Orthopaedic Surgery - Our Past Events & Achievements

The Role of Tranexamic Acid in Orthopaedic Surgery

Paediatric Flat Feet

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He is the Director of the NUS / NUH Bone Bank, and also the Director of the IAE / NUS Regional Training Centre for Tissue Banking.

He is author of over 83 scientific research articles, seven books and over 336 conference papers. He is on the editorial board of Diabetic Foot & Ankle and Cell & Tissue Transplantation and reviewer of scientific articles for the Journal of Bone and Joint Surgery (British), Journal of Diabetes & its Complications, Malaysian Orthopaedic Association Journal, Singapore Medical Journal and the Annals of the Academy of Medicine of Singapore.

Books published include Diabetic Foot Problems (2008) and Diabetic Foot (2012).

He is the editor of the University Orthopaedics & Hand Journal launched in October 2012.

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These lectures were delivered at the 35th Annual Scientific Meeting of the Singapore Orthopaedic Association held at the Four Seasons Hotel. In addition, five workshops were also run for the Residency Teaching Programme in the University Orthopaedics, Hand & Reconstructive Microsurgery Cluster (UOHC) from 8 to 10 October 2012, namely: Musculoskeletal Oncology Symposium, Acetabular Reconstruction Workshop, Workshop on Examination Technique, Paediatric Trauma Workshop and Workshop on Paper Writing.

60th Anniversary Celebration Dinner

A gala dinner was held in the Shangri-La Hotel ballroom on the 10th of October 2012 with Professor Yeoh Khay Guan, Dean of the NUS Yong Loo Lin School of Medicine, as the guest-of-honour, attended by more than 300 guests. This included more than 20 clinical fellows who have worked with us in the past, from countries including Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, South Korea, Sri Lanka, and Thailand.

From left: Dr Saw Aik, Mrs Wilkins, Dr Kaye E Wilkins, Dr Gary G Poehling, Mrs Hui, A/Professor James Hui during the 60th Anniversary Celebration Dinner

The Department of Orthopaedic Surgery, National University of Singapore (NUS), commemorated its 60th Anniversary from 8 to 12 October 2012. Three distinguished professors were invited to the department for this occasion:

Professor Gary G Poehling, North Carolina, USA as V K Pillay Lecturer

“Evolution of Arthroscopy from Wrist to Hip”

Professor Franklin H Sim, Mayo Clinic, Rochester, USA as R W H Pho Lecturer

“New Paradigms in Musculoskeletal Oncology”

Professor Kaye E Wilkins, San Antonio, Texas, USA as N Balachandran Professorship Lecturer

“Leave skills in addition to your scars”

Recipients of the 2012 Orthopaedic Teaching Excellence Awards.

New Lectureship

During the dinner, Professor Wong Hee Kit, Chair of the University Orthopaedics, Hand & Reconstructive Microsurgery Cluster (UOHC), also announced the formation of a new lectureship, the Pesi B Chacha Lectureship in Spine and Scoliosis Surgery. This will add to the existing three other lectures - V K Pillay Lectureship, R W H Pho Lectureship and N Balachandran Professorship.

Professor Todd J Albert, Philadelphia, PA, USA as Pesi B Chacha Lecturer

“How to deal with a new healthcare paradigm: What we have learnt from the SPORT studies” 8 January 2014

Mr Colin Howie Consultant, Orthopaedic Surgeon Edinburgh Royal Infirmary, U.K., as V K Pillay Lecturer.

“Dealing with Deformity in Total Hip Replacement”, 23 April 2014

New Research Fund

In addition, a new Orthopaedic Research Fund was set up. This was made possible by a donation of $625,000 from the Kwang Inn Thong Hood Cho Temple and further boosted by another $100,000 from the Lee Foundation and top-up fund of another $100,000 from the Departmental Fund. All these donations were matched one-to-one by the Government.

“…….This fund is meant to provide small start-up research grants for residents and young doctors embarking on research for the first time…….”
Launch of the University Orthopaedics & Hand Journal (UOHJ)

A new journal, the UOHJ, was launched by the Dean during this dinner. It was a special inaugural 60th Anniversary Commemorative Issue produced for the event.

It documented our achievements over the last 10 years from 2001 to 2011, such as 28 Research Awards, and also recorded our history as a mark of tribute to the contributions made by our predecessors and colleagues.

“……It will help teach your young residents in an interesting and novel way on how to do research, how to teach and also how to do clinical practice by sharing our best clinical practices and advances……” - Prof Yeoh Khay Guan

“……The achievements of the Department is best summarized by the 9 Special Awards received by the Department over the last 10 years including the Lee Foundation – NHG Lifetime Achievement Award 2004 (Emeritus Professor RWH Pho), NUS Outstanding Researcher Award 2006 (Professor EH Lee), National Outstanding Clinician Mentor Award (Professor EH Lee), Lee Foundation-NHG Lifetime Achievement Award 2008 (Professor EH Lee), Healthcare Humanity Award 2011 (Associate Professor J Thambiah), Healthcare Humanity Award 2011 (Nurse Manager Irene Yeo), NUS Annual Safety and Health Performance Award 2011, Master Clinician Award 2011 (Professor Wong Hee Kit), and National Outstanding Clinician Award 2012 (Professor Wong Hee Kit) – an outstanding achievement by a single Department……”

– A/Prof Aziz Nather, Editor, UOHJ
Then...

The University Department of Orthopaedic Surgery was set up on 1 April 1952 in the Singapore General Hospital with Professor J A P Cameron as Head of Department. In January 1961, Professor D R Gunn assumed the Headship. The first research laboratory was built in 1964. In 1983, an Animal Experimental Surgery Laboratory and Biomechanics Laboratory was set up in “Harrower’s Hall” SGH. Other laboratories included Histology, Motion Analysis and Cadaveric Research Laboratory. In June 1985, the Department moved into the newly built National University Hospital.

Now...

Under NUH, the Department of Orthopaedic Surgery is combined with the Department of Hand and Reconstructive Microsurgery to become the University Orthopaedics, Hand & Reconstructive Microsurgery Cluster (UOHC). UOHC provides tertiary subspecialty care with University Spine Centre and Divisions of Hip & Knee, Shoulder & Elbow, Sports Injury, Paediatric Orthopaedics, Musculoskeletal Trauma, Musculoskeletal Oncology and Foot & Ankle Surgery, in addition to Hand Surgery by Department of Hand & Reconstructive Microsurgery. The cluster now provides good infrastructure and research facilities in 6 core areas: cell and tissue culture, histology, biomechanics, motion analysis, bone densitometry and X-ray. It is actively engaged in advanced translational research and has won several local and international research prizes.

60th Anniversary Mural

A special mural was also designed to mark this historic event. It marked some of the Department’s milestones in recognition of the important contributions made by our predecessors, and also our plans to bring the Department to greater heights. This mural is now on display on the office wall of the Cluster at NUHS Tower Block.
Prof Lee obtained his MD from the University of Western Ontario and his FRCS(C) in Orthopaedic Surgery after training in the University of Toronto teaching hospitals. He subsequently did a fellowship in paediatric orthopaedics in the Hospital for Sick Children in Toronto before joining NUS as a Senior Lecturer in Orthopaedic Surgery in 1983. In 30 years of service to NUS/NUH, Prof Lee has made substantive contributions in all the domains of teaching, research, clinical and administrative service. As Head of the Division of Paediatric Orthopaedics from 1989 to 2008, Prof Lee developed multidisciplinary clinics with the paediatricians, paediatric surgeons and therapists for various neuromuscular conditions and established a Seating Clinic with the then Spastic Children’s Association of Singapore. Under his leadership, paediatric orthopaedics in NUH gained regional and international recognition as one of the leading centres in the Asia Pacific. Prof Lee himself was elected a member of the prestigious International Paediatric Orthopaedic Think Tank. Prof Lee was also responsible for establishing the department’s research programme in Musculoskeletal Tissue Engineering and he currently leads the NUS Tissue Engineering Programme. His research has led to clinical trials in the use of stem cells for the repair of physeal and articular cartilage in NUH.

Prof Lee was Head of the Orthopaedic Department in NUS/NUH from 1998 to 2001 and Dean of the Faculty of Medicine, NUS from 2000 to 2003. During his Deanship he established the Medical Education Unit which today is acknowledged as the leader in promoting professionalism and excellence in medical education in the Asia Pacific. During his tenure, problem-based learning was introduced into a new medical curriculum and the MBBS PhD programme was inaugurated. As the Director of the Division of Graduate Medical Studies, NUS from 2000 to 2010 he was responsible for ensuring the standards and rigour of postgraduate training and examinations. From 2008 to 2012 Prof Lee contributed to the national R&D landscape as the Executive Director of the Biomedical Research Council, A*STAR. Today Prof Lee continues to see many children with complex orthopaedic problems from Singapore and the region in his paediatric orthopaedic clinic in NUH. He is regularly invited overseas to teach and share his knowledge in paediatric orthopaedics and stem cell research. His passion for teaching and nurturing the next generation of doctors and researchers was acknowledged by the Ministry of Health and Prof Lee was awarded the inaugural Outstanding Clinician Mentor Award in 2008. For his passion and devotion to teaching, research and clinical service, he was awarded the Lee Foundation-NHG Lifetime Achievement Award in 2009.

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Shoulder Pain
Key Pointers for Making a Diagnosis

Shoulder pain affects both the young and the old. When I see a young individual with shoulder pain, trauma is often a precipitating cause. A dislocating glenohumeral joint or a dislocated acromio clavicular joint is the usual diagnosis. Pain localised to the acromio clavicular joint in upper limb sportsmen, bodybuilders and weight lifters is often related to a tear of the meniscus within the acromio clavicular joint. For want of a better term I refer to this condition as an acromioclavicular joint dysfunction or internal derangement.

An anterior apprehension test confirms a recurrent dislocation of the shoulder and an MRI would be the next investigation of choice to confirm an anterior labral tear or a Bankart lesion. An x-ray will establish the changes in a traumatic dislocation of the acromioclavicular joint beside the obvious deformity over the top of the shoulder and tenderness on bouncing the lateral end of the clavicle.

The middle-aged female with shoulder pain has often rotator cuff pathology or a frozen shoulder. A full range of active and passive movements of the shoulder in all directions excludes the latter. Differentiating a cuff tear from tendinitis is often tricky. Pain predominates in a patient with tendinitis and weakness in somebody with a rotator cuff tear. Restriction of active movements with...
full passive movements of the shoulder would point to a significant tear of the rotator cuff. In both groups range of movements is usually full albeit associated with pain. The classical textbook description of a painful arc or catch between 60° and 120° of abduction is an uncommon finding. Restriction of active movements with full passive movements of the shoulder would point to a significant tear of the rotator cuff. (Figures 1a & b)

The rotator cuff has remained an enigma for most surgeons. A small insignificant tear can present with disabling pain and limited active range of movements while a massive tear involving 2 or more of the 4 rotator cuff tendons may present with little or no pain and a surprisingly good range of movements. The clue to a tear in this situation will be a strength testing of the different rotator cuff muscles. The supraspinatus tendon is most frequently involved in tendinosis or tears followed by the infraspinatus and subscapularis. The teres minor is the least likely to be involved in any significant pathology. Plain x-rays are usually normal and an MRI or ultrasound will help to confirm the diagnosis, whether it be tendinosis or tear.

A frozen shoulder is the disease of the middle-aged female and presents with disabling, painful limitation of all shoulder movements.

Unlike a rotator cuff tendinitis or tear, both active and passive movements are restricted in all directions – abduction, flexion, extension, internal rotation and external rotation.

A plain x-ray is usually normal. The older patient is also affected by rotator cuff pathology, tendinitis or tears. In addition, degeneration or osteoarthritis of the acromioclavicular joint is an occasional finding.

Acromioclavicular joint disorders present with pain that starts beyond 120° of abduction or flexion and persists right up to the end of range of movements.

A cross chest adduction of the shoulder often produces pain and is highly specific for this condition. Plain x-rays usually confirm the diagnosis. (Figure 2)

Osteoarthritis of the glenohumeral joint is uncommon and will present like a frozen shoulder with painful restriction of active and passive movements in all directions. An x-ray will confirm the diagnosis and differentiate osteoarthritis from a frozen shoulder (Figure 3).

One has to be mindful of radiating pain from a C5 root lesion in the neck which may present as shoulder pain and of referred pain from intra-thoracic or intra-abdominal conditions. An appropriate history and physical examination will identify the site of pathology accurately. In these patients examination of the shoulder reveals no significant findings.

In older patients one needs to be aware of the “red flags” denoting infection or neoplasm and these have to be ruled out with careful history taking and appropriate physical examination and investigations.
‘Primary’ osteoarthritis of the hip and Femoro-Acetabular Impingement (FAI) is rare in Asians compared to Caucasians. In a personal study done in 1997 for disabling hip disease, 105 patients came in for total hip replacement (THR). Out of this, only 3 patients had primary osteoarthritis of the hip compared to 29 patients with Avascular Necrosis (AVN) and 39 patients with secondary osteoarthritis from acetabular dysplasia. The remaining patients needed THR for a variety of post inflammatory, post trauma and previous septic arthritis. \(^{(23,25)}\) It was postulated that this rarity of primary osteoarthritis of the hip could be due to racial or genetic differences or, possibly to habitual squatting and sitting cross-legged frequently from early childhood. Overtime this may lead to remodelling of the hip joint, increased lubrication and nutrition of the hip articular cartilage by putting the hip joint through extreme ranges of motion—unlike the range of hip motion in individuals who only walk and sit with the hip at 90° flexion and rarely squat. Prof Donald Gunn highlighted the importance of squatting in a paper titled “Don’t Sit – Squat!” in 1974.\(^{(16)}\) Though squatting may be beneficial to the hip joint, it may increase patello–femoral pressure leading to increased incidence of osteoarthritis of the knee, especially of the patello–femoral joint as observed in our local population so while we win on one count we lose in the other!

Most of our patients with disabling hip disease have secondary osteoarthritis from AVN and acetabular dysplasia and they are relatively young. Total hip replacements may have to be performed at a younger age. Hence, careful choice of hip implants has to be planned and surgeons have to be careful too in assessing the femoral canal and acetabular morphology\(^{(14,29)}\), as some patients may return to have revision THR once or even twice in their lifetime, specially with increase in longevity. Increased or random use of steroids and alcohol abuse will lead to AVN of the hip in young individuals and this is worrying!

Cemented total hip replacement was popularised by Sir John Charnley from the UK in the 1960’s. The first patient to have a cemented THR in Singapore was in 1974. The ‘cleanest’ operating theatre then was the Neurosurgical theatre at Tan Tock Seng Hospital (TTSH). With permission from the late neurosurgeon Dr Tham Chok Fai, this patient was transferred from SGH to be operated in TTSH. I joined the Department of Orthopaedic in Singapore in 1981 after my training in the UK. The same patient, who had the first THR in Singapore in 1974, consulted me for increasing pain in his THR in 1988 (Figure 1). After 14 years he had shown signs of loosening of his THR. I revised his hip with a cementless hip replacement the same year. Subsequently I had to perform a THR on the opposite side as he was suffering from Ankylosing spondylitis. I still follow him up yearly since 1988 and he is managing well.
The advent of new and better material technology has allowed for:

- Clean laminar floor operating theatres (Fig 2)

- Less invasive surgical approaches (Figures 3A & 3B)

This has resulted in the improvement of survival figures for THR. Newer materials like trabecular metal and titanium implants, highly cross-linked polyethylene and ceramic acetabular liners, and ceramic or cobalt chrome articulating heads with different sizes and modularity have improved survival in both cemented and cementless implants.

With the introduction of better and more effective anti-inflammatory drugs, we will be seeing less deformities in patients with Ankylosing spondylitis (AS), Systemic Lupus Erythematosus (SLE) and rheumatoid arthritis. Many of them may delay the need for THR. However, steroid-induced and alcohol abuse leading to AVN may still require THR in relatively young patients in the coming decades.

Treatment for Avascular Necrosis (AVN) of the hip can be very controversial and the natural history and progression of AVN is unpredictable, depending on the aetiology, extent of femoral head involvement, and causative factors of the AVN and dosage and duration of steroid intake.

The surgical treatment for advanced AVN with whole head involvement and collapse is straightforward by performing a total hip replacement. The challenge is when the AVN is diagnosed early before femoral head collapse. I have always supported the dictum “Save the Hip Campaign” in young patients by performing biological procedures like core decompression, vascular pedicle bone grafts and rotational osteotomy of the femoral head.

However, these procedures may also give unpredictable results if the AVN progresses, especially in patients with renal failure, system lupus erythematosus (SLE) and those on continual steroid therapy.

These surgical techniques are also technically demanding with increased morbidity. Recently, I have performed successfully in a few selected patients with AVN by core decompression, limited curetting of the femoral head under radiographic control and injecting patients’ bone marrow stem cells from the iliac crest mixed in a collagen framework (scaffold) with hydroxyapatite “Healos” Johnson & Johnson. A patient has to offload his hip and be on crutches for about 2 months for osseous integration of the avascular zone. Even if this technique fails, subsequent THR will not be technically difficult. Conserving bone in a young individual coming for THR is essential as he may need 1 or even 2 revisions in his lifetime. Performing a standard THR with the use of modular cementless titanium implants are getting more popular.15,20 Recently with this philosophy in mind, a number of patients globally had bone-preserving metal on metal surface replacements.

Some of the implants have released dangerous metal ions in serum with local tissue toxicity. These implants have been removed from the market. Research is still ongoing to design better hip joint implants which can resist infection, last longer with less wear debris between the articulations and also induce better osteo integration into host bone for longer survivorship of the implants.
REFERENCES


Without doubt, one of the most common GP referrals to the Paediatric Orthopaedic Clinic we receive is for children with flatfeet.

Naturally, parents are concerned about the appearance of their child’s feet. It is thus important to have an understanding on how to evaluate a child with flatfeet in order to provide the appropriate management at the primary care level.

In general, there are two types of flatfeet which need to be distinguished: flexible versus rigid. The flexible flatfoot is much more common, often physiological and occasionally presents with symptoms of pain over the medial arch or lateral subtalar region of the sinus tarsi. Conversely, the rigid flatfoot is abnormal and will often present with symptoms of pain around the foot.

For the initial evaluation of the child with flatfeet in the standing position at rest, one will notice flattening of the medial arch and a valgus alignment of the heel. The entire foot will appear overpronated or ‘turned out’ due to excessive eversion at the subtalar joint.

The next step in clinical examination is to get the child to stand on tiptoes. In a flatfoot which is flexible, the medial longitudinal arch will reform and the heel will swing into a varus position. If the flatfoot is rigid in nature, then there will not be any change in the appearance of the foot alignment.

Another way to differentiate the two types of flatfeet is to perform the Jack test (Figure 1). With the child seated in the chair with the foot placed flat on the ground, the big toe is passively hyperextended at the level of the metatarsophalangeal joint. In a flexible flatfoot, the medial arch will reform, the heel will swing into varus and the tibia will be noted to rotate externally.

Figure 1. Performing the Jack test restores the medial longitudinal arch in a flexible flatfoot

It is normal for a child under the age of 8 years to have flexible flatfeet as it is physiological in nature due to ligamentous laxity. Beyond this age, as the foot grows, the longitudinal arch develops. However, some children will continue to have flexible flatfeet due to underlying generalised ligamentous laxity. It is important to understand that the use of orthotics does not influence the development of the arch. Hence in older children with asymptomatic flexible flatfeet, no form of treatment is required.

In the child with painful flexible flatfeet, the initial management will include activity modification as well as the use of a shoe orthoses—in the form of an insole with a medial arch support and heel stabiliser. Commonly, there is also an association with tightness of the calf muscles, for which stretching exercises can be taught. Formal sessions of physiotherapy can also be helpful for strengthening of the heel inverters.
If conservative measures fail over an adequate period of time, then an orthopaedic consult will be warranted. In such an instance, X-rays of the feet in the weight-bearing position with AP and lateral views will enable us to determine the degree of mal-alignment between the talus and tarsal bones. In particular, we measure the talonavicular uncoverage angle on the AP view as well as Meary’s talus-first metatarsal angle and calcaneal pitch angle on the lateral view (Figure 2). The x-rays will also help determine whether an accessory navicular bone, which can cause excessive pain and prominence over the medial side of the foot, is present.

Hence this procedure involves inserting a screw implant into a region of the subtalar joint called the sinus tarsi, to block and limit excessive eversion. This procedure has been used over many decades but more recently, there has been an advancement in implant material and design to improve the safety and efficacy of this procedure which is considered minimally invasive surgery. If the gastrocnemius muscle is noted to be tight, a recession can simultaneously be performed. It has been postulated that the static and dynamic stabilisers of the foot adapt and remodel to this improved position of alignment. Recent studies have shown good patient satisfaction levels and better functional scores. The arthroereisis screw can be removed at a later time if desired.

The other surgical option is a bony realignment of the foot which involves performing a lateral opening wedge osteotomy over the anterior aspect of the calcaneum. This operation is considered more invasive and the recovery period longer compared to the former procedure.

Apart from the symptomatic flexible flatfeet which can be treated initially by the GP, the child with a rigid flatfoot deserves special attention. Most commonly, the underlying cause for this condition will be a tarsal coalition— which usually presents with symptoms of pain in the region of the foot due to increased stiffness of the subtalar and mid-foot joints during the adolescent age. An orthopaedic consult will be mandatory. The majority of the coalitions occur between the calcaneum and navicular bones, as well as at the level of the subtalar joint. The coalition can be single or multiple and can be fibrous, cartilaginous or bony in nature. In addition to the standard foot x-rays, a CT scan and MRI scan will often be useful to delineate the extent of the coalition. This will help with surgical planning for excision of the coalition to improve mobility, appearance and function of the foot.

With regards to surgical management of severe painful flexible flatfeet, two options can be offered to the older child. The first is a procedure called ‘arthroereisis’. The word ‘arthro’ means ‘joint’ and ‘ereisis’ means to ‘block’.

Figure 2. Weight bearing X-rays of the left foot showing increased talonavicular uncoverage angle (normal ~ 20 degrees) on AP view (top) and increased Meary’s talus-first metatarsal angle (normal ~ 10 degrees) on lateral view (bottom) in a 10 year-old-child with symptomatic flexible flatfeet

Figure 2. Weight bearing X-rays of the left foot showing increased talonavicular uncoverage angle (normal < 20 degrees) on AP view (top) and increased Meary’s talus-first metatarsal angle (normal < 10 degrees) on lateral view (bottom) in a 10 year-old-child with symptomatic flexible flatfeet

References


Meniscal tears are among the most common knee injuries.

Athletes, particularly those who play contact sports, are at risk for meniscal tears. However, anyone at any age can tear a meniscus. When people talk about torn cartilage in the knee, they are usually referring to a torn meniscus. Other meniscal pathologies include parameniscal cysts and discoid menisci.

Functional Anatomy

The menisci are semilunar wedges between the tibia and femur. They help deepen the articular surface of an otherwise relatively flat tibial plateau. They are triangular in cross section, with thick borders attached to the joint capsule. Each meniscus has an anterior horn, body, posterior horn and root. They are anchored to the tibia by coronary (meniscotibial) ligaments.

The body of the medial meniscus is attached at its periphery to the deep medial collateral ligament, while the lateral meniscus lacks attachment to the lateral collateral ligament. As such, the medial meniscus is half as mobile as the lateral meniscus.

Menisci are dense fibrocartilaginous structures, with cells and an extracellular matrix of collagen fibres. They mainly contain type 1 collagen (>90%). Most collagen fibres are longitudinal, helping to dissipate hoop stresses. Other fibres are radially or obliquely arranged (figure 1). The extracellular matrix also includes proteoglycans, glycoproteins and elastin.

Branches from the geniculate arteries supply up to 30% of the peripheries of each meniscus; the remainder depends on passive diffusion and mechanical pumping for its nutrition. Various zones of the meniscus are described – the red zone is the well-vascularized periphery, the red-white zone is the middle portion and the white zone is the central avascular portion. Vascular supply of the meniscus is a primary determinant of healing potential. Tears in the red zone have the highest potential for healing.

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The menisci are tough and rubbery ‘shock absorbers’. They serve multiple functions, such as load bearing, load distribution, joint stabilization, joint lubrication and proprioception. The orientation of collagen fibres enables load bearing by converting compressive forces to tensile forces.
Meniscal Tears

Causes
Meniscal tears are often related to trauma, typically resulting from twisting movements of the weight-bearing knee in varying degrees of flexion. Meniscal tears in older people are more likely to be degenerative, as the fibrocartilage weakens and thins over time.

Symptoms
Patients may feel a ‘pop’ at the time of injury. They are usually able to walk on the injured knee, which gradually stiffens and swells over 2 to 3 days. The most common symptoms are pain, swelling, catching or locking of the knee, ‘giving way’ of the knee and reduced range of motion. Pain is usually localised to the joint line, usually the result of synovitis or abnormal movement of the unstable meniscus fragment. Swelling is usually delayed or absent. Immediate swelling suggests a tear in the peripheral vascular segment. Degenerative tears often have recurrent effusions due to synovitis.

Signs
Physical examination may reveal several signs, such as joint line tenderness, effusion or limited range of motion. The torn meniscus may cause a mechanical block but restricted motion may also be due to pain or swelling. There are several provocative manoeuvres that cause impingement by causing compression or shearing forces on the torn meniscus.

The McMurray Test elicits pain or a ‘click’ sound upon extending the fully flexed knee. The tibia is internally rotated with varus stress to test the medial meniscus; the tibia is externally rotated with valgus stress to test the lateral meniscus. The joint line should be palpated during the maneuver.

Differential Diagnoses
Many pathologies may mimic or accompany meniscal injuries. They include anterior cruciate ligament (ACL) injuries, collateral ligament injuries, iliotibial band syndrome, osteochondritis dissecans, patellofemoral joint syndromes and knee contusions.

Investigations
Plain radiography – weight-bearing anteroposterior and lateral views should be obtained. The Merchant Patellar View (or skyline view) helps to evaluate the patellofemoral compartment.

Magnetic resonance imaging (MRI) is the gold standard for imaging meniscal pathology, ligament injuries, avascular necrosis, and articular cartilage defects (Figure 2). Normal menisci have a homogeneous low signal. Meniscal tears show an increased signal that reaches the surface or edge of the meniscus.

Magnetic resonance imaging (MRI) involves injection of contrast into the joint (usually gadolinium). It is the most accurate imaging method for diagnosis of recurrent meniscal tears after repair. Meniscal tears can be classified according to their location (anterior horn, body, posterior horn, root), vascularity (red-red, red-white and white-white zones) and their orientation (Figure 3).

Treatment
In the absence of intermittent swelling, catching, locking or giving way, meniscal tears (particularly degenerative tears) may be treated conservatively. Conservative management includes...
rest, ice, compression and analgesia for the initial period. Physiotherapy is important and aims to normalise gait, maintain range of motion and prevent muscular atrophy. A trial of conservative treatment should be attempted in all but the most severe cases, such as a displaced bucket-handle tear causing a locked knee. Patients with tears causing mechanical symptoms and patients with symptoms that fail to improve with conservative measures may benefit from operative treatment. Stable tears with minimal displacement, tears less than 10mm in length, degenerative tears and partial thickness tears often become asymptomatic with conservative treatment.

If the patient cannot resume desired activities, sports or occupation, surgical treatment is considered. In general, complex, degenerative and central/radial tears are not amenable to repair – they are best treated with partial meniscectomy. Meniscal repair is recommended for all peripheral longitudinal tears, especially in young patients and in conjunction with ACL reconstruction. Four techniques are commonly used: open, ‘outside-in’, ‘inside-out’ and ‘all-inside’. The ‘gold standard’ for meniscal repair remains the ‘inside-out’ technique with vertical mattress sutures. Results of meniscal repair are generally best with acute peripheral tears in young patients with concurrent ACL reconstruction.

Other Meniscal Disorders

Discoid Meniscus

Patients may develop mechanical symptoms or ‘popping’ with the knee in extension. Tears in discoid menisci, like those in normal menisci, may cause pain and/or swelling. According to the Watanabe Classification, discoid menisci can be (1) incomplete, (2) complete or (3) Wrisberg types (Figure 4). Appearance of a contiguous lateral meniscus on three consecutive sagittal images on MRI is diagnostic. Treatment includes partial meniscectomy for tears, meniscal repair for peripheral detachments (Wrisberg variant) and observation for discoid menisci without tears.

Meniscal Cysts

Meniscal cysts usually accompany horizontal cleavage tears of the lateral meniscus (Figure 5). En bloc excision is out of favour. Arthroscopic partial meniscectomy and cyst decompression through the tear is a common surgical treatment method.

Figure 4: Watanabe Classification of discoid lateral meniscus. Type I is complete, type II is partial and type III is the Wrisberg variant. (From Scott WN: Insall and Scott surgery of the knee, ed 4, Philadelphia, 2006, Elsevier.)

Figure 5: Meniscal Cysts usually involve the lateral meniscus. (From Triu AJ, Klein KS: An illustrated guide to the knee, New York, 1992, Churchill Livingstone, p 101)
Tranexamic Acid
Tranexamic acid is a synthetic analog of the amino acid Lysine. It is used as an anti-fibrinolytic agent and acts as a competitive inhibitor that prevents the activation of Plasminogen to Plasmin. It binds reversibly to the Lysine binding site of Plasminogen, preventing activation by Tissue Plasminogen Activator. Tranexamic acid also has a secondary effect of non-competitively inhibiting the action of Plasmin. This action of Tranexamic acid leads to decreased fibrinolysis of blood clots and stabilisation of existing thrombi, leading to decreased post operative bleeding (Figure 1).

Tranexamic acid can be administered orally, topically and intravenously. It has a bioavailability of 50%, a biological half life of about 3 hours in joint fluid and is excreted via glomerular filtration with less than 5% being metabolised. The most common dosage is between 10-20mg/Kg and it is most effective when administered before fibrinolysis occurs. The cost-effectiveness of Tranexamic acid (US$13/gram) makes it a potential method for reducing blood loss and transfusion requirements in Singapore.

Trauma
In the CRASH-2 double blind randomised control trial, 20,211 polytrauma patients with or who are at risk of significant bleeding were randomised to receive either tranexamic acid or a placebo. Treatment of patients within an hour of injury with tranexamic acid led to a significantly reduced risk of mortality RR 0.68 (95% CI 0.57-0.82; P<0.0001). The trial showed that early use of tranexamic acid can reduce mortality without increasing the risk of vascular occlusion.

Hip Arthroplasty
In 2011, during a meta-analysis of randomised control trials comparing tranexamic acid against placebo, Sukeik et al evaluated the efficacy of Tranexamic acid in hip arthroplasty. Intra-operative, post operative and total blood loss fell by an average of 104.4 ml (p <0.001), 172.4 ml (p< 0.001) and 289.4 ml (p < 0.001) respectively. Overall, the number of patients requiring transfusion fell by 20% with Tranexamic acid.

Knee Arthroplasty
In a meta-analysis of randomised control trials by Yang et al, tranexamic acid was shown to be associated with reduced blood loss and transfusion. The amount of blood loss per patient decreased in the tranexamic acid group by a mean of 504.90 mL (p < 0.00001) while the units of blood transfused fell by 1.43 units (p <0.00001).
In recent years, intra-articular use of tranexamic acid has gained popularity due to concerns regarding the systemic effects of intravenous tranexamic acid. Wong et al compared patients randomised to receive either 1.5 or 3.0 grams of Tranexamic acid or placebo. Post-operative blood loss was reduced in both groups receiving tranexamic acid by about 400mls, which is comparable to reduction in blood loss in patients receiving intravenous tranexamic acid\textsuperscript{1}. There was no increase in deep vein thrombosis or pulmonary embolism in the intervention groups. This study also showed that topical tranexamic acid may be as effective as intravenous tranexamic acid without the systemic risks (Figure 2).

**Spine**

Tzortzopoulou et al evaluated randomised controlled trials assessing the effect of antifibrinolytics on perioperative blood loss in children that were 18 years old or younger and undergoing scoliosis surgery. The use of anti-fibrinolytics such as tranexamic acid reduced the amount of blood transfused by 327 ml (95% CI -469.04 to -185.78) and the amount of blood loss by 427 ml (95% CI -602.51 to -250.56)\textsuperscript{4}.

In adult spinal surgery, a randomised control trial by Wang et al of 151 patients who underwent elective spinal fusions showed that perioperative blood loss fell significantly in the tranexamic acid as compared to the placebo group (3079-2558 mL versus 4363-3030 mL) (p=0.017)\textsuperscript{5}.

**Conclusion**

Tranexamic acid has been shown to reduce perioperative blood loss and transfusion requirements in various fields of orthopaedic surgery. Hence, it can be considered a safe and efficacious method to reduce blood loss and the risk of mortality for patients undergoing major orthopaedic surgery.

**References**


Introduction

Rheumatoid arthritis (RA) is characterised by chronic inflammatory response in the joint synovium leading to capsular distension, ligament laxity, joint erosion and destabilisation resulting in deformities.1-3 Rheumatoid forefoot commonly presents with a hallux valgus deformity and dorsal subluxation of the lesser metatarsophalangeal (MP) joints.1-3 It is also associated with claw toe deformity.1-3 This is due to the disruption of the 1st MP joint from chronic destabilisation of the joint capsule, collateral ligaments and plantar plate combined with progressive bony erosion leading to hallux valgus deformity. As a result, a greater force is being transferred to the lesser MP joints causing dorsal subluxation of the proximal phalanges and a resultant plantar displacement of the metatarsal heads. The plantar fat pad also displaces dorsally with the plantar plate further uncovering the metatarsal heads. Due to imbalance of the intrinsic-extrinsic muscles of the foot, progressive deformity of the lesser toes causing claw toes occurs. Upon weight bearing, chronic depression of the metatarsal heads causes metatarsalgia, corns and calluses over the plantar aspect of the metatarsal heads which may then ulcerate.1-3

Foot orthotics such as custom-made footwear with metatarsal bar or dome, footwear with wide toe boxes and rocker shoes are the mainstay of non-surgical management for rheumatoid foot and ankle.4 Studies have shown that these foot orthotics reduce plantar pressure and therefore provide pain relief for patients.4 Surgical intervention is recommended when conservative management with foot orthotics has failed and patient presents with persistent pain and progressive forefoot deformities. Here, we describe the modified Kates Kessel Kay (KKK)5 operation for rheumatoid forefoot reconstruction.

Figure 1. A plantar elliptical incision made to access all lesser metatarsal heads and perform dermoplasty to realign the plantar fat pad.
Adapted from Kates et al JBJS 19675
Positioning

1) Patient is put in prone position.

2) A pneumatic tourniquet is applied on the thigh but not inflated

Procedure

1) A single elliptical plantar incision convex proximally is made from the neck of the second metatarsal neck to the neck of the fifth metatarsal neck to excise all the lesser metatarsal heads. [Figure 1]

2) The skin and subcutaneous layer are carefully dissected away from the underlying tissues.

3) Vertical incisions along the axis of the lesser metatarsals are made from the second to fifth MTP joint to expose the joint and metatarsal heads. This is done carefully to prevent damage to the neurovascular bundles.

4) Metatarsal heads of the second to fifth toe are transected in that order with.

5) Special attention paid to maintain the parabolic curvature of the metatarsal necks. Reconstitution of the smooth arc allows for even distribution of weight bearing stress during ambulation.

6) Subsequently, make a separate dorsomedial incision over the hallux to expose the first metatarsophalangeal (MP) joint capsule.

7) Dorsal and volar skin flaps are created and made along the capsular plane to prevent damage to the cutaneous nerves. Following that, the extensor hallucis longus is retracted laterally and a longitudinal capsulotomy performed to visualise the joint.

8) Joint capsule is stripped off the medial eminence to expose the prominence and buniectomy performed in line with the medial aspect of metatarsal shaft. Joint surfaces are prepared till healthy cancellous bone is seen with appropriate sized chisels. A 1.1mm Kirschner wire is used to perform mini perforations over the cancellous bone surfaces for better fusion.

9) A separate dorsolateral incision is made over the first MTP joint to expose and release the adductor hallucis tendon.

10) The hallux is reduced and held temporarily with Kirschner wires such that it is not impinging on the second toe and is 5 - 10 degrees off the axis of the floor. Confirm the final reduction and alignment with orthogonal views using fluoroscopy guidance.

11) Arthrodesis is then completed with a crossed compression screw construct using the cannulated screw system.

12) Wounds are washed, medial capsular repair carried out and skin closure using interrupted skin suture with a synthetic, absorbable suture (Monocryl).

13) Dermoplasty is performed to realign the dorsally displaced plantar fat pad under the refashioned metatarsal heads followed by subcutaneous and skin closure. [Figure 1]

14) In the presence of lesser toe deformity such as claw toe, a dorsal incision over the proximal interphalangeal (PIP) joint is performed.

15) Careful dissection is done to expose the capsule and the PIP joint following that. The extensor tendons of the lesser toe are tenotomised to correct the dorsal subluxation of the MTP joint and the PIP joint surfaces prepared for arthrodesis. [Figure 2A]

16) A Kirschner wire is then inserted to hold the lesser toe in line with the second metatarsal under fluoroscopic guidance. Similar steps are taken for the reconstruction of the other lesser claw toe deformity if required. [Figures 2B & 2C]

17) A below knee Plaster of Paris backslab is then applied to immobilise the limb.

Figure 2. Picture A showed a typical claw toe from rheumatoid forefoot deformity. Pictures B and C showed a extensor tendon tenotomy and reduction of the MP joint with arthrodesis of the PIP joint using a Kirschner wire. Adapted from Heide et al. 2 2014 JANUARY - MARCH MEDICO • 19
Rehabilitation

1) Non-weight bearing is maintained for 6 weeks to allow fusion to take place. The limb is placed in a below knee cast initially but converted to Darco Wedge shoe after initial wound dressing change at 1 week postoperatively.

2) Weight bearing is allowed from 6 weeks onwards. Complications encountered include wound infection, delayed wound healing, delayed union or nonunion, malunion with dorsiflexion or plantarflexion deformity, loss of fixation at the MP joint due to loosening and screw breakage.

Figure 3 shows a patient with rheumatoid forefoot deformities. Patient underwent the procedure.

Figure 4 shows the post operative radiographs and clinical photographs of the foot.

Conclusion

The modified Kates Kessel Kay operation for rheumatoid forefoot deformities is a reliable method of achieving correction of progressive deformity.

References


Why did you become a Spine surgeon?

I appreciate the precision and technical challenges that encompass spinal surgery.

How would you describe what you do?

I specialise in the treatment of all types of orthopaedic spinal pathologies – such as degenerative spinal conditions, spinal fractures and spinal metastatic disease. In addition, I sub-specialise in complex cervical spine surgeries, both paediatric scoliosis and adult degenerative scoliosis spinal deformity correction and minimally-invasive keyhole spine surgery.

What do you like about what you do now?

I get fulfillment through planning, constructing and executing the treatment of complex spinal procedures for patients to get better. I also participate actively in various forums both locally and internationally to improve and promote spinal health care. These forums are achieved through research, medical education and advocacy.

What are some challenges that you face in patient care?

The most challenging cases that I constantly face relate to the treatment of scoliosis in two extreme age spectrum of the patient population.

Firstly, a very young scoliosis patient (who is less than 10 years old) is physically small and applying spinal instrumentation for deformity correction in a very small and deformed spine is a challenge. The lung of a very young scoliosis patient is not fully formed, and until it reaches adult lung capacity, spinal fusion surgery, which arrest spinal growth, should be delayed. To avoid this, I perform growing rods spine technique to correct the scoliosis and allow for spinal growth until the spine matures.

The other technique which I recently performed was the first MAGNETIC growing rods spine surgery in Singapore. The in-built magnetic motor in the growing rods allow spontaneous correction of spinal deformity and allow spinal growth to continue.

A/Prof Liu obtained his medical degree at University College Dublin, Ireland in 1994, received a scholarship and completed his Masters of Science in Human Anatomy with Honors in 1996. In 2003, he completed his Advanced Surgical Training in Orthopaedic Surgery in Singapore and a further two-year spine surgery training at NUH. He has also completed fellowships including Lumbar Degenerative Spinal Disorders at University of Basel in Switzerland in 2005, Advanced Complex Cervical Spinal Surgery and Scoliosis Spinal Deformity Surgery Training at Washington University in St Louis, USA from 2006 to 2007 and Minimal Invasive Spine Surgery at University of California at San Francisco (UCSF) in 2007.

He is a committee member to multiple local and international spine societies, and notably, a founding member for Cervical Spine Research Society – Asia Pacific (CSRS-AP).
Almost everybody knows someone who has a back or spine problem. How common are spinal problems / conditions exactly? And what procedures do you carry out most often?

Neck and back pain is a common clinical condition.

There are two types of neck and back pain – one is localised axial spinal pain, whereas the other is spinal pain with radicular limbs pain (i.e. pain that runs from spine to the hands or legs) or myelopathy (when patients complain of ‘clumsy hands’ and unsteady gait).

Majority of these pains is benign and self-limiting. The cause of these benign, localised axial neck and back pain may be related to muscle injuries or intervertebral spinal disc degeneration, which may be caused by strenuous activities, aging or poor posture.

Relief and treatment include, but not limited to:

- Correcting poor posture
- Taking frequent breaks from activities (such as prolonged desk-bound activities or computer use)
- Ensuring good infant-carrying positions
- Reducing frequent use of high heel shoes
- Doing regular spinal and cardiovascular exercises

Most of the benign, localised axial neck and back pain can be managed successfully with the above conservative treatment; further spinal imagings (x-rays, MRI scans) are required if patients have persistent neck and back pain with radicular limbs pain, myelopathy or when patient presented with red flag signs outlined below.

In the area of paediatric scoliosis, there has been some progress. Under current practice, upon diagnosis, frequent hospital visits within a minimum period of 3 to 5 years are required to monitor and assess the requirement for a surgery. The good news is that genetic testing to predict paediatric scoliosis progression is under development in Asia. In NUH, we have also just completed a collection of 1,000 scoliosis patients’ DNA and are waiting for future Genome-wide association study (GWAS) to identify genetic loci for possible diagnostic kit development.

Other administrative challenges include time and resources. Time is a precious commodity to spine surgeons when we spend long hours in surgeries, handling professional advocacy issues and providing patient care. We take great care in reviewing quality control of our procedures and training successors.

Could you share your most rewarding professional moments?

It is rewarding to witness my patients, who have been suffering for years or even decades, improve their quality of life and mobility through spine surgery. Each surgery requires long hours of planning, reviewing and monitoring. Watching patients respond to treatment and recover well is immeasurable. I have patients telling me, “Thank you, you save my life” or “You gave me back my life”, etc. Such words and appreciation serve as encouragement for me.

Where do you see your specialty in 10 years?

In the coming years, I hope to see advances in our ability to diagnose and treat spinal deformities, as well as greater improvements in the development of keyhole surgical techniques.

In the area of paediatric scoliosis, there is still a need for further research to understand the underlying genetic causes of this condition. A better understanding of the genetic factors involved may lead to improved diagnostic and therapeutic interventions for this disease.

We are currently developing new keyhole surgical techniques with an aim to achieve the same surgical outcomes as in an open spinal deformity surgery. These techniques would reduce para-spinal muscle damage, blood loss, postoperative pain and earlier patient recovery from current open techniques. Our initial results from the key-hole techniques have been encouraging.
Red flags (indications for further investigations):

- Trauma
- Pain persists for more than 4 to 6 weeks
- Neurological deficit
- Bladder or bowel dysfunction
- Disturbed gait
- History of cancer
- Fever and unexplained weight loss (>10 kg within 6 months)
- Spinal pain even at rest
- Ill health or presence of other medical illness or syndrome (e.g. Rheumatoid Arthritis, Osteoporosis, Downs Syndrome)
- Age of onset: < 20 years or > 55 years
- Obvious spinal deformities
- Therapy that does not help to improve condition

Patients with persistent spinal pain with radiculopathy or myelopathy may indicate spinal pathologies resulting in spinal nerves or spinal cord compression. These patients would experience numbness or pins-and-needles sensations in the limbs. They may also have reduced ability to write or use chopsticks, and may have unsteady gait. Should such symptoms occur, surgical spinal nerve decompression may be required.

**Adult degenerative scoliosis is a condition increasingly on the rise amongst the elderly population. What is it exactly and what are the treatment options?**

Adult degenerative scoliosis is side-to-side curvature of the spine caused by degeneration of facet joints. It often presents varied clinical presentations—from progressive deformity to nerve pain involving the limbs and chronic axial back pain.

In my previous study on 7,000 Singaporeans, we identified the prevalence of adult lumbar scoliosis at 9.1% of the population. A near-linear increase in scoliosis prevalence from the 4th decade (4%) onwards to > 8th decade (25%) was found. Individuals who are at risk of developing scoliosis include the elderly, female patients, as well as patients with previous spinal fractures which may result from long-standing osteoporosis.

Most patients may not require any surgical intervention. The pain resulted from spine deformity often responds to good postural habits and regular spinal exercises. Occasionally, patients may require painkillers, physiotherapy or acupuncture treatment. Surgery is only indicated for those whose conditions result in persistent back pain radiating down to the patient’s legs, limiting his/her walking ability and significantly affecting his/her quality of life. The other reason for surgery would be the progressive worsening of the deformed spine.

**What are some advices that primary care physicians could give to elderly patients with spinal deformities?**

Adult degenerative scoliosis is not uncommon; one would expect to see this condition more as the population ages. For one to maintain good back care is to have good postural habits, regular exercises and physiotherapy as deemed appropriate.

Regular spinal examination and monitoring of spinal deformity progression by spine surgeons will be beneficial. And should surgery be required, it should be performed safely in a specialised spine centre with modern techniques.

**What do you like to do with your (limited) free time?**

My free time is always reserved for my family – leisurely relaxing at home, catching up on movies and going for holidays. I also enjoy visiting my family members in Canada; spending time with them during such visits are valuable to me.
UPCOMING EVENTS

NUH GP CME Programme 2014

Please refer to our GPLC website for online registration.

June

SATURDAY

Khoo Teck Puat – National University Children’s Medical Institute
Aero-Digestive Disorders – A consolidated approach to children with upper airway and gastrointestinal problems

August

WEDNESDAY TO SUNDAY

3rd Wong Hock Boon Masterclass and 1st Allergy Primer @ NUHS Auditorium

Topics include:
• Food allergy testing
• Autism and the leaky gut; school failure
• Recurrent abdominal pain; Drug allergy
• Gastro-oeseophageal reflux disease
• Common myths about speech and language development in children.

Pre-Masterclass courses:
Pediatric Advanced Life Support Course (PALS)
2nd Paediatric Flexible Bronchoscopy Course
20-22nd August, 2014

Please visit: www.nuhkids.com/events for more information.

June

FRIDAY TO SUNDAY

CardioVascular Clinical Trialists Asia Forum 2014 @ Fullerton Hotel, Singapore

Key Sessions include:
• Arrhythmia trials
• Biomarker trials
• Cardiometabolic trials
• Heart Failure Device trials
• Heart Failure Drug trials
• Interventional trials
• Thrombosis trials

For more information please visit:

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