvement in nerve root was seen in 7 cases distal sensory improvement was seen in 17, however functional Frankel grade recovery was seen only in 10 patients. Relieve of pain was seen in most of the incomplete neurological patients. Inference :- shorter the interval from the onset of injury-surgery-greater is the neurological improvement.

Regional Spinal Injury Network; The First Year's Experience

Maggie Muldoon, Administrator, John Grooms Overseas, Ireland
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During the International Conference on Spinal Cord Lesion Management held in Bangladesh in November 2001, participants representing different organizations from different countries in the region came together to discuss the formation of a network/society/association to promote advances in spinal cord injury management in the region through the facilitation of mutual learning.

The network has been operating for one year and this paper will discuss the experience to date and information gathered in relation to:

- Aims, Objectives, Activities and Name of Network
- Activities undertaken by network member organizations
- How the objectives of the Network can be furthered and the momentum continued,

Information was collected from network members through a questionnaire and through ongoing communication during the year. The results have been used to draw up a set of suggestions relating to

- The formal launch of the regional network
- Development of clear goals, objectives and related action plan
- Suggestions for naming the network
- Use and effectiveness of the newsletter

For the network to be effective and receptive to the needs of its members it must continue to be appropriate. The information within provides a framework for this and the continued development of this initiative.

Ergonomical Considerations for Spinal Cord Injury Patients in Home Environment

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Ergos=Work, Nomos=Law or knowledge. Ergonomics or human factor is the multi-disciplinary science of designing or structuring work environment or work conditions and capabilities of the patient. Occupational therapy practitioners use their knowledge of the structure and function of the human body, the effect of illness and injury, the component of the work and the interaction of the work environment to increase the subjects involvement in safe and productive work.

The occupational therapist involves, both, the internal and external factors during the ergonomical considerations in the home environment.

Home Evaluation in Spinal Cord Injury Patients

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Home evaluation is an important part of the therapeutic process. The initial focus of home evaluation is limited to those areas where the patient is currently functioning. As the function improves, the areas of assessment change. Before starting the home evaluation, the occupational therapist should be aware of the ideal home environment, which must include safety resource proximity and aesthetics. Home evaluation is a continuous process and information is gathered in various ways and arranged in the form of a checklist called the Home Evaluation Check List (HECU).

Low Back Pain - A Problem Solving Approach to Iron-Game Communities

Mr. S Mohan Sunder

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This presentation suggests a method of approach to overcome Low Back Pain that is quite prevalent among the Iron-Game communities, engaged in weight lifting, bodybuilding, etc. It may be useful to build up an optimal physique. Luis

Berriose first suggested this method. An effort was taken by the author to implement the idea at Aruppukkottai town, Tamilnadu, India, which has given fruitful results.

Simple random sampling was used to select the samples. The details of the method are discussed.

Session XVI

Skip laminectomy - Minimally Invasive Technique for Posterior Cervical Decompression

Mr Jake Timothy

Mr Gerry Towns

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Introduction : There are many disadvantages of conventional posterior cervical surgery such as denervation and devascularisation of the muscles, pain, reduced cervical mobility and prolonged hospitalisation. We would like to present another technique which achieves the same surgical decompression without the above problems. This has been termed 'Skip Laminectomy'. This involves a 3-4 cm skin incision, the splitting of the spinous process in the Sagittal plane but leaving the interspinous ligament intact. Foraminal decompression is also possible by this technique.

Methods : Patients undergo plain C-spine x-rays and MRI radiography as preoperative investigations. All consecutive patients with myelopathy who would have normally undergone laminectomy or laminoplasty were included. In total 10 patients up to date have undergone a skip laminectomy, 7 were male and 3 were female, age range from 73-85. 5 patients underwent single level, 4 two level and 1 single level skip laminectomy. Follow-up has been for a mean of 8 weeks.

Results : 5 patients had improvement of their symptoms, 4 unchanged and 1 patient died of an unrelated condition. The only complication was a dural tear in one patient. The most striking effect of the skip laminectomy where there was virtually no postoperative pain in any of the patients and little need for analgesia. Postoperative radiography objectively showed adequate postoperative decompression by this technique.

Conclusions : We conclude that the technique of skip laminectomy is easy, safe, reduces operative time and blood loss leaving virtually no postoperative pain and leads to a rapid mobilisation with adequate radiological and clinical posterior cervical decompression.

The Development of A New Occipito-Cervico-Thoracic Implant.

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Historically, fixing of the occiput to the cervical spine, or the cervical spine to the thoracic spine has been technically difficult and the implants have been poorly designed. For many years the sublaminar wires were the mainstay of fixation. However, this had the disadvantage of being unstable in compression and transgressing the spinal canal. The "SUMMIT" system allows midline skull fixation, where the bone is at least 1cm thick, and a choice of bony fixation in the cervical spine, either lateral mass screws, pedicle screws or sublaminar wire, if preferred. This can be extended into the thoracic spine using thoracic polyaxial screws, thus allowing one continuous construct with no connectors to extend from the occiput down the full length of the spine if necessary.

The system was originally developed by Professor Jeurgen Harms and over the past three years has undergone continuous development, so that, now, we have a system that allows safe strong fixation with a small number of parts and simple instrumentation making it user-friendly for both, the surgeon and the scrub staff.

The Future of Spine Surgery

Dr. Julio Gallego, Orthopaedic Surgeon, Memphis, USA

Anterior Approach to the Upper Dorsal Spine

Dr. PS Bawa

Dr Munish Aggrawal

Anterior approach to diseases of the upper dorsal spine constitutes a formidable challenge. Unfamiliar territory and the presence of vital structures makes this approach particularly difficult. We operated three cases of upper dorsal anterior cord

compression using the anterior trans-sternal approach. Cases of Pott's spine and a lower cervical chordoma with a recurrence, and extending into the upper dorsal spine were operated by this approach. The clinical details along with the details of the operative procedure shall be discussed.

Session XVII

Conservative Treatment of the Neuropathic Bladder in Spinal Cord Injured Patients

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Summary : In the article presented here different conservative treatment modalities for the lower urinary tract dysfunction in patients with spinal cord lesion are reviewed. Conservative treatment is still the mainstay of the urological management in these patients. Growing experience has changed the classical approach. Spontaneous voiding with/without triggered voiding or/and bladder expression has proven to be less safe methods except in well defined patients with regular urological follow-up. Nowadays intermittent catheterization and self catheterization with/without bladder relaxants are accepted as the methods of choice. Condom catheters are still needed if incontinence persists while penile clamps have no place in the treatment of patients with spinal cord lesions. Long-term indwelling catheters should be avoided. External electrical stimulation may be used to correct the neurogenic dysfunction by neuromodulation and/or to induce a direct therapeutic response in the lower urinary tract.

Introduction : The history of the modern treatment of the neuropathic bladder in spinal cord lesion (SCL) patients is relatively short but is still not far away to celebrate it's 50th birthday. This only goes however if we accept that the major findings published by Bors¹, Comarr², Guttmann³ and others in the 1950's and 1960's have given birth to a better understanding and a better approach of SCL medicine as a whole and to its urological part more specifically.

However, fifty years later we still are faced with some of the same problems that our distinguished teachers experienced. Last year a survey was published in *European Urology*⁴ which was a sort of a shock to an attentive reader. The data given in this survey show that the acute care of the bladder in SCL patients still today can give rise to a frightening number of complications some of which are hard to treat. Also other aspects of neuropathic bladder management still can be improved. Despite of 50 years of intensively promoting the proper acute urinary treatment after spinal cord lesion, studies like the one mentioned above make us aware how far the clinical reality can stand away from the ideal situation created in ideal settings. It invites to reflection and urges more continuous action. It makes us realize that work is seldom ever finished, but needs to be continued, repeated and improved.

The important clinical and scientific work done in the second half of the past century have given us some major evolution in bladder management.

This paper wants to give an updated overview of what conservative management of the neuropathic bladder can be and should be today. How we should treat a SCL patient nowadays has become different from what even some of us have learned in the beginning of our careers.

Treatment modalities

Decisions on treatment should depend on an accurate diagnosis of what type of neurologic dysfunction is present in a specific patient. Not only the bladder activity but also the coordination with the bladder neck and the striated external sphincter need to be studied and documented.

However, the urological treatment starts from admission of the patient after trauma or event.

During the acute phase of spinal shock, proper bladder drainage by intermittent catheterization (IC) is preferably used if not too large urine output occurs. A suprapubic fine bore cystostomy or even an indwelling catheter (ID) can be used although the latter is less preferable in male patients. Without doubt, it is best not to leave a catheter in for a long period. If an indwelling catheter is judged necessary, complications can be limited by strict catheter care. The importance of a team approach to urinary bladder management has also been stressed⁵.

How should IC be done in the hospital? Two main techniques are currently described: a sterile and a clean technique. In the sterile, non-touch technique advocated by Guttmann and Frankel⁶. Sterile materials are used by a sterile non-touch technique with sterile gloves and forceps. In an intensive care unit, some advocate to wear a mask and a sterile gown as

well. In some centres patients are taught to catheterize themselves within a few weeks after the lesion. Selfcatheterization (ISC) has proven to be practical in patients with good handfunctions and it can make cross infections in a ward almost completely disappear⁷.

After the spinal shock resolves the new neurologic and functional situation of the lower urinary tract (LUT) gradually becomes clear. Clinical neurological examination gives useful information that to a certain degree reflects the LUT function. Urodynamic studies are necessary for a profound evaluation of the function of different parts of the LUT and their interaction⁸. Cystometry and other urodynamic tests should be repeated to follow the LUT evolution, to evaluate the effect of treatment, and to early discover aspects of unbalanced bladder with risks for the upper urinary tract⁹.

Madersbacher et al¹⁰ have well standardized the various types of neuropathic bladder dysfunction. Damage to the innervation of the LUT mostly affects the detrusor and the sphincter. Both can become either hyperreflexic or areflexic. Clinically the combination corresponds with mainly 4 types: 1) hyperreflexic detrusor with hyperreflexic sphincter which almost always means detrusor-sphincter dyssynergia; 2) hyperreflexic detrusor with hypo-/areflexic sphincter; 3) hypo-/areflexic detrusor with hyperreflexic sphincter; 4) hypo-/areflexic detrusor with hypo-/areflexic sphincter.

Table 1 gives an overview of each type with the possible treatment modalities. Following are critical evaluations of each treatment type.

Triggered reflex voiding

The importance of triggered reflex voiding has decreased considerably in the era of clean intermittent catheterization (CIC). Nevertheless it is still used. According to the ICS committee on standardisation of terminology bladder reflex triggering comprises various manoeuvres performed by the patient or by the one who takes care for him in order to elicit reflex detrusor contractions by exteroceptive stimuli¹¹. The aim of regular triggered voiding is to regain control over the reflex bladder i.e. whenever a patient wants to void, the bladder is triggered to contract. However, this type of voiding has many pitfalls and the clinical outcome is not very good. In suprasacral lesions a reflex bladder normally develops. Bladder emptying via this triggered sacral reflex is unphysiologic: it comprises C-fibres activation, bladder contraction is involuntary and not sustained, detrusor-striated sphincter dyssynergia or detrusor-bladder neck dyssynergia is present in over 90% and autonomic dysreflexia can be associated. In addition, only a few patients have a balanced voiding i.e., a residual urine less than 25% of the functional bladder capacity or with less than 100 ml¹².

There are many ways to perform triggering¹³. Some achieve a prompt voiding after rhythmic suprapubic percussions while others provoke strong spasticity of the pelvic floor and the external striated sphincter which prevents expulsion of urine for some time or makes the outflow interrupted. Some can improve the contraction by continuing tapping but others have a better voiding when tapping is stopped after 7-8 percussions. Other manipulations such as thigh scratching, touching the penile skin, pulling the pubic hair, ano-rectal manipulation are successful in some patients¹². Low and Donovan have proved that stretching the anal sphincter helps overcome urethral sphincter spasticity¹⁴.

It is well known that the pressure development in the bladder, the strongness of the detrusor contraction and the duration of the high detrusor contraction are crucial for the longterm outcome of the urinary tract. Reflex voiding is based on an unphysiologic sacral reflex and its use by triggering the reflex several times a day is a potentially dangerous procedure with a limited role in spinal cord injury patients. Deterioration of bladder function and form, hydronephrosis and renal impairment have been described¹⁵. Therefore urodynamics should be performed in all patients starting or continuing with triggered voiding.

In continence is a problem in many patients on triggered voiding due to spontaneous contractions of the bladder between triggering episodes. Bladder relaxing drugs may be tried but external appliances are often necessary. If the outflow obstruction remains a problem surgery e.g. sphincterotomy to relieve the obstruction may have a role. Eighty percent of patients who develop reflex voiding and require an external urine collecting device for control of incontinence have chronic or recurrent bacteriuria¹⁶.

The working group on Conservative Management in the Neuropathic Patient of the 1st International Consultation on Incontinence, have summarized indications and contraindications¹⁰. The indication must be based on (video-)urodynamics to find out whether the urodynamic situation is safe: one should elicit an adequate detrusor contraction with bladder pressures less than 70-80 cm H₂O in males and 40-60 cm H₂O in females resulting in balanced voiding. In addition triggered voiding can be recommended for patients after sphincterotomy/bladder neck incision, in order to support/improve spontaneous reflex voiding. The patient who can achieve balanced voiding by this way and in whom a good solution can be found for reflex incontinence is the best candidate.

Triggered voiding is not recommended if there is no adequate detrusor contraction (too low, too high, too short, too long), if it results in unbalanced voiding, if vesico-uretero-renal reflux is present, if in the male a reflux in the seminal vesicles or in the vas is present, if there is uncontrollable autonomic dysreflexia or if recurrent urinary tract infection persists.

Bladder Expression

Bladder expression comprises various manoeuvres aiming at increasing intravesical pressure in order to enable/to facilitate bladder emptying. Bladder expression has been recommended for a long time for patients with so-called lower motor neuron lesions, resulting in a combination of an underactive detrusor with an underactive sphincter or with an incompetent urethral closure mechanism of other origin.

The most commonly used maneuvers are the Valsalva (abdominal straining) and the Credé (manual compression of the lower abdomen) manoeuvre. Clinical experience has shown that by bladder expression many patients are able to empty their bladders, albeit mostly incompletely. Urodynamics/vidéourodynamics have demonstrated that despite high intravesical pressures, created by these manoeuvres, the urinary flow may be very poor and residual urine present. Difficulty in emptying the bladder this way may be due to contraction of the external sphincter and/or inability to open the bladder neck¹⁷. Especially in patients with complete flaccid paralysis of the musculature of the pelvic floor, these manoeuvres induce a mechanical obstruction at the level of the striated external sphincter. Voiding-cystourethrogram shows a typical bending, deformation and narrowing of the membranous urethra at the level of the pelvic floor induced by pushing downwards¹⁸. This narrowing cannot be recognized by a retrograde urethrogram, nor felt by catheterization, nor is it visible endoscopically. Clarke and Thomas¹⁹ studied static urethral pressure profiles in paraplegics with an acontractile bladder and showed that the urethral pressure in all flaccid male paraplegics investigated was much higher at the external sphincter than at the bladder neck. It was largely abolished by alpha-blockers. Their conclusion was that in flaccid male paraplegics the major component of urethral resistance is a constant, adrenergically innervated muscular resistance in the distal intrinsic urethral sphincter. Alpha-blockers, if effective, usually increase urinary stress incontinence²⁰.

With increasing time more than 40 % of the patients show demonstrable reflux into the prostate and the seminal vesicles, and other complications due to the high pressures during the Valsalva or Credé manoeuvre. These unphysiologically high pressures may also cause reflux to the upper urinary tract with all known consequences.

Bladder expression may only be recommended for patients with an underactive detrusor with an underactive / incompetent sphincter mechanism. It must be clear that sphincter-hyperreflexia and detrusor-sphincter dyssynergia are contraindications for bladder expression. There is one exception, when used in the reflex bladder together with the anal sphincter stretch described by Low and Donovan¹⁴: by inserting one or two gloved fingers into the anal canal and then stretching the anal sphincter, the external urethral sphincter relaxes and voiding is then achieved by abdominal straining. Bladder expression is contraindicated if it induces a high intravesical pressure. Moreover, an existing vesico-uretero-renal reflux, reflux into the male adnexa, hernias and haemorrhoids as well as urethral pathology and symptomatic UTI's are contraindications.

Condom catheters

Condom catheters (external catheters) aim at collecting leaking urine into a device. They will prevent spilling of the urine and give better hygienic control, better control of unpleasant odour and a better quality of life. Due to the fact that they are not invasive, they permit prevention of most of the complications related to indwelling catheters. Old versions of the currently used condom catheters are reusable devices fitted rather loosely around the penis. They are still preferred by a few paraplegics who have been accustomed to them for a long time, especially those with a retractile penis. They are also still used in developing countries due to low cost.

More modern condom catheters are thin conical shaped sheaths reinforced at the tip to prevent kinking and twisting. They are made of rubber, latex, silicone or other plastic material. They fit over the shaft of the penis towards the penoscrotal junction. Their tips are open and connected with the tube of a urinary collecting device.

With a smaller and/or retractile penis and/or abundant pubic fat difficulties of fixation may occur. To overcome this inconvenience, different sizes of condom catheters and different means of adhesion of the sheath to the penis have been manufactured. The implant of a penile prosthesis may be a possible solution for those with a retractile small penis. In the recent years special condoms and special devices allowing urethral catheterisation without removing the condom have been manufactured. However, the clinical experience is still limited.

Although the advantages of condom catheters over indwelling catheters and incontinence pads are evident, they are not without problems and complications, sometimes severe. Newman and Price found bacteriuria in more than 50 % of patients using a condom catheter²¹. One of the factors correlated with increased risk for UTI was change of condom less than daily²².

Lesions of the penis can be secondary to mechanical damage to the skin from an excessively tight condom worn for prolonged time. Preventive measures are to discontinue the use of the condom during some part of the day, especially at night, and to replace them with bottle urinals or another appliance. Another common cause of skin lesions is allergy to the material of the condom, usually to latex. This kind of allergy is well documented in patients with long-term use of latex products, especially in myelomeningocele patients and in patients with spinal cord lesion. In severe cases, it caused life

threatening episodes of intraoperative cardiovascular collapse²³. In case of latex-allergy the best prevention is to use a latex-free (silicone, vinyl, etc.) condom catheter.

In conclusion: a condom catheter may be indicated in male spinal cord lesion patients with urinary incontinence provided that they have no penile lesion and their intravesical pressures during storage and voiding are urodynamically safe. No absolute contraindications for such appliances seem to exist¹⁰.

Penile clamps are not recommended for patients with neuropathic voiding dysfunction today due to the danger of skin and urethral lesions.

Electrical stimulation

The aim of electrical stimulation may be to modulate LUT dysfunction or to directly induce a therapeutic response.

Non-invasive electrical therapy for neurogenic LUT dysfunction comprises mainly of neuromodulation for detrusor hyperreflexia and intravesical electrostimulation for the hyposensitive and hypocontractile detrusor.

There are two main effects of therapeutic electrical stimulation of pudendal nerves: sphincter activation and bladder inhibition. Bladder inhibition can be achieved in various ways: by direct stimulation of the sacral roots or of the pudendal nerve itself or indirectly by stimulating its branches either transcutaneously via the dorsal penile/clitoral nerve, via the anal or vaginal mucosa activating its branches in the pelvic floor musculature or by stimulation of segmental afferent nerves. The general principle is to activate artificially normal inhibitory reflexes.

In 1986 Vodusek and Light²⁴ described strong detrusor inhibition induced by stimulation of pudendal nerve afferents and demonstrated the effects in patients suffering from detrusor hyperreflexia after suprasacral spinal cord injury. The complex nature of the central nervous control of micturition implies numerous possible explanations of the therapeutic effects.

The inhibitory effect on the urinary bladder is mediated by activation of pudendal afferents resulting in hypogastric nerve stimulation, direct inhibition of the pelvic nerve outflow and also by cortical inhibition as shown by Jiang²⁵ and by Oliver et al²⁶.

For detrusor inhibition short-term maximal electrical stimulation is applied in clinic or later as a home treatment programme. Short-term stimulation usually consists of a series of 20-30 minutes sessions, once or twice a day. To elicit optimum bladder inhibition a stimulation frequency of 5-10 Hz and a pulse duration of 0.2 ms have been found most efficient, with intensity below the pain-threshold if sensation is present. Clinical experience has shown that this type of stimulation has a certain re-education or carry-over effect, which implies that the effect of stimulation has a longer duration than the stimulation itself. This might be due to long-term potentiation for which Jiang has demonstrated a neuropharmacologic basis¹⁸.

The efficacy of stimulation, the inhibition effect, is dependent on the proximity of the electrode to the appropriate nerve, the number of nerve branches activated and whether specific branches are stimulated. Direct stimulation of the pudendal nerve is more effective than stimulating its pelvic floor branches via the vaginal or anal mucosal surface.

According to the findings of Nakamura and Sakurai the transcutaneous access to the pure sensory, dorsal penile or clitoral nerve, using clip electrodes in the female and ring electrodes in the male would be preferable²⁷ (transcutaneous electrical nerve stimulation of the pudendal nerve = TENS-P).

If non-invasive electrical neuromodulation fails, invasive sacral neuromodulation should be considered. This will not be discussed in this manuscript.

Intravesical electrostimulation (IVES) is not a new technique. Already in 1878 the Danish surgeon Saxtorph recommended IVES to treat patients with urinary retention²⁸. In 1899 two surgeons in Vienna, Frankel-Hochwart and Zuckerkandl, reported that „faradisation“ intravesically was much more effective than the transcutaneous technique²⁹. The method was rediscovered by Katona et al. in 1959 as a method to treat weak detrusor contractility in children with myelomeningocele³⁰. Although several studies reported good results, the procedure has not been generally accepted for a long time. The scepticism was caused possibly by a lack of theoretical background and a scarce clinical documentation.

In animal experiments Ebner et al proved that IVES induced reproducible detrusor contractions at volumes below micturition threshold³¹. The contractions elicited were reflex responses. From the characteristics of the afferent discharge measured on the posterior sacral roots during IVES these authors proved that this technique involves an artificial activation of bladder mechanoreceptor afferents of the A-delta type, known to be responsible for the normal micturition reflex. The increase of the afferent input increases also the efferent output to the bladder. Prerequisites for successful IVES are incomplete nerve lesions where at least some afferents have remained intact, the mechanoreceptors must be intact, the detrusor must still be able to contract and it needs a cerebral cortex able to percept afferent stimuli. Indications can be found amongst children with congenital neurogenic detrusor dysfunction and amongst adults with incomplete spinal or peripheral neurologic lesion. The advantage of IVES is that there are no side effects. The disadvantages are that IVES needs a specialized personnel, although home treatment is possible. It is very time consuming. Moreover there is no simple investigation of predictive value, but the presence of cortical evoked potentials with electrical stimulation of the bladder neck, indicating

functioning afferent fibres from the bladder to the cortex, is helpful. IVES on a more chronic basis is necessary in 70% of patients with neurogenic bladder dysfunction³².

Intermittent catheterization

The use of catheters for bladder emptying dates back to many thousands of years.

Intermittent catheterization (IC) and selfcatheterization (ISC) have become properly accepted during the last 40 years.

The general aims of IC and ISC are to empty the bladder and to prevent bladder overdistension in order to avoid complications and to improve urological conditions. The main indication is inability to empty the bladder adequately due to conditions which may be neuropathic.

Many studies show good results both in the acute stage as in the long-run. Therefore, IC and ISC are nowadays the methods of choice recommended for the management of neurologic bladder dysfunction¹⁰.

Many types of catheters are used. Choices depend on availability and cost. In developing countries where IC has become very much accepted, limitation of resources is still a problem¹⁰. Also the material has an important role i.e. silicone/plastic is needed if latex allergy exists. Silicone/rubber/glass/stainless steel are alternatives if the catheter is reused³³. Size 10-14 Fr for males and 14-16 for females are preferable but bigger sizes may be necessary when urine is very cloudy and after bladder augmentation.

If the decision is made to treat with IC or ISC patient's education is of utmost importance. They should learn a proper technique and should have a chance to discuss with their physicians or nurses about specific questions and problems encountered. The basic principles of good catheterization should be used: Catheterization must be atraumatic and with necessary precautions to prevent infection.

To be atraumatic the catheterization has to be done with a normal size catheter, with a good quantity and type of lubricant, with a good and gentle handling of the catheter. For the latter, sufficient hand function is necessary if ISC is recommended.

To prevent infection the meatus should be cleaned and a clean and preferably sterile or resterilized catheter should be used. The catheter must be handled in a way to keep it clean during the introduction into the bladder. The bladder has to be emptied completely. A frequency of catheterization between 4- 6 times a day has proved to be optimal if normal drinking habits are used.

ISC in the chronic stage after spinal cord lesion is done in a clean non sterile way that is applicable in most places.

IC and ISC are very good techniques but complications can occur and should be looked for. Urinary tract infection in patients on chronic ISC has a prevalence of 13.6 infections per 1.000 patient-days³⁴. Genito-urinary complications as urethritis, epididymo-orchitis are rare³⁵. Prostatitis is underestimated and probably has a prevalence around 5 % to 18 %³⁶. Urethral bleeding is frequent. False passage, meatitis and meatal stenosis are rare. Urethral strictures in male patients increase in prevalence with longer follow-up³⁷.

IC and ISC seldom stand alone. Their use together with drugs can overcome incontinence and recurrent infections.

It is mandatory to have a regular follow-up and this includes urodynamic investigation even if the patient is continent and infection free because the neuropathy can silently cause LUT deformities with impact on the upper urinary tract.

IS and ISC are not possible in all patients. Some have poor hand function and no relative to perform the catheterization. Unwillingness of the patient, high cost, lack of knowledge from carers, persistent incontinence, general bad condition or difficulty to reach the meatus can be reasons why ISC is not practical. In many cases these problems may be overcome with proper treatment and education. However in some cases an indwelling catheter will be used.

Indwelling catheters

Transurethral and suprapubic catheters have been used since long. The dangers of the techniques have been well documented and the complications are well known.

If they are used it is very important to apply good rules of indwelling catheter management. A catheter size of 12-14 Fr is recommended to avoid blocking of the urethral lumen and still permitting a good outflow of urine. The catheter should be properly introduced with the balloon positioned in the bladder: it is important to be especially careful in the presence of a spastic sphincter. The outflow should be controlled regularly to avoid overdistension of the bladder. The catheter should be changed regularly several times a week in an acute situation, every 10 days in a more chronic clinical setting, every 4-6 weeks in a chronic patient who has little complications³⁸.

Anticholinergic drugs may be important in patients with bladder hyperreflexia to prevent the development of small contracted bladder. Antibacterial drugs should not be used to prevent or to treat an asymptomatic infection of the urine³⁹. With an indwelling catheter the prevalence of infection is 100% if the catheter is used for more than a couple of weeks⁴⁰. In case of symptomatic infection treatment is necessary.

Suprapubic fine bore catheters may be preferable especially in the male patient as it leaves the urethra open¹⁰. But urinary tract infection develops in all patients if the suprapubic catheter is used for more than 5 to 7 weeks⁴¹.

There is no general agreement on clamping the catheter for bladder training. It was aimed to prevent a contracted bladder, to condition a time-related reflex pattern and to increase patient awareness of bladder function⁴². However this technique is not well accepted in neuropathic patients due to infection, unawareness of overdistention during the acute stage and leakage around the catheter in chronic spastic bladder. In cases of severe incontinence unsuccessfully treated with drugs a continuous outflow is not seldom the only possible solution. If clamping is considered it is needed to avoid bladder spasticity with drugs or other treatment. Complications are frequent. The permanent catheters can cause acute septic episodes, urethral trauma and bleeding, false passages, strictures, diverticuli and fistuli of the urethra, bladder stones, squamous cell bladder carcinoma, epididymo-orchitis and prostatitis⁴³⁻⁴⁴. With good daily care many of these can be avoided. The role of education is obvious.

The presence of an indwelling catheter should be known to all who take care of the hospitalized patient: OT, PT and of course the nursing staff.

Pharmacologic treatment

Drugs are used for many different indications in patients with LUT neuropathy. Bladder relaxant drugs, bladder afferent blocking drugs, drugs to influence the urethral resistance are an important part of treatment¹⁰. New drugs are developed at a regular basis trying to overcome shortcomings in specificity, complications and side effects. The topic will not be discussed further in this manuscript.

Conclusion

The conservative treatment of the neurologic bladder in patients with a spinal cord lesion has seen quiet some evolution during the last century. Some techniques like triggered voiding and bladder expression have lost their predominant position. Intermittent catheterization is now accepted to be the method of choice if applicable. The treatment however must be based on a clear diagnosis of the urodynamic function, the patient's personal abilities and wishes. Treatment must first of all aim at keeping the patient alive but can now with the existing possibilities give ample attention to the life's quality.

Table 1 : types of neurologic dysfunction of the lower urinary tract after spinal cord lesion, the urodynamic data and treatment modalities.

Types of neurologic bladder and sphincter dysfunction	Urodynamic data	Possible treatment modalities
Hyperreflexia of detrusor and sphincter Former: <i>Upper motor neuron bladder</i>	Detrusor involuntary contractions + sphincter dyssynergia Reflex incontinence Residual urine	Intermittent (self) catheterization Bladder relaxing drugs Electrotherapy External appliances Triggered voiding Indwelling catheter
Detrusor areflexia with sphincter areflexia Former: <i>Lower motor neuron bladder</i>	No activity in detrusor or sphincter Stress incontinence Residual urine	External appliances Bladder expression Drugs Surgery
Detrusor areflexia with sphincter hyperreflexia	Overflow incontinence Urinary retention	Intermittent selfcatheterization Indwelling catheter
Detrusor hyperreflexia with sphincter areflexia	Reflex incontinence and stress incontinence	Bladder relaxant drugs Electrotherapy External appliances Surgery

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Incontinence in patients with spinal cord lesions: an update

Prof Dr JJ Wyndaele

The innervation of the lower urinary tract is very elaborate. It consists of central pathways and neurones from cortex to cauda, of several peripheral nerves through which run autonomic and somatic potentials both afferent and efferent. Its composition permits to use a main involuntary system with a difficult social pattern through voluntary action.

At birth, this neuro-urological unit works differently than in adults. During the first months of life it acts mainly with spinal reflexes without too much integration of sensation. Bladder contraction occurs 20-24 times a day and micturition is complete due to a flaccid relaxation of the striated sphincter. Between 6 months and 4 years children learn to put a voluntary control onto these structures permitting an increase in bladder volume, a lowering of the frequency of micturition and "continence". This situation continues during a normal adult life and gets minor disturbances during a normal ageing process.

The important medullar levels are

1. T10-L1 for the orthosympathetic pathways (OS) responsible for the bladder filling through the noradrenergic modulated relaxation of the detrusor muscle and the noradrenergic modulated contraction of the bladder neck
2. S2-S4 for the parasympathetic pathways (PS) responsible for the micturition through the acetylcholine modulated bladder contraction
3. S2-S5 for the somatic striated external sphincter.

It is obvious that such an innervation can be harmed without great difficulty: neuro-urological pathology has a high prevalence.

Spinal cord lesions are amongst the pathological conditions with have been studied most. The knowledge related to it is extended.

Depending on the level, extent and completeness of a lesion the impact on the lower urinary tract will be different.

Two main types of lesions are recognised: those with destruction of the PS motor neurons and those where these motor neurons have been saved but where the cerebral control has been interrupted. The terminology Upper and Lower Motor Neuron Lesion has been gradually abandoned for a more clear description of the functions found: areflexia or hyperreflexia.

Apart of the detrusor function also the function of the bladder neck and of the striated sphincter are described: synergic with the detrusor contraction, dyssynergic, flaccid paralysis etc.

Intermittent catheterization

Prof Dr JJ Wyndaele

The use of catheters for bladder emptying dates back to many thousands of years.

Intermittent catheterization (IC) and selfcatheterization (ISC) have become properly introduced during the last 40 years.

The general aims of IC and ISC are to empty the bladder and to prevent bladder overdistension in order to avoid complications and to improve urological conditions. The main indication is inability to empty the bladder adequately due to conditions which may be neuropathic or other.

Many studies show good results both in the acute stage as in the long-run.

IC and ISC are nowadays the methods of choice recommended for the management of neurologic bladder dysfunction¹.

Many types of catheters are used. The choice shall depend on availability and on cost. Also the material can be important f.e. if allergy exists (latex). Size 10-14 Fr for males and 14-16 for females are preferable but bigger sizes might be necessary if urine is very cloudy as after bladder augmentation.

IC in the hospital can be done by nurses or by the patients as soon as they are able to do it.

A sterile non touch technique is used in special conditions. ISC is done in a clean non sterile way which is applicable in most places.

If the decision is made to treat with IC or ISC patient's education is utmost important. He should learn the technique properly and should be able to talk to his physician or nurse about specific questions and problems encountered.

The basic principles of good catheterization should be used: Catheterization must be atraumatic and with necessary precautions to prevent infection.

To be atraumatic the catheterization has

1. To be done with a normal size catheter
2. With a good quantity and type of lubricant
3. With a good and gentle handling of the catheter.

To prevent infection

1. The meatus should be cleaned, if possible
2. A clean and preferably sterile or resterilized catheter should be used
3. The catheter must be handled in a way to keep it clean
4. The bladder has to be emptied completely
5. A frequency of catheterization between 4- 6 times a day has proved to be optimal

IC and ISC are very good techniques but complications can occur and should be looked for:

- Urinary tract infection: in patients on chronic ISC a prevalence of 13.6 infections per 1.000 patient-days on ISC has been found².
- Genito-urinary complications as urethritis, epididymo-orchitis are rare. Prostatitis is probably underestimated and is thought to have a prevalence around 5 % to 18 %^{3,4}.
- Urethral bleeding is frequent. False passage, meatitis and meatal stenosis are rare. Urethral strictures in male patients increase in prevalence with longer follow-up⁵.

IC and ISC stand seldom alone. Their use together with drugs can overcome incontinence and recurrent infections.

It is mandatory to have a regular follow-up and this includes urodynamic investigation even if the patient is continent and infection free. Bladder pressure is very important for the upper urinary tract.

In developing countries IC has become also very much accepted but limitation of material can be a problem.

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Neurophysiology and neuropathology of neurogenic bladder dysfunction

Prof Dr JJ Wyndaele

The innervation of the lower urinary tract is both an interesting and a difficult part of the knowledge of the urinary tract. Its combined activity of autonomic and somatic nerves is important. Its central control makes a "voluntary" working of a mostly "autonomic" system possible, adapted to daily living. The increasing knowledge of neurotransmitters, of afferent system, of neuroplasticity improves the understanding of gray zones. The evolution in diagnostics and in treatment modalities is reconforting for the clinician. The fact that all these evolutions and all this energy have improved the life expectancy of patients with a neurological problem of the lower urinary tract dramatically make all involved happy. But there is still a lot of work to do.

Overview of the normal neurology of the lower urinary tract LUT

The innervation of the lower urinary tract is manifold. Sympathetic, parasympathetic and somatic nerves are involved.

Neuropharmacological studies and studies on receptors and transmitters have given an incomplete but easy to use scheme for daily practice. The innervation of the LUT counts sensory and motor nerves.

The sensory system is related mainly to free nerve endings in the bladder wall and to receptors which are linked to at least two types of nerve fibres: Adelta and C. The latter would play a role in the conduction of afferent potentials from nociceptive origin while they would also become active after a spinal lesion has interrupted the normal pathways.

Three peripheral nerves are involved in LUT innervation

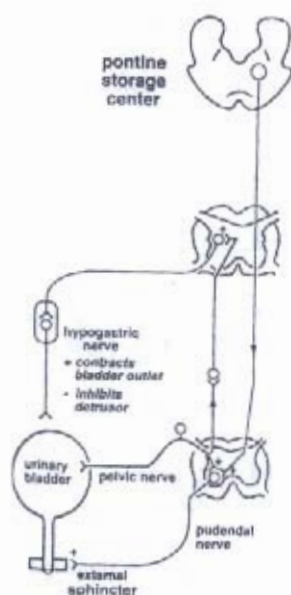
- The hypogastric nerves with medullar location at T12-L1 and involved in first sensation of filling and the orthosympathetic innervation.
- The pelvic nerves, medullar S2-S4, which are involved in the first desire to void and the parasympathetic innervation
- The pudendal nerves, S3-S5, involved in the sensation of bladder fullness "strong desire to void" and the voluntary activity of the pelvic floor muscles and the external striated sphincter as part of it.

Elbadawi and others have shown that a special distribution exists of neuroreceptors in the LUT.

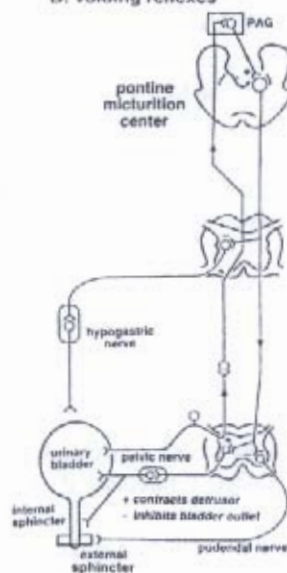
receptor	location	neurotransmitter	function
alpha	Bladder neck	noradrenaline	Closing bladder neck
beta	Bladder wall	noradrenaline	Relaxing bladder
muscarinic	Bladder wall	acetylcholine	Contraction bladder

This has permitted to accept that the OS system is mainly involved in bladder filling and that the PS system is mainly involved in the micturition. The higher neurologic system has several pathways in the spinal cord, the brainstem and the brain.

A: storage reflexes



B: voiding reflexes



This schematic overview is far from complete concerning the actual knowledge but it is not intended to be complete. It wants to give data that permit to understand easily and thus to be usable in daily practice. It becomes clear that a neurologic lesion can cause great disturbance in the LUT functions.

Overview of neuropathy of the LUT

If the innervation of the LUT is damaged, this can affect the detrusor, the urethra and the sphincter. Often the lesion is combined. Madersbacher has developed a schematic overview of types of neurologic LUT dysfunction and their related treatments, overview which is given later on in this text.

Many causes for lesion of the neurologic control of the LUT have been seen:

Central: neurotrauma, brain tumor, cerebrovascular accident, meningitis-encephalitis et al

Medullar: spinal cord trauma, vascular event, tumor, infection, multiple sclerosis, meningocele and many more

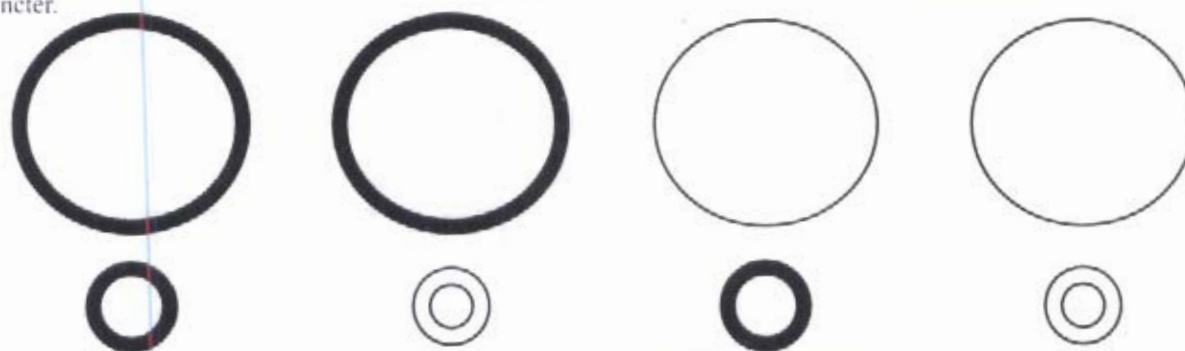
Peripheral: neuropathy from alcohol, from diabetes, important surgery in the pelvic region et al.

The occurrence of the neurologic defect can thus be abrupt or slow, from birth or happening somewhere during life. A neurologic lesion can be evolving or stable as far as its clinical signs are concerned.

All these factors will play a role in the management of the LUT neuropathy.

Figure 1 gives the types of neurologic bladder as described by Madersbacher

Heavy lines represent hyperreflexic, thin lines hypo-/areflexic structures. On top the detrusor, on the bottom line the sphincter.



Apart of these types also activity of the bladder neck has to be evaluated. Sensation can be present or absent. This can be important for the treatment.

Another way of typing the neurologic bladder is by giving a summary of all known urodynamic data including those from a clinical examination, neurological testing and radiologic investigation.

Such a scheme can be

Detrusor: hyperactive (unstable or hyperreflexic), hypoactive, areflexic, normal Compliance normal, low or high

Bladder neck: normal, open during filling, closed or even contracting during micturition (dyssynergia)

Striated sphincter: normal, unstable, acontractile, hyporeflexic, dyssynergic

Sensation of filling: normal, absent, hyposensitive, hypersensitive

Neurological lesion of the spinal cord: complete, incomplete

Radiologic: vesicoureteral reflux, bladder trabeculation and diverticula, inflow in prostate gland and more.

Introduction to treatment

The treatment of the patient with a neurogenic bladder has different aims:

- To empty the bladder regularly and completely
- To keep the intravesical pressure low during filling and micturition
- To avoid infection of the lower urinary tract
- To avoid other complications as lithiasis, reflux, kidney problems
- To keep the patient continent
- To achieve a state of "balanced" bladder which permits a good quality of life

The therapy can consist of several things

1. Reeducation
2. Physiotherapy
3. Drugs
4. Catheterization

5. External appliances

6. Surgery

Depending on the combined disorders of detrusor and sphincter the following very general guidelines can be put forward. One must however bear in mind that treatment of a patient with a neurologic bladder dysfunction is and has to be very individual thus adapted to the patient's possibilities and needs:

Hyperreflexic detrusor with spastic sphincter:

The main possibilities are triggered voiding, intermittent (self)catheterization + bladder relaxant drugs or electrotherapy, surgery and condomcatheter, indwelling catheter.

Areflexic detrusor with areflexic sphincter

Bladder expression, external appliances, surgery are amongst the possible ways of treatment

Areflexic detrusor with spastic sphincter

Intermittent catheterization. Indwelling catheter.

Hyperreflexic detrusor with areflexic sphincter

Bladder relaxant drugs, electrotherapy of the pelvic floor. Surgery, appliances

This topic will be fully discussed during the course.

Urodynamics: terminology, technique and interpretation

Urodynamic investigations are very important in the diagnosis of pathology of the lower urinary tract and in the follow-up of its natural evolution and of its treatment.

In the attached file on methods for urodynamic investigations are given details of techniques for uroflowmetry, cystometry, urethral pressure profile and electrosensation determination.

Not all techniques have an equal value in each patient and to decide what has to be done in what patient is mandatory for a most direct and complete diagnosis.

Let us not forget that diagnosis starts with a proper history taking which should include actual complaints and signs, cause and type of neurological lesion which should include level of spinal cord lesion and completeness in spinal cord lesioned patients, previous history and family history. In non acute patients drinking and food habits, drug intake should be asked for.

Neuropathy of the LUT is not seldom caused by pathology of nerves that are also involved in bowel function and in sexual function, which thus should also be asked for.

A clinical examination is mandatory including evaluation of the perineal sensation and of the lumbosacral reflexes related to LUT innervation. Voluntary contraction of anal sphincter and /or pelvic floor can indicate that a lesion is motor incomplete.

An urine analysis is needed to permit proper interpretation of the results.

The methodology of cystometry does not need to be very sophisticated. A correct interpretation of what is measured is much more important. The basics of urodynamics is: to measure what happens in the LUT in a way that is representative of the patients daily situation and permitting to reproduce his symptoms and signs.

The wealth of information which can be gathered with video urodynamics is great but not available to everyone. A simple one line water type cystometer can give valuable basic information too in countries where possibilities are limited.

Figure showing one line cystometer.

Terminology

Has been well described in the proposals for standardization of the International Continence Society. Some will be given here.

Uroflow:	Qmax= max volume voided in a second
	Q average= average volume voided in a second
	Voiding time = time of voiding
	Voiding volume = volume voided
Cystometry:	First sensation of filling
	First desire to void
	Strong desire to void
	Cystometric capacity = volume in the bladder when cystometry had to be stopped
	Bladder overactivity = detrusor contracts unvoluntary during filling
	Compliance of the bladder = n ^o ml needed to increase the intravesical pressure with 1 cm H ₂ O
	Max detrusor pressure
	Volume at first overactive contraction
	Volume at leakage

Pressure at first leakage
And many more.

Let us never forget

1. Data from technical urodynamics are not the only information we need: diagnosis is made from all data including observations by patients and carers
2. CORRECT INTERPRETATION OF URODYNAMIC CURVES NEEDS CLOSE VIEW, CRITICAL EVALUATION
3. pitfalls are frequent and can completely mismatch diagnosis
4. the proper purpose of urodynamic tests is to try to reproduce the complaints or signs the patient brought to consultation. Not unfrequently data unrelated to the complaints are of no consequence and thus need not to induce overenthusiastic reactions.

Surgical Management of The Neuropathic Bladder.

Mr. Gurpreet Singh, Consultant Urologist

Spinal cord injury is a formidable non-fatal event with serious consequences both to the patient and his family. A balanced well-managed bladder is instrumental in reducing both morbidity and mortality in patients with such profound disability.

The primary goal in neuropathic bladder management remains preservation of the upper tracts and protecting renal function and to this end all conservative and surgical treatment should be directed. Surgical management should be directed towards the functional abnormality within the bladder and this includes either a neuropathic overactive detrusor or detrusor sphincter dyssynergia or sphincter weakness incontinence.

Enterocystoplasty remains the gold standard in management of the hypocompliant and the over active detrusor; it provides an increase in functional bladder capacity, a reduction in detrusor pressure and protection of the upper tracts. 78 Patients with neuropathic bladder dysfunction have undergone a cystoplasty, the results including a continence rate of over 90%, complications and consequences will be presented.

An AMS artificial urinary sphincter remains the main stay in the management of the neuropathic bladder with sphincter weakness incontinence. Our results, which include an artificial sphincter implantation in 90 neuropathic patients, will be presented, a continence rate of over 90% is again achieved, and the outcome of sphincter implantation is discussed along with the failures and the complications. Also discussed is the role of combining an artificial sphincter implantation with a cystoplasty.

Continent and incontinent urinary diversion is another surgical hallmark in the management of the neuropathic patients. Our results following this procedure will be presented the complications and the different management protocols will be discussed here with.

Other procedures including Memokat insertion, a sphincterotomy, autoaugmentation etc will be discussed. Management of the neuropathic patient is a formidable challenge, decisions need to be discussed with the patient and the surgical results are gratifying.

Talk 2 – Urodynamics and its application to the neuropathic bladder

Urodynamics assesses the workings of the lower urinary tract. It is paramount that investigations should be done by the treating clinician and results interpreted in context to the clinical management of the patients. Investigations under the blanket of urodynamics include a frequency volume chart, uroflowmetry, a cystometry, video cystometrogram, urethral pressure profiles, EmG studies and ambulatory urodynamics. Video urodynamics are mandatory for investigating complex cases especially in neuropathic bladder dysfunction; these involve simultaneous radiological and cystometric analysis of the lower urinary tract.

Different types of neuropathic bladder dysfunction including neuropathic detrusor over activity, an atonic detrusor, detrusor sphincter dyssynergia will be discussed and the clinical application to patients defined.

Session XVIII

Panel Discussion - Challenges in Rehabilitation of Spinal Injuries in the Developing Countries

Session XIX

Traumatic Cranio Vertebral Junction Injuries

Dr. Rana Patir, Sr. Consultant Neurosurgeon, Sir Ganga Ram hospital, New Delhi

Anterior Cervical Fixation

Prof. Raj Bahadur, Head of Department Orthopaedics & Medical Superintendent, Chandigarh Medical College, Chandigarh, Punjab

Management of Cervical Spine Cord Injury with no Skeletal Abnormality

Dr. V. Jaiswal, Consultant Neurosurgeon, ISIC, New Delhi

Management of Thoraco-lumbar Fracture

Dr. Yash Gulati,

Sr. Consultant, Department of Spine Surgery, Apollo Hospital, New Delhi

Thoraco-lumbar fractures comprise of fractures of lower thoracic and upper lumbar spine. This is the second most common location of spine injuries. Thoraco-lumbar spine is peculiar in anatomy as well as neuroanatomy. It is a junction of relatively "splinted" thoracic spine and "unsplinted" mobile lumbar spine. Spinal cord ends at L1 and this area of spinal canal houses the conus medullaries and cauda equine. Where as complete injuries of spinal cord are usually irreversible, injuries of nerve roots have a great potential to recover. Thoraco-lumbar junction injuries therefore, need to be examined, investigated and treated with great care. Appropriate and timely treatment can lead to an 'ambulator' rather than 'wheel chair bound' patient.

But what is appropriate treatment? What is timely treatment?

There is controversy on every aspect of treatment of Thoraco-lumbar fractures including classification. Dennis gave the three-column concept and McAfee et al gave a classification based on the mechanism of injury. This classification helps in deciding the mode of treatment. Investigation include X-ray, C. T. Scan and MRI. C. T. Scan should be done for most cases unless the fracture is very trivial wedge fracture. One has to remember that even innocuous looking wedge fracture can, rarely, have a significant protrusion of bony fragment into bony canal. MRI should be done in all cases of Thoraco-lumbar fractures with no neurologic deficit. It is especially useful in Thoraco-lumbar fractures in children. Thoraco-lumbar fracture without neurological deficit. Wedge fracture usually can be treated with a brace unless there is severe wedging (more than 50%). Posterior stabilization may be considered in later care. But in Indian set up, it is very difficult to convince a patient to have surgery done for this type of fracture. Treatment of Burst fracture is very controversial. More than 50% canal compromise is better treated with indirect reduction by posterior instrumentation. Thoraco-lumbar fracture with neurological deficit One has to decide whether the injury is a two column injury or whether all the three columns unstable. There is controversy on decompression, approach for decompression and instrumentation for stabilization. Flexion, distraction injuries, chance fracture and translational injuries are often associated with severe neurological deficit. Posterior decompression and posterior stabilization preferably by pedicle screw system is the treatment of choice. There are proponents of both anterior and indirect posterior reduction for burst fractures associated with neurologic deficit. Where as posterior reduction is relatively easy and surgeon friendly, it is difficult to assess adequacy of reduction per operatively. Intra-operative myelography or ultrasound is a good option. Indirect reduction may be difficult in severely comminuted fractures or if surgery is delayed for more than two weeks.

Anterior reduction is direct, has less chances of causing further neurologic deficit and chances of fusion are enhanced. Cage with graft and anterior instrumentation can make the situation stable. However, if the posterior column is also disrupted, posterior stabilization may be added. However, anterior decompression is tedious, re-do surgery is difficult and there are chances of injury to vascular structures. Some surgeon try posterior indirect reduction first and go anterior if adequate decompression could not be achieved. There have been some reports challenging the need for decompression in T-1 fractures. It has been suggested that neurologic deficit occurs due to the energy of initial impact and immobilization allows gradual recovery. Remodelling of spinal canal occurs gradually. However, close scrutiny of these reports reveals a lot of flaws. As things stand, decompression of injuries associated with neurologic deficit may be in order. For treating Thoraco-lumbar fractures one has to understand the mechanism and type of injury. Decide whether the fracture is stable or unstable. Need for decompression and stabilization has to be decided on an individual basis in each case.

Sexual Management of Spinal Cord Injured Patients

Dr. Dinesh Suman, Urologist, ISIC, New Delhi

Sexuality of persons with spinal cord injury has received increasing attention especially in the Western world. However, in the Indian context, focus and awareness regarding the sexuality of the disabled has been scarce. Health care professionals tend to neglect it due to their insensitivity to the sexual needs of the disabled, and a lack of understanding and expertise in this area. Patients themselves have a negative self concept and a low esteem; and this affects their attitudes towards sexuality and sexual behaviour.

With growing awareness, need for a multidisciplinary approach towards the rehabilitation, with added focus on sexual rehabilitation is already being realized. Improving the understanding and expertise of the specialists, greater role for nurses and peer counsellors, value of group counselling sessions and sharing of personal experiences amongst the patients themselves have emerged as valuable tools. Methods of intervention must suit the individual's personal, social and cultural background, and also be affordable. Early sexual rehabilitation at about 6 months after injury, with the involvement of the sexual partner in the session has been realized to have positive impact.

During the presentation, sexual dysfunction among the spinal cord injured patients, its epidemiology, socio-cultural and ethical aspects along with clinical assessment and treatment options shall be discussed. The need for education and information dissemination shall also be highlighted.

Sexual Rehabilitation of the male SCI Patients - Modalities of Treatment for Infertility & Impotence - A single centre

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Introduction : Sexual Rehabilitation is an integral part of total rehabilitation of the SCI. It is most often ignored. There are two aspects of the sexual disability involved. Male Infertility & Erectile Dysfunction. The infertility is because of ejaculatory dysfunction which is secondary to neurogenically dysfunctional bladder neck and also because of inability to deposit ejaculate intra-vaginally due to erectile dysfunction which itself is secondary to the SCI. Advances in the fields of Infertility and Impotence can solve both problems.

Aims

1. To describe the modes and modalities of treatment available and applicable in our society today for MI and ED in the SCI.
2. To present the preliminary experience.

Procedures described

1. (Audio Visual) Electro-Ejaculation for Intra Uterine Insemination (IUI)
2. Testicular Sperm retrieval for Intro Cytoplasmic Sperm (ICSI) with IVF
3. Intra-Penile Self Injection of Vaso-Active Drugs for Erection.
4. Other relevant procedures and their applicability are explained.

Preliminary Data

86 males with SCI were counseled for their andrological problems, their needs for sexual rehabilitation, % of them who opted for treatment and the outcome.

Discussion

The demands for physical and vocational rehab in our social set up are very high. Hence the patients are concerned medical personnel tend to ignore the sexual needs. If both become aware of treatment modalities available, then there can be an attempt to overcome the problems. Psychosexual counseling of the couple, understanding their priorities in life can decide a suitable modality of treatment for sexual disability. Awareness of the treatment options is necessary for correct guidance.

Conclusion

Sexual rehab is necessary a part of total rehab of the SCI. The treatment is available. The therapist has to be well informed to guide the patient and allow him to choose the option.

AQUATIC THERAPY OR HYDROTHERAPY

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Indian Spinal Injuries Centre, New Delhi

Use of water for treating various conditions is not new. Physiotherapist has been using water for years. The Indian spinal injuries centre uses a heated swimming pool for providing water therapy to patient. Water is an ideal medium in which to learn normal movement patterns. The movements that are extremely painful outside water can be done in water with minimum pain or without any pain. Aquatic therapy is easy and effective and a fun, comfortable way to increase your flexibility and strength without risking injury. The water's buoyancy and warmth is gentle and soothing to your joints while taking pressure off your knees, hips, and back. Water lessen joint stress, but provides enough resistance to build serious muscle strength. Running and walking in water and floating gives more benefits than any other activity known.

INVENTION

Hydro is thought to have been an invention of the ancient Greeks, especially by athletes and after major sports competitions.

WHAT IS IT?

The term Hydrotherapy is derived from the Greek words. Hydro-water and Therapeia-Healing. Hydro – or aquatic therapy is a method of using the physical aspect of water for medical and relaxing treatments. Water has proved its medical significance for a very long time. The up – thrust or buoyancy is used for reducing the pressure effect of gravity on the skeletal structure. The human body reacts to the increased hydro-static pressure by dilating the arterial blood vessels. The resistance or drag of the water is a property which is used for muscle strengthening. The force speed relationship obeys the rules of is kinetic training of muscle power.

WHY HYDROTHERAPY THE BASIC ADVANTAGES

- Hydrotherapy offers an early start in a (muscular) re – education program .
- Hydrotherapy offers treatments which are otherwise impossible .
- Hydrotherapy offers treatment of impairments like pain , decreased ROM, decreased strength , and stiffness .
- Hydrotherapy offers treatment of disabilities like change of position , holding a posture and walking .
- The combination of treatments of above mentioned impairments and disabilities using hydrotherapy is beyond comparison .
- Hydrotherapy automatically improves cardio - vascular and respiratory function.
- Hydrotherapy positively influences overall as well as local metabolism .
- This reduces arousal, pain and stiffness .
- Hydrotherapy has therapeutic , prophylactic and cosmetic effects .
- Hydrotherapy can easily be adapted to patient – specific needs and can simply be applied in a progressive way, from non – weight-bearing to a full-weight-bearing programme.
- Hydrotherapy offers the possibilities to handle even the very heavy patients with great ease .
- Specific hydrotherapy techniques and leisure activities can easily be combined to increase compliance of the patient.
- The patients is warm throughout the session.
- The physiotherapist can observe the total body and check e.g. body alignment .

Hydrotherapy is very useful in postoperative rehabilitation programme to reduced pain, increase mobility and accelerate the curing process. Hydrotherapy is very useful in various Orthopaedic and Neurological condition like Arthritis, stiff shoulder, post fracture stiffness, back pain, multiple sclerosis, polio, ankle sprain, Haemotoma, Rheumatoid arthritis etc.

This paper will describe: -

- What is hydrotherapy?
- Principal and properties of water.
- Dimension of hydro pool.
- Temperature
- Special equipment
- The basic advantages
- Condition treated with hydrotherapy
- Exercises
- Guidelines when doing water exercises
- Contraindications
- Health and hygiene

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TEAR HERE

SPINAL CORD SOCIETY

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- Serve as a national body for promoting Academics, Education & Research in the field of Spinal Injury.
- Provide an exchange amongst the members and others individuals through Publications, Seminars, Conferences, Workshops and other activities.

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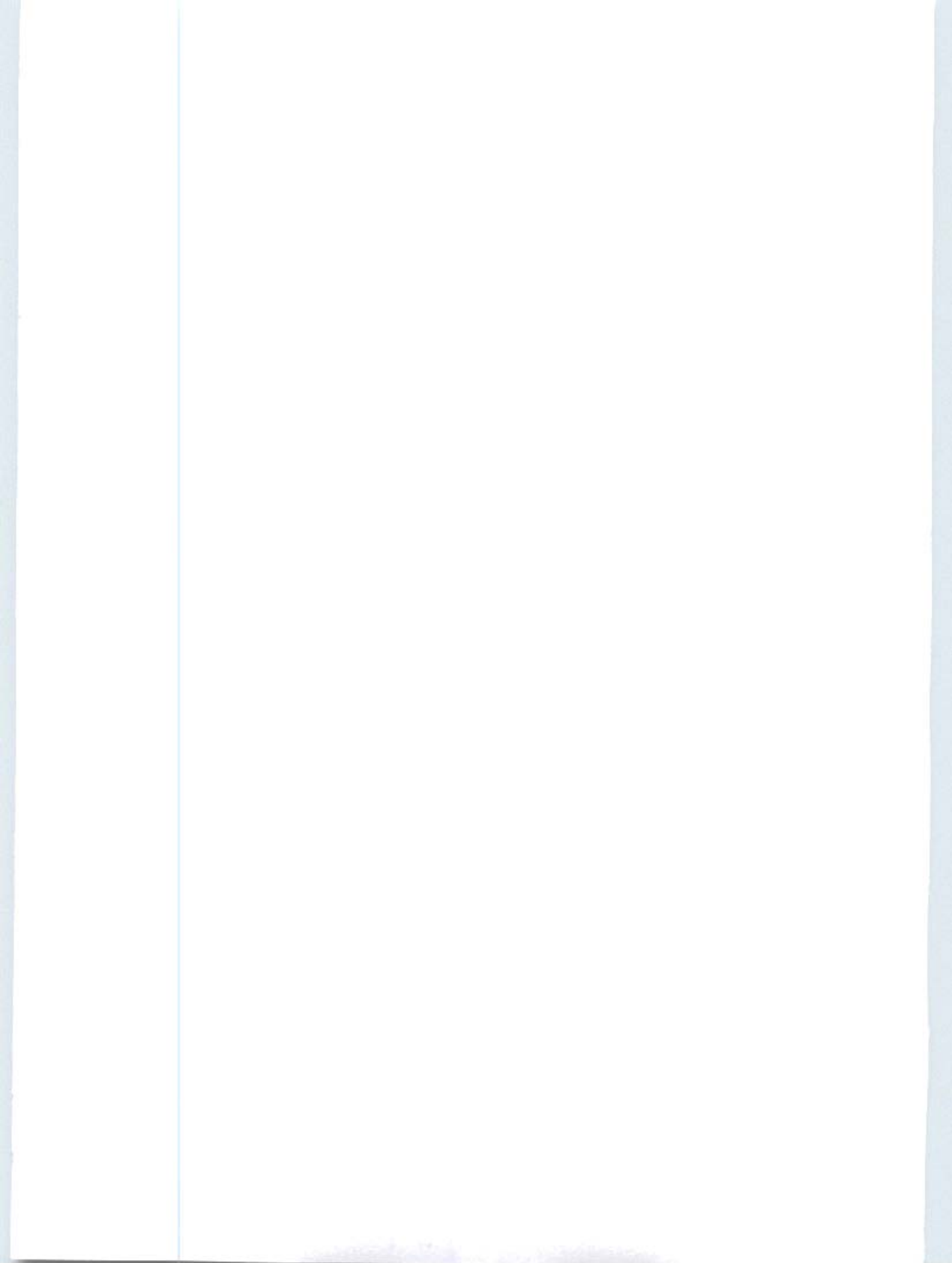
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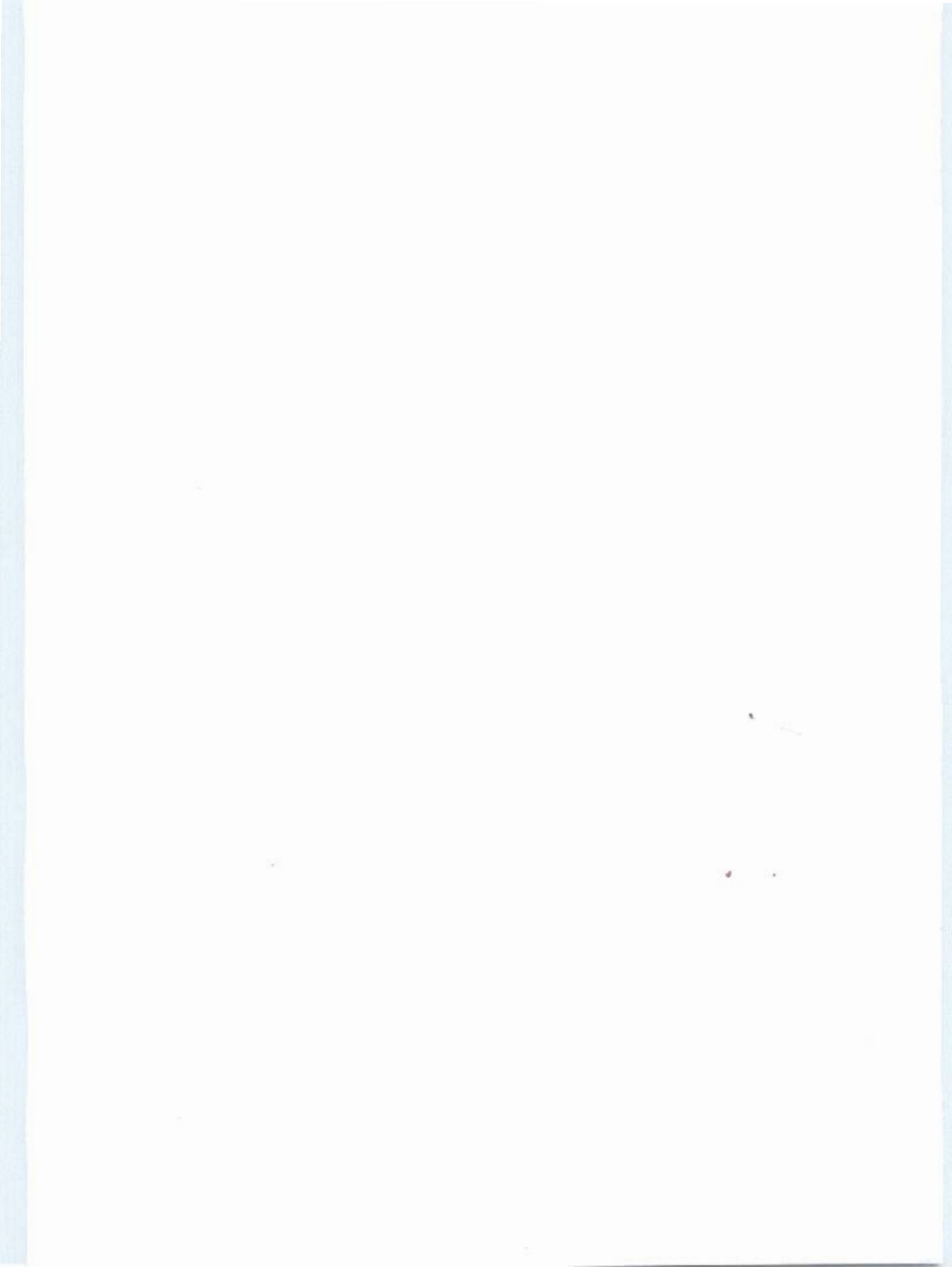
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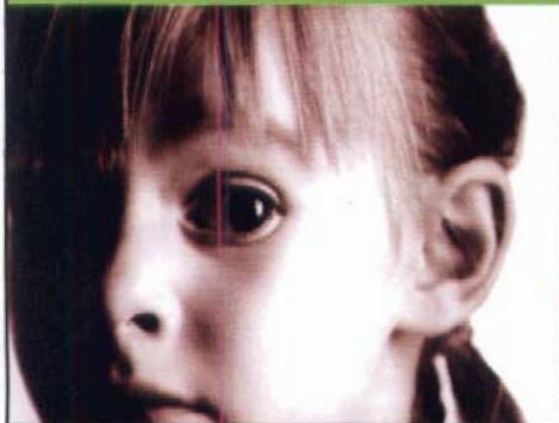
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Gleaming white building, wide airy rooms, polished tile floors, efficient nurses bustling in starched white uniforms, busy doctors moving from ward to ward.... sounds exactly like one of those corporate hospitals that dot the Metros across the country? Yes and no! Yes because this is an extremely modern, ultra efficient hospital; and no because it is the only hospital of its kind in South Asia & contrary to most corporate hospitals it is not a money-spinner. It is a hospital with a heart and a soul. Known as The Indian Spinal Injuries Centre (ISIC), it is notable for providing the best medical attention for spinal, orthopaedic and neuromuscular disorders, across the country. Located at Vasant Kunj, Delhi virtually next door to the airport, ISIC is a non profit venture. Though built with Italian collaboration it is the result of one man's vision - a soldier, a mountaineer, a dreamer, an administrator and a tetraplegic - Major H.P.S. Ahluwalia, Chairman ISIC, has been all this and more.

Indian Spinal Injuries centre

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