Research Collaborations

Ganga Hospital has established collaborations with internationally recognized research institutions.

- **The University of Hong Kong**
  Selective Nucleotide Polymorphism analysis for genetic study

- **University of Delhi, India**
  Biochemical analysis for apoptosis and pro-inflammatory cytokines in Disc Degenerative Disease.

- **Rush University, Chicago**
  Functional Element Model Analysis of Post Tubercular Deformity

- **Cotrel Foundation, Paris**
  Role of Mechanical stress on the causation of disc degeneration - scoliotic disc study

- **Siemens India**
  Diffusion Tensor Imaging studies of Spinal cord, Functional MRI studies and Disc diffusion Analysis.

- **Microlab, Coimbatore**
  Histopathological analysis for microstructural changes in Disc Degenerative Disease.

- **Tromsoe Mine Victim Resource Center, University Hospital of Northern Norway**
  Study on Open Injuries

- **Tamilnadu Agricultural University, Coimbatore**
  Molecular Biology Analysis - Isolation of DNA from blood samples and proteomic analysis of disc specimens
The Ganga Orthopaedic and Research Education Foundation (GOREF) was established in August 2002 to facilitate research in spine and orthopaedic surgery. The foundation was set up by a large personal donation by Dr S Rajasekaran.

GOREF is approved by Department of Scientific and Industrial Research (DSIR), a department under Ministry of Science & Technology, Government of India in recognition to the high quality research conducted. The foundation has now grown in strength and added to its credit various activities such as academic training of surgeons and paramedical staff, organizing scientific meetings and conferences, funding on-going research activities of the department.

The foundation has also taken up social responsibilities. It provides funds to the ‘Project Helpline’ (a project to support surgical correction of physical deformities in poor children), Projects under ‘SWASAM’ a social initiative inaugurated by Shri. APJ Abdul Kalam and primary education of underprivileged children.

GOREF also supported the establishment and running of Ganga Spine Rehabilitation Centre at a cost of Rs.3 Crores which provides subsidised or free rehabilitation to spinal cord injured patients.

Dr. S. Rajasekaran PhD.,
Managing Trustee

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CONVENTIONAL MRI assesses the spinal cord as a whole and does not evaluate the spinal cord at the tract level. Hence it is not useful in accurate assessment or prognostication of acute or chronic injuries. DTI is a new and emerging technique which can assess individual tracts by following the movement of water molecules. This technique has been used widely in the imaging of brain but not in the spinal cord. Our study was aimed at evaluating the sensitivity and specificity of this technique in assessing the extent of damage to the tracts of the spinal cord in both acute injuries and chronic compressive myelopathies.

We are also aiming to document the DTI data metrics of various parameters like FA and ADC values at various levels of the cervical spinal cord and in different age groups. We obtained grants from Department of Biotechnology (DBT), a department of Ministry of Science and Technology, Government of India and AOSpine, Asia Pacific, to support the study.

The anatomy of failure in Lumbar disc herniation - An in vivo, multimodal, prospective study of 181 subjects
Study Team: S. Rajasekaran, Nipun Bajaj, Vijay Tubaki, Rishi M. Kanna and Ajoy Prasad Shetty

• ASSI Best Research Award

Although in vitro mechanical disruption studies have implicated both the endplate junction (EFJ) and the annulus fibrosus (AF) as the site of failure in LDH, there are no in vivo human studies to document the exact anatomy of failure. 181 patients requiring microdiscectomy were evaluated by plain radiograph, thin slice computed tomographic scan, plain and contrast magnetic resonance imaging, intraoperative examination, and histopathological analysis. Results showed that LDH due to EFJ failure (EFJ- type I herniation) was more common (117; 65%). The EFJ was evident radiologically as vertebral corner defect in 30 patients, rim avulsion in 46, frank bony avulsions in 24, and avulsion at both upper and lower EF in 4. Our study provides the first in vivo evidence that LDH in humans is more commonly the result of EFJ than AF rupture.

Diffusion Tensor Imaging (DTI) as a novel method for assessing spinal cord at tract level.
• IOA Golden Jubilee Commemoration Lecture Award
• Neuro Spine Conference - Best e-poster Award, Chennai
• IOACON - Basic Science Research Award

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**Modic Vertebral Endplate changes - Prevalence, Patterns and Exiologic Genetic Association Analysis of 71 Genetic Polymorphisms in 809 patients**

Study team: S. Rajasekaran, Rishi M Kanna, Ranjani Raja Reddy, Natesan Senthil, Muthuvara Raveendran, Kenneth MC Cheung, Danny Chan, Patrick YP Kao, Ajoy Prasad Shetty

- **Prof A Subramanian Best Research Paper Award**

Modic changes (MC) are vertebral end plate signal changes observed in sagittal magnetic resonance imaging sequences. As the true significance of MC is not known, the present study was performed to evaluate the prevalence of MC and the role of genetic polymorphisms in 40 candidate genes (including 71 SNPs). Results showed that there were 809 individuals and based on the presence of MC, the total population was divided into 702 controls and 107 cases. Modic changes were identified in 254 endplates among the 1090 endplates. L4-5 endplates were the most commonly affected level (n=77, 30.7%) followed by L5-S1 (n=66, 26.3%), L3-4 (n=60, 23.9%) and others. The rs2328570 SNP of Vitamin D receptor (VDR) gene (p=0.02) and rs17099008 SNP of Matrix Metallo proteinase (MMP 20) (p=0.03) were significantly associated with MC, which has not been reported previously.

**The assessment of neuronal status in normal and cervical spondylotic myelopathy using diffusion tensor imaging.**

Study team: Rajasekaran S, Yerramshetty JS, Chittode VS, Kanna RM, Balamurali G, Shetty AP.

- **IOA Golden Jubilee Award 2010**

Magnetic resonance imaging is the current “gold standard” in the assessment of cord status in CSM, however, various parameters such as extent of compression and presence of signal intensity changes do not correlate well with clinical status. A prospective analysis of DTI datametrics collected from control and patients with cervical spondylotic myelopathy was performed to study the use of DTI in CSM. Patients with CSM (n = 35) and 40 normal individuals were included. Results showed that there was significant difference in DTI datametrics between patients with myelopathy and control (P < 0.05), with decrease in fractional anisotropy (0.49 ± 0.081 vs. 0.53 ± 0.07) and increase in apparent diffusion coefficient (1.8 ± 0.315 vs. 1.44 ± 0.145) and eigenvalues.

**In Prone Position Ideal for Manipulation and Pinning of Displaced Pediatric Extension-type Supracondylar Fractures of Humerus?: A Randomized Control Trial.**

Study Team: Venkatadas K, Balachandar G, Rajasekaran S.

- **Dr Joy Patankar Gold Medal, IOMCON 2013**

Closed reduction and percutaneous pin fixation is the standard of care for displaced supracondylar fractures of humerus in children. Although it is routinely performed in supine position, some authors recommend prone position to be advantageous as it aids in gravity reduction and avoids elbow hyperflexion. 52 children with acute, grade III supracondylar humerus fractures without vascular injury were included in the study. They were grouped into prone (n=26) and supine (n=26). Results showed that there was no significant difference between the 2 groups in the duration of procedure (P=0.422), number of radiation exposure (P=0.491), attempts at closed reduction (P=0.904), and attempts for pinning (P=0.745) and the final clinical and radiologic outcomes.

**Research**

**Multilevel Non-contiguous Spinal Injuries – Incidence and Patterns based on Whole Spine MRI**

Study Team: Chandrasekhar Gaike, Rishi M Kanna, Ajoy P Shetty, S Rajasekaran

- **ASSI Best Basic Science Research Award**

Multi-level non-contiguous spinal injuries are not uncommon and their incidence varies from 1.6 to 77% depending on the type of imaging modality used. The efficacy of whole spine MRI in detecting asymptomatic significant vertebral fractures is not known. Consecutive spinal injury patients treated between 2011 and 2013 were retrospectively evaluated based on clinical and radiographic records. Among 484 patients, ninety five (19.62%) patients had multilevel injuries including 86 (17.76%) with non-contiguous injuries. Five common patterns of non-contiguous spinal injuries were observed. Whole spine MRI scan detected 24 (28.6%) missed secondary injuries of which 5 were unstable.
Incidence and Impact of Low back pain and lumbar spine disorders in patients undergoing total knee replacement

Dr. P. Dhanasekararaja, Dr Harsha G, Prof. S. Rajasekaran

The incidence of symptomatic osteoarthritis of the knee and degenerative lumbar spinal disorders is increasing in our aging population. Prospective study of 202 patients with end stage arthritis of knee who underwent TKR was performed. Back pain was present in 98 patients (49%). There was significant correlation (p, 0.005) of pre op back pain VAS & ODI with coronal plane and sagittal plane deformities of knee. 82% (80 patients) had resolution of back pain with significant improvement in VAS and ODI scores after TKR. 18 patients had persistence of back pain and 2 patients underwent spine surgery. Degree of coronal and sagittal plane deformity of knee, pre op VAS and pre op ODI and structural spinal pathologies are prognostic indicators for resolution of back pain following TKR.

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Genetic basis of degenerative lumbar disc disease in Indian population

- ASSI – Basic Science Research Award – 2011

There is growing opinion that disc degeneration has more genetic basis than environmental factors. All the genetic studies performed so far were in the Chinese, Japanese and Finnish population and there were no studies on Indian population which accounts for 1/6th of the world population. This project aims to study the effects of genetics in the Indian population and to find the association of 57 SNP’s within highly selected phenotypes. The study included 1000 cases and 400 controls and is being conducted in collaboration with Genetics department of the Tamil Nadu Agricultural University and the University of Hong Kong who have good expertise in this field.

International Publications Published From Recent Research Works


