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DEPARTMENT OF SURGERY & DEPARTMENT OF UROLOGY

In this issue

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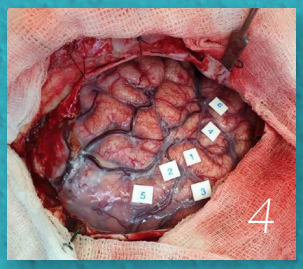

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Department of Surgery and Department of Urology

Department of Surgery

The Department of Surgery is led by Professor Krishnakumar Madhavan (Group Director Surgery, NUHS), and has three main focuses: Clinical Services, Research and Innovation, and Education and Training.

The Surgery Clinical Department is made up of teams of medical professionals who provide comprehensive specialised care for surgical conditions such as Breast Surgery, Colorectal Surgery, Hepatobiliary & Pancreatic Surgery, Neurosurgery, Plastic, Reconstructive & Aesthetic Surgery, Thyroid & Endocrine Surgery, Trauma Services and Upper Gastrointestinal Surgery.

The Department of Surgery leverages on technology to provide quality clinical care to our patients. Innovations have led to the performing of the Peroral Endoscopic Myotomy (POEM) as a new cure for Achalasia patients for the first time in Singapore in 2015 as well as pancreas transplant programme and awake craniotomy.

We also believe in the importance of educating our undergraduate students and post-graduate surgical trainees in the optimal management of surgical patients. In 2019, some of our specialists were recognised for their efforts through various teaching awards.

Our facilities:
Kent Ridge Wing
- Level 5 – Aesthetic Plastic Surgery Centre
- Level 5 – University Surgical Centre

NUH Medical Centre
- Level 8 – 8b Breast Care Centre
- Level 15 – 15a Surgical Specialists Centre
- Level 16 – 16b Colorectal Centre

Department of Urology

Led by Associate Professor Edmund Chiong, the Department of Urology focuses on the delivery of specialised care in all major aspects of urology and strives to fulfil our academic mission of research and education.

We provide comprehensive care in a wide range of conditions involving the Genito-urinary system. Our medical professionals sub-specialise in the areas of Urologic Oncology, Endo-urology (including laparoscopy, benign prostate and Urolithiasis services), Andrology (including men's health) and Male Reproductive Medicine, Kidney and Pancreas Transplantation, Reconstructive Urology, Neuro-urology and Functional Urology, Female Urology, as well as Adolescent and Transitional Care Urology. The department routinely leverages technologies such as minimally invasive robotic surgery, robotic prostate biopsy platform, transurethral needle ablative and non-ablative procedures for benign prostate hyperplasia (BPH) and flexible ureteroscopy, to provide quality care and treat patients with complex conditions.

Our department is heavily involved in the medical undergraduate and post-graduate Urology residency training. Our staff also hold key leadership positions and contribute significantly to the Surgery undergraduate programme and national Urology training programme. We are very active in research activities, which include clinical trials, translational research and basic science laboratory work. We also participate in international research collaborations, and are constantly engaged in medical innovations, resulting in a number of patents and commercialisation of devices.

Our Urology Centre, located in the NUH Medical Centre, Level 16, is a comprehensive one-stop centre that performs both outpatient diagnostic and interventional procedures.

Awake Brain Surgery

In neuro-oncology, the main goals of neurosurgery are to increase overall survival and to preserve or even improve patients' quality of life. To accomplish this, neurosurgeons should be able to achieve the maximum extent of resection, and yet, they must not only avoid severe disabling neurological deficits *(such as speech and motor deficits)* but also try to preserve high-order neurocognitive functions. This *"compromise"* between achieving maximum tumour resection and preserving functions can be accomplished through awake craniotomy.

Intraoperative brain mapping in a fully conscious patient during brain surgery is also known as awake craniotomy. It is increasingly used in patients operated on for tumours in eloquent areas and uses the principles of direct electrical stimulation **(DES)** of the cortical and subcortical regions of the brain. Advancements in neuro-psychology, neuro-anaesthesia and intraoperative neuromonitoring or mapping modalities have played vital roles in awake craniotomies.

Increasingly, brain mapping and awake craniotomy are being considered for resections of most intra-axial tumours within eloquent parts of the brain. Particularly for glioma surgery *(especially diffuse low-grade gliomas)*, DES, coupled with neuropsychological testing, is now considered the standard practice. It has been shown that awake intraoperative mapping allows greater extent of resection, while maintaining or even improving patients' quality of life, hence maintaining *"oncological and functional balance"* in such patients.

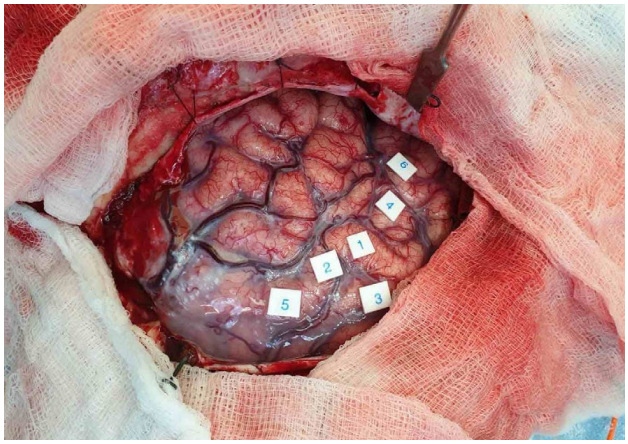
Principles of DES of the brain

During awake surgery, patients are woken up intraoperatively with the aim of investigating the functional role of various areas of the brain and preserving eloquent structures. These areas are commonly specific to individuals with interindividual variability. Hence, the type of intraoperative tasks performed should be tailored to each patient.

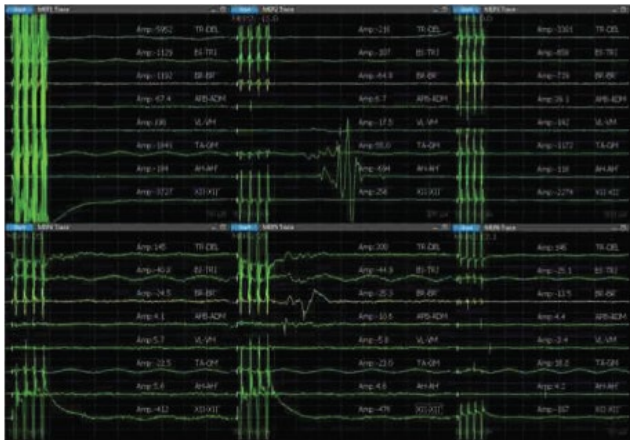
Patients are then required to perform several sensorimotor, visuospatial, language, and cognitive tasks, while the surgeon uses **DES** to temporarily disrupt discrete regions around the tumour. For language testing in our multilingual population in Singapore, two languages will be tested intraoperatively.

A low frequency biphasic electrical current or a high frequency monophasic current is used. It creates a *"transient lesion"*. This is initially performed at the level of the cortex of the brain. After the completion of cortical mapping, resection of the tumour subcortically is performed next. At the axonal level, **DES** is again used to generate a virtual transient lesion when the electrode is applied directly in contact with the white matter tracts. If the patient stops moving or speaking, or produces an inappropriate response, the surgeon can avoid removing the area of the brain involved.

In this way, the surgeon can increase the extent of resection without causing permanent neurological deficits. Consequently, the resection is achieved according to functional, as opposed to structural or radiological boundaries.



Bilingual language mapping of Hindi and English intraoperatively



Intraoperative motor monitoring and mapping (MEPs and EMGs)

Awake Craniotomy and Brain Mapping Service at NUH

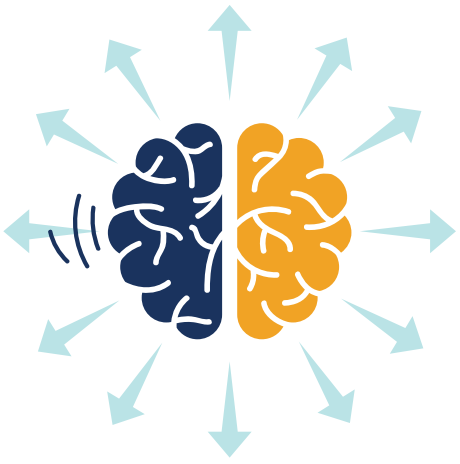
Prior to surgery, patients will be reviewed by a team of specialists involved in the awake surgery, namely the neurosurgeon, neuroanaesthetist, and neuropsychologist.

Neuroanaesthesia:

A pre-operative review of the patient will be performed by the neuroanaesthetist and the whole process of *"sedation-awake-sedation"* will be explained. Uncomfortable phases of the surgery, such as burr hole and craniotomy, will be performed when the patient is asleep.

During the surgery, local anaesthetic will numb the scalp to reduce the discomfort for the patient and careful positioning will ensure the patient remains comfortable throughout the duration of the surgery.

Patients with severe breathing or cardiac problems may not be suitable for awake surgery due to the relative stress involved.



Neuropsychology:

The neuropsychologist will perform a mandatory pre-operative neuropsychological assessment that includes a comprehensive characterisation of the patient's cognitive status and evaluation of emotional functioning *(e.g. acceptance of diagnosis and treatment, coping mechanisms).* Supportive counselling and psychoeducation will be conducted during the session for the patient as well as their family, if deemed appropriate. Following that, training of the tasks to be done intraoperatively during the awake phase of the surgery will commence.

Unlike many neurosurgical centres that are unable to provide specialist neuropsychological services, neuropsychology at National University Hospital **(NUH)** is an integral part of individualised management of patients undergoing awake surgery to have their tumour removed. In-depth neuropsychological evaluation allows characterisation of the patient's baseline functioning, identification of subtle cognitive deficits, and planning for post-treatment rehabilitation.

Post-operatively, patients would undergo a neuropsychological re-assessment and an individually-tailored rehabilitation programme consisting of physiotherapy, speech and language therapy, as well as other services as required *(e.g. supportive counselling, neurocognitive rehabilitation, return-to-work/school support).*

Team Awake *(left to right): Dr Teo Kejia, Dr Will Loh (Senior Consultant, Department of Anaesthesia, NUH), Dr Chan Hui Minn (Senior Clinical Neuropsychologist, Department of Psychological Medicine, NUH)*

Conclusion

Awake craniotomy focuses on the optimisation of oncological and functional outcomes of patients with brain tumours. In addition, tumours located within eloquent areas of the brain previously considered *"inoperable"* are now resectable, while preserving or even improving patients' quality of life.

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Neuro-Oncology; Brain Tumour Surgery on Eloquent Areas of Brain; Pituitary and Skull Base Surgery; Functional Neurosurgery

High-Intensity Focused Ultrasound

A Non-Invasive Method of Treating Benign Thyroid Nodules

Thyroid nodules are common, and although most nodules are benign and remain static, some become large and symptomatic. The revised American Thyroid Association **(ATA)** guidelines recommend surgical resection for a benign solid or predominantly solid nodule that is either large *(>4 cm in diameter)* and/or causes compressive symptoms or clinical concern. Cosmesis is another indication for treating benign thyroid nodules.

While the consensus that surgery is still the mainstay of treatment, it does have small risks of complications like bleeding, infection, and recurrent laryngeal nerve injury. General anaesthetic risks due to patient comorbidities must also be factored in while considering surgery.

For these reasons, various non-surgical techniques have now been introduced at specialised treatment centres. Several thermal ablation techniques have been shown to be effective in treating predominantly solid or solid benign thyroid nodules, such as focused ultrasound, radiofrequency and laser ablation. It is well-recognised that temperatures above 55 °C maintained for more than one second induced non-reversible enzymatic denaturation, leading to coagulative necrosis and cell death.

High-Intensity Focused Ultrasound **(HIFU)** is a relatively recent thermal ablative technique that directs energy inside the targeted nodule without invasive instruments *(Fig. 1)*. **HIFU** is gaining momentum as one of the most promising non-surgical techniques for treating benign thyroid nodules due to its non-invasiveness, absence of scars, accuracy, and ease of use.

The Division of General Surgery – Thyroid and Endocrine Surgery at the National University Hospital **(NUH)** published results of the clinical use of HIFU in the World Journal of Surgery in 2019. In this early study conducted between 2017 and 2018, NUH reported the results of the initial 10 patients who had undergone the HIFU treatment.

HIFU procedures were performed as day cases under sedation, with monitored care in the operating theatre. Intravenous analgesia was given peri-procedural to ensure patients' comfort during the treatment. A typical treatment session lasted for 45 minutes to one hour, depending on the size and number of thyroid nodules treated. Nodules on both sides of the thyroid might be treated in a single session.

Figure 1:
High-intensity focused ultrasound (HIFU) treatment

The treatment was carried out using the HIFU machine (Fig. 2), which has a computer-controlled robotic arm to ensure precise ablation of the thyroid nodules. Critical nearby structures like the carotid artery and trachea were marked out on the treatment screen prior to starting the procedure as shown in Fig. 3. The built-in software automatically calculated safety distances and appropriate energy settings for ablation. There was continuous sonographic monitoring of the treatment area during the procedure for all patients, and the system was able to abort the treatment at any time during the ablation.

Minute adjustments were constantly made by the operator to ensure optimal positioning of the target nodule to the intended point of ablation, while avoiding nearby critical structures. Immediate ultrasonographic ablation effects like cavitation artefacts were noted after each pulse.

The results of our study showed that HIFU treatment for benign thyroid nodules is efficacious, with a statistically significant mean volume reduction of 63.2% (±22.5), suggesting a substantial reduction in thyroid nodule volumes. Only one patient required re-treatment after one year due to nodule regrowth.

There was no local skin complications, minimum and short-term post-treatment pain, and a low incidence of temporary, but no permanent voice hoarseness. The Division of General Surgery – Thyroid and Endocrine Surgery has since performed more cases of HIFU with similar volume reduction across all patients and with no significant short and long-term complications.

Figure 2:
High-intensity focused ultrasound (HIFU) machine

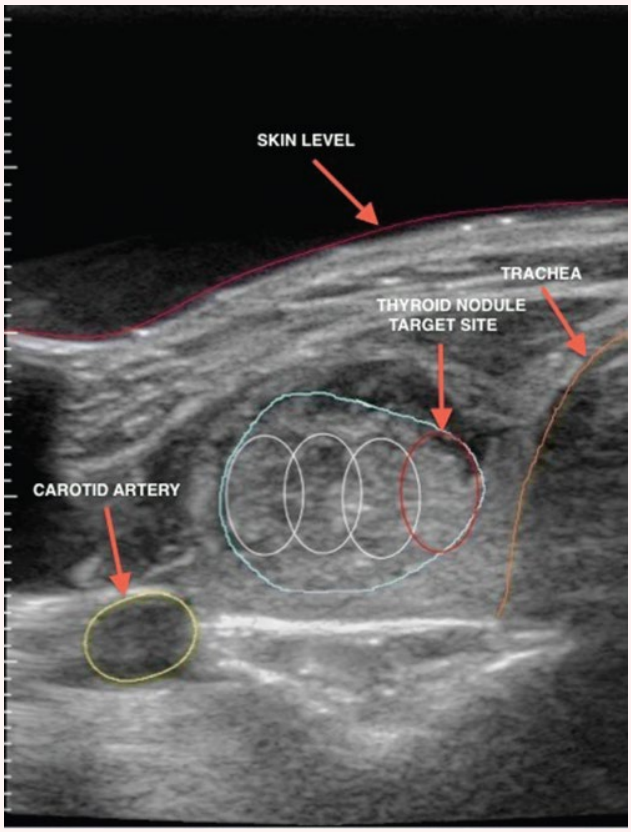


Figure 3:
Ablation targets and safety margins to critical nearby structures (carotid artery and trachea) are marked out on the treatment screen with real-time ultrasound navigation

A summary of indications and contraindications for HIFU treatment is as follows:

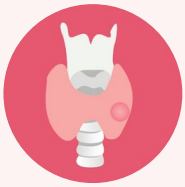
Indications:

1. Patients with solid or predominantly solid thyroid nodules (cystic component <30% of nodule volume) with fine-needle aspiration (FNA)-proven benign cytology (Bethesda II);
2. Nodule size between 1.5 and 3.0cm in size, and more than 1cm deep into the skin;
3. Patients presenting with compressive symptoms (like dysphagia or subjective dyspnoea), who had cosmetic concerns, who declined or were medically unfit for surgery, and who have no limitations in extending their neck.

Contraindications:

1. Patients who had thyroid nodules with cystic component >30% of the nodule volume (mixed solid and cystic, predominantly cystic, or cystic composition), nodules with coarse or microcalcifications;
2. Retrosternal or pre-tracheal thyroid nodules;
3. FNA results of these nodules are suspicious for malignancy (Bethesda III and above);
4. Patients with pre-existing skin conditions or scars on the neck anterior to the thyroid and/or limitations with neck extension.

In summary, HIFU treatment for benign thyroid nodules is safe and efficacious if appropriate indications are met. Even if patients have contraindications to HIFU, other methods can be employed to treat the thyroid nodules. These options can be discussed with an endocrine surgeon who can provide holistic treatment counselling for thyroid nodules.



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Clinical Interests
Robotic and Endoscopic Thyroid Surgery; Parathyroid Surgery; Adrenal Surgery; Metabolic and Bariatric Surgery; Health Information Technology and Artificial Intelligence

Prostate Cancer Diagnostics and Biopsy for the 21st Century

Moving Away from Blind 'Trans-Faecal' Prostate Biopsies

Introduction

Prostate cancer **(PCa)** is the third most common cancer in Singaporean men. The diagnostic pathway of PCa comprises either an abnormal finding during a rectal examination, or an elevated serum Prostate-specific Antigen (PSA) level (>4.0ng/dL). Traditionally, the diagnosis is confirmed by obtaining 10 – 12 cores of non-targeted prostate needle biopsies via a trans-rectal route **(TRUS-BX).** However, TRUS-BX has a high false negative rate and carries significant risk of infection and sepsis, despite antibiotics prophylaxis. In recent years, PCa diagnostic pathway is changing to improve diagnostic accuracy and morbidity risk.

Prostate Health Index (PHI)

Serum Prostate Health Index **(PHI)** test was approved by US FDA, as an adjunct to stratify risk of PCa for PSA range 4 – 10 ng/dL. The National University Hospital **(NUH)** validated this test in Singaporean males and initiated its regional use [1,2]. PHI facilitates a shared decision-making between the patient and the urologist, on further evaluation strategy *(Table 1)*. A low PHI reading does not exclude PCa.

Table 1: PHI Risk Stratification for PCa

PHI Level*	Probability of Cancer	Category
0 – 23	8.7%	Low risk
24 – 45	20.6%	Intermediate risk
45+	43.8%	High risk

*Beckman Coulter PHI Range (WHO Calibration)

Trans-Perineal Prostate Biopsy (TP-BX)

TP-BX uses a percutaneous route, avoiding rectal mucosal puncture *('trans-faecal' biopsy)* and thereby minimises the risk of infection. NUH performed the region's first TP-BX under local anaesthesia via two perineal puncture points using the Precision Point Device (Figure 1), and is now the training site for this procedure in Singapore.[3]

Advantages of TP-BX over TRUS-BX:

- *Infection and sepsis risks are lower.*
- *The prostatic apex and anterior areas are more easily reached, increasing cancer detection.*

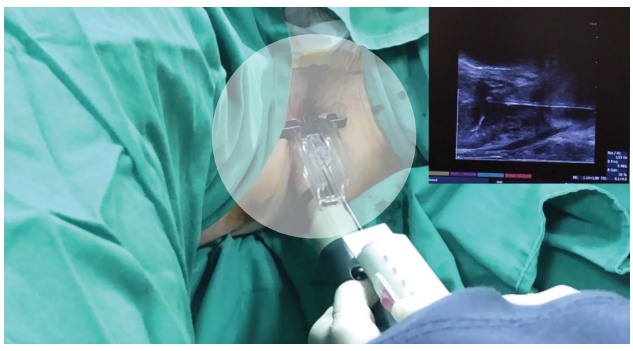


Figure 1a:
Trans-Perineal Systematic 12-core biopsy using the Precision Point Device

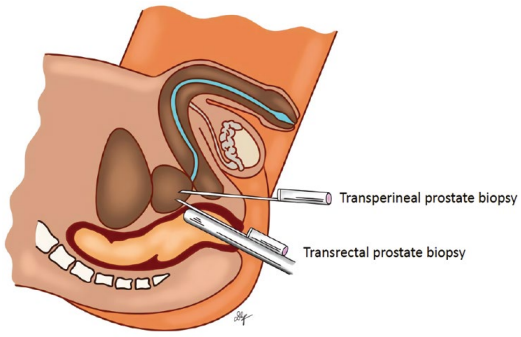


Figure 1b:
TP-BX vs TRUS-BX

Multi-Parametric MRI Scan (mpMRI) and MRI-US Fusion Targeted Prostate Biopsy (Targeted-BX)

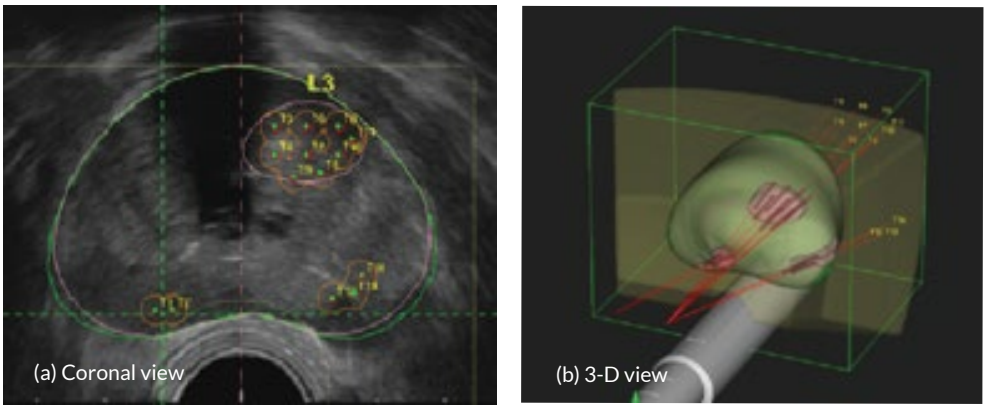
mpMRI prostate is now increasingly being performed prior to prostate biopsy. Lesions detected on mpMRI are scored using the PIRADS system to determine PCa risk on biopsy *(Table 2)*.

Table 2: PIRADS score and risk of Clinically Significant (CS) PCa (Gleason score ≥3+4 or Grade Group ≥2) [4]

PIRADS Score (version 2)	Risk of Cancer	Category
1 – 2	Minimal	Low cancer risk
3	12%	Indeterminate lesion
4	60%	Suspicion of cancer
5	83%	High suspicion of cancer

Findings on mpMRI cannot replace prostate biopsy, nor can a low PIRADS score exclude PCa. mpMRI images are used to guide prostate biopsy targeting, by digital fusion with 'real-time' transrectal ultrasound prostate images. Suspicious lesions (PIRADS 3 – 5) are targeted for biopsies, with or without concurrent systematic/saturation prostate biopsies. Targeted-BX is now frequently being done, using various platforms, due to benefits of increased diagnostic accuracy and potential reduction in clinically insignificant PCa detection (Figure 2).

Figure 2: *MRI-US Fusion targeted Prostate Biopsy at* ***NUH***



Key Takeaway

PHI and mpMRI are new adjuncts in the PCa diagnostic pathway. Prostate MRI followed by targeted-BX may increase PCa diagnostic accuracy, whilst potentially reducing clinically insignificant cancer detection compared to the traditional non-targeted biopsy. TP-BX has lower infection rates compared to the transrectal route.

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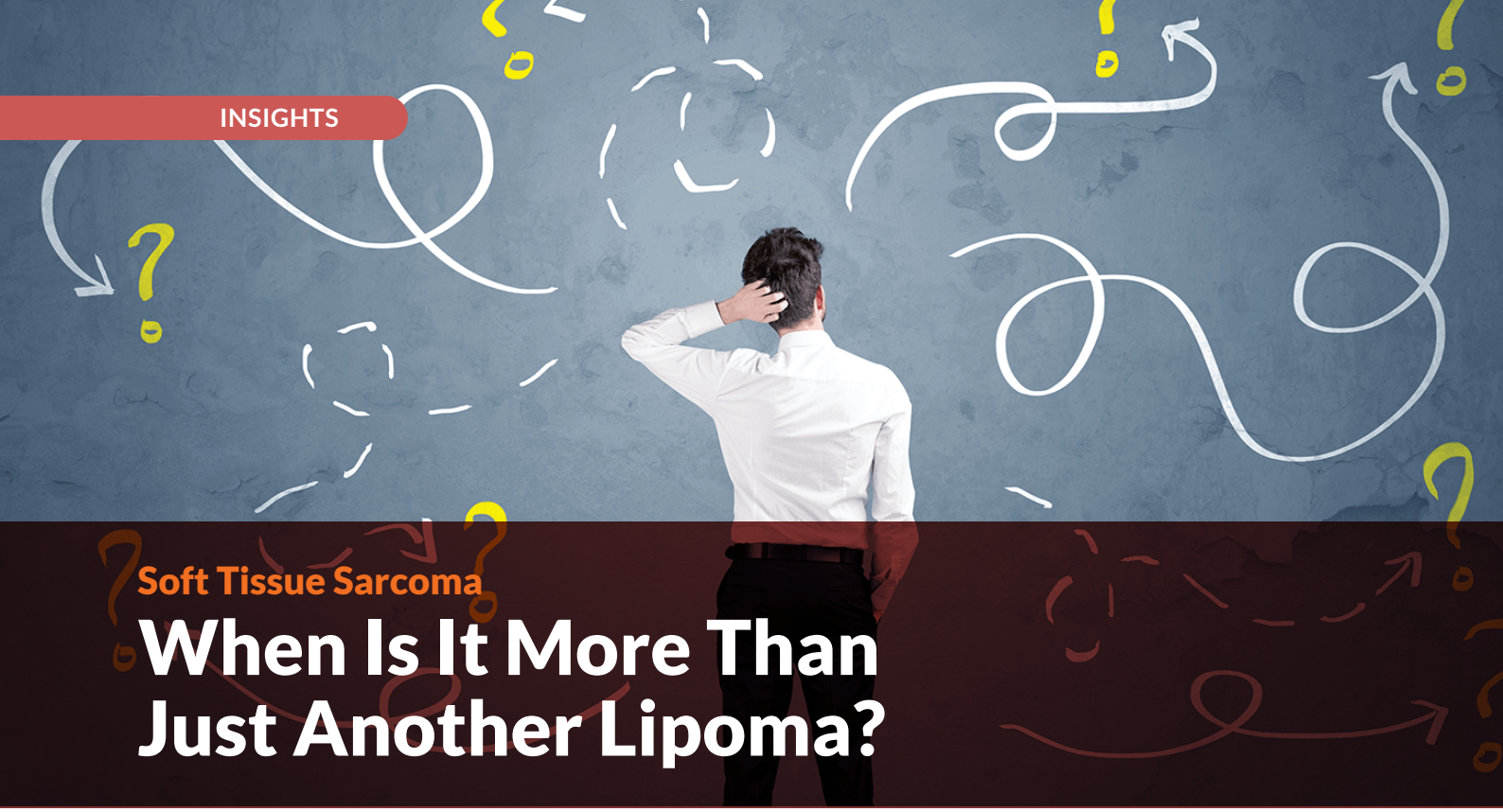
Clinical Interests
Uro-Oncology (Prostate Cancer, Kidney Cancer, Bladder Cancer, Testicular Cancer and Penile Cancer); Prostate Cancer High-Dose Rate Brachytherapy; Da Vinci Robotic Surgery; General Urology



Soft Tissue Sarcoma

When Is It More Than Just Another Lipoma?

Soft tissue mesenchymal tumours are a common occurrence in general practice, with patients presenting with *"lumps and bumps"* at almost anywhere on the body. Majority of these lesions are benign in nature with the common differentials being lipomas and sebaceous cysts. However, about one per cent of these turned out to be soft tissue sarcomas.[1] It is therefore important to be able to distinguish between the two groups.

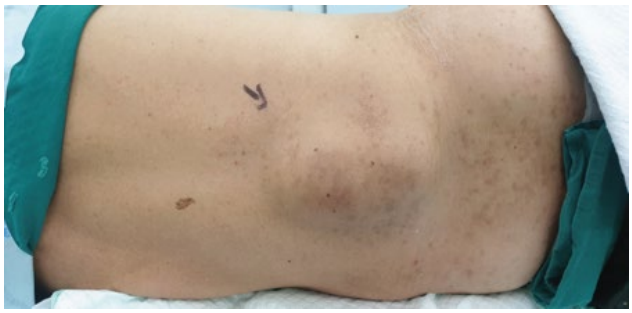
Soft tissue sarcomas may occur at any age, most often in middle-aged and older adults. It comprises more than 50 different histopathological subtypes, such as liposarcoma and chondrosarcoma. The international incidence of soft tissue sarcoma is estimated to be around 1.8 to 5 per 100,000 people per year.[2] For the vast majority, the aetiology is unknown, although there are certain genetic associations, such as malignant peripheral nerve sheath tumour in individuals with familial neurofibromatosis. There is an increased risk of sarcomas in patients with familial retinoblastoma and Li-Fraumeni syndrome. There should also be a high index of suspicion in areas of the body previously treated with radiotherapy, for example, angiosarcoma following treatment for breast cancer.

Due to the heterogenous sites of origin of soft tissue sarcomas, it is difficult to clearly define the clinical features of the disease. Furthermore, the symptoms of presentation of benign and malignant soft tissue tumours can often overlap. However, if a soft tissue lump has any of the following features, it should be considered malignant until proven otherwise[3]:

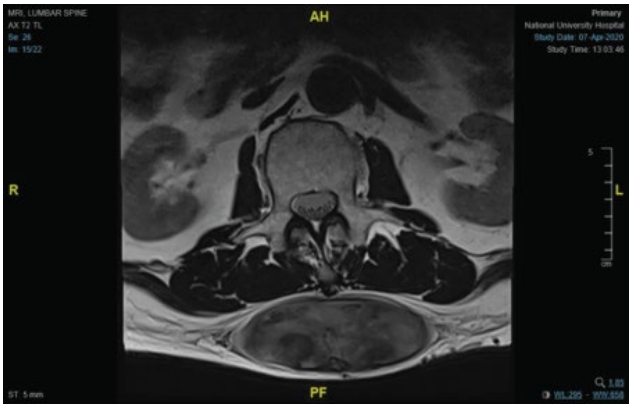
1. Increasing in size
2. Size more than 5cm
3. Painful

The greater the presence of these features, the greater the risk of malignancy with increasing size being the most sensitive indicator. In addition, deeper lying masses *(e.g. submuscular versus subcutaneous)* are more likely sarcomatous. Approximately 99% of benign soft tissue tumours are superficially located, with 95% being less than 5cm in diameter. The recommendation therefore is that the presence of any of these characteristics would warrant a referral to a general surgeon. There is increasing evidence to support that early recognition and referral to a specialist centre that is experienced with sarcoma could improve outcomes in these patients. The most frequent mistake is the practice of inadequate excisional biopsies of these suspicious tumours without prior investigation, which leads to poor outcomes. The impact of affected surgical margins in primary surgery implies a poorer local control and higher risk of recurrence.

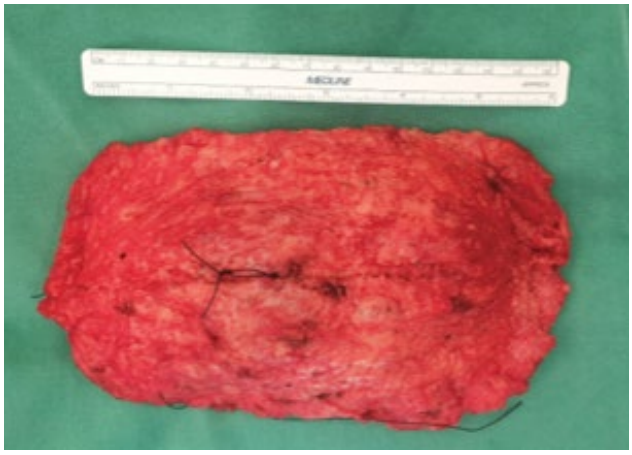
After clinical assessment, an initial ultrasound is often used in lower risk cases to confirm benign conditions such as a simple lipoma. Patients with suspicious ultrasound or clinical features should usually have an MRI scan of the affected region. For retroperitoneal tumours, a CT scan is often more convenient and as useful as MRI. A biopsy for histological confirmation prior to definitive treatment is the standard approach to diagnosis. This can be in the form of a percutaneous core biopsy, or on some occasions, an incisional biopsy. The biopsy should be planned in such a way that the biopsy tract can be safely removed at the time of definitive surgery to reduce risk of seedling.



Patient with a large back liposarcoma



An MRI scan showing the well-circumscribed ovoid mass at the posterior subcutaneous tissue of the back



Resected specimen

All patients diagnosed with sarcoma should have their care discussed at a sarcoma multidisciplinary tumour board (MDT) attended by surgeons, oncologists, radio-oncologists, pathologists and radiologists. Surgery is the standard treatment for all patients with adult-type, localised soft tissue sarcoma. Evaluation of resectability and timing of chemotherapy and radiotherapy, if any, should be decided at the sarcoma **MDT**. Following treatment, it is recommended that patients with low grade sarcomas are followed up every four to six months over three to five years, then annually. Those with high grade sarcomas should be followed up every three to four months for the first two to three years, then twice a year for up to five years, then annually thereafter, for a total of eight to 10 years.

In summary, any patients with a soft tissue mass that is increasing in size or has a size more than 5cm should be referred for an urgent ultrasound or to a sarcoma specialist. These cases should be discussed at a sarcoma **MDT** for individualised management and subsequent follow-up.

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3. Johnson CJD, Pynsent PB, Grimer RJ. Clinical features of soft tissue sarcomas. Ann R Coll Surg Engl. 2001;83(3):203–5.

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Clinical Interests
Thyroid Surgery; Parathyroid Surgery; Adrenal Surgery; Minimally Invasive Surgery

IN ADDITION

Magnetism as Medicine

Magnetic Mitohormesis Boosting Prehabilitation Outcome

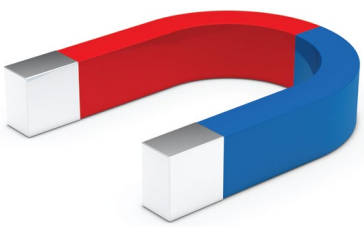
Physical prehabilitation is an accepted strategy to improve post-surgical outcomes, particularly in the elderly and the frail. The intervention takes advantage of the ability of muscle, when appropriately activated, to enhance physiological reserves to improve patient resilience. The functioning of the skeletal muscle is intrinsically linked to immunity and postsurgical recovery[1], an axis that is largely reliant upon the muscle's production and release of metabolic/regenerative factors, collectively known as *"myokines"* or sometimes as *"exerkines"*. As myokines are secreted from the muscle into the general circulation following physical activity, they exert broad systemic effects, such as improving insulin-sensitivity, heart and liver function, adipose metabolism, disease resistance and mental functioning and attenuating damaging systemic inflammation.[2] *Indeed, as our muscle health goes, so does our overall health, functional capacity and resilience.*

This secretory response of skeletal muscle is coupled to its energy usage and therefore, impinges on its mitochondria, otherwise known as the *"powerhouse"* of the cell.[3] In essence, muscle monitors the production of mitochondrial respiratory by-products produced during exercise to gauge its adaptive responses. One such class of respiratory by-products is the Reactive Oxygen Species, or ROS. Therefore, the combined facts that muscle is our single largest source of mitochondria and is uniquely activatable by our own volition *(we choose whether or not to move)* helps explain the healthful benefits of exercise. Gravely, certain clinical scenarios exist where physical activity is limited, impossible or ill-advised, ultimately compromising patient recovery. How to recruit this important physiological response under conditions of imposed or involuntary immobilisation was thus an urgent unmet need in clinical medicine.

The underpinning targets of this response are the muscle mitochondria, and it would hence be more appropriate to assert that *"As our muscle mitochondria's health goes, so does our overall health, functional capacity and longevity"*. Mitochondria adapt to the energy demands we place on them, which ultimately translates to the entire system, a process known as Mitohormesis.[4] Consequently, the body becomes more capable of coping with increased environmental demands. Importantly, a growing body of home-grown scientific evidence is now showing that weak magnetic fields are capable of inducing mitohormesis in muscle, which is less of a vicarious response than an evolutionarily-designed biophysical directive. We drove this point home in a recent manuscript by demonstrating that shielding muscle cells from all environmental magnetic fields reverted the same genetic and epigenetic pathways enhanced by supplemental magnetic fields.[5] The basic interpretation of this finding is that magnetism is naturally modulating muscle development, even under ambient conditions. In essence, our biochemistry is set to reach a threshold near the Earth's magnetic field strength, which really makes sense, given that life evolved in a magnetic environment.

Simply put, we are able to turn nature's magnetic response up a notch with precisely deigned fields. We have recently demonstrated mitochondrial activation and associated survival adaptations in response to brief exposure to weak magnetic fields in both isolated muscle cells,[5] as well as animals,[6] via a novel process of *"Magnetic Mitohormesis"*. These magnetic fields are very low energy, only 10 to 15 times greater in amplitude than the Earth's standing magnetic field, and of similar magnitude to those generated by common household appliances such as a hand-held hairdryer.[7] The trick is how the fields are delivered, which is beyond the scope of the present discussion.

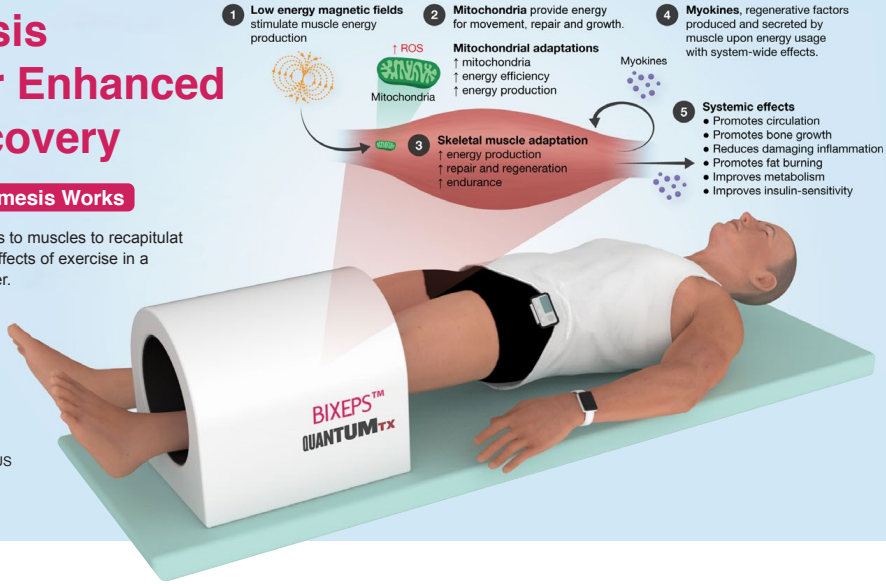
Moreover, it is important to stress that these fields act at the quantum biological level to promote mitochondrial respiration, not by acting as an inadvertent form of movement; that is, our therapeutic magnetic fields **do not** cause muscles to contract, which would produce mechanical stress. This is an important distinction to make as weight bearing or physical exertion is impossible or ill-advised in some patients. Our apparatus does not require the patient to bear their own weight or, for that matter, to be conscious during the treatment and is delivered without the use of contact electrodes, pads, probes or penetrating pins. This technology arose from nearly 20 years of scientific research commencing at the Swiss Federal Institute of Technology *(ETH Zurich)* and later brought to fruition at the National University of Singapore, Yong Loo Lin School of Medicine, Department of Surgery. It is unlike any other magnetic system currently available.



Magnetic Mitohormesis Therapy for Enhanced Muscle Recovery

How Magnetic Mitohormesis Works

Provides patented magnetic fields to muscles to recapitulat the metabolic and regenerative effects of exercise in a non-invasive and painless manner.



Infographic by Zac Goh, iHealthtech, NUS
Coil design courtesy of QuantumTx:
https://www.quantumtx.com

Potential Applications

For post-surgical patients
Reduces muscle degeneration in periods where physical activity is not possible

For aging population
Slows muscle loss and maintains healthy muscle metabolism in the elderly

For professional athletes
Maintains muscle fitness during detraining

Our preliminary human clinical trials have also garnered promising results showing improvements in muscular mitochondrial activity as well as an upregulation of myokines reflecting enhanced bone and muscle regeneration. These results were noteworthy, given the small sample size of 10 individuals, or less, per cohort limb. Nonetheless, much remains to be done. Now that the COVID-19 restrictions are starting to be lifted and life is slowly going back to normal, we are very much looking forward to resuming our human clinical trials to gain a better understanding of the potential benefits and limitations of our magnetic field paradigm in the human clinical population. The evidence does seem to suggest, however, that Magnetic Mitohormesis may represent a potential adjuvant therapy to conventional prehabilitative measures to non-invasively improve post-surgical outcomes in the elderly and the frail.

Research Associate Professor Alfredo Franco-Obregón

Department of Surgery
Yong Loo Lin School of Medicine
National University of Singapore

Scientific Focus
My laboratory is actively investigating how magnetic fields promote mitochondrial respiration and downstream developmental and survival adaptations via a process known as Magnetic Mitohormesis.

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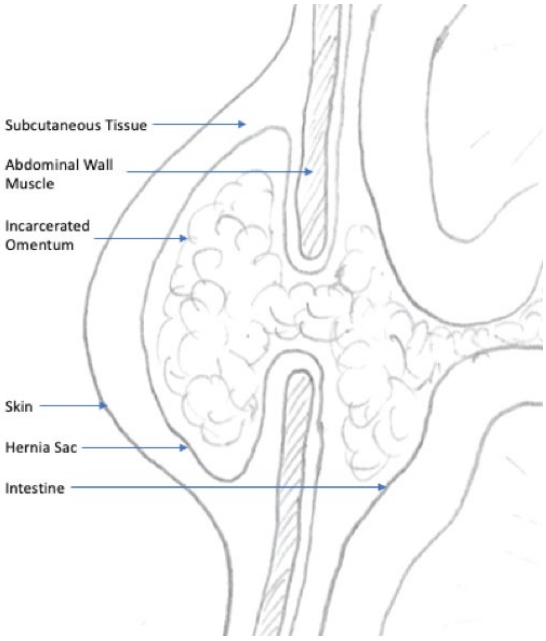
Abdominal Wall Hernia

What to Expect and What to Do

What is an abdominal wall hernia?

An abdominal wall hernia is a bulge over the abdominal wall caused by a weakness or tear of the muscles, which allows intra-abdominal organs or fat to protrude through the defect. Patients usually notice a swelling in the affected area and may occasionally experience pain and discomfort. Symptoms may worsen after prolonged standing, walking or during activities that require straining.



What are the types of hernias?

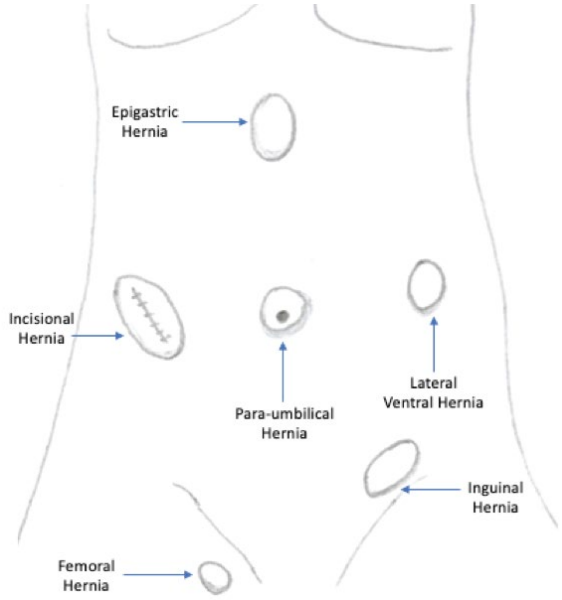
Hernias are broadly categorised according to their location and occasionally based on their specific cause.

1. **Groin hernia:**
   This includes mainly inguinal and femoral hernias. Inguinal hernias can be direct, indirect or both (Pantaloon). Some of the groin hernias can be recurrent after a previous repair. An obturator hernia is another rare type of hernia that can occur at the lower groin region.

2. **Primary midline ventral hernia:**
   Majority of these hernias are umbilical and para-umbilical hernias. Other primary midline ventral hernias are rare and can occur in supra-pubic, epigastric and subxiphoid regions.

3. **Incisional hernia:**
   This is the most common type of secondary ventral hernia. It develops at sites of previous surgical incisions and may include single or multiple defects.

4. **Lateral ventral hernia:**
   These hernias are rare, and the defects are lateral to the rectus abdominis muscle and mainly include spigelian, lumbar and incisional hernia.



How is hernia diagnosed?

Hernia is mainly a clinical diagnosis. The presence of a visible and palpable cough impulse with evidence of reducibility confirms most hernias while some need dynamic imaging like an ultrasound scan or CT scan to confirm the diagnosis.

Picture of an incarcerated para-umbilical hernia

Why and when is surgery needed?

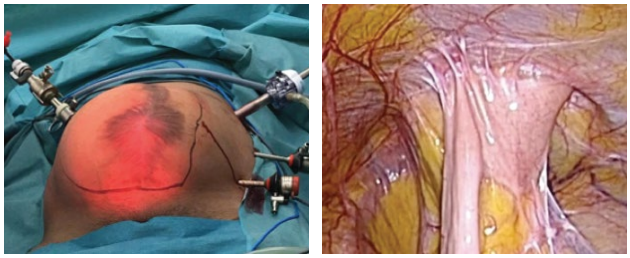
Abdominal wall hernia defects do not get self-resolved. There is a risk of pain, incarceration, strangulation and obstruction occurring in some hernias that have not been surgically treated. Surgical repair with a synthetic mesh is beneficial in cases if the patient is symptomatic and deemed fit to tolerate the stress of surgery and anaesthesia.

What are the surgical options and their benefits?

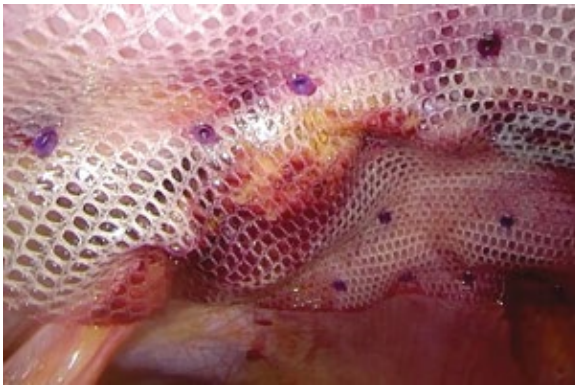
Majority of the hernias mentioned above can be repaired with a synthetic mesh using the endo-laparoscopic or minimally invasive surgery approach with its proven benefits of:

- *Reduced post-operative pain*
- *Shorter duration of admission*
- *Reduced post-operative complications and wound infection*
- *Early return to work with higher patient satisfaction compared to the traditional open surgery approach*

At the National University Hospital, our specialists provide hernia treatment options with a wide spectrum of hernia surgery, from open surgery to robotics, including pre-operative optimisation for cases with high BMI and/or large and complex defects.



Performing laparoscopic surgery for an incisional hernia (left) and intra-abdominal view of small bowel adhesions to the previous incision (right)



Intra-abdominal picture of a ventral hernia after completion of a laparoscopic mesh repair

Healed scars after endo-laparoscopic inguinal hernia repair (left) and after minimally invasive open mesh repair for para-umbilical hernia (right)

Dr Sujith Wijerathne

Consultant
Division of General Surgery –
Minimally Invasive Surgical Centre
Department of Surgery
National University Hospital

Clinical Interests
Minimally Invasive Surgery; Complex Hernia Surgery; Diagnostic and Therapeutic Endoscopy

Dr Kim Guowei

Consultant, Division of General Surgery –
Upper Gastrointestinal Surgery
Department of Surgery
National University Hospital

Clinical Interests:
Upper Gastrointestinal Surgery
(Special Interest in Oesophageal and Gastric Cancer)
Metabolic and Bariatric Surgery
Minimally Invasive Surgery
Diagnostic and Therapeutic Endoscopy

1. What are your challenges as a surgeon specialising in upper gastrointestinal surgery today?

One of the challenges of upper gastrointestinal (UGI) surgery is the variety of work that we do. We must be competent in treating cancers of the UGI tract, in benign UGI surgery, including conditions like gastroesophageal reflux, achalasia and paraesophageal hernias, in bariatric and metabolic surgery, and in diagnostic and therapeutic endoscopy. As such, a wide range of skill sets must be mastered. However, this variety makes our work very enjoyable and exciting!

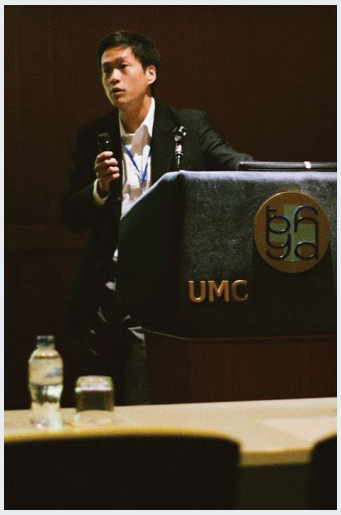
Another challenge in our sub-specialty is the lack of awareness of UGI conditions. Gastric cancer is one of the top ten cancers affecting Singaporeans. However, there is no national screening programme and many patients tend to present late, with advanced stage of the disease. Early diagnosis is key to improve survival outcomes for UGI cancer, and a low index of suspicion is important for this. The same goes for bariatric and metabolic surgery. Despite growing evidence in support of it, coupled with the worsening diabesity pandemic, awareness and acceptance of bariatric and metabolic surgery in Singapore is still poor among both patients and doctors.

Dr Kim Guowei and his family

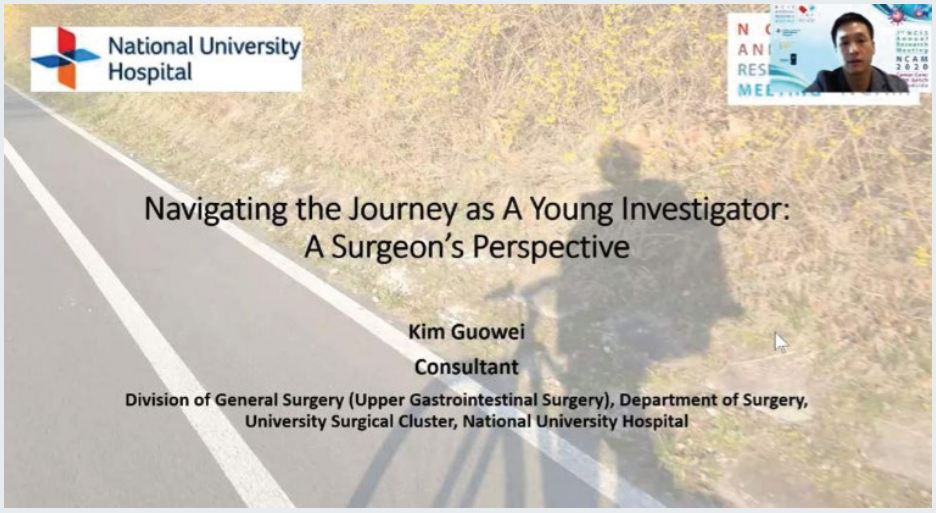
2. How do you keep on top of the latest developments in your field?

An advantage of being in a tertiary institution is the opportunity to advance UGI surgery through research. The need to formulate and run clinical trials and research is based on a thorough understanding of the current evidence and gaps in clinical practice, allowing me to keep abreast of the latest in UGI surgery.

Furthermore, clinical research provides ample opportunity to participate in academic conferences and to visit internationally renowned centres of excellence to broaden horizons. Despite COVID-19, numerous webinars and e-conferences are still ongoing, which provide an excellent platform for continued learning.



At the First Congress of Upper Gastro-Intestinal Surgical Association of ASEAN (USAN) in Ho Chi Minh City, 2019



NCIS Annual Research Meeting (NCAM) Digital Meeting, 2020 – The Way Forward in the COVID-19 Era

3. What draws you to the clinician-research-educator pathway? Has this pathway influenced and/or assisted you in your clinical work with your patients?

Ultimately, as doctors, we must be patient-centric in all pursuits. It does not necessarily have to be in one specific pathway or another. However, clinical research has given me an opportunity to question the current best practices and to push frontiers to better serve our patients. For example, our unit has a strong focus on peritoneal metastasis from gastric cancer, which is a challenging condition with limited treatment options. At NUH, we offer suitable patients intraperitoneal chemotherapy and have seen promising results thus far. Another treatment option that we are investigating is pressurised intraperitoneal aerosol chemotherapy (PIPAC) for patients with peritoneal metastasis who have disease progression on standard treatments.

We are fortunate that the spirit of educating the next generation is strong in medicine. Being a clinical faculty member with the National University of Singapore (NUS), Yong Loo Lin School of Medicine, has provided me with ample opportunity to do just that. Educating and training juniors to surpass ourselves is extremely important. Though we may not see a direct influence in our own clinical work with patients, these doctors will be equipped to pay it forward and benefit many more patients.

4. How would you describe your experience as an instructor at surgical workshops, locally and abroad?

My experiences have put things into perspective – I helped with endoscopic and surgical workshops in Singapore, Malaysia and Bangladesh, performed surgery in a temporary facility in Borobudur, Indonesia, as part of Project SOUL, a charity medical mission of the Department of Surgery, NUS, and spent a year in a top gastric cancer centre in Korea, at Seoul National University Bundang Hospital, as part of my fellowship training in 2019. I've grown to appreciate Singapore much more and have learnt how surgery can still be effectively practised in resource-limited, austere environs. We learn and grow as we share and exchange knowledge and ideas. It is a two-way process that should be perpetuated.

Operating in a temporary surgical facility in Borobudur with medical student volunteers from NUS

Teaching at a surgical workshop in Dhaka

Give a surgical video presentation in Dhaka 2018

Team Singapore at Project SOUL in Borobudur in 2018

5. What developments would you consider to be significant in UGI surgery?

The management of achalasia has changed dramatically in the last decade. This is due to a relatively new but effective procedure, Per-Oral Endoscopic Myotomy (POEM), which has become one of the standard treatment options. This procedure allows us to perform myotomy endoscopically, which had to be performed surgically in the past.

Surgery for gastric and oesophageal cancer is constantly striving to be less invasive and less traumatic. This has driven the widespread adoption of laparoscopic surgery (including single port surgery), with a more recent push for robotic surgery. While the jury is still out on whether current technological developments for minimally invasive UGI surgery actually translate to improved results, I think it is only a matter of time – history has shown us that technology develops exponentially.

Performing a single port radical gastrectomy for cancer in South Korea

Mastering robotic surgery – the next frontier

6. Does the current ageing population trend pose challenges in your subspecialised area and how can NUH work together with our local general practitioners to cope with these challenges?

The ageing population brings forth many challenges for UGI surgery, especially so for UGI cancers. Elderly patients undergoing major UGI surgery are enrolled into the Management and Innovation for Longevity in Elderly Surgical Patients programme (MILES).

The MILES programme was started in 2016 in NUH for general surgery patients to enhance peri-operative care to decrease risk/morbidity and improve outcomes. In the MILES programme, we institute prehabilitation to improve fitness of the elderly patients before going for surgery, strive to employ new technologies such as tele-medicine and tele-monitoring to enhance prehabilitation, reduce the length of hospitalisation, and transit patients back home smoothly for recovery.

We are also developing a comprehensive long-term survivorship programme for UGI cancer patients, with plans to involve local general practitioners to actively participate in the follow-up of UGI cancer survivors. With many elderly patients having numerous co-morbidities, the role of general practitioners is crucial in helping to provide holistic care for our patients' medical and social needs.

Selfie with Mr Ho Yin Hin, a gastric cancer survivor

7. Describe the most rewarding/memorable experience you have had with a patient or that made your day.

Cancer patients go through a lot. Some patients with advanced gastric cancer undergo chemotherapy for several months, then go through radical gastrectomy, and then go for more chemotherapy. It is a long and gruelling journey, and Mr Ho Yin Hin is one such patient. In spite of the trials and tribulations, he still shows tremendous *joie de vivre*, going back to doing one of his favourite activities – golf! The sense of reward from walking this journey with our patients and seeing them enjoying their hobbies again is immeasurable. Words cannot describe it.

Upcoming GP CME Webinar

Annual NUH Urology GP CME Updates 2020

31 October 2020, Saturday
2.00pm – 4.00pm

In our ageing population today, there is an increasing number of elderly patients who present with various urological conditions. Urology is constantly evolving with ongoing advancements in diagnostics, management and therapeutics.

In lieu of the COVID-19 situation, we will be holding our GP Symposium online for the first time. We hope you can join us as we engage you with up-to-date management strategies and urological advancements centered on the patient, for day-to-day general practice.

Time	Topic	Speaker
2.00pm – 2.10pm	Welcome Address	Associate Professor Edmund Chiong Head & Senior Consultant Department of Urology National University Hospital
2.10pm – 2.40pm	LIFTing Spirits for Benign Prostatic Hyperplasia: Latest Advancements in Minimally Invasive Surgery in BPH	Assistant Professor Chua Wei Jin Senior Consultant, Department of Urology National University Hospital
2.40pm – 3.10pm	The Overactive Bladder – A Patient-Focused Update	Dr Fiona Wu Consultant, Department of Urology National University Hospital
3.10pm – 3.40pm	Renal Masses – The INs and OUTs	Assistant Professor Benjamin Goh Consultant, Department of Urology National University Hospital
3.40pm – 4.00pm	Q&A Session	

2 CME points will be awarded to participants attending the entire session.

Registration:

Please email your name, MCR no., clinic name, email address and contact no. to **gp@nuhs.edu.sg.**

Two days before the event date, an email with the link and password will be sent to you.

Department of Surgery

Department Head

Prof Krishnakumar Madhavan	Senior Consultant

Colorectal Surgery

A/Prof Tan Ker Kan	Division Head & Senior Consultant
Dr Cheong Wai Kit	Senior Consultant
Dr Frances Lim	Senior Consultant
Dr Bettina Lieske	Senior Consultant
Dr Chong Choon Seng	Senior Consultant
Dr Lee Kuok Chung	Consultant
Dr Ian Tan Jse-Wei	Associate Consultant

General Surgery

A/Prof Mikael Hartman	Division Head & Senior Consultant

General Surgery – Breast Surgery

A/Prof Mikael Hartman	Division Head & Senior Consultant
Dr Chan Ching Wan	Senior Consultant
Clinical A/Prof Philip Iau	Senior Consultant
Dr Shaik Ahmad Buhari	Senior Consultant
Dr Tang Siau-Wei	Consultant
Dr Celene Ng Wei Qi	Consultant

General Surgery – Minimally Invasive Surgical Centre

Prof Davide Lomanto	Director & Senior Consultant
Dr Sujith Wijerathne	Consultant

General Surgery – Trauma

Clinical A/Prof Philip Iau	Senior Consultant
A/Prof Mikael Hartman	Senior Consultant
Dr Lynette Loo Mee Ann	Consultant
Dr Raj Menon	Consultant

General Surgery – Thyroid & Endocrine

Dr Rajeev Parameswaran	Division Head & Senior Consultant
A/Prof Ngiam Kee Yuan	Senior Consultant
Dr Tan Wee Boon	Consultant

General Surgery – Upper Gastrointestinal Surgery

Prof Jimmy So	Division Head & Senior Consultant
Dr Asim Shabbir	Senior Consultant
Dr Kim Guowei	Consultant

Hepatobiliary & Pancreatic Surgery

A/Prof Iyer Shridhar Ganpathi	Division Head & Senior Consultant
Prof Krishnakumar Madhavan	Senior Consultant
A/Prof Alfred Kow Wei Chieh	Senior Consultant
Dr Glenn Kunnath Bonney	Consultant
Dr Pang Ning Qi	Associate Consultant
Dr Gao Yujia	Associate Consultant

Neurosurgery

Clinical A/Prof Yeo Tseng Tsai	Senior Consultant
Dr Sein Lwin	Senior Consultant
Dr Teo Kejia	Consultant
Dr Vincent Nga	Consultant

Plastic, Reconstructive & Aesthetic Surgery

A/Prof Lim Thiam Chye	Division Head & Senior Consultant
Dr Jane Lim	Senior Consultant
Dr Yap Yan Lin	Consultant
Dr Lee Hanjing	Consultant
Dr Lee Jing Tzer	Associate Consultant

Department of Urology

A/Prof Edmund Chiong	Head & Senior Consultant
Prof Kesavan Esuvaranathan	Senior Consultant
Dr David Terrence Consigliere	Senior Consultant
Dr Chua Wei Jin	Senior Consultant
A/Prof Tiong Ho Yee	Senior Consultant
Dr Joe Lee King Chien	Senior Consultant
Dr Wu Qing Hui	Consultant
Dr Fiona Wu Mei Wen	Consultant
Dr Benjamin Goh Yen Seow	Consultant
Dr Melissa Tay Hui Wen	Associate Consultant
Dr Lu Jirong	Associate Consultant
Dr Wang Ziting	Associate Consultant
Dr Kelven Chen Weijing	Associate Consultant

GPLC

NUH GP Liaison Centre

October - December 2020

At the National University Hospital (NUH), we recognise the pivotal role general practitioners (GPs) and family physicians play in general healthcare provided within the community. As such, we believe that through closer partnerships, we can deliver more personalised, comprehensive, and efficient medical care for our mutual patients.

The General Practitioner Liaison Centre (GPLC) aims to build rapport and facilitate collaboration among GPs, family physicians and our specialists. As a central coordinating point, we provide assistance in areas such as patient referrals, continuing medical education (CME) training, and general enquiries about our hospital's services.

Through building these important platforms of shared care and communication, we hope that our patients will be the greatest beneficiaries.

FOR ASSISTANCE, PLEASE FEEL FREE TO CONTACT US

Tel: +65 6772 2000 / +65 6772 4829
(GP referral appointments and other enquiries)

Fax: +65 6777 8065
Email: gp@nuhs.edu.sg

NUH Continuing Medical Education (CME) Events

At NUH, we strive to advance health by integrating excellent clinical care, education and research. As part of our mission, we are committed to providing regular **CME** events for GPs and family physicians. These events aim to provide the latest and relevant clinical updates practical for your patient care.

Organised jointly by the **GPLC** and the various clinical departments within **NUH**, our specialists will present different topics in their own areas of specialties in these symposiums.

*For more information on our **CME** events, please visit: www.nuh.com.sg/GPLC*