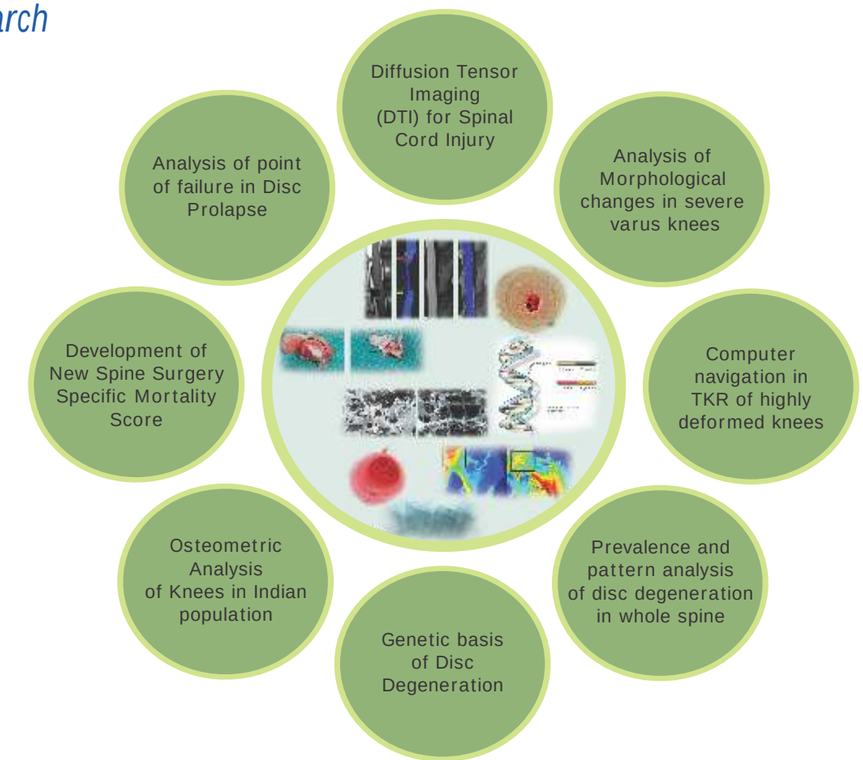
Research



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Ganga Medical Centre & Hospital Private Limited

(Registered with US Department of Health & Human Services) Regn No. IRB 00004503

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Ganga Orthopaedic Research & Education Foundation (GOREF)

Ganga Orthopaedic Research & Education Foundation' (GOREF) was established in August 2002 to facilitate and conduct research in all aspects of orthopaedic surgery, in both clinical and basic sciences.

This organization was also awarded the recognition of Scientific and Industrial Research Organisation (SIROs) by the Government of India, Ministry of Science & Technology, Department of Scientific and Industrial Research Organisation (SIRO), New Delhi on 30th April 2009 in recognition of the high quality research performed in the last many years. The foundation has now grown in strength and has to its credit, various activities such as supporting the academic training of the hospital staff, holding scientific meetings and conferences, funding on-going research activities of the department, providing funds for 'Project Helpline' (a project to support the surgical correction of physical deformities of poor children) and also the primary education of deserving under privileged children.

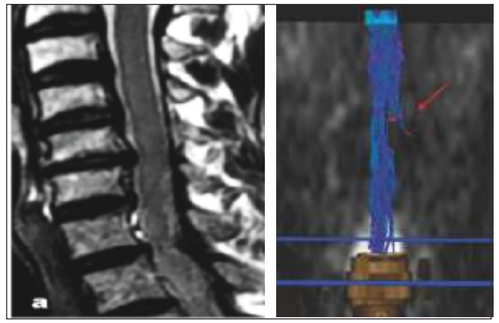
Memorandum of Understanding

- Tamil Nadu Agriculture University,Coimbatore-
  Gene analysis in patients with back pain
- University of Hongkong-
  Genetic basis of DDD
- Venkateshwara University, New Delhi-
  Biochemical and end plate analysis in disc prolapse
- Central Leather Research Institute, Chennai-
  Effect of mechanical forces in lumbar discs

Diffusion Tensor Imaging (DTI) as a novel method of assessing spinal cord at tract level.

- ASSI – Clinical Science Research Award – 2010
- IOA Golden Jubilee Commemoration Lecture Award - 2011

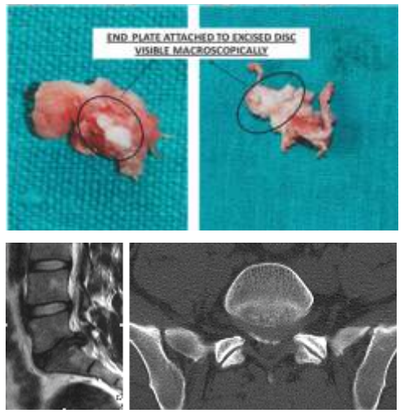
- Conventional MRI assesses the spinal cord as a whole and does not evaluate the spinal cord at the tract level. Hence it is not useful in accurate assessment or prognostication of acute or chronic injuries.
- DTI is a new and emerging technique which can assess individual tracts by measuring the movement of protons.
- This technique has been used widely in the imaging of brain but not in the spinal cord.
- Our study aims 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 datametrics of various parameters like FA and ADC values at various levels of the cervical spinal cord and in different age groups.



Case illustrating the value of DTI. A hemi section of the spinal cord is scarcely visible in the normal MRI. The DTI however shows the disruption of the fibers indicating the hemisection of the spinal cord dramatically.

A multi-modal evaluation of the anatomical site of failure in lumbar disc herniation.

- ASSI – Clinical Science Research Award – 2011



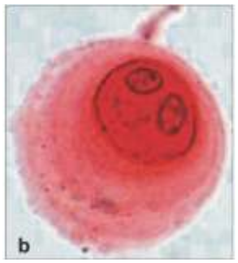
L5-S1 disc extrusion in the MRI showing a rim avulsion fracture of the end plate in the CT scan as the etiology of the avulsion. The excised disc material clearly shows large end plate fragment attached to the extruded disc.

- It is traditionally believed that lumbar disc herniation is the result of an acute or chronic tear of the annulus which allows the nucleus pulposus to herniate.
- Our hypothesis is that the majority of herniations occur as the result of failure of the end plate as an avulsion of the end plate – annulus junction which allows the nucleus to herniate subligamentously.
- This hypothesis is being verified by the use of plain radiology, thin slice CT, plain MRI, post contrast serial MRI studies, intra-operative evaluation of the herniated material and histopathological studies of the removed disc material.
- Our preliminary results does indicate that avulsion of the end plate may be the primary mode of failure of the disc in majority of the patients.

A Study of Effects of in vivo Mechanical Forces on Human Lumbar Discs with Scoliotic Disc as a Biological Model.

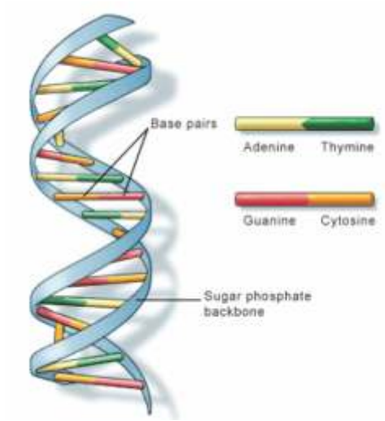
- ISSLS – Basic Science Research Award – 2010
- ASSI – Basic Science Research Award – 2010

- The effect of mechanical stress on the biology of the disc has largely been studied in animal models which may not truly reflect the biology of human lumbar disc. Scoliotic discs of humans offer a perfect study model for both compressive and distractive stresses.
- 6 patients with AIS were assessed with pre and post contrast MRI followed by a histological and biochemical evaluation of the disc material harvested during scoliosis correction surgery.
- The results were compared to normal discs harvested from tumor surgery.
- Our study showed that end plate damages occurred early on both the concave and convex sides and this led to changes in the diffusion leading to early degeneration. These changes were more pronounced in the caudal end segments than in the apex and were more pronounced in patients with truncal deviation.
- Our finding have important implications in the timing and choice of surgery.



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 studies perform so far have been in the Chinese, Japanese and Finnish population and there are no studies in the Indian population which accounts for 1/6th of the world population.
- This project aims to study the genetics in the Indian population and to find the association of 57 SNP's with very highly selective phenotypes.
- The study is done in collaboration with Genetic department of the Tamil Nadu Agricultural University and the University of HongKong who are experts in similar studies.

Development and validation of a New Spine Surgery Specific Morbidity Score to predict post operative morbidity and mortality in elective spine surgery.

- ASSI – Young Investigator Award - 2011

- Spine surgery can be associated with significant intra operative and post operative complications, the predictors of which are poorly defined. Although Charlson's Comorbidity Index has been used for tumor related surgeries, it is neither sensitive nor specific for spine surgeries.
- In a preliminary study, we have identified the risk factors for development of postoperative complications and have developed a good scoring system by assigning risk stratification weightage to each patient variable.
- This new scoring system will help in directly assessing the risk- benefit ratio of surgery in the older age groups and enables the practicing spine surgeon to adequately inform patients regarding the surgical risk.
- The score was validated in over 500 patients subsequently and was found that our new score was highly specific and sensitive in predicting the complications of spine surgery.

Pre-operative predictors		Score
Age	< 50	1
	50-70	2
	>70	5
ASA	Class 1	1
	Class 2	2
	Class 3	5
	Class 4	6
	Class 5	7
No. of instrumentation levels	£ 3 levels	1
	> 3 levels	2
Duration of surgery (min)	? 180 min	1
	> 180min	2
Blood loss (ml)	? 500 ml	1
	> 500 ml	4

Osteometrical analysis of the distal femurs in Indian patients with respect to total knee replacements

- Prof. M.Ramanathan Consultant Gold Medal- TNOACON 2010

The above AP radio graphs of femur from 2 different patients show that the medio lateral bowing is very different individuals. Currently the jig based system of femoral implantations is based on the osteo metrical values of the Western population. This may be lead to minor alignment errors of the Total Knee Replacement. Our study aims to document the accurate osteo metrical data of the distal femurs of the Indian population.

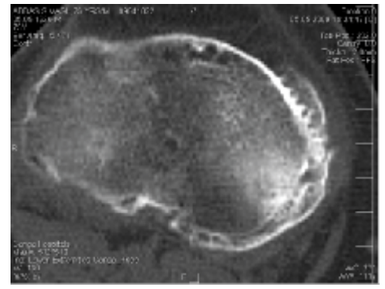
- Conventional method of resection of distal femur is based on analysis of morphometry of western population which may not be accurate for Indian population.
- Our preliminary radiological review has shown a high incidence of bowing and extra articular deformities in the femur which can significantly alter the alignment of TKR components.
- This study attempts to change the conventional method of using fixed angles of resection for the distal femoral cut during primary total knee replacement.
- The results of the study may help in designing more accurate instrumentation and implants for TKR in Indian population.

Prevalence and pattern analysis of disc degeneration

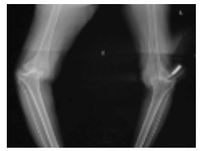
- Previous studies have studied the prevalence of MRI changes in the spine and correlated these change to clinical findings but have the drawbacks and have focused on a single or few changes Studying the association of MRI changes with disc degeneration will help in determining the factor most influencing disc degeneration.
- Our objectives are 1) to examine the pattern and prevalence of MRI changes in the spine and correlate the changes to age, pain symptoms and occupation.
  2) to examine the association of various MRI findings to one another within each spinal level.
  3) To determine patterns of distribution of disc degeneration in the spine. This may provide insights into the aetio-pathogenesis of Disc Degenerative Disease.

Morphological changes of upper end of tibia in severe varus knees:

- Our anatomical and radiological analysis has shown significant changes in bone density and morphology with severity of deformity in arthritic knee patients.
- In severe varus knees, there is bone migration and eburnation on the posteromedial aspect of the medial plateau of the tibia leading to alteration in the shape of the upper tibial surface.
- The changes in morphology, if not recognized, can lead to errors in component placement during total knee replacement.
- Our study involves documentation of the extent of the morphological changes with the severity of varus and identification of landmarks for accurate component placement.



Application of computer navigated surgery in improving alignment and ligament balancing in severely deformed knees.



- The role of navigation in TKR has been established in the west.
- However we have observed that deformities both intra and extra articular are more pronounced in Indian population due to nutritional and social causes.
- Achieving accurate alignment in severely deformed knees with and without bone loss is a challenge. The role of navigation in this situation has not been assessed and reported in the literature.
- We are aiming to define its role in the severely deformed knees in Indian population to assess its efficacy and cost effectiveness in clinical practice