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## MANAGEMENT OF LUMBAR SPINAL STENOSIS

*Contributed by Associate Professor Hee Hwan Tak,  
Deputy Head and Senior Consultant  
University Spine Centre*

**L**umbar spinal stenosis is a disease affecting mainly the middle aged and beyond, and is due to the gradual narrowing of the spinal canal from encroachment by thickened ligamentum flavum, hypertrophic facet joints, and bulging discs (Figure 1). Typically, a person with spinal stenosis complains about developing tremendous pain in the legs or calves and lower back after walking. This is usually very reproducible and immediately relieved by sitting down, or leaning over. When the spine is bent forward, more space is available for the spinal canal, causing a reduction in symptoms. Although symptoms may arise from narrowing of the spinal canal, not all patients develop symptoms. Why some patients develop symptomatic stenosis and others do not remain unknown. Therefore, the term spinal stenosis refers not to the finding of spinal canal narrowing, but rather to manifestation of lower extremity pain caused by compression on the affected nerves.

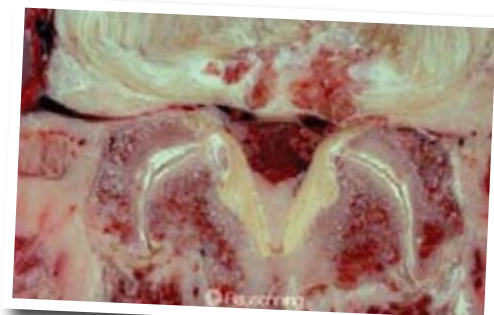


figure 1

The risk of developing spinal stenosis increases in those who:

- are born with a narrow spinal canal
- are female
- are 50 years of age or older
- have had previous injury or surgery of the spine

Conditions that can cause spinal stenosis include:

- Osteoarthritis and osteophytes (bony spurs) associated with aging
- Inflammatory spondyloarthritis
- Spinal tumours
- Trauma
- Paget's disease of the bone
- Previous surgery

Diagnosis of spinal stenosis is usually made clinically. It is important during the clinical evaluation to rule out vascular claudication as a possible differential diagnosis. Investigations to confirm spinal stenosis include the use of plain

radiographs (anterior-posterior, lateral, and dynamic flexion extension films). Specialised investigation like magnetic resonance imaging of the lumbar spine will reveal the level and nature, as well as the severity of the spinal stenosis (Figure 2).

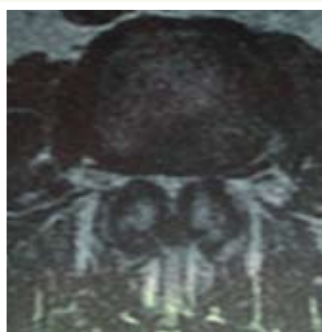


figure 2

In the absence of severe or progressive nerve involvement, we can manage spinal stenosis via the following conservative measures:

- Nonsteroidal anti-inflammatory drugs to reduce inflammation and relieve pain
- Analgesics to relieve pain
- Nerve root blocks near the affected nerve to temporarily relieve pain (Figure 3)



figure 3

- Restricted activity
- Prescribed exercises and/or physiotherapy to maintain motion of the spine, strengthen abdominal and back muscles, and build endurance, all of which help stabilize the spine. Some patients may be encouraged to try slowly progressive aerobic activity such as swimming or using exercise bicycles.
- A lumbar corset to provide some support and help the patient regain mobility. This approach is sometimes used for patients with weak abdominal muscles or older patients with multi-level degeneration.
- Chiropractic treatment—This treatment is based on the philosophy that restricted movement in the spine reduces proper function and may cause pain. Chiropractors may manipulate (adjust) the spine in order to restore normal spinal movement. They may also employ traction, a pulling force, to help increase space between the vertebrae and reduce pressure on affected nerves.
- Acupuncture—This treatment involves stimulating certain places on the skin by a variety of techniques, in most cases by manipulating thin, solid, metallic needles that penetrate the skin.

In many cases, the conditions causing spinal stenosis cannot be permanently altered by nonsurgical treatment, even though these measures may relieve pain for a period of time.

Surgery might be considered immediately if a patient has numbness or weakness that interferes with walking, impaired bowel or bladder function. The effectiveness of nonsurgical treatments, the extent of the patient's pain, and the patient's preferences may all factor into whether or not to have surgery.

The purpose of surgery is to relieve pressure on the cauda equine and/or nerve roots, as well as restore and maintain alignment of the spine. This can be done by decompressive laminectomy, i.e. removal of the lamina (roof) of one or more vertebrae to create more space for the nerves. If the affected spinal segment is also deemed to be unstable (e.g. spondylolisthesis or lateral subluxation in degenerative scoliosis) or responsible for a significant proportion of the patient's axial back pain, fusion may also be performed at the same setting. Fusion often involves the use of the patient's own bone (autograft) from the removed lamina or facet, supplemented by titanium pedicle screws. Various methods may be used to enhance fusion and strengthen unstable segments of the spine following decompression surgery, e.g. the use of interbody cages placed in the intervertebral disc spaces after thorough discectomy. One advancement in the surgical fusion technique is the use of BMP (bone morphogenetic protein) to improve the fusion success rate, especially in patients with higher risks of non-union e.g. diabetics, smokers, multi-level surgeries, and revision surgeries.

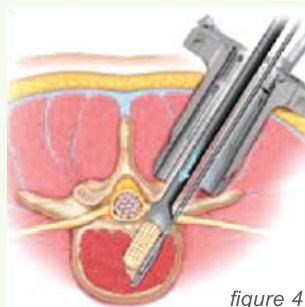


figure 4

The buzz words in spine surgery nowadays are non-fusion surgery and minimally invasive surgery. These techniques are now applicable in the surgical treatment of lumbar spinal stenosis in carefully selected patients.

Non-fusion surgery is possible with the use of dynamic devices placed after decompression laminectomy in order to restrict but not completely eliminate spinal motion at the affected level. Minimally invasive surgery is now possible with the use of specially designed ports (Figure 4) and cannulated screw systems (Figure 5), with the added advantage of reduced hospital stay and earlier return to work.



figure 5

# TraumaCad Digital Templating For Joint Replacements

*Contributed by Dr Kevin Lee,  
Division of Adult Reconstructive Surgery*

We are the first in Singapore to acquire the TraumaCad web-based pre-operative planning and digital templating software. In terms of Xrays, our hospital is film-less and this means that all images are digitally stored on servers and accessible from any computer in the hospital. The TraumaCad system integrates seamlessly with these digital images and pre-operative planning can be carried out with ease. TraumaCad's optimization of hip and knee replacements is ideal for complex reconstructions and osteotomies as well as for standard primary joint replacements. We evaluate the post-operative anatomical alignment of various surgical scenarios (cutting, displacing, implanting) to create an optimal surgical plan.



## Computer Guided, Minimally Invasive Total Knee Arthroplasty

*Contributed by Dr Andrew Dutton,  
Division of Sports Medicine*

**T**otal knee arthroplasty is considered an extremely successful operation with a ten years survivorship of over ninety-five percent.

It has allowed patients to regain their function of being able to travel and stay independent. It also leaves patients out of severe knee pain. As patients become more discerning and more informed, the need for improved cosmesis, less post-operative pain and faster functional recovery has become more important in assessing total knee arthroplasty. In response to this, there was the development of the minimally invasive technique for performing a total knee replacement. The implant itself remains the same, however the surgical approach and technique for placement of the implants has been modified for the minimally invasive technique. It is also technically demanding and there is a significant learning curve required in order to obtain familiarity with this type of surgery.



*Computer monitor and infrared camera used for Total Knee Arthroplasty*

The traditional methods of performing a total knee replacement involve a skin incision of approximately 18 cm. The quadriceps tendon as well as the medial capsule of the knee joint is cut in order to gain visualisation of the knee. Minimally invasive total knee arthroplasty involves making a smaller skin incision which is less than 12 cm long. It avoids substantial violation of the quadriceps tendon. The patella or 'knee cap' is not inverted but rather subluxated laterally to gain access to the knee joint. It requires the use of special soft tissue retractors that allow the surgeon to move the surgical field via a mobile soft tissue window. Balanced retraction is required to achieve this.

Another recent advancement in total knee arthroplasty is the use of computer navigation. One of the primary goals in knee replacement is to realign or 'straighten' the lower limb. This consists of re-establishing a neutral mechanical axis. This axis can be assessed on radiographs as a straight line beginning from the centre of the hip joint, through the centre of the knee to the centre of the ankle. During knee surgery, the surgeon is unable to directly locate the centre of the hip joint, thus the surgeon uses special jigs to indirectly locate this point. However, due to anatomical variation among patients, this may be inaccurate in up to 40% of patients. Thus implantation of the total knee prosthesis may be inaccurate. If the placement of the implant is greater than three degrees from the ideal, there is an increased risk of early failure of the prosthesis. In order to avoid this, computer navigation for total knee arthroplasty was developed.

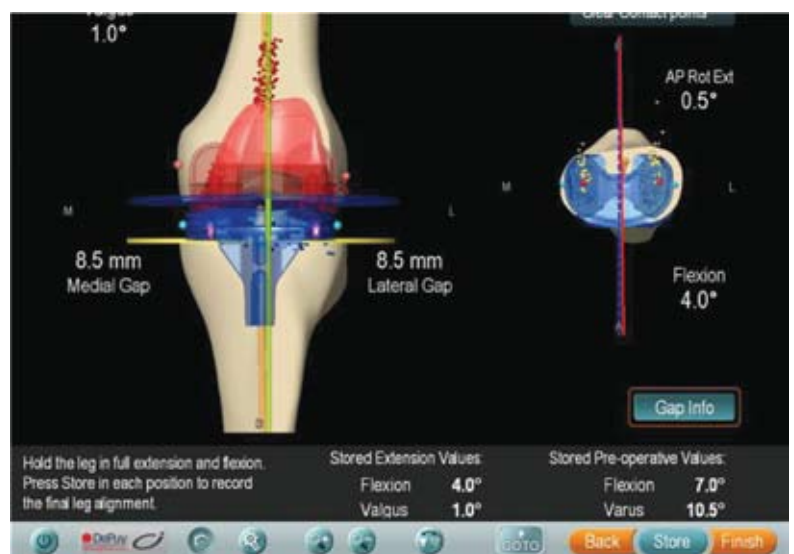
Computer navigation involves the insertion of extra metal pins into the femur and tibia. On this pins are reflectors that allow an infrared camera to locate the position of the pins in three dimensional space. Once these pins are placed, the surgeon then locates certain anatomical points around the knee which the computer then analyses and is able to produce a three dimensional bony model of the knee joint in real time. The computer is then able to assist the surgeon in terms of making bony cuts during the surgery, helps with choosing the correct implant size as well as inserting the implant in the correct rotation. Because the surgeon is guided by the computer rather than the conventional jigs, metal rods are not inserted into the shaft of the femur and tibia bones. This prevents the possible complication of fat embolism. It is also useful in those patients that have had previous trauma or severe anatomical deformity of the femur or tibia. Studies have shown that computer navigation has improved the implants position for total knee arthroplasty.

Minimally invasive total knee arthroplasty does have the proposed of improved cosmesis, less blood loss, less pain and faster rehabilitation and recovery of function. However due to a smaller surgical field when performing the surgery, there could be the possibility of poor implant placement and inadequate cementation leading to early failure of the implant. In order to overcome this problem, one surgeon at the National University Hospital who was completing his subspecialty training at Harvard Medical School worked on a technique to combine minimally



*Special instrumentation for minimally invasive, computer guided total knee arthroplasty*

invasive surgery with computer navigation in performing total knee arthroplasty. Combining the two techniques would thus provide the best outcome for patient undergoing this procedure. A study was performed on 108 patients undergoing total knee replacement. Half of these patients underwent the new procedure of minimally invasive, computer guided total knee arthroplasty. The result revealed that the patients undergoing the new procedure had a shorter hospital stay, less blood loss during the surgery and faster functional recovery within the first month. Radiographic examination of the position of the total knee implant revealed improved alignment compared to the traditional technique. This was an important discovery and it was published in the American Journal of Bone & Joint Surgery. This journal is the most widely read journal for orthopaedic surgeons worldwide. After the publication of this study, representatives of this journal have requested to come and produce an instructional video of this surgery to educate orthopaedic surgeons. This was a first for Singapore.



*Computer screen during surgery*



Equipment and traction table for hip arthroscopy



View of the hip during arthroscopy

# HIP ARTHROSCOPY

*Contributed by Dr Andrew Dutton, Division of Sports Medicine*

**H**ip arthroscopy or keyhole surgery of the hip is relatively new. The concept of hip arthroscopy was initially introduced in the 1930s and used in mainstream orthopaedic surgery from the 1980s. It is considered relatively new compared to keyhole surgery of the knee or shoulder. The difficulty associated with hip arthroscopy is related to the location of the hip joint underneath the level of the skin. The joint is surrounded by a large bulk of muscles and access to it requires substantial traction to the lower limb. Consequently the especially long arthroscopic equipment is required to perform the surgery.

The indications for hip arthroscopy are evolving and expanding due to excellent clinical success. Hip arthroscopy is very useful for treatment of loose bodies within the hip joint. These can be removed through the keyholes without cutting the muscles around the hip. Another common condition treated is that of a labral tear. The labrum is the main ligament surrounding the hip joint. Tears of this structure are often seen in the very active and young patient. If the tear is small, then the labral can be smoothed out. However if the tear is large, then these tears can be treated by suture repair with bony anchors. The articulating surfaces of the hip joint are covered by cartilage which can be damaged for various reasons

such as trauma or steroid medication. Chondroplasty can be performed by hip arthroscopy. Femoro-acetabular impingement syndrome and early stages of osteoarthritis can often be treated by hip arthroscopy with success.

The procedure of hip arthroscopy requires a general anaesthesia and full relaxation of the muscles. The patient can be placed in the supine or lateral position on a traction table which allows distraction of the hip joint. Two 5mm incisions are made over the lateral aspect of the hip for the introduction of the arthroscopic equipment. Extra long and curved shaver blades can be used to perform chondroplasty. Long graspers can be used to remove loose bodies. Temperature control thermal wands or lasers can be used for coagulation or smoothing out of the labrum or cartilage. Confirmation of the position of instrumentation usually requires the use of fluoroscopic or x-ray guidance.

This procedure is technically demanding and surgeons who perform hip arthroscopy require special post-graduate training. The hip arthroscopist at the National University Hospital was trained at Harvard Medical School under Dr Joseph McCarthy who is considered the foremost hip arthroscopist in North America.

## Endoscopic Carpal Tunnel Release

*Contributed by Dr Alphonsus Chong and Dr Tan Ter Chyan, Department of Hand & Reconstructive Microsurgery*

Carpal Tunnel Syndrome is one of the commonest conditions referred to a Hand Surgeon. While mild cases can be treated conservatively, more severe cases require carpal tunnel release. Traditionally, this is an open surgical procedure requiring a 2 to 3 cm incision over the palm. Endoscopic carpal tunnel release is a newer alternative to open surgery. This procedure uses a minimally invasive technique to release the carpal tunnel. It can be done under local anesthesia with a small incision placed over the distal wrist crease. The incision is smaller than traditional surgery and along the skin crease. This ensures a cosmetic surgical scar. A special endoscope (see Figure) is inserted into the incision through the carpal tunnel. The roof of the carpal tunnel is then released under direct vision. Multiple research studies have shown endoscopic release to be as effective and safe as the traditional open technique. In the short term, there is reduced scar pain with endoscopic carpal tunnel release when compared to the open technique.



# Clinical Excellence at Your Service

## NUHS WAY QUEST AWARD PRESENTATION UOHC NURSES' DAY CELEBRATION ON 20 JUL 09



FY08 NUHS Way Quest – Merit Award for project "To improve Orthopaedic Inpatient Discharge Process"



FY08 NUHS Way Quest – Merit Award for project "Promote patient comfort using hand elevator for hand injury patient" & "Reduce unnecessary motion to get pat slide to transfer patient"



FY08 NUHS Way Quest – Merit Award for project "To increase percentage of Ortho P2 cases operated within less than 6 hours"



A/Prof Naresh Kumar led the team to receive Merit Award presented at the 9th NHG Quality Week Launch, TTSH Theatre on 1 Oct 09



UOHC Nurses' Day Celebration

### OTHER EVENTS



UOHC Specialist Outpatient Clinic Patient Satisfaction Workshop on 5 Sep 09



UOHC Service Appreciation Day to Inpatient & Specialist Outpatient Clinic Staff on 1 Oct 09



NHG-NUHS Inter-Institution Games 2009 Finale at MacRitchie Reservoir on 1 Aug 09

### NUHS DINNER & DANCE 2009 NUH Model Patient Service Associate Award



Our heartiest congratulations to Senior PSA Meenachi D/o Sivalingam in receiving the award at the NUHS Dinner & Dance on 11 Jul 09

### HAND HYGIENE CAMPAIGN



Our Cluster Chair, Prof Wong Hee Kit, leading by example at the NUH Hand Hygiene Campaign – Save Lives with Clean Hands in month of May 09



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Operating Hours	Mondays to Fridays: 8.30am – 5.30pm Saturdays / Sundays / Public Holidays Closed			