

Platform Presentation

**Suprascapular Nerve Block in Adhesive Capsulitis of Shoulder**

*Dr. Mrinal Joshi*

Shoulder pain is a common complaint and may cause an important functional disability. An estimated 20% of the population will suffer shoulder pain during their lifetime. Shoulder pain is second only to low back pain in seeking care of musculoskeletal abnormalities.

The treatment of adhesive capsulitis is challenging because the problem and initial treatment is painful. The mainstay of treatment is physical therapy regimen which most of the patients find difficult to follow due to pain.

Suprascapular nerve block can help reduce pain thereby reducing the requirement of NSAIDs and allow patients to follow physical therapy properly.

**Objective:** To assess the efficacy of suprascapular nerve block for management of adhesive capsulitis shoulder.

**Methods:** Twenty people with adhesive capsulitis were selected for study who had persisting problem of movement restriction and moderate to severe pain after four weeks or more of physical therapy and medications. Selected patients received suprascapular nerve block while using anatomical landmarks and nerve locator. They also underwent a common standardised physical therapy program. Patients were followed for 15, 30, and 60 days after the nerve block.

**Results:** Clinically & statistically significant improvement was observed in range of movement, SPADI & SST. No adverse effects were observed during or after the procedure/nerve block.

**Conclusion:** Suprascapular nerve block is a safe & efficacious treatment for the management of adhesive capsulitis shoulder. It reduces pain & improves mobility and functions at shoulder.

**Epidemiological Study of Prevalence of Backache in School Children vis-a-vis Weight of School Bag and Other Life Style Factors**

*Dr Virinder Singh Gogia, Dr Deepak Kumar*

An epidemiological study is being undertaken in a

Chandigarh high school to determine the prevalence of backache among school kids vis-a-vis weight of school bag. Other physical parameters, height, weight etc, of the children and lifestyle factors like physical activity, postural habits during prolonged constant posture activities, duration of such activities, type of uniform footwear, seating, bag carrying style are also being considered. In this interim report of the ongoing study, data will be presented on students corresponding to age range 13-15 years. Some preliminary take home messages are also suggested.

**Outcome of Rehabilitation Exercises in BPPV Disorders**

*Dr. Jayanta Saha, Dr. Dipankar Mukherjee, Dr. Debasish Mukherjee*

A large variety of patients with vertigo were referred to the department of PMR at Salt Lake S.D. Hospital & S.N. Pandit Hospital from the departments of ENT & Medicine from March 2008 to March 2011.

A majority of these patients were suffering from benign paroxysmal positional vertigo (34%). The rest of the other patients of vertigo were suffering from vestibular neuronitis and other vestibular diseases.

The present study was conducted to assess the role of Brandt-Daroff's exercises in BPPV vestibular diseases. BPPV was diagnosed by presence of positional vertigo and Dix-Halpike test and subsequently included in the study.

Advancement in diagnostic procedures enabled the diagnosis of the cause of vertigo with some certainty but still clinical features had an important role in the diagnosis.

Vestibular neuronitis and acute viral labyrinthitis were the commonest cause of self-limited inner ear conditions.

Meniere's disease, perilymphatic fistula and acoustic neuroma were other peripheral causes of vertigo though their incidence was far lesser.

Rarely vertigo of peripheral aetiology was also caused by impairment of proprioceptive and visual input.

In addition to the peripheral causes there were the central causes which came in the differential causes of vertigo.

Common causes include stroke and TIA which accounted for 35% of cases. In addition migraine related vestibulopathy, multiple sclerosis, postinfectious demyelination, temporal lobe seizure, Arnold- Chiari malformation, tumours of the brainstem and cerebellum and cerebellar degeneration were associated with vertigo.

After proper evaluation Brandt-Daroff's exercises were advised for vertigo of benign paroxysmal positional vertigo for a period of 2 (two) months.

Non -BPPV patients were excluded from the study.

Results were quite satisfactory.

Before advising the specific exercises the following criteria were ensured in a patient:

- 1) The patient was suffering from a true vertigo.
- 2) The vertigo was of the peripheral –labyrinthine variety. Exclusion of the central causes –by clinical examination was ensured.
- 3) BPPV as a cause of vertigo was established in the study.

It is important to note that management of vertigo is often a multipronged, multidisciplinary approach where rehabilitation exercises are a single cog of the entire wheel.

**Key words :** Vertigo, labyrinthine disorders, rehabilitation exercises.

## An Interesting Case of Fixed Flexion Deformity of Hip & Knee Presented at PMR OPD : A Case Report

*Dr Rajesh Pramanik*

A 17 year old female patient presented to PMR OPD, IPGMER with FFD of left hip and knee and cachexia.

She was absolutely fine 5 year back. Suddenly a severe pain developed in her left knee and thigh which was investigated for juvenile inflammatory arthropathy and rheumatic arthritis. At that time all the serological markers (ANA, RF, ASO titre) and x-ray of knee were normal.

Subsequently left hip pain and restricted ROM developed which made it clear that the knee pain was actually referred from hip. A plain x- ray of hip was done to rule out Perthe's disease which was reported as AVN.

When the patient was examined at PMR OP , a CT Scan of hip, routine hemogram, CXR, Mantoux test were advised considering a provisional diagnosis of

infective pathology like TB hip with a differential of neoplasia in or around hip keeping in mind about cachexia and weight loss. Surprisingly CT scan showed a big mass originating from glutei muscles evading back of the thigh and even left sphincter ani muscle. Fortunately patient was continent at that time.

Interestingly the pathological report suggests a relatively rare diagnosis which practically made the patient bedridden with commonly featured FFD.

## Value of Sonographic Measurement of Median Nerve in a Referred Population of Suspected CTS Cases

*Dr. Unnikrishnan Ramachandra*

**Aim :** To assess the usefulness of sonographic measurements of median nerve cross sectional areas (CSA) in the diagnosis of Carpal Tunnel Syndrome (CTS) among a referred population of patients using electrodiagnosis as the reference Gold standard.

**Materials and Methods :** From a group of 55 patients referred with a clinical diagnosis of CTS to the electrodiagnostic and sonographic labs of a tertiary centre, a total of 47 patients and 84 symptomatic hands were selected for analysis. The symptomatic hands were classified according to Steven's classification by electrodiagnosis. Sonographic measurements of median nerve CSA at the inlet (CSA.I), tunnel (CSA.T) and outlet (CSA.O) of the carpal tunnel were measured and their mean value (CSA.M) was calculated. These values were statistically analysed using statistical programme STATA version 8.2.

**Results :** Symptomatic hands were grouped by electrodiagnosis as normal- 9 (10.7%), mild- 29 (34.5%), moderate- 26 (31.0%), and severe- 20 (23.8%). Since there was no clear cut off value for sonographic measurement of median nerve agreed upon for the diagnosis of based on available literature, we compared the CSA values against electrodiagnostic gradation of severity. There was a significant correlation between clinical severity and sonographic measurement of CSA of median nerve at all these levels, (Spearman  $r=0.360$ ,  $p=0.001$  for CSA.I, Spearman  $r=0.439$ ,  $p<0.001$  for CSA.T, Spearman  $r=0.405$ ,  $p<0.001$  for CSA.O, Spearman  $r=0.430$ ,  $p<0.001$  for CSA.M). The median cross sectional areas of the severe CTS group was significantly high when compared pairwise with the

moderate, mild, and normal groups, while the differences in CSAs were not significant between the other pairs. Using electrodiagnosis as the reference standard the diagnostic accuracy of the CSA measurements was determined by ROC curves, the highest area under the curve was for outlet - CSA.O, 0.75 (95% CI, 0.55-0.96); followed by mean - CSA.M, 0.74 (95% CI, 0.54-0.94); inlet - CSA.I, 0.72 (95% CI, 0.53-0.92); and tunnel - CSA.T, 0.71 (95% CI, 0.51-0.90). A value of  $<8.5\text{mm}^2$  showed a negative LR of 0.09 (sensitivity 96%, specificity 44.5%) and a cut off of  $>12.3\text{mm}^2$  showed a positive LR of 4.08 (45% sensitivity, 89% specificity).

**Conclusion :** Ultrasonography can be considered a cost effective, less time consuming and non-invasive modality for the diagnosis of CTS in a referred population of clinically suspected cases. These findings need to be validated by further studies including healthy controls.

## Physical, Social & Economic Impact of the Jaipur Limb

*Dr Pooja Mukul*

**Background :** The amputee population worldwide is rising at an alarming rate. The Jaipur foot organisation – Bhagwan Mahaveer Viklang Sahayata Samiti, Jaipur serves a huge volume of the amputee population. Addressing amputee rehabilitation holistically, with the view that the prosthesis we provide is not an end in itself but a means to restore dignity, individual autonomy and social inclusion. A study was undertaken to quantify the varied facets of impact of the Jaipur technology.

**Objectives :** To study the pre and post-prosthetic status of the amputee with reference to their physical, social and economic situation. To also study patient compliance and longevity of the prosthesis.

**Study Design :** Personal interview.

**Materials and Methods :** The study tool was a questionnaire which comprised 108 questions under 5 domains. The 5 domains were demographic, amputation and prosthesis, functional impact, feedback on prosthetic service, economic impact. Four indices were prepared to facilitate the analysis Functional index, Prosthetic satisfaction index, Quality of life index and Emotional status index. The scoring was ordinal.

The data was processed using the statistical package for Social Sciences.

A total of 341 amputees were included in the study; 67.4% were transtibial and 32.6% and transfemoral, 69.8% of these were under 40 years of age. Less than 5% of the respondents were women. The educational background of 56.5% was secondary school or above. Ability to carry out ADL was adversely affected in 92.8% amputees pre-prosthesis. As many as 90.2% respondents were not doing any work prior to getting the prosthesis from BMVSS. QOL Index showed 60.5% amputees as having a low QOL. Emotional assessment revealed the emotional status of 55.9% to be low, 75.3% amputees reported good family support.

**Results :** Post-prosthetic use 91.4% of amputees felt medium to good improvement in mobility and ability to carry out ADL. There was a 6 fold increase in employability, the QOL and Emotional indices also showed a positive impact in proportion to the effect on physical performance.

The average distance walked per day was over 3 km. The average duration of use of the prosthesis was 9 hours per day. The longevity of the prosthesis was 3.89 years.

**Conclusion :** The study demonstrated that the Jaipur limb had a very significant effect on the lives of its beneficiaries.

However, despite the patient compliance and patient performance physical independence could not be translated into economic independence of the same scale.

## Spasticity & Drugs

*Dr Mrinal Joshi*

Spasticity following spinal cord injury (SCI) is a common symptom which negatively affects quality of life. Despite its prevalence, spasticity as a syndrome in the SCI population is not always managed effectively because it has various presentations. Different drugs are used to manage spasticity.

A prospective study in 20 acute spinal cord injury patients has been done to find out the effect of various antispastic medications like Baclofen, Diazepam, Tizanidine, Gabapentine, on spasticity and results were measured clinically on Modified Ashworth scale (MAS), Penn Spasm Frequency scale (PSFS) and Hmax/Mmax ratio. Baclofen in dose range of 15-37.5 mg/day showed highly significant reduction in mean Hmax/Mmax ratio and significant reduction in mean PSFS. Mean MAS also showed reduction, but this was non-significant.

## A Comparison Study of Endoskeletal versus Exoskeletal Prosthesis in Lower Extremity Amputees

*Dr. Chitra G, Dr. V.K.Sreekala, Dr. Jayasree. M*

**General Objectives :** To compare the factors associated with the daily use of endoskeletal and exoskeletal prosthesis among lower extremity amputees who have at least used the prostheses for a minimum period of 3 months.

### Objectives :

1. To compare the mobility status of persons using endoskeletal and exoskeletal prostheses.
2. To study and find the difference in social and emotional aspects of persons using endoskeletal and exoskeletal prostheses.
3. To study and compare various other factor like utility, appearance, perceived response, residual limb health, sounds and well being.

**Study Design :** Cross sectional study.

**Setting :** All the lower limb unilateral amputees who have used the prosthesis for a minimum period of 3 months and who attended the OP of Physical Medicine and Rehabilitation Department attached to Medical College Hospital, Thiruvananthapuram are included for the study. These patients hail from the districts of Thiruvananthapuram, Kollam and Kanyakumari.

**Study period :** One year

**Inclusion Criteria :** Unilateral lower limb amputees who have used the prosthesis for a minimum period of 3 months.

### Exclusion Criteria :

- Bilateral Transfemoral and Transtibial amputees.
- Patients with severe cardiopulmonary disease, mental illness and cognitive defects.
- Severe contralateral limb problems, scoliosis, bilateral visual impairment.
- Patient who have not given their consent.

**Study Instrument :** Mobility status, appearance, frustration, perceived response, residual limb health, social burden, sounds, utility and well being are assessed by using a validated self administered Prosthesis Evaluation Questionnaire (PEQ).

Most questions in the PEQ use a visual analogue scale format. Each visual analogue scale is scored as a continuous numerical variable measured as the distance in millimeters from the left endpoint of the line to the point at which the respondent's mark crosses the line.

Each time is 100 mm long and is always measured from the left (0-100). The questions are all worded so that a higher number (toward the right) will correspond with a more positive response.

### The PEQ Scales

Validated Scale Name Questions for each scale by page number and question letter

Ambulation (AM) - 13A, 13B, 13C, 13D, 14E, 14F, 14G, 14H

Appearance (AP) - 3J, 3M, 3N, 4O, 4P

Frustration (FR) - 10B, 10C

Perceived Response (PR) - 10A, 11D, 11E, 11G, 12H

Residual Limb Health (RL) - 4Q, 4R, 4S, 5T, 5U, 5V

Social Burden (SB) - 12I, 12J, 12K

Sounds (SO) - 3K, 3L

Utility (UT) - 1B, 1C, 1D, 2E, 2F, 2G, 2H, 2I

Well Being (WB) - 16C, 16D

To calculate the scale scores the average of all the questions which make up the particular scale was computed 4 to compare the tow prosthesis T-test done.

Base line information like age, address, income side of amputation, level of amputation, type of prosthesis used were collected using a pretested questionnaire

**Materials and Methods :** All patients who have used prosthesis for a minimum period of 3 months and who attend the Physical Medicine and Rehabilitation OP attached to Medical College Hospital, Thiruvananthapuram were interviewed using the Prosthesis Evaluation Questionnaire. PEQ consists of 82 questions. The PEQ is divided into nine scales computed from 42 of the questions. These scales include ambulation, appearance, frustration, perceived response, residual limb health, social burden, sounds, utility and well being. The 40 remaining items pertain to other evaluation and are not grouped into scales. Individual questions of the PEQ are answered with respect to the amputee's recollection of the previous 4 weeks. Answers are recorded on a visual analogue scale that records the amputee's response between two extremes of the scale.

Base line information like age, address, income, side of amputation, level of amputation, type of prosthesis used were collected using a pretested questionnaire.

**Study Analysis :** Descriptive analysis was done to find out percentages. Comparison was made using chi-square test and T-test.

### Conclusion :

- In this study it was found that the new endoskeletal prosthesis and the conventional exoskeletal prosthesis both are having an almost equal acceptability among amputees.

- Both the endoskeletal prosthesis and exoskeletal prosthesis satisfied most of the requirements of the amputee.
- When utility of the 2 prosthesis were compared Exoskeletal prosthesis had better performance and it was also statistically significant.
- Regarding ambulation, appearance, frustration, perceived response, residual limb health, social burden, well being no statistically significant difference was noted between there two prosthesis.
- Compared to exoskeletal prosthesis, endoskeletal prosthesis produced less mechanical sounds during ambulation.

### Could Early Emptying of Intrathecal Baclofen Pump in Patient with Spastic Paraplegia Lead to Baclofen Withdraw Syndrome, Intracerebral Bleed and Death?

*Dr. Maheswarappa B M, Dr. Swaroop Gopal,  
Dr. Ullas Gopala Krishna*

**Objectives :** To report early emptying of intrathecal baclofen pump in patient with spastic paraplegia leading to baclofen withdraw syndrome, intracerebral bleed and death

**Case Report :** Forty-one years old software engineer working in IT was been paraplegic from Oct 1990 following surgery of neurofibroma in posterior mediastinum. He had undergone intrathecal baclofen pump implantation for spasticity and severe flexor spasms in 2005 and on regular baclofen refilling and follow-up. On 20 April 2011 he was brought to the emergency department with history of severe headache, dizziness, shivering, severe spasms upper and lower limbs and followed by unresponsiveness. On initial evaluation, his airway, breathing and circulation were stable, BP 220/120 mmHg and pulse 180/minute, his pupils were 1 mm diameter on both sides and not reacting to light. He couldn't open eyes and was posturing to pain (GCS of E1, V1, M2). He was intubated and transferred to the multidisciplinary intensive care unit (MICU) for further care. Baclofen pump was found empty and immediately the refilling of the pump done with 40ml of baclofen and bolus dose of 150 mcg. CT brain was done which showed massive intracerebral bleed in the right caudate region that had ruptured into the ventricular system. The haematoma was evacuated through a right frontal burr-hole and an external ventricular drain (EVD) was placed.

However, there was no change in his neurological status. The EVD had to be replaced later on, as it was blocked. In spite of evacuation of haematoma and continued supportive measures, his neurological status remained unchanged leading to death at the end of week.

**Conclusion :** In patients with intrathecal baclofen pump implantation for managing spasticity and spasms, the pump may empty early before the date of refilling due to pump malfunction. This can lead to baclofen withdraw syndrome, very high blood pressure, massive intracranial bleeding and death.

### Hand Splints in the Management of Upper Limb Spasticity in Hemiplegia

*Dr. Bimal Naorem*

**Objectives :** To determine the effectiveness of hand splints in the reduction of upper limb spasticity in hemiplegia.

**Design :** Randomised controlled trial.

**Setting :** Department of PMR, RIMS, Imphal.

**Participants :** Eighty-eight hemiplegic patients attending PMR Department, RIMS, Imphal during 1<sup>st</sup> August 2008 and 31<sup>st</sup> July, 2010 was included.

**Intervention :** Wrist hand orthoses was given in the intervention group. It has to be worn for 8 hours at night and 4 hours during the day for 12 weeks. Followed up was done at the end of 1<sup>st</sup>, 3<sup>rd</sup> and 6 months.

**Outcome Measure :** Spasticity measured by modified Ashworth scale.

**Results :** Forty-four were assigned to intervention and 44 to control group. The proportion of patients with biceps spasticity score of 2 was observed to be significantly more among controls 36 (85.7%) as compared to the intervention group 10 (25.0%) at first follow up. Flexor spasticity score of 2 was also seen more among controls as compared to intervention group. Similar finding was also observed at second follow up. Majority in the intervention group had lower finger flexor spasticity scores 20 (90.9%) at first follow up as compared to the intervention group 9 (56.3%). Similar findings are also observed in case of biceps spasticity. Duration of hemiplegia of less than two weeks was significantly associated with reduction in spasticity.

**Conclusion :** There is significant reduction in upper limb spasticity if hand splint is applied to the affected limb within two weeks of post stroke hemiplegia.

**Key words :** Spasticity, Wrist Hand Orthoses, Modified Ashworth Scale.

## Feasibility of Robot-Assisted Motor Training with Motor Imagery-Based Brain-Computer Interface (MI-BCI) Combined with the Neuromodulatory Technique of Transcranial Direct Current Stimulation (tDCS)

*Dr. Effie Chew, Dr. Irvin Teh, Ivan Chua,  
Dr. Prasanth*

(Randomised control trial still going on up to 2012)

The primary aim of this study is to investigate the feasibility of robot-assisted motor training with motor imagery-based brain-computer interface (MI-BCI) combined with the neuromodulatory technique of transcranial direct current stimulation (tDCS) to facilitate functional motor recovery in the affected upper extremity of chronic stroke survivors with moderate to severe impairment of the upper extremity function.

We hypothesise that both MI-BCI combined with tDCS (tDCS-BCI) and MI-BCI with sham-tDCS (sham-BCI) will result in improved motor function in the stroke-affected arm; and that tDCS-BCI will be more effective than **sham-BCI to result in functional improvement**.

We propose a randomized controlled study of 32 subjects who have sustained their first ever haemorrhagic or ischaemic subcortical stroke more than 9 months prior to study enrollment, with upper extremity impairment of 11-45 out of a maximum score of 66 on the Fugl-Meyer assessment scale. In addition to these subjects, we will recruit 12 age-matched healthy control subjects for the purpose of obtaining normative data for DTI comparison. Healthy subjects will be recruited as a sample of convenience from visitors to the hospital or staff.

Clinical outcome measures including Fugl-Meyer Assessment, Box and block test, modified ashworth scale, grip strength, Beck depression inventory, fatigue severity scale, forward and backward digit span.

**Key words :** Transcranial direct current stimulation, functional recovery in upper limb subcortical stroke, training with brain computer interface, cortical excitability measure by fmri, transcranial magnetic stimulation.

## Is Rehabilitation Medicine the End of the Journey for Our Patients ?

*Dr. Anupam Datta Gupta, Dr. David Wilson*

**Objective :** This paper highlights the importance of

diagnosis in rehabilitation medicine. Three patients were referred to rehabilitation unit – the first patient had neck pain on the background of postpolio paralysis of right upper limb and was diagnosed with postpolio syndrome. The second patient was operated for repair of ruptured abdominal aortic aneurysm (AAA) on the background of a Ankylosing Spondylitis. The third patient underwent conservative management for a compression fracture of the L1 following a fall at home.

**Materials and Methods :** The first patient had restricted neck movement – the open mouth view of the cervical spine revealed atlanto-axial subluxation. Subtle upper motor signs in the lower limbs and the MRI confirmed the diagnosis of Arnold Chiari malformation. The second patient was complaining of persisted back pain who had the history of collapse and a fall. The x-ray and the CT scan revealed unstable T10 fracture with spinal canal stenosis. Third patient developed lower motor weakness of the lower limbs along with up going plantar response and bladder symptoms which was eventually diagnosed with conus medullaris syndrome.

**Results :** All these patients were referred to the spinal surgical unit. The first patient had foramen magnum decompression. The second patient underwent open reduction and internal fixation of the T10 fracture dislocation. The third patient underwent decompression and internal fixation of L1. They were all referred back to the rehabilitation unit eventually recovered well and went home.

**Implications/Impact on Rehabilitation :** The patients are usually referred to rehabilitation medicine after the diagnosis has been made and primarily for overcoming the effects of disability and increasing functional ability. The rehabilitation physicians should not be anchored in assumptions and follow the same medical model of diagnosis i.e. detailed history, careful clinical examination, laboratory tests and radiological investigations. Rehabilitation can be the beginning of the journey for some of our patients as described in this series contrary to the popular notion that it is the end. This presentation will also discuss the biases the physicians are vulnerable to in making the diagnosis and how to address them.

## Unusual Syndrome in a Child with Global Development Delay

*Dr. C. Ramesh*

**Introduction :** A 10 months old infant, third child of non-consanguineous marriage presented to our outpatient department with history of global development delay.

**Evaluation :** On examination there was no obvious external deformity, social smile present, baby could listen to sounds, sucking normal, moving all four limbs, neck control not attained and visually challenged.

Investigations including routine blood tests and metabolic screening were normal. MRI brain showed congenital cerebellar vermis atrophy, bat wing appearance, inverted molar tooth appearance and prominent cerebellar peduncle suggestive of Joubert syndrome.

**Rehabilitation :** Sensory stimulation programme started. Exercises to improve coordination may be needed in the future.

**Conclusion :** Global developmental delay may be associated with rare syndromes which needs active intervention.

**Key words :** Joubert syndrome, global development delay.

## An Important Cause of Shoulder Pain and Weakness – Usually Overlooked

*Dr. Ramita Sardana*

A 30 years old painter developed pain in the right posterior shoulder region after 1 month of intensive work. Pain intensified as he continued his job and finally he noticed weakness of the involved shoulder which led him to seek medical advice. He was referred to PMR from orthopaedics as a case of rotator cuff injury. Examination was normal except for atrophy of infraspinatus muscle on the involved side and decreased strength of shoulder on abduction and external rotation. Routine X-ray were normal. Electromyographic examination demonstrated denervation of right infraspinatus and supraspinatus muscle. A diagnosis of right suprascapular neuropathy was made. The patient is being treated conservatively from the past 3 months and has showed significant improvement in power and relief in pain.

**Key words :** Suprascapular Neuropathy, infraspinatus atrophy.

## Syndrome Associated with Transverse Myelitis – A Case Report

*Dr. Sobee Krishna*

**Introduction :** A 48 years old lady presented to our department with history of weakness of both lower limbs. She was investigated and since it was a documented case of transverse myelitis, clinical diagnosis of recurrent transverse myelitis was put forth.

**Evaluation :** On detailed investigations as to the cause

of recurrence vasculitis profile showed anti Ro positive. So aetiology of vasculitis was entertained. On further evaluation since the patient had a history of persistent dryness of mouth and eyes, Schirmer's test was positive, awaiting minor salivary gland biopsy to confirm Sjogren's syndrome.

**Discussion :** MRI of brain and spinal cord showed hyperintensity signals which pertained to vasculitic aetiology. Along side the Sjogrens syndrome is also being followed up.

**Conclusion :** This is a single case study to report the rare association of Sjogrens syndrome with recurrent transverse myelitis.

## Development of the Manipuri Version of the Health Assessment Questionnaire (HAQ) and Validation of the New Tool

*Dr. Syrpai Karlukhi*

**Introduction :** Over the course of time functional disabilities is common in rheumatoid arthritis (RA) patients and this is directly related with the control of diseases activity. For assessment, Health Assessment Questionnaire Disability Index (HAQ-DI) was commonly used. Translated and validation of the HAQ-DI has been done at various centres. A sensitive and valid instrument is needed for RA patients residing in Manipur.

**Materials and Methods :** Development of a Manipuri HAQ was attempted, and modifications were made in the domains of rising, eating, hygiene, grip and activity; this is done to suit the needs of our local people in this part in the country. Following the development of the Manipuri version HAQ, it was administered to a total 55 patients who fulfilled the inclusion criteria. The test-retest for reliability was done at baseline and 1 week follow-up. For construct validity, DAS score correlates with Manipuri HAQ at baseline and follow up.

**Results :** The mean age of our study population was 53.07 years; with mean duration of disease illness was 4.98 years. Female patients comprised 90.9%. Test-retest reliability of the Manipuri version HAQ was found to be acceptable with an intraclass correlation coefficient of 0.91, and with an internal consistency using Cronbach's alpha of 0.942. Pearson correlation coefficient for validity was found to be satisfactory with a score of 0.866 and 0.900 at baseline and follow up respectively. Also strong correlation was found between Manipuri HAQ and outcome measures disease activity with an average score of 0.73.

**Conclusion :** The Manipuri HAQ found to be reliable

and valid tool to be used in Manipuri speaking RA patients. It is also sensitive to changes in evaluation the functional status of patients suffering from RA in Manipur.

## **Hypokalemic Periodic Paralysis Associated with Hypothyroidism – A Case Report**

*Dr. Ngampa Sangme, Dr. Th. Khelendro,  
Dr. L. Nilachandra, Dr. A. K. Joy*

**Abstract :** Periodic paralysis is also seen as one of the uncommon cause of quadriplegia in the Physical and Rehabilitation Medicine practice. Association of periodic paralysis with hyperthyroidism has been documented.

There have been anecdotal reports of periodic paralysis associated with hypothyroidism. However, there is no clear cut evidence of hypothyroidism causing hypokalaemia leading to periodic paralysis or vice versa.

A 21 years old male was admitted because of recurrent paralytic attacks involving all the four limbs with two similar attacks in the past in which, the symptom resolved without any interventions. There were no clinical features of hypothyroidism. Motor power was 2- 3/5 in all the key muscles of both upper and lower limbs without any sensory deficit when examined within 24 hours of the attack. Serum K<sup>+</sup> was consistently low (2.7 and 3mEq/l) in two consecutive readings with high TSH level and thyroid related antibodies in the serum. He was treated with potassium and thyroxine supplements and was able to walk and perform his duties within 72 hours of the attack.

This case report highlights the importance of keeping periodic paralysis as an important cause of the recurrent paralytic attack, importance of serum potassium and thyroid function tests and recovery pattern without active physical therapy intervention which may actually aggravate the disease process.

## **Comparative Study of Effect of Diclofenac Alone *versus* Diclofenac with Ultrasound Therapy in Patients with Plantar Fasciitis using Pedography**

*Dr. Sumalatha*

**Objectives :** To compare the efficacy of two treatment

modalities (Diclofenac alone vs. Diclofenac with Ultrasound therapy) using pedography and visual analogue scale.

**Intervention :** Comparison of the treatments with respect to pressure profiles using pedography and visual analogue scale in 23 patients with U/L plantar fasciitis.

**Results :** Comparison of various gait parameters in pre vs. post-treatment with both Diclofenac alone and Diclofenac with ultrasound therapy is done and the significance of the difference in outcomes in terms of pressure areas, gait parameters and VAS scale of the two treatment modalities is calculated. In the diclofenac alone group, there is significant decrease in VAS score post-treatment. Rest of the parameters is not significant. In diclofenac and ultrasound group, there is statistically significant increase in the rear foot pressure area and decrease in the VAS score post-treatment. Rest of the parameters is not significant. Comparison of the difference among the two treatment modalities with respect to pressure areas and VAS scale shows no significant value statistically.

**Conclusion :** Ultrasound therapy can be used as an add-on therapy along with other treatment modalities in plantar fasciitis. Use of pressure profile analysis gives an objective measure of the treatment modalities used and can guide for further management of plantar fasciitis.

**Key words :** Plantar fasciitis, pedography, ultrasound therapy.

## **A Descriptive Study on Sexual Functions of Vocationally Rehabilitated Persons with Spinal Cord Injury**

*Dr. Javed Anees*

**Rationale of Study :** Vocational rehabilitation makes persons with spinal cord injury contributory members of the society. There is a paucity of literature regarding sexual functions (or dysfunctions) of persons with spinal cord injury who are otherwise healthy contributors to the society especially from nations like India.

**Aims and Objectives :** To assess the sexual functions of persons with spinal cord injury.

To assess the nature of dysfunction when sexual dysfunction is present.

**Study Design :** Descriptive cross sectional.

**Study Setting :** Department of Physical Medicine & Rehabilitation and home or working place of persons with spinal cord injury who are vocationally rehabilitated.



**Study period :** June 2011 to November 2011.

**Inclusion criteria :** Vocationally rehabilitated persons with SCI who are currently working and had been treated from outpatient / Inpatient departments of PM&R, Calicut Medical College.

**Exclusion criteria :** Persons with SCI who have not vocationally rehabilitated and persons with spinal cord injury who are not earning members at the time of this study

**Study Tool :** Sexual function questionnaire–internationally validated questionnaire.

**Data Collection :** After getting essential validated questionnaire, individual interview and provisional questionnaire, measures ensure privacy of patients.

**Data Analysis :** Data collected entered in MS Excel and analysed using SPSS software.

**Results :** Current trend shows persons with spinal cord injury having sexual dysfunctions including sexual desire disorders, sexual arousal disorders and sexual dysfunction due to medical condition, orgasm disorders and substance induced sexual dysfunction in the given order and detailed analysis awaits completion of the study.

**Key words:** Sexual dysfunction, vocational rehabilitation.

## Effect of Intraarticular Corticosteroid Injection in SI Joint in Sacroilitis

*Dr. Om Prakash*

**Design of the study :** Prospective follow up study.

**Objective :** To see the therapeutic efficacy of intra-articular corticosteroid injection in sacroiliac joints (SIJs) of patients with Spondyloarthropathies.

**Method :** Eighteen SIJs were injected with long-acting corticosteroid (40 mg. methyl-prednisolone) in 9 patients of confirmed sacroilites. Needle placement was confirmed with CT scan in initial 3 patents. All 9 patients underwent clinical follow-up at 1, 4 and 12 week intervals after injection. The degree of subjective and objective outcomes before and after the intervention was recorded using BASFI (Bath Ankylosing Spondylitis Functional Index), BASMI (Bath Ankylosing Spondylitis Metrology Index), BASDAI (Bath Ankylosing Spondylitis Disease Activity Index), BAS-G (Bath Ankylosing Spondylitis Global Score) and ESR.

**Results :** Till date, out of 9, 2 patients have completed 12 weeks follow up, 4 patients have completed 4 week follow up and 3 patients have completed 1 week follow-

up. At 1 and 4 week follow up period all out come measures (BASFI, BASMI, BASDAI, BAS-G and ESR) have improved but at 12 weeks follow up period BASFI, BASDAI and BAS-G tend to regress towards base line.

**Conclusion :** Intra-articular corticosteroid injection in sacroiliac joint may be of short term benefit and can be considered as one of the therapeutic options in acute care.

**Key words :** Intra-articular Corticosteroid Injection, Sacroiliac Joints.

## Upper Tract Abnormalities in Neurovesical Dysfunction Secondary to Traumatic Spinal Cord Injury

*Dr Anand V*

**Background :** Abnormal urodynamic parameters-do they spell high risk for hydronephrosis in traumatic spinal cord injury (SCI), as in myelodysplasia?

**Aim :** To study the association between urodynamic parameters and upper tract changes on ultrasonography in persons with traumatic SCI.

**Study Designs :** Descriptive study.

**Materials and Methods :** Forty-one subjects undergoing urodynamic evaluation following traumatic SCI were recruited. Demographic data, serum creatinine levels and urodynamic parameters were collected and studied for association with upper tract changes on ultrasonography.

**Results :** Six subjects (14.6%) had upper tract changes, of which 5 had mild hydronephrosis and 1 had severe hydronephrosis. Fifteen (36.59%) had neurogenic detrusor overactivity (NDO), among which Detrusor external sphincter dyssynergia (DSD) pattern of EMG was seen in 10 (66.6%). Univariate analysis showed that NDO (p value 0.01) and DSD (p value 0.02) were associated with upper tract changes. Pdetmax did not show an association with upper tract changes. When considered in two groups, with pressures above and below 40cm H<sub>2</sub>O, a statistically significant association was observed in the group with Pdetmax above 40cm H<sub>2</sub>O (p=0.046).

**Conclusion :** NDO and DSD had strong association with upper tract changes, majority of which were mild hydronephrosis. Follow-up USG and urodynamic studies are necessary to assess the clinical significance of these findings in traumatic SCI.

**Key words :** Spinal cord injury, hydronephrosis.

## Comparison of Intraarticular Corticosteroids with DMARDs Versus DMARDs Alone in RA

*Dr. Nitin Menon*

**Design of the Study :** prospective, Randomized, Case-controlled study.

**Objective :** To compare the efficacy of a combination of Disease Modifying Anti-Rheumatoid Drugs (DMARDs) with Intraarticular Glucocorticoids versus only DMARDs in a group of patients with early Rheumatoid Arthritis (RA)

**Methods :** Fifty patients diagnosed as RA by American Rheumatic Association (ARA) criteria (1987) with disease duration less than two years were divided into two groups. The control group received a combination along with Intra-articular injection of triamcinolone acentonide (40mg.ml) in each of the swollen joints at the start of the study. Outcome was assessed in terms of Disease Activity Score (DAS-28), American College of Rheumatology (ACR) 20/50/70 criteria and number of Rescue medication used at the end of 3 months.

**Results :** The study group had significant reductions in DAS 28 scores (3.39 versus 4.99 in control group) and significantly more subjects achieved the ACR 20/50/70 criteria at the end of 3 months (100/60/36% versus 84/20/0%) also, significantly lesser rescue medications were needed in the study group.

**Conclusion :** Combination of DMARDs with Intra-articular corticosteroids is significantly better than DMARDs alone in early RA.

**Key words :** Rheumatoid arthritis, Intra-articular steroids.

## Electrophysiological & Ultrasonographic Evaluation of Efficacy of Local Steroid Injection in Carpal Tunnel Syndrome : A Preliminary Report

*Dr. Junis Ali*

**Introduction :** Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy and is caused by compression of median nerve at wrist. Patients usually present with numbness and paraesthesia in the hand. Most of the patients report worsening of symptoms at

night often waking the patients. Most CTS cases are idiopathic but may be associated with a number of systemic conditions. Diagnosis is based on clinical finding and electrophysiological evidence. Both non-surgical and surgical treatment options are available for CTS. Local steroid injection is reported to be an effective non-surgical treatment option in these patients

**Objective :** To study the efficacy of local steroid injection on clinical, electrophysiological, ultrasonographic parameters in patients with carpal tunnel syndrome.

**Design :** prospective follow up study.

**Methods :** 45 clinically diagnosed patients with mild to severe CTS were treated with 20 mg local Methyl Prednisolone injection after baseline electrophysiological and ultrasonographic evaluation. Follow up was done at one and three months after injection using clinical, functional, electrophysiological findings.

**Results :** 25 patients completed three months follow up. Improvements has been found in the parameters used at the end of three months. The improvement was less prominent at the end of one month.

**Conclusions :** From the preliminary findings of the study it can be concluded that local Methyl Prednisolone injection is an effective non surgical treatment option in the treatment of CTS. However a definitive conclusion can be made only after the completion of the study.

**Key words :** Carpal tunnel syndrome, Methyl Prednisolone, Electrophysiological evaluation, Ultrasonographic evaluation.

## A Comparative Study of Suprascapular Nerve Block and Intra-articular Steroid Injection in Case of Adhesive Capsulitis of Shoulder Joint

*Dr. Yesh Veer Singh*

**Study Design :** Prospective study.

**Objective :** Analysis of the effectiveness of suprascapular nerve block to relieve pain and improve range of motion as compared to intra-articular steroid injection.

**Materials and Methods :** 60 patients with primary idiopathic adhesive capsulitis with <6 months of disease duration, age >18 years treated in PMR Department of S.N.P. Hospital kolkata-20, over period of 6 months. Patients were divided randomly into 3 groups after taking consent from patient. 1st group were treated with suprascapular nerve block and 2nd with intra-articular

steroid injection with Base line treatment given to both groups (home based ROM exercise + analgesic on SOS basis+heat therapy) and 3<sup>rd</sup> group with only base line treatment.

We were prospectively followed-up and clinically assessed pre and post-treatment (at 6 and 12 weeks) both objectively and subjectively. Objectively parameters-active and passive ROM(measured by goniometer) and subjective parameter-total SPADI and both pain and disability scale.

**Results :** Suprascapular nerve block produces faster and more complete resolution of pain and improvement of range of motion than intra-articular injection.

**Conclusion :** From this study it is concluded that suprascapular nerve block relieves the pain faster and complete and because of this fast and complete action, patient requires less analgesic and improve compliance for home based exercise and improve ROM. So that suprascapular nerve block is proved as a safe and effective treatment option for adhesive capsulitis of the shoulder joint. This study also justified to considered suprascapular nerve block should be an independent group in large multicentred trial.

## Functional Evaluation of Paralytic Claw Hand after Stiles Bunnell's Procedure

*Dr. Shikha Bhatnagar*

**Study Design :** Prospective follow up study.

**Objectives :** To study the results of Stiles Bunnell's procedure for correction of claw hand deformity, increase in power of grip and motion and function of hand; and effect of new technique of attachment of the motor tendon.

**Materials and Methods :** Twenty-one patients of four finger claw hand, willing to participate in study and fulfilling inclusion criterion, were operated and followed up for one year. The results were graded into three groups-good, fair and poor. Good and fair results were considered as satisfactory.

**Results :** Satisfactory results were found in 100% of the patients. Correction of deformity was 100% satisfactory (85.7% good and 14.3% fair). There was a definite increase in grip strength with 100% satisfactory results (power increased in 85.7% and remained static in 14.3%). Motion and function of hand improved in 100% patients (76.2% good and 23.8% fair).

**Conclusion :** Stiles Bunnell's procedure is effective and predictable in correcting claw hand deformity, restoring synchronous pattern of finger flexion and it also improves grip strength of hand. With slight modification introduced in original technique, complications were minimal.

**Key words :** Claw hand deformity, Stiles Bunnell's procedure.

## Traumatic Cervical Spine Injury Pattern – A Snapshot

*Dr. Mahima Agrawal*

**Study Design and Subjects :** Prospective descriptive analysis of data of patients with cervical spine injury admitted to S.M.S.M.C and Hospital, Jaipur from 1<sup>st</sup> December 2010 to 15<sup>th</sup> October 2011.

**Objectives :** To observe the demographic profile and injury pattern in cervical spinal cord injured cases admitted at a tertiary care rehabilitation centre.

**Materials and Methods :** One hundred and forty-one clients of traumatic cervical SCI were admitted from 1<sup>st</sup> December 2010 to 15<sup>th</sup> October 2011 at Department of Physical Medicine and Rehabilitation, R.R.C., S.M.S. Hospital, Jaipur. Detailed clinical evaluation and radiological assessment was done along with identification of mechanism of injury, mode of evacuation and presence of associated injuries. Data analysis was done in October 2011 and results were compiled and analysed.

**Results :** Rajasthan is the largest state of India in terms of area and comprises 5.67% (6,86,21,012) of total India's population share, of which 80% reside in rural areas dependent for their living on agriculture industry. The mean age of our sample universe is  $35.87 \pm 14.38$  years that comprised 11 females (7.8%) and 130 males (92.2%) of whom 78 (55.3%) fell in the age group of 25 to 55 years. Majority 64 (45.4%) of our clients were illiterate, 80 (56.8%) being farmers and labourers, 99 (70.2%) residing in rural areas having an average monthly income of Rupees 6000. Greater fraction had road traffic accidents 66 (46.81%) and fall from height 56 (39.72%) as the mechanism of trauma. None of our clients received any spinal trauma management as per standard protocols at the injury site from where only 69 (49.8%) could arrange for an ambulance transport leading to a delay in admission from the time of trauma to tertiary care centre of more than 24 hours. An interesting fact that came to light from our study was that majority of the injured 84 (59.57%) presented with neurologically

complete picture, most common involvement 103 (73.15%) being of cervical segments 5 and 6, as against the data in the west which suggests incomplete injuries to be the most common type. Most alarming fact is the poor recovery 17 (12.15%) seen at the end of 1 month.

**Conclusion :** The most unfortunate but avertable part was increased morbidity and bad prognosis that could be explained by the delay in provision of first aid and transport to a tertiary care centre and substandard evacuation techniques. Also, as most people continue to remain in the same neurological state, this further strains the already limited resources of the country. Rajasthan is a poor state, where 80% people live in rural areas, so there is a strong need to establish such primary and community health care centres with essential equipment and staff trained in primary management of spinal cord injured individuals. As most of the states now have 108 ambulance facility, so basic need of specialised evacuation teams can be easily met, the only obstacle being the need to realise the requirement for the same. Establishing a SCI registry in India will help a great deal towards realising the same. Even though this is a single hospital based study, giving only a snapshot of actual figures, it can help a great deal in predicting the real picture if extrapolated.

## Evaluation of Upper Pole Release in the Treatment of Congenital Sternocleidomastoid Contracture

*Dr. Ravi Kumar Prennija*

**Study Design :** Combined prospective & retrospective study.

**Objective :** To analyze patients with congenital sternocleidomastoid contracture treated surgically at upper pole of sternocleidomastoid muscle in terms of:

- Deformity correction,
- Cosmetic appearance,
- Complications of surgery

All patients who satisfied set inclusion and exclusion criteria were enrolled in the study. Cases were examined pre-operatively and post operatively at one, six and twelve weeks. The assessment of cases was done by scoring system of Cheng et al, which includes Rotational deficit, Lateral bending deficits, Facial asymmetry, Scar, Band, Head tilt & Subjective assessment.

**Results :** Twenty one patients were enrolled in the study and there was significant improvement in all the patients. The method proved to be safe and without complications and dangers associated with release at the lower pole.

**Conclusion :** The present study shows that upper pole release in the treatment of Congenital Sternocleidomastoid Contracture gives excellent results with minimal complications.

**Key words :** Upper Pole Release, Sterno-cleidomastoid Contracture.

## An Innovative Instrument for Measuring Spasticity Quantitatively

*Dr. Javed Anees*

**Relevance of the Study :** Spasticity management is important and crucial part of rehabilitation care. Still we use subjective scales like Ashworth/modified Ashworth scale for measurement of spasticity. Measuring spasticity objectively will have varied implications in the field of rehabilitation care ranging from clinical drug trials to evaluation of rehabilitation interventions.

**Aims :** At present to our knowledge no such instruments are available in the world. Ours is an humble effort to create an instrument based on nature of spasticity and engineering technique. We would like to demonstrate the instrument before the august body of eminent physiatrists. Our instrument model is functioning well and still needs more stringent studies to validate it and make it more 'professional'. We are presenting the basic model of our idea before you and will try if needed to show how it is functioning, with the instrument.

**Method :** In this equipment, we are measuring the degree of spasticity by analyzing the movement of hand. Here hand is kept and strapped on a handle which is connected to the shaft which is coupled with a stepper motor using a timing pulley. Here we are using a high precision motor ie, stepper motor which is having a holding torque of 18 kg-cm. The average weight of a human hand is about 1.5 – 1.6kg. So that the holding torque wouldn't be enough to lift it and move it in a path. So by using a timing pulley of ratio 1:4 is used which will provide a holding torque of 72 kg-cm. Here by this equipment, we are measuring the : Continuity of motion, Angular velocity, Angular displacement and Muscle pressure of the hand.

**Continuity measurement :** For measuring the continuity light dependent resistors are used. And on the movement of hand, corresponding signals will be received on the resistors and their combined output will give exact continuity of the hand movement.

**Muscle pressure measurement :** This is done by using a body muscle pressure sensor and the output of the sensor is fed through various instrumentation

amplifiers, filters etc. And is finally fed to the display unit.

**Angular velocity and angular displacement measurement :** These are done by analysing the displacement of the hand at various time intervals and continuously analysing it through a oscilloscope and by processing its output through various softwares. Finally a graphical presentation is shown on the screen. By changing/modifying/using different the handle (in various modes) we can measure spasticity of leg. Also we are finding out ways out to measure rigidity and dynamic spasticity based on same principle.

**Limitations (at-present) :** Though we have succeeded in getting a fully functional spasticity measuring machine in our dreams we are yet to conduct a large scale study to validate. We are displaying this interdisciplinary co-operation output to get the suggestions and well-wishes from the visionaries in the field of rehabilitation medicine. At present we are more concentrating on the instrument quality in results.

## Intralesional Hylan GF20 Injection in Lateral Epicondylitis – A Pilot Trial

*Dr. Antony D'Cruz*

**Study Design :** Randomised clinical trial.

**Objectives :** The purpose of this trial is to study the efficacy of intralesional hylan GF 20 injection in lateral epicondylitis.

**Materials and Methods :** Patients with lateral epicondylitis were injected 1ml hylan GF 20 intralesionally. They were assessed for four parameters namely pain before grip, pain after grip, pain free hand grip strength and maximum hand grip strength before injection and 15days, 1month and 3 months after the injection. Pain was measured using visual analogue scale, while grip strength was measured using Jamar's dynamometer.

This is a preliminary report of the ongoing study and results of 12 patients will be presented for a follow-up period of three months and 18 patients for a period of one month.

**Key words :** Hylan GF 20, lateral epicondylitis.

## Organism Causing Urinary Tract Infections in Traumatic Spinal Cord Injury – Calicut Experience

*Dr. Nasheeda. K*

**Background :** Prevalence of urinary tract infections is high in spinal cord injury patients and also depends on

the type of bladder management and any pre-existing renal problems.

**Materials and Methods :** Retrospective analyzing traumatic spinal cord injury patients admitted in Department of PM&R during the period of 1<sup>st</sup> July 2010 to 30<sup>th</sup> June 2011. The parameters looked into were type of injury, duration of injury, the bladder management and faulty technique of ICC, frequency of urinary tract infection and association with any pre-existing renal complications. Urine culture reports analysed including type of organism and sensitivity pattern.

**Summary :** An evaluation comparing the level of injury (paraplegia/quadriplegia), the organism grown on urine culture and sensitivity patterns and response to treatment.

**Conclusion :** This study has been done to analyse the prevalence of urinary tract infections and type of organism frequency of urinary tract infections and association with method of bladder drainage in traumatic spinal cord injury patients.

**Key words :** Urinary tract infections, spinal cord injury.

## Effect of Epidural Steroid Injection in Symptomatic Lumbar Disc Herniation with Radiculopathy

*Dr. Prem Anand*

**Settings :** The clinical material comprised patients admitted in the Division of Physical Medicine and Rehabilitation in Rajah Muthiah Medical College, Chidambaram, for clinical features of lumbar disc herniation and radiculopathy from the period of 2009 Nov – 2011 Jan who met the following criteria. Thirty-four patients were taken up for the study. The MRI findings were as follows: 74% had multiple level of disc prolapse and 26 % had prolapse at single level. The most common presentation of disc herniation was protrusion (51%), followed by bulge (30%) and extrusion (19%). The most common levels of disc herniation was in the lower lumbar L4-L5 (41%) and L5-S1 (42%)

**Inclusion criteria :** Patients whose documented signs and symptoms met criteria for a diagnosis of long standing lumbosacral radiculopathy, which included the following:

Pain lasting greater than six months, not responding to Non-steroidal with or without physical modalities.

Anti-inflammatory drugs.

Lower back pain radiating down past the knee joint on one or both lower extremities.

Positive straight leg raising test on one or both lower extremities.

MRI findings of one or more levels of herniated lumbar disc.

Both sexes of ages from 20 to 80.

Refusal for surgical management

**Exclusion criteria :** Refusal for the procedure.

Allergic reactions to injecting solutions (corticosteroid, lignocaine, adrenaline).

Bleeding disorders.

Pregnancy.

Acute spinal cord compression.

Systemic infection or local infection at the site of a planned injection.

Uncontrolled diabetes.

Cardiac diseases.

Immune suppressed patients.

Patients who have had prior treatments with epidural steroid injections.

Patients with multiple pain syndromes which precludes a clearly defined source of pain.

Patients with multiple injuries and congenital malformations.

Patients with prior lower back surgery.

Malignancy.

Recent trauma to the spine.

### Materials and Methods :

After clinical confirmation consent obtained and 2ml of injection triamcinolone (80 mg) with 2ml of xylocaine + adrenaline (2%) is administered through the needle with the bevel tip facing downwards. Patient is rested for 30 minutes in the same position. Visual analog scale for low backache and radicular leg pain and straight leg raising test are assessed after 20 minutes, 1 week, 1 month, 4 months and 8 months. Statistical analysis was done by using Kruskal – Wallis one-way ranked analysis of variance which is a non-parametric test.

**Results :** In the study, the average intensity of back pain recorded before epidural steroid injection procedure is 6 and after the procedure at 1 week, 1 month, 4 months and 8 months are 1.8235, 1.6471, 1.5294 and 1.4118 respectively.

The average intensity of sciatic pain recorded before epidural steroid injection procedure is 7.0882 and after the procedure at 1 week, 1 month, 4 months and 8 months are 1.2941, 1.0294, 1.0001 and 1.0002 respectively.

The positive incidence of straight leg raising test reported in all 34 patients before the procedure become 100% negative, when assessed 20 min after ESI and only 12% remains positive while assessing at 1 week, 1 month, 4 months and 8 months after the procedure.

The equality of mean scores of pain has been tested using Kruskal – Wallis one way ranked analysis of

variance which is a non parametric test. The Chi-square statistic is 77.386 with a corresponding  $p = 0$ . Hence there exists a significant difference between the mean levels of pain taken before and afterwards.

Again the same test procedure has been applied for the four time measurements taken after the treatment. It is observed that the value of the Chi-square is 4.013 with a corresponding  $p = 0.26$ . Since  $p$  is greater than 0.05, the difference between the average of pain scores taken at four time points are not significant different and so they are equal. This shows that the impact of the steroid application remains or persists the same for a period of eight months.

In the case of radicular pain also the efficacy of the steroid has been tested at different time periods after the treatment. The pain rating has been done before and after the application of steroid. It is observed that the Chi-Square value was 85.755 with a corresponding  $p = 0$ . Hence, there exists a significant difference between the average values. Hence there is a positive impact of steroid in reducing the radicular pain.

The average of pain scores during the four time points,, after the use of steroid have been recorded. It is observed that the Chi- square statistic value is 4.794 with a corresponding  $p = 0.1888$ . Hence, difference between the average scores is not significant. Hence, the pain score on the average is the same thereby implying that the pain scores are low at different time points afterwards.

It may also be observed that, after the use of steroid, the average level of back pain is 1.6029. Similarly, in the case of leg pain the average level of pain is 1.1029. Hence it implies that the reduction in the level of pain is more pronounced in the case of patients with leg pain rather than in the case of back pain.

## Effect of Peripheral Nerve Block with 5% Phenol on Modified Ashworth Scale (MAS) in Lower Limb Spasticity in Patients with Cerebral Palsy

*Dr. Amalesh Basak*

**Aims And Objectives :** To evaluate the effect of therapeutic peripheral motor nerve block of tibial and obturator nerves using 5% aqueous phenol on reduction of lower limb spasticity in children with spastic CP using modified Ashworth scale.

**Sample Size :** 40 subjects.

**Study Area :** Children of CP affecting lower limbs in the age group of 2-16 years who attended the PMR OPD

of IPGME & R, SSKM Hospital, Kolkata, and Dr. B.C.Roy PGI of Paediatric Sciences, Kolkata.

**Study Population :** Patients with CP who fulfilled inclusion and exclusion criteria.

**Study Design :** Before - after treatment trial.

**Materials and Methods :** The study was done for a group of 40 patients who were selected from PMR OPD according to inclusion and exclusion criteria. Modified Ashworth scale was measured at the base line (0 week), then after phenol neurolysis at 1wk, 3 week and 6 weeks.

After preparation of the master chart result analysis was done using Graph Pad Prism 5 software.

**Study Duration :** 12 months (July 2010 – June 2011).

**Inclusion Criteria :**

- 1) Spastic CP patients involving lower limbs causing difficulty in ADL.
- 2) Patients who are in trainable/educable IQ range.
- 3) Patients having adequate trunk control.
- 4) Patients in the age group of 2-16 years.

**Exclusion Criteria :**

- 1) Patients with fixed deformities.
- 2) CP associated with significant mental retardation.
- 3) Mixed variety of CP.
- 4) Patients with history of convulsion and sensitivity to phenol.

**Result :** Mean MAS before block (0 week) was 3.477. At the end of 1 week, 3 week, and 6 week after block, the mean MAS were 1.707, 1.461, and 1.492 respectively.

Comparison between before block after block at 1 week, 3 week, and 6 week were statistically significant with P value <0.001.

**Conclusion :** Most of the improvement in MAS occurring during the 1<sup>st</sup> week and this improvement is maintained through 6 weeks. However after the end of 3 weeks improvement in MAS score reached a plateau.

## A Study on the Effectiveness of AFO in Children with C.P

*Dr. Pampa De*

**Purpose :** In children with cerebral palsy, orthoses, primarily ankle-foot orthoses (AFOs) are recommended to prevent or correct dynamic deformity by supporting joint alignments and mechanics. This study was done to determine the effectiveness of different AFOs in children with cerebral palsy.

**Methods :** Over a period of six months, 23 cases (16 males, 7 females) were studied ( hemiplegics excluded). Measurements of hip-knee ankle contractures, initial

standing balance and assessment of Paediatric Balance Scale (PBS) score were done before and after giving the four types of AFOs (moulded AFO in neutral position, moulded AFO in 2-3 degrees of dorsiflexion, hinged AFO and floor reaction AFO).

**Results :** Hip-knee ankle contractures improved in all the cases with AFO. Initial standing balance improved in 13(56.5%) cases and was not affected in ((39.1%) cases. PBS score was found to increase in 12(52.1%), decrease in 6(26.0%) and unchanged in 5 (21.7%) cases.

**Conclusion :** AFOs are undoubtedly very useful in all those cases with abnormal joint kinematics at hip-knee ankle and help in improvements of Paediatric Balance Scale score. For minor degrees of recurvatum and crouch AFOs may correct the joint kinematics but impair dynamic balance to some extent. AFOs may also prove to increase the standing balance in cases where appropriate foot plate or University of California Biomechanics Laboratory (UCBL) or Supra malleolar orthoses are not available.

**Key words :** Cerebral palsy, orthosis.

## Compressive Cervical Myelopathy due to Fluorosis – A Case Report

*Dr. Priyavadhana. R*

Spinal cord compression due to ossification of the posterior longitudinal ligament secondary to fluorosis is very rare. There are only a handful of reports, mainly from endemic areas where fluorosis has been implicated as a cause of myelopathy and none from Kerala, We present a case of compressive myelopathy due to fluorosis from Alappuzha district in Kerala. Excessive exposure to fluoride causes a bone disease called skeletal fluorosis. In the advanced stages of skeletal fluorosis, the spine may develop extensive ligament calcifications and bone spurs (osteophytes), which in turn can produce a narrowing of the spinal canal and damage to the spinal cord. Reddy DR *et al* (1993) has quoted that a sizeable number of patients suffering from ossified posterior longitudinal ligament (OPLL) may have fluoride intoxication as the underlying cause. Neurological sequelae in skeletal fluorosis manifest as radiculomyelopathy, principally due to mechanical compression of the spinal cord and nerve roots. Though the disease develops slowly with relentless progression, the neurological manifestations may sometimes be precipitated by minor trauma. The diagnosis of fluorosis is based on the residence in the endemic area and the radiological features of fluorosis, which included

osteosclerosis, calcification of the interosseous membrane/ligaments, periosteal bone formation, and irregular osteophytes (Misra UK, *et al.* 1988). The present patient is a 45 years old male, who presented with features of cervical myelopathy and diagnosed to have posterior ligament calcification in cervical spine. He underwent multiple laminectomy and decompression following which admitted in Dept of PMR, TDMC, Alappuzha for rehabilitation. He was further worked up for endemic fluorosis as he had history of living in fluorosis endemic areas and found to have both radiological and biochemical features suggestive of skeletal fluorosis.

**Key words :** Compressive myelopathy, fluorosis, posterior ligament calcification.

### An Observational Study Identifying Gait Deviations in Transtibial Amputees

*Dr Zachariah T. Zachariah,  
Dr. Sreedevi Menon. P, Dr. V. K. Sreekala*

This is an observational study screening for gait deviations, conducted on a population of 20 transtibial amputees using PTB prostheses, attending the Artificial Limb Centre attached to the Department of PM&R, Medical College, Thiruvananthapuram. The study was conducted during a three-month period from August to October 2011. The subjects were evaluated using visual observation of gait parameters both anteroposteriorly and laterally. The gait deviations were noted and documented; probable causes were identified and remediation was done.

**Key words :** Gait deviations, PTB prostheses, screening.

### Co-relation of Bladder Wall Thickness with Complications of Neurologic Bladder Dysfunction

*Dr Minju George, Dr V. K. Sreekala,  
Dr Sreedevi Menon P.*

This study is aimed at identifying the co-relation between bladder wall thickness and complications of neurologic bladder dysfunction like hydronephrosis, hydroureter, cystitis, calculi etc. Study is conducted on inpatients of Department of PMR, MCH Trivandrum over a period of three months. Bladder thickness is measured using USG and the presence of various complications are assessed by history, physical examination and investigations. The study is under progress now.

### Surgical Intervention in Physiatric Practice – A Case Reports

*Dr. N. Jungindro Singh*

Physiatrist deals with different cases of rehabilitation patients who need surgical intervention at one or the other time, especially in India where locomotor disability accounts 57.50% of all the disabilities (NSSO 2002). Most commonly performed surgeries are tenotomy, tendon lengthening or transfer for CP, CTEV, PPRP, leprosy and even in poststroke hemiplegics to simple split skin graft or rotation flap transfer for pressure ulcers and intrathecal baclofen pump insertion in paraplegic/tetraplegics. Some physiatrists also do bony procedures like osteotomy, arthrodesis, etc, for congenital or acquired bony deformities to laminectomy/discectomy for PIVD. Here we present two such cases, one with congenital and other acquired deformities wherewith simple surgical procedures change the quality of life dramatically, preventing/reducing disability.

**Key words :** Physiatrist, congenital dislocation of knees, amputee.

**Case 1:** A female child of 8 months old presented with grade III bilateral congenital dislocation of knees and congenital talipes equinovarus with hypoplastic patellae both sides. Manual manipulation and casting was tried but could not achieve correction. We decided of surgical correction. Surgeries were performed in four stages, each side at a time and each deformity at a time. Quadriceps plasty (lengthening of quadriceps muscle) was done on the knee followed by posteromedial soft tissue release (PMSTR) on the ipsilateral foot. After removal of the cast KAFO with drop locked knee unit was given. Exercise programme started with gradual flexion-extension to strengthening exercises. Gait training started with a wheeled walker. In two years follow-up she could walk independently with the KAFO.

**Case 2 :** A female child of 6 years old presented with bilateral below knee amputation and right radial nerve palsy following road traffic accident. There was anterior angulation of the tibia from tibial tuberosity downwards on the right side, which limits her from prosthetic fitment. The weakness of the wrist extensor on the right side also prevents her from driving wheel chair. Psychologically she was depressed and started neglecting social activities. So we decided to correct the deformity and did simple anterior open wedge osteotomy and fitted with BK PTB prosthesis on both side. Dynamic cock-up splint was given with electrical muscle stimulation for the wrist drop and in 6



months' time power improved. Gait training started with the prosthesis after one and half months of the surgery and she could able to walk independently with the prosthesis in 3 months of gait training.

**Summary :** In both the cases we did simple surgical procedures and followed the normal routine rehabilitation programmes which make them walk independently from a sessile life. But if the surgeries were not done we couldn't have been able to proceed further rehabilitation programme.

During our service delivery to the people as a Physiatrist/ Rehabilitation specialist we come across many such cases with locomotor disability where surgery is required at one or the other step of the rehabilitation programme. It's being on debate since long time whether Physiatrist should do/continue to perform surgeries or not and now it's high time to make a clear platform.

### **Correlation of Soft Tissue Changes in Different Stages of Hemiplegic Shoulder During Functional Recovery – An Ultrasonographic Evaluation**

*Dr. Pradeepkumar Kalathil,  
Dr. T. K. Vasudevan, Dr. S. Abdul Gafoor*

**Objectives :** To study the correlation between ultrasonographic features of soft tissues in different stages of hemiplegic shoulder with functional and motor recovery.

**Materials and Methods :** Design - Prospective study.

**Settings :** Patients with stroke attending Dept. of Physical Medicine & Rehabilitation, Kozhikode Medical College.

**Study Tool :** Poststroke patients, irrespective of duration since stroke

**Sample Size :** 30 patients

**Period of Study :** 1<sup>st</sup> March 2011 to 30<sup>th</sup> September 2011

**Inclusion Criteria :**

1. First stroke resulting in unilateral hemiplegia
2. No history of shoulder disability within 6 months prior to stroke
3. Both males and females of any age

**Exclusion Criteria :**

1. History of shoulder disease within 6 months prior to stroke.
2. Cognitive impairment.
3. Neuromuscular disorders due to other causes resulting in shoulder disability.

**Outcome variables :**

1. Visual analogue scale, 2. Brunnstrom motor recovery stage, 3. Range of motion, 4. Spasticity grade, 5. Ultrasonographic findings

**Procedure :** Patients taken into study with written informed consent are given comprehensive stroke rehabilitation programme with periodic ultrasonographic examination at regular intervals. Changes in soft tissues like biceps tendon, rotator cuff, subacromial bursa, glenoidal labrum etc., are measured with USG. Results statistically analysed for correlation with other variables.

**Results :** Significant correlation exists between pathology of biceps tendon and supraspinatus with functional recovery of hemiplegic shoulder.

**Conclusion :** Periodic USG examination will help in individualised modification of shoulder rehabilitation in stroke patients.

**Key words :** Ultrasonogram, hemiplegic shoulder.

### **A Study on the Change in the QOL of Traumatic SCI Persons Following Rehabilitation**

*Dr. Rooru*

A quasi-experimental study on the changes in the Quality of Life of Traumatic Spinal Cord Injured patients following rehabilitation. This study included 45 patients admitted in our ward, Department of PMR, Medical College and Hospital, Thiruvananthapuram from the period October 2008 to June 2009. QoL was assessed with WHO Brief version prior to and after six months of rehabilitation and statistically analysed.

**Key word :** Quality of Life Traumatic Spinal Cord Injured Persons, Rehabilitation.

### **A Short Study on Short Stature**

*Dr. Sindhuja. N.S, Dr. Sreedevi Menon.  
P, Dr V. K.Sreekala*

If the height of a person is less than 2SD from the mean height for that person, the person is considered to be short in stature. This study is aimed at identifying a few persons with short stature and evaluating their previous growth data, diet history, antenatal, natal and postnatal history, family and socio-economic history, parental heights, and parental pubertal history. Physical examination aimed at identifying the impairments and

setting therapeutic goals is also done. If the diagnosis is not obtained by history and clinical examination, screening laboratory tests individualised for each patient are done. In some, specialised tests may be required. The problems of being short statured - musculoskeletal, psychosocial etc, are also addressed. The therapy which depends on the underlying aetiology is prescribed. Often, reassurance becomes all that is necessary. The study is under progress now.

### **Status of Neurogenic Bladder and Bowel Function and its Effect on Quality of Life in Persons with Spinal Cord Injury, One Year Post Insult**

*Dr. Davis J Paracka*

**Objective :** To study the factors affecting quality-of-life (QOL) and status of bladder and bowel function in persons with spinal cord injury (SCI), 1 year after insult.

**Study Design :** Descriptive study.

**Study Setting :** Department of Physical Medicine and Rehabilitation, Govt Medical College, Trivandrum .

**Study Population :** Persons with spinal cord injury, one year after the event who were either admitted in our department or came for OPD follow up.

**Materials and Methods :** Structured questionnaire containing demographic, clinical details of the present bladder and bowel status and management techniques, along with Incontinence impact questionnaire to evaluate the effect of the current bladder and bowel status in the quality of life and Wexner Cleveland Clinic faecal incontinence severity scoring system to study the severity of bowel incontinence were used.

**Results :** The study population consisted of 42 subjects of which majority (55%) belonging to 40 - 59 years age group and with a period of 1 to 2 years post illness. Upper motor neuron neurogenic type bladder dysfunction was most common (62%) and intermittent clean catheterisation (57%) was the commonest type of bladder management technique used. Urinary tract infection (81%) was the most common neurogenic bladder related complication that occurred following the injury. Suppository (50%) was commonest bowel evacuation method used. Impacted stools (31%) and haemorrhoids (28%) were the most common neurogenic bowel related complications post injury. Majority had poor quality of life with regards to the neurogenic bladder and bowel dysfunction. Type of bladder management, frequency of intermittent clean

catheterisation and presence of urogenital fistula were the major factors affecting quality of life with regards to neurogenic bladder, while presence of faecal incontinence and need of digital bowel evacuation were the major factors affecting quality of life with regards to neurogenic bowel.

### **To Study the Histopathological Changes in Various Stages of Pressure Ulcer and to Know Whether This Knowledge will Help in its Management**

*Dr. Sreejith. R*

#### **Materials and Methods :**

Design – Descriptive study

Settings – Patients with pressure sore admitted in Department of Physical Medicine & Rehabilitation, Kozhikode Medical College

Study tool – Patients with pressure sore.

Period of study – 1<sup>st</sup> November 2011 to 31<sup>st</sup> December 2011.

**Inclusion Criteria :** Patients with pressure ulcer of stages 2,3 and 4 who require tissue biopsy for culture and sensitivity.

#### **Exclusion criteria :**

1. Patients with stage 1 pressure sore.
2. Cognitive impairment.
3. Patients without significant caregiver.

**Procedure :** Patients are taken into study with written informed consent. Tissue is biopsied from the edge of the ulcer along with those taken for culture and sensitivity and send separately to department of pathology for histopathological examination.

**Results :** The salient histopathological features of stage 2, 3 and 4 pressure ulcers are studied.

**Conclusion :** Discuss if the knowledge of microscopic details help in improving management of pressure ulcers.

**Key words :** Pressure ulcers, histopathology.

### **Comparative Study of Oral Diazepam and Baclofen on Spasticity in C.P**

*Dr. Vinay Goyal*

**Study design :** Randomized, Prospective follow-up study.

**Objective :** To prospectively compare the outcome of

reduction of spasticity after oral administration of Baclofen and Diazepam in terms of :

- 1) Reduction of Spasticity
- 2) Improvement on range of motion
- 3) Reduction in scissoring
- 4) Improvement in hand functions
- 5) Side effects

**Method :** Spastic cerebral palsy children who satisfied inclusion & exclusion criteria were enrolled in the study. Cases were examined before and after medication during follow-up at 1 and 3 months. Spasticity was assessed in elbow, wrist, knee and ankle using Modified Ashworth Scale and in adductor group by Grading of Scissoring on vertical suspension. Range of Motion at elbow, wrist, knee and ankle was recorded with help of a goniometer. Hand function was assessed objectively. Patients were randomly assigned to two groups by draw of lots. One group received oral Diazepam initially 0.1mg/kg/day in divided doses with weekly increment of 0.1mg/kg up to a maximum of 0.8mg/kg/day and other group received oral Baclofen increment initially 2.5mg t.i.d in children <8 years and 5mg t.i.d >8 years with weekly increment of 5mg to a maximum of 40mg/day in former and 60mg/day in latter group. At each follow up visit, patients were assessed on predefined assessment criteria. All adverse reactions were recorded.

**Key words :** Baclofen and Diazepam.

## Clinical Appraisal of Spastic Diplegic C.P with Knee Hyperextension

*Dr. Sumedh Narayan More*

The prospective study was conducted to assess factors contributing to knee hyperextension in ambulatory patients with spastic diplegic CP. The objective and quantifiable data collected was used to select the best possible available modality of treatment.

Patients above 5 years, both male and female, having ambulatory potentials and those who were able to undergo instrumented gait analysis in motion laboratory were recruited.

10 patients of OPD, IPD & CP Clinic of AIIPMR satisfying above criteria were recruited. The detail history was elicited. Patients were clinically evaluated for range of movement. Also the tightness, contracture and deformity at the hip, knee & ankle joint was assessed with goniometer. Kinematic study in gait lab had six infrared cameras and two video cameras. All these

findings were synchronized to obtain temporal and distance parameters of gait cycle.

Out of 10 patients 8 had rectus & gastrosoleus spasticity and among these 8 patients 4 had tendoachilles contracture and other 4 had gastrosoleus spasticity. 2 patients had only rectus spasticity out of these 2, one had tendoachilles contracture and other had hamstring weakness. Motion gait analysis in gait lab revealed that knee goes into hyperextension in late stance.

## Identification and Management of Locomotor Problems in Children with Cerebral Palsy Aged 5 to 10 Years Attending CP Clinic

*Dr. Reeba Sini Jacob, Dr. Sreedevi Menon P,  
Dr. V K Sreekala*

The purpose of this study was to describe problems of children with cerebral palsy (CP) with special emphasis on locomotion. Data concerning demographic facts, locomotion, musculoskeletal problems, interventions done and present physical activity were collected during a period of 3 months from August to October 2011. Study population consisted of 20 children with CP aged 5 to 10 years, attending the CP clinic of the Department of PMR, Medical College Hospital, Thiruvananthapuram.

**Key words :** Cerebral palsy, locomotion.

## Identification of Problems in Children with Ligamentous Laxity and Their Management

*Dr. Sajeena. A. S, Dr. Sreedevi Menon. P,  
Dr. V. K Sreekala*

This is an observational study conducted in a population of children attending the Department of PMR, Medical College, Thiruvananthapuram on outpatient-basis, with ligamentous laxity. Their problems/ complaints were identified and analysed and the appropriate management was given. The study population of sample size, n=50, consisted of children who presented with ligamentous laxity in OPD during a three-month period from August 2011 to October 2011.

The study population was evaluated using the parameters of age, sex, consanguinity, events during antenatal, natal and postnatal period, developmental milestones, most

common complaint, physical examination and appropriate investigations. The necessary management was given. The study is under follow-up now.

**Key words:** Observational study, children with ligamentous laxity.

### **Comparison of the Effectiveness of a Home-based Self-administered Exercise Program with that of Conventional Supervised Physiotherapy in Chronic Mechanical Low Back Pain**

*Dr. Sujith. K .R, Dr. Sreedevi Menon. P, Dr. V. K. Sreekala*

This is an interventional trial for comparing the effectiveness of a home-based self- administered exercise programme with that of conventional supervised physiotherapy in chronic mechanical low back pain, conducted on a population aged 20-40 years, attending the Department of PMR, Medical College, Thiruvananthapuram on outpatient-basis.

After initial assessment, the patients fulfilling the inclusion criteria were assigned to 2 groups, A and B. Group A underwent conventional physiotherapy in the hospital. Group B underwent home-based exercise programme with specific exercises. The sample size of the study population was 104, and the period of study was one year.

Outcomes of the interventions were measured by the visual analogue scale, Oswestry Disability Questionnaire, Rolland Morris Low Back Questionnaire and Dartmouth

COOP Functional chart. The analysis is under progression now.

**Key words :** Interventional trial, mechanical low back pain, conventional physiotherapy, home-based exercise programme.

### **Bilateral Spontaneous Rupture of Achilles Tendon**

*Dr. Asem Rangita Chanu*

**Study Design :** Case report.

**Objectives :** To report a rare case of bilateral spontaneous rupture of Achilles tendon and discuss the possible mechanisms of its injury

**Case :** A 59years old milkman from a hilly rural background of Manipur reported on 5<sup>th</sup> February 2011 with the complaint of pain both ankles and difficulty in walking since 12<sup>th</sup> October 2010. There was no history of injury or local or systemic steroid use. Since then, he was able to walk only with a walking stick. Clinically, we diagnosed him as a case of spontaneous bilateral rupture of Achilles tendon.

Clinical diagnosis of bilateral spontaneous rupture of Achilles tendon was confirmed during the operation on 9<sup>th</sup> February 2011. End to end suturing was not possible. Repair was done using reinforcement technique.

By the end of 4<sup>th</sup> postoperative month, patient was able to walk without crutches.

**Conclusion :** Spontaneous bilateral rupture of Achilles tendon is very rare and surgery is indicated in majority of cases. Repeated microtrauma caused by moving up and down the hill slope could be the reason for spontaneous rupture.

**Key words :** Achilles tendon, spontaneous rupture.