

IN THIS ISSUE

BREAKING THE SOUND BARRIER

*Singapore's first successful
auditory brainstem implantation
for a child below the age of
seven years paves the way for
advancing medical intervention
for children with hearing loss.*



**SPECIAL
DELIVERY**

MEDICAL EDITORIAL COMMITTEE

Associate Professor Tan Thiam Chye
Head and Senior Consultant,
Department of Obstetrics and Gynaecology,
Deputy Campus Director, Education Office,
KK Women's and Children's Hospital
Associate Professor,
Duke-NUS Graduate Medical School
Assistant Professor,
Yong Loo Lin School of Medicine, NUS

Associate Professor Anne Goh
Head and Senior Consultant,
Department of Paediatrics, Allergy Service,
KK Women's and Children's Hospital
Adjunct Associate Professor,
Duke-NUS Graduate Medical School

Associate Professor Nancy Tee
Senior Mentor and Senior Consultant,
Department of Pathology and
Laboratory Medicine,
KK Women's and Children's Hospital
Academic Vice Chair (Clinical),
Pathology Academic Clinical Programme
Adjunct Associate Professor,
Duke-NUS Graduate Medical School

Dr Serene Lim
Senior Consultant,
Department of Paediatric Anaesthesia
and Children's Pain Service,
KK Women's and Children's Hospital

EDITORIAL TEAM

Editors-In-Chief
Audrey Lau
Vincent Lim

Editor Photographer
Rebecca Tse Jaffri Kassim

If you would like to discontinue
receiving Special Delivery or receive it
at a different address, please contact us
at corporate.communications@kkh.com.sg
or +65 6394 8048.

Published July 2017. Copyright © is held
by KK Women's and Children's Hospital.
All rights reserved.

Articles may be reproduced in whole
or in part with written permission. For
permission requests, please write to
"Corporate Communications Department"
at the email address below.

MICA MCI (P) 085/11/2016 REG NO 198904227G

CONTACT INFORMATION

KK Women's and Children's Hospital
100 Bukit Timah Road, Singapore 229899
Tel: +65 6-CALL KKH (6-2255 554)
Fax: +65 6293 7933

Website: www.kkh.com.sg
Email: corporate.communications@kkh.com.sg

We are on facebook. 'Like' us for updates and
news about KKH. www.facebook.com/KKH.sg

CONTENTS

News from Singapore's Academic Tertiary Hospital For Women And Children

08

KKH ANNOUNCES NEW CEO AND CMB

Leadership transition continues a 159-year legacy
of care, as KKH welcomes the appointment of
Professor Alex Sia as Chief Executive Officer
and Associate Professor Ng Kee Chong as
Chairman of the Medical Board.



05

ENHANCING THE BREAST DIAGNOSIS

A promising new tool in the breast
imaging armamentarium, contrast
enhanced spectral mammography,
is enabling KKH medical professionals
to detect, diagnose and treat breast
cancer with greater accuracy.



10

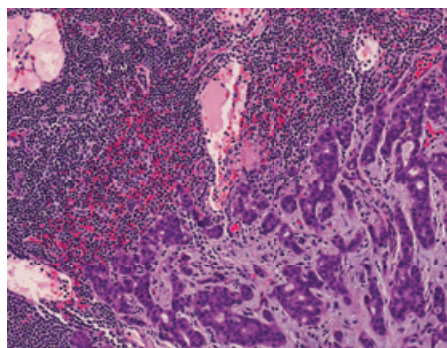
MAINTAINING CONSTANT HAEMOVIGILANCE

KKH is maintaining constant
haemovigilance to prevent
patients experiencing potential
adverse reactions to the very
substance that is meant to
save lives.



< 13 **NON-SURGICAL APPROACH TO UTERINE FIBROID MANAGEMENT**

Uterine artery embolisation,
a minimally invasive treatment
option that has matured over
the past 20 years, offers select
patients with uterine fibroids
an alternative to surgical
intervention.



Fibroid cells, which are morphologically
similar to myometrial smooth-muscle cells
typically found in the uterus.

Breaking The Sound Barrier

Singapore's first successful auditory brainstem implantation for a child below the age of seven years is paving the way for advancing intervention for paediatric hearing loss in Singapore.

The effort was led by Associate Professor Henry Tan, Head and Senior Consultant, Department of Otolaryngology, in collaboration with Dr David Low, Head and Consultant, Neurosurgical Service, KK Women's and Children's Hospital (KKH).

By Dr Jean Roschelle Alonso



A/Prof Henry Tan (right) consults with Dr David Low on a patient's condition.

Six-year-old Natalie (not her real name) was found to have profound bilateral sensorineural hearing loss following universal newborn hearing screening in 2010. She was subsequently diagnosed with incomplete partition type 1 cystic cochleovestibular malformation of the right ear and a hypoplastic cochlea with dilated vestibule on the left ear.

"Despite the use of hearing aids from the age of two and auditory-verbal therapy, Natalie's hearing did not improve. She was unable to develop any verbal output and was also dependent on sign language for very basic communication," said A/Prof Tan.

Upon recommendation by doctors at KKH, she underwent a surgical auditory brainstem implantation in January 2017.

"The complexity of this procedure involves delicately accessing part of the brainstem and precisely positioning the implant. This is particularly challenging in younger patients as the anatomical structures are smaller and we are operating in a confined location with many critical structures in close proximity."

"We were fortunate to receive guidance from Professor Robert Behr from Fulda Clinic in Marburg, Germany," said Dr Low.

Six weeks after the surgery, Natalie's implant was switched on and she began an intensive rehabilitation journey with support from her committed family. Results have been very positive.

"It was a challenging journey for Natalie and for us, as we were concerned about the risks of surgery and anxious about the results and potential benefits it would bring to her," Natalie's mother shared. "However, she did a great job coping with the surgery and recovery process in the hospital, and bounced back quickly."

"Since her surgery, Natalie is able to respond when her name is called. She can also count

from one to 10 without using sign language, and is even able to listen to music and dance to the beat," Natalie's mother added.

"Following her successful auditory brainstem implantation, the improvement in Natalie's hearing will be greatly beneficial to improve her speech, language and neurocognitive development, as well as her psychosocial and learning skills, which are particularly important during her crucial years of rapid growth," said A/Prof Tan.

"Following on, we hope to further develop KKH's Paediatric Auditory Brainstem Implantation Programme, to help more children with hearing loss overcome the barriers of silence, achieve optimal outcomes and live full and meaningful lives," added Dr Low.

HEARING LOSS IN CHILDREN

Hearing loss is the most common congenital and acquired sensory deficit among children. According to international reports, five out of 10,000 infants under two years are profoundly hearing impaired and unable to hear any sounds. Early onset profound hearing loss has been shown to have devastating consequences for the development of language and learning.

* A/Prof Henry Tan is also Clinical Associate Professor, Yong Loo Lin School of Medicine, National University of Singapore and Adjunct Associate Professor, Duke-NUS Medical School. Dr David Low is also Consultant, Department of Neurosurgery, National Neuroscience Institute, Program Director, SingHealth Neurosurgical Residency Program and Adjunct Assistant Professor, Duke-NUS Medical School.

Continued from page 3...

Annually, about one in 1,000 Singaporean infants are born with profound sensorineural hearing loss. Based on statistics at KKH, an estimated 12 infants are diagnosed with profound sensorineural hearing loss yearly.

COCHLEAR IMPLANT AND AUDITORY BRAINSTEM IMPLANT

The cochlear implant is the most successful neuro-prosthesis for restoring sensorineural hearing loss and provides meaningful sound and speech perception to paediatric patients worldwide. Unfortunately, a small subset of patients with severe-to-profound sensorineural hearing loss cannot benefit from a cochlear implant, due to a small or absent cochlea or auditory nerve, or scarring of the inner ear due to infection or trauma.

Infants born without auditory nerves or cochlea are very rare, and comprise one to two cases per year. Patients who suffer from neurofibromatosis Type 2 (NF2) and have brain tumours leading to permanent damage in the auditory nerve are also not able to benefit from a cochlear implant. This spectrum of patients would depend on an auditory brainstem implant (ABI) as possibly the only hope of restoring their ability to hear.

An ABI is an electronic device that is surgically implanted to provide the patient with a sense of sound. It is typically an ideal intervention for patients with the following conditions:

- Severe cochlear malformation
- Complete ossification of cochlear
- Cochlear nerve hypoplasia
- Absent cochlear nerve
- Neurofibromatosis Type 2

Utilising technology similar to a cochlear implant, the ABI directly stimulates the brainstem auditory pathway, bypassing both the cochlea and the eighth cranial nerve. It comprises two components – an external processor worn at the ear, which picks up sound signals and converts them into electrical signals; and a surgically implanted receiver positioned just below the skin secured to the skull, which receives the transmitted signals. The receiver is connected to an electrode implant positioned on the brainstem, enabling the patient to experience hearing sensations.

PAEDIATRIC AUDITORY BRAINSTEM IMPLANT

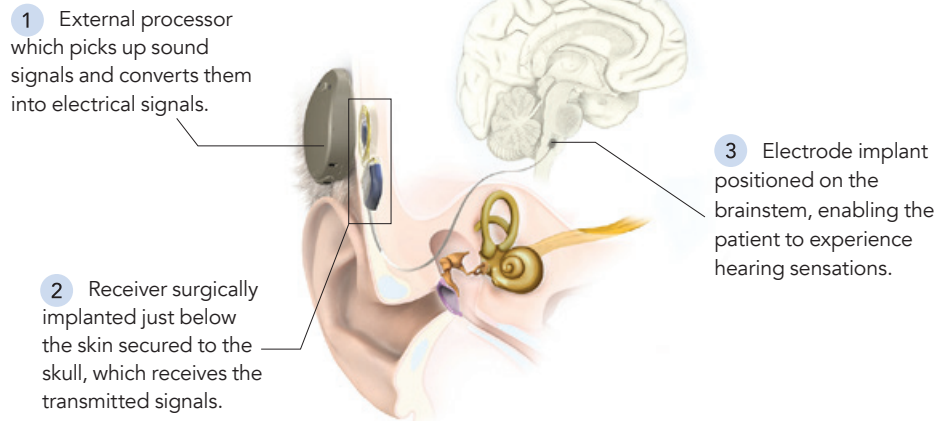


Image reproduced with permission from MED-EL Medical Electronics

The ABI was originally developed to benefit patients with NF2, who had lost bilateral eighth cranial nerve function after undergoing surgery to remove vestibular schwannoma, a tumour which affects the eighth cranial nerve. Post-implantation, these patients' sound awareness showed improved performance over lip reading alone during face-to-face communication. However, speech understanding without visual cues (also known as 'open-set' speech recognition) was poor.

More recent results have seen high levels of open-set speech recognition in patients who had lost their eighth cranial nerve function from causes other than NF2. Post-ABI implantation, these patients, who did not have vestibular schwannoma, were able to recognise more than 50 percent of quietly-spoken sentences and conduct conversations using the telephone.

AUDITORY BRAINSTEM IMPLANTATION AT KKH

At KKH, ABI surgery is jointly performed by a neurosurgeon and an otolaryngologist to access and expose the cochlear nerve nucleus via minimally-invasive keyhole craniotomy. An electrode is then micro-surgically implanted in a targeted location identified via neurophysiological mapping techniques. Finally, a groove is created in the skull to house the receiver and connect it to the implanted electrode.

"Prior to the surgical procedure, the patient's family receives rigorous counselling to educate them that the procedure alone does

not provide an instantaneous cure nor enable the child to hear and perceive sounds similar to someone without hearing impairment," said Dr Low.

"Post-surgery, the family would need to commit to regular auditory and speech rehabilitation sessions and practice sessions at home to maximise the chances of success of the treatment."

EARLY DETECTION KEY TO SUCCESSFUL INTERVENTION FOR HEARING LOSS

Children with suspected hearing loss should be referred for tertiary assessment, which includes measurement of hearing thresholds and speech discrimination, as well as site-of-lesion detection – to diagnose and determine the type and degree of hearing loss.

Following diagnosis, the medical team can assess the impact of hearing loss on the child's speech and language development, and conduct further tests to determine whether the child's reduced hearing is indicative of a syndrome.

Rehabilitation and intervention measures can also be planned, which can include medical and surgical management, dispensing of hearing aids, or evaluation of the child for cochlear implants or ABI.

Community healthcare practitioners can refer patients to the Department of Otolaryngology for assessment, by contacting the hospital at +65 6294 4050.



Enhancing the Breast Diagnosis

By Dr Lee Yien Sien

A promising new tool in the breast imaging armamentarium, contrast enhanced spectral mammography (CESM) is enabling KKH medical professionals to detect, diagnose and treat breast cancer with greater accuracy.

A mammogram is an X-ray examination of the breast, and is often used as a screening tool to check for breast cancer in women who have no signs or symptoms of the disease. A mammogram can also be used as a diagnostic and interventional imaging tool in women experiencing symptoms suggestive of breast cancer, such as a lump, pain, skin dimpling or nipple discharge.

To date, mammography is the only screening modality shown to reduce breast cancer mortality. However, full field digital mammography is a two-dimensional modality in which overlapping breast tissues can pose diagnostic difficulty resulting in false negative and false positive findings. In breasts with dense tissues, the sensitivity of mammography can decrease by up to 50 percent.

Introduced in KK Women's and Children's Hospital (KKH) in 2015 and a first for restructured hospitals in Singapore, CESM technology combines the benefits of

both full field digital mammography and intravenous contrast media utilisation, providing valuable information to guide the assessment and management of breast abnormalities, cancer and indeterminate findings on mammography and/or ultrasound.

Other advantages of this relatively new modality include high diagnostic accuracy, cost-effectiveness, shorter waiting time to definitive treatment and the ease of image acquisition. As the use of CESM techniques continues to evolve, its use looks set to further improve patient care and experience, particularly in the area of breast cancer diagnosis and treatment.

CONTRAST ENHANCED VISUALISATION

CESM is performed after administration of intravenous iodinated contrast medium. Utilising the concept of new blood vessel formation observed in tumours, the injected contrast agent highlights areas of blood vessel proliferation within tumours, making them more visible on mammogram.

The dual energy CESM technique takes advantage of the differences in X-ray attenuation between iodinated contrast material and breast tissue to further enhance the visualisation of tumours within the breast.

DURING THE EXAMINATION PROCESS

At KKH, mammography is carried out by female radiographers. The iodinated contrast medium is administered into the patient through an intravenous cannula, and two sequential images of both breasts are taken at low and high energies.

The low energy image is similar to a standard full field digital mammography image, which provides soft tissue and calcification detail. The high energy image demonstrates the iodine contrast enhanced areas. These two images are digitally subtracted from one another to produce an image that highlights areas of contrast enhancement.

Continued on page 6...

Continued from page 5...

INDICATIONS FOR CESM

Established indications for screening with CESM include criteria indicating the patient is at high risk for breast cancer. This includes at least one of the following: known BRCA1 and BRCA2 mutations, family history of both breast and ovarian cancer, two or more first degree relatives with breast or ovarian cancer, and breast cancer occurring before the age of 50 years in a close relative.

A COMPELLING ALTERNATIVE TO MRI

CESM is a useful tool in cancer staging and can serve as a compelling alternative to patients requiring magnetic resonance imaging (MRI) of breasts for further work up. This can be especially valuable for patients with contraindications to MRI such as the presence of a pacemaker, allergy to a contrast agent or severe claustrophobia.

Further, studies have shown that CESM is comparable to MRI for the depiction of the index tumour. While CESM is less sensitive than MRI in the detection of additional sites of cancer, the added sensitivity of MRI has to be weighed against the higher frequency of false positive results. These false positive results can lead to the increased need for biopsies and mastectomies, which may delay the time to definitive treatment.

In comparison to MRI, breast examination by CESM is more cost-effective for patients. It is also time-saving, as the preparation and process of an examination is typically 30 to 45 minutes. MRI preparation and process typically requires about 75 minutes to complete.

CESM is a useful tool in cancer staging and can serve as a compelling alternative to patients requiring magnetic resonance imaging (MRI) of breasts for further work up.

CESM is also useful in the assessment of inconclusive findings that cannot be clarified by conventional mammography and/or ultrasound. CESM, like MRI, can be used in inconclusive findings because the possibility of cancer is virtually ruled out if the examination is negative.

For patients with dense breast tissue, within which cancer lesions can often be obscured, CESM can be useful in detecting additional cancerous lesions within the same breast or contralateral breast. For patients with multiple solid nodules within the breasts, CESM can help the radiologist to determine which nodules may require biopsy based on the enhancement pattern.

CESM can also be used to monitor the patient's response to neoadjuvant chemotherapy, especially in patients with contraindications to MRI.

AN EVOLVING TECHNOLOGY

With CESM, the assessment of very posteriorly located lesions may be limited, specifically chest wall invasion and evaluation of internal mammary lymphadenopathy. Additionally, technology to target areas of abnormal enhancement for tissue diagnosis using CESM is currently unavailable. However, the development of CESM-guided biopsy technique is underway.

Until CESM-guided biopsy becomes available, second look ultrasound is used to find a sonographic correlate for abnormal areas of enhancement so tissue sampling can be obtained under ultrasound guidance. False negative results may be seen with small cancers or low grade histology due to minimal enhancement. False positive results may be seen in enhancement of benign lesions.

CASE STUDY: EVALUATING A PATIENT FOR BREAST CANCER IN THE CONTRALATERAL BREAST

Hui (not her real name), a 65-year-old Chinese lady presented with a hard lump in her right breast. Her late mother had been diagnosed with breast cancer at the age of 33 years and died in the same year.

A full field digital mammogram showed widespread suspicious calcifications in the upper right breast, and multiple clusters of moderately suspicious calcifications scattered in the left breast. Ultrasound of the upper right breast confirmed the presence of a suspicious solid mass, which was biopsied under ultrasound guidance and a diagnosis of cancer was confirmed.

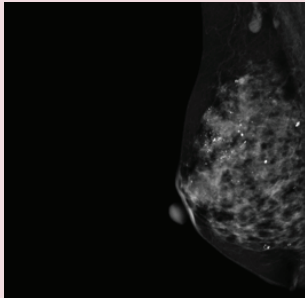
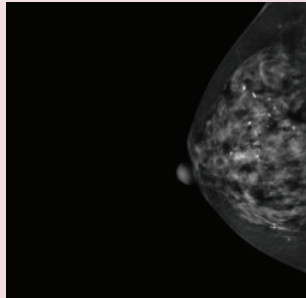
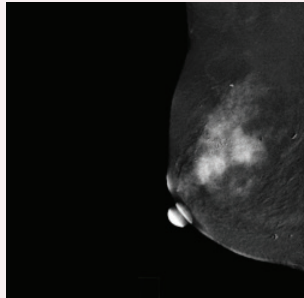
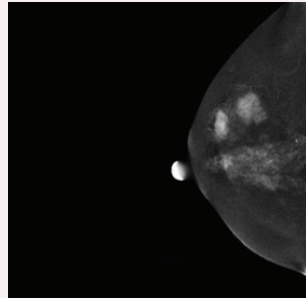
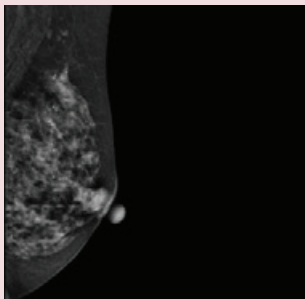
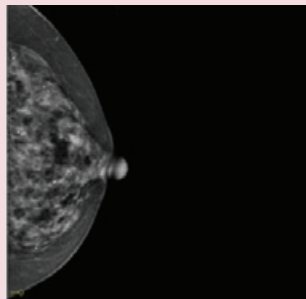
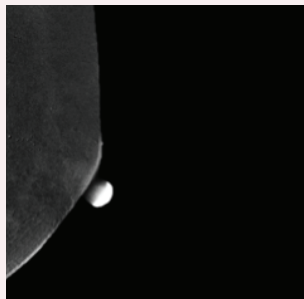
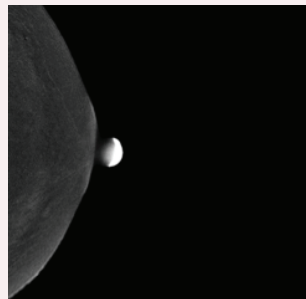
As cancer had been diagnosed in the right breast, the clinical question was - were there additional foci of cancer in the left breast? Which cluster of calcifications out of the many clusters of calcifications should be evaluated, taking into consideration the patient's ability to tolerate biopsy of multiple areas within the breast?

To further enhance the visualisation of calcifications and tumours within both breasts, CESM was performed. The proven cancer in the right breast showed abnormal enhancement, the size of which correlated well with the tumour size depicted on mammography and ultrasound. Further, the histopathological size of the cancer in the mastectomy specimen correlated with the size of the enhancement seen on CESM.

In the left breast, no abnormal enhancement was seen. Two clusters of calcifications which were deemed most suspicious were subsequently biopsied; both showed benign result consistent with the negative CESM result. The likelihood of cancer in the breast with a negative CESM result is very low.

This case illustrates the value of CESM in providing clarity and conclusiveness to the assessment of tumour size and evaluation of the contralateral breast for additional foci of cancer. Through the use of CESM, invasive procedures and biopsies of certain lesions in patients diagnosed with breast cancer can be averted.

Comparison of full field digital mammography and contrast enhanced spectral mammography images

FULL FIELD DIGITAL MAMMOGRAM		CONTRAST ENHANCED SPECTRAL MAMMOGRAM	
RIGHT BREAST			
<p>Mediolateral oblique view</p> 	<p>Craniocaudal view</p> 	<p>Mediolateral oblique view</p> 	<p>Craniocaudal view</p> 
<p>Malignant segmental pleomorphic calcifications detected in the upper outer quadrant of the breast.</p>		<p>Segmental enhancement detected (indicated in white) in the upper outer quadrant of the breast, which corresponds to the malignant calcifications detected through full field digital mammography.</p>	
LEFT BREAST			
<p>Mediolateral oblique view</p> 	<p>Craniocaudal view</p> 	<p>Mediolateral oblique view</p> 	<p>Craniocaudal view</p> 
<p>Multiple groups of indeterminate calcifications detected, scattered in the breast.</p>		<p>No abnormal enhancement detected in the breast. Biopsy of two groups of calcifications show benign result, commensurate with this finding.</p>	



Dr Lee Yien Sien, Consultant, Department of Diagnostic and Interventional Imaging, KK Women's and Children's Hospital
 Dr Lee Yien Sien has a subspecialty interest in breast imaging and her areas of research include positron emission mammography, automated breast ultrasound and contrast enhanced spectral mammography. In 2009, she underwent a Health Manpower Development Programme at MD Anderson Cancer Centre in Texas, United States. As an adjunct assistant professor at the Duke-NUS Medical School, Dr Lee is also actively involved in the education of radiology residents.

KKH Announces New CEO And CMB

Leadership Transition Continues 159-Year Legacy Of Care



Continuing a legacy of care - Prof Alex Sia (left), new CEO of KKH, receives a key symbolising the passing of the leadership mantle, from outgoing-CEO Prof Kenneth Kwek (right).

On 1 May 2017, KK Women's and Children's Hospital (KKH) welcomed the appointment of Professor Alex Sia as Chief Executive Officer. Prof Sia had formerly served as Chairman of the Medical Board at KKH from 22 January 2012 to 30 April 2017. KKH also welcomed Associate Professor Ng Kee Chong, formerly Chairman of the Division of Medicine, into the role of Chairman of the Medical Board.

With the leadership transition, outgoing KKH CEO, Professor Kenneth Kwek relinquished his duties at KKH on 30 April 2017, concurrent to his appointment as CEO of Singapore General Hospital.

"Over her 159-year history, KKH has established an enduring legacy of excellent care that has benefitted countless women and children.

"We are truly indebted to Prof Kwek for his thoughtful leadership and strategic foresight, which has helped KKH push the frontiers in clinical care, research and education to enhance care delivery and to benefit our patients," says Prof Sia.

"It is a privilege for us to be able to continue to build on the foundation that our predecessors have laid, and we are humbled by the responsibility entrusted to us to steward KKH to greater heights.

"As an academic medical centre in the pursuit of excellence, we aim to continue to provide compassionate and holistic care for generations to come; we will need 'all hands on deck' to continue to deliver the care that all Singaporeans will be proud of," adds Prof Sia.

"Let us continue working together to pursue our shared vision to further advance KKH as a centre of excellence, committed to improving patient care through clinical innovation, education and research. Through greater collaboration and integrated care, we will be able to better support and help patients to achieve optimal outcomes," says A/Prof Ng.



"We will continue to build on a culture of safety where everyone speaks up and is accountable

as we strive to be a learning organisation that is dedicated to improving on the care we deliver."

Prof Alex Sia
Chief Executive Officer, KKH

Prof Alex Sia was appointed Director, KK Research Centre (1 August 2009 – 2013) and assumed the role of Chairman, Medical Board, KKH in 2012, playing a pivotal role in the inaugural launch of the SingHealth Duke-NUS Academic Clinical Programmes for both Paediatrics and Obstetrics & Gynaecology.

Under his leadership, KKH continued to transform many areas of healthcare for women and children, exemplified by the establishment of an accredited chromosomal microarray analysis (CMA) diagnostic test to aid the diagnosis of genetic disorders in infants and children, as well as the national laboratory for Non-invasive Prenatal Testing under the Ministry of Health's Health Service Development Programme.

As Deputy Group Chairman Medical Board (1 March 2016 – 30 April 2017) of SingHealth, Prof Sia provided strategic leadership to the SingHealth Medical Board and supported the SingHealth Duke-NUS Disease Centres in pursuing excellent clinical outcomes through seamless, person-centred care.

A passionate researcher and educator, Prof Sia is Professor with the Duke-NUS Medical School, Singapore. He also holds appointments as Clinical Professor with the Yong Loo Lin School of Medicine, and Adjunct Professor with the Engineering Design & Innovation Centre, National University of Singapore.

"Underpinned by our core values of compassion, integrity and collaboration, KKH's focus on targeting Zero Harm for all patients and staff will remain a key priority," says Prof Sia.

"We will continue to build on a culture of safety where everyone speaks up and is accountable as we strive to be a learning organisation that is dedicated to improving on the care we deliver. We will partner everyone, particularly our patients, in the quest of transforming care to enhance patient safety and experience.

"As an institution that is unwaveringly devoted to placing patients at the heart of all we do, KKH will continue to reach out to all our partners within the healthcare family and the community in our journey to provide truly person-centric care."



"We will strengthen our commitment in providing coordinated and integrated care to all our patients."

The key to KKH's ongoing success will be based on our ability to embrace elements of academic medicine, including research and education, as we continuously look for innovative ways to provide cost-effective healthcare."

A/Prof Ng Kee Chong
Chairman Medical Board, KKH

A stalwart champion for clinical advancement, education and research, A/Prof Ng Kee Chong was Chairman of the KKH Emergency Preparedness Committee (1997 to 2016), leading the hospital's disaster response following the Indian Ocean tsunami in 2004, and Head of the Children's Emergency at KKH from 2005 to 2016.

From 2012 to 30 April 2017, A/Prof Ng was Academic Chair of the inaugural SingHealth Academic Clinical Programme for Paediatrics, and Chairman of the Division of Medicine, KKH, spearheading the establishment of the Temasek Foundation Cares Trauma Network for Children, and the KKH Regional Disaster Outreach Programme. Active in humanitarian projects, A/Prof Ng has led KKH teams into various countries on medical education and training missions to combat maternal, paediatric and infant deaths. In 2015, he further stepped into the role of Campus Director of Medical Innovation & Care Transformation, KKH.

A/Prof Ng is a member of the Ministry of Health National Trauma Committee, the National Resuscitation Council (NRC) and Chairman of the Paediatric Life Support Subcommittee, NRC. He was appointed to the pro tem committee of the Singapore Resuscitation & First Aid Council (SRFAC) in 2016, and is a member of the International Liaison Committee on Resuscitation (ILCOR) Pediatrics Taskforce.

He is concurrently Duke-NUS Senior Associate Dean, KKH Campus, Adjunct Associate Professor with the Duke-NUS Medical School and Yong Loo Lin School of Medicine, and also a member of the Duke-NUS Medical School Admissions Committee, and a council member of the College of Paediatrics & Child Health, Singapore.

"We will strengthen our commitment in providing coordinated and integrated care to all our patients. The key to KKH's ongoing success will be based on our ability to embrace elements of academic medicine, including research and education, as we continuously look for innovative ways to provide cost-effective healthcare," says A/Prof Ng.

"In this respect, we count ourselves fortunate to be in the company of all our very committed people in the KKH family as we live our shared values and work towards our singular aim of improving patients' lives."

Over the course of three decades of service at KKH, Prof Kwek has inspired many with his humility and strong commitment to patient care. His commitment and exemplary leadership during his term as CEO (22 January 2012 – 30 April 2017) led KKH to be recognised as the region's referral women's and children's hospital.

His strong advocacy for patient safety drove many new initiatives at KKH, such as the Zero Harm and Speak Up for Safety Commitment (Patient Safety A.S.A.P), the partnership with Cognitive Institute to promote high reliability and safety, and Leadership Rounding where KKH EXCO members are onsite with patients and staff for direct feedback on patient safety and quality.

Prof Kwek's contributions led to KKH receiving numerous awards. KKH's Trusted Care for Pregnancy won the IT Excellence in Providing Quality of Care at the National Health IT Summit 2016, and the hospital also received the Best Innovative Use of Infocomm Technology (Public Sector) and HIMSS-Elsevier Digital Healthcare Award – Outstanding ICT Innovation Award.

"The progress and outstanding culture of safety, transparency and collaboration in KKH are the result of all of us working together. I am confident that Prof Sia and A/Prof Ng are even more able to lead KKH forward in providing the best and safest care as well as the best experience for our patients," says Prof Kwek.



"The progress and outstanding culture of safety, transparency and collaboration in KKH are the result of all of us working together. I am confident that Prof Sia and A/Prof Ng are even more able to lead KKH forward in providing the best and safest care and the best experience for our patients."

Prof Kenneth Kwek
CEO, Singapore General Hospital
(May 2017 onwards)
CEO, KKH
(January 2012 – April 2017)

Maintaining Constant Haemovigilance

Blood transfusion is a common life-saving procedure, with an estimated 14 units of blood used per hour in Singapore. KK Women's and Children's Hospital is maintaining constant haemovigilance to prevent patients experiencing potential adverse reactions to the very substance that is meant to save lives.

By Dr Joyce Lam

In Singapore, an estimated 160,000 units of blood was transfused every year from 2013 to 2016. The blood and its vital components – including red blood cells, platelets and plasma – are used to sustain patients during general surgery, and during the treatment of medical conditions such as haemorrhagic fever and cancers, blood diseases such as thalassaemia, and trauma sustained through accidents and emergencies.

Donated blood is processed and tested at the Health Sciences Authority (HSA) laboratories before it is transfused to patients. Stringent donor screening and testing of donor samples are also carried out. Thus, the risks of acquiring transfusion-transmitted viral infections such as Hepatitis B, Hepatitis C or the Human Immunodeficiency Virus are almost negligible, in the order of 0.001 to 0.00015 percent.

Nevertheless, similar to most medical procedures, blood transfusion carries some unavoidable risks – after a blood transfusion, a patient may experience an adverse transfusion reaction. This is an undesirable response that is related to the administration of a blood product such as red cells, platelets or plasma.

At KK Women's and Children's Hospital (KKH), which manages high risk conditions in women and children, haemovigilance is observed – where a set of surveillance

procedures is established to collect and analyse information on adverse incidents related to blood transfusions. This allows for identification of transfusion hazards and areas of practice where key improvements can be made to reinforce patient safety.

EARLY RECOGNITION AND PROMPT MANAGEMENT

Adverse transfusion reactions can be acute and present within hours of a blood transfusion, or be delayed up to four weeks after a transfusion has taken place. Collating nationwide statistics, the Blood Services Group noted that approximately 600 to 700 adverse transfusion reactions were reported annually by the blood banks of restructured hospitals during the same period. This translates to a low annual incidence of less than 0.5 percent of all transfusions in Singapore.

While adverse transfusion reactions cannot be completely predicted or prevented, early recognition and prompt management of these reactions are key to successful management outcomes in patients.

Following Clinical Practice Guidelines by HSA and Ministry of Health (MOH), when a transfusion reaction is suspected at KKH, the transfusion will be stopped immediately while intravenous access is maintained with normal saline. The patient's vital signs are carefully monitored and appropriate treatment will be instituted.



Concurrently, an investigation of a suspected transfusion reaction will be conducted, starting at the bedside with a repeat check of the patient's identification against the unit of blood and transfusion slip to rule out patient misidentification. The hospital's blood bank will also be notified of the suspected transfusion reaction. Blood samples from the patient may be requested for further investigation, and the affected unit of blood will be returned to the blood bank.

As many of the initial signs and symptoms of a transfusion reaction can be non-specific, it is important for healthcare providers to be mindful of these differentials and continue to follow up with patients after their transfusion to promptly recognise and react to potential transfusion reactions. Blood transfusion recipients should also seek medical help if they develop unexpected symptoms in the hours and days following a transfusion.

POSSIBLE REACTIONS FOLLOWING A BLOOD TRANSFUSION

		SYMPTOMS	CAUSED BY	RISK OF OCCURRENCE	MANAGEMENT
COMMON AND LESS SERIOUS	ALLERGIC REACTION	<p>Symptoms present in the first one to four hours of transfusion, and include:</p> <ul style="list-style-type: none"> • Rash similar to measles • Urticaria • Swelling of the eyes and lips <p>Symptoms are similar to what is seen in a person with seafood allergy who breaks out in hives after consuming prawns.</p>	Antibodies in the recipient, which react to allergens in the plasma of the transfused blood product.	1-2%	Antihistamines or steroids may be prescribed. Patients with repeated allergic reactions to blood products can prevent further occurrences through premedication with prescribed antihistamine or steroids prior to transfusions.
	FEBRILE NON-HAEMOLYTIC TRANSFUSION REACTION	<ul style="list-style-type: none"> • Fever of more than 38°C within four hours of a blood transfusion (in the absence of other causes) 	Antibodies in the recipient directed against white cells in the transfused blood product, which release cytokines that can cause a fever.	0.5-1%	Antipyretics such as paracetamol may be prescribed. Patients with repeated episodes of transfusion-associated fever can use a white cell filter during transfusions or be provided with blood that has been specially depleted of white cells to prevent further episodes.
RARE AND POTENTIALLY LIFE THREATENING	BACTERIAL CONTAMINATION	<p>Symptoms present in the first one to four hours of transfusion, and include:</p> <ul style="list-style-type: none"> • Fever • Chills • Rigours 	Bacterial contamination of blood products, with the highest risk seen in platelet concentrates. Platelets require incubation at a temperature close to 25°C to preserve their function. This is a temperature at which bacteria naturally present within the platelet concentrate may proliferate.	0.1%	The causative bacteria will be identified and treatment with appropriate antibiotics will be administered.
	TRANSFUSION-ASSOCIATED ACUTE LUNG INJURY (TRALI)	<p>Signs of lung injury present within six hours of a transfusion, and include:</p> <ul style="list-style-type: none"> • Changes in the chest x-ray • Dyspnoea (breathlessness) • Hypoxaemia (deficiency of oxygen in the blood) 	Specific anti-human leukocyte antigen (anti-HLA) antibodies from the donor's plasma directed against the lungs.	Less than 0.02%, with a higher risk of occurrence in recipients with pre-existing lung conditions.	<p>Treatment is mainly supportive and may involve the provision of supplemental oxygen and mechanical ventilation. The donor is identified and tested for the presence of anti-HLA antibodies in the donated blood.</p> <p>(Blood that is found to have anti-HLA antibodies will not be transfused to other recipients, and the donor will be advised against future donations to prevent similar complications from occurring.)</p>
	TRANSFUSION-ASSOCIATED GRAFT-VERSUS-HOST DISEASE (TAGVHD)	<p>Symptoms present from one to four weeks after the transfusion, and include:</p> <ul style="list-style-type: none"> • Maculopapular rash • Fever • Diarrhoea • Jaundice 	Circulating donor lymphocytes from the transfused blood product, which mount an immune reaction against the recipient's tissues.	Less than 0.0001%, usually occurring in immunocompromised patients.	To prevent TAGVHD in immunocompromised patients, such as transplant recipients and patients with congenital immunodeficiencies, blood products are irradiated prior to transfusion to render lymphocytes in the transfused blood product non-viable.
	ABO-RELATED ACUTE HAEMOLYTIC TRANSFUSION REACTION	<p>Symptoms present shortly after starting a transfusion, and include:</p> <ul style="list-style-type: none"> • Fever • Haemoglobinuria • Abdominal, chest or flank pain <p>Subsequently, these symptoms may rapidly progress to:</p> <ul style="list-style-type: none"> • Hypotension • Shock • Disseminated intravascular coagulopathy (a condition that can cause life-threatening bleeding, organ damage and potentially lead to death) 	Preformed Anti-A or Anti-B antibodies directed against incompatible red cells.	0.00017% (1.7 per million units of blood transfused)	Prompt diagnosis and recognition of this reaction is important. The transfusion should be stopped immediately and supportive measures will commence, which include intravenous fluids and medications to maintain the blood pressure.

Continued from page 11...

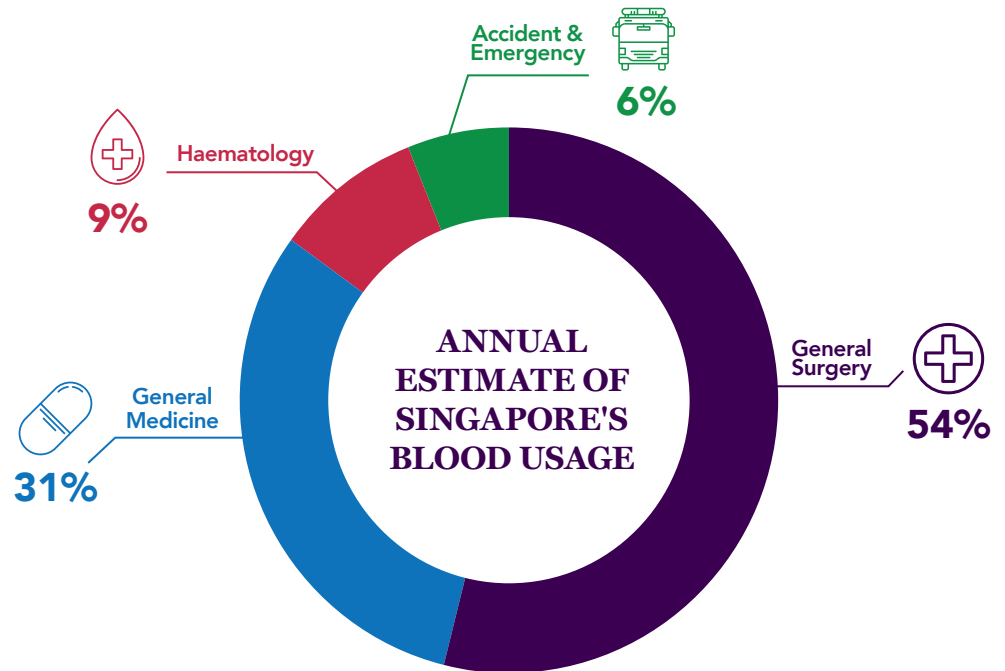
CASE STUDY: A TRANSFUSION THAT LEFT A PATIENT BREATHLESS

Four-year-old Jessica (not her real name), who was diagnosed with Stage 4 neuroblastoma, had received multiple transfusions of blood products without incident. Following a course of chemotherapy, she was admitted for a routine platelet transfusion.

Four hours after the successful platelet transfusion, Jessica became progressively breathless with an abnormally fast heart rate. While she had no associated fever or cough, her oxygen saturation decreased to 75 percent on room air, warranting a transfer to the Children’s Intensive Care Unit for further management of her symptoms.

Differentials which were considered included infection, fluid overload and acute pulmonary embolism. A chest X-ray taken during the episode showed bilateral lung infiltrates. Her electrocardiogram result was normal and an echocardiography showed normal cardiac function without any signs suggestive of fluid overload. In view of the recently completed platelet transfusion, a diagnosis of transfusion-associated acute lung injury (TRALI) was suspected and treatment was promptly administered. Jessica responded well to supportive therapy, which included non-invasive ventilatory support, and made a full recovery.

Subsequently, the suspected transfusion reaction was reported to KKH’s blood bank, leading to the discovery of Anti-HLA antibodies implicated in TRALI in the donor’s plasma through a test. All blood products from the donor were discarded, and the donor was advised to refrain from further donations to prevent recurrence of this transfusion reaction in other recipients.



Source: The Big Blood Picture 2016, Health Sciences Authority

SAVING LIVES ONE DROP AT A TIME

While blood transfusion reactions are not able to be completely predicted or prevented, it is reassuring that the incidence of adverse transfusion reactions in Singapore remains very low. Many lives continue to be saved by blood donations every year.

The volume of blood needed for transfusions in Singapore is estimated to increase by three to five percent annually

as the needs of the local population evolve. Concurrently, a rising number of blood donors are stepping forward due to increasing awareness of national blood needs. KKH continues to partner with HSA and MOH in maintaining haemovigilance, to ensure a safe and adequate blood supply for all patients who need a transfusion.

To find out more about blood donation, or to give blood to help save a life, please call +65 6220 0183 or visit <https://giveblood.sg>.

References:

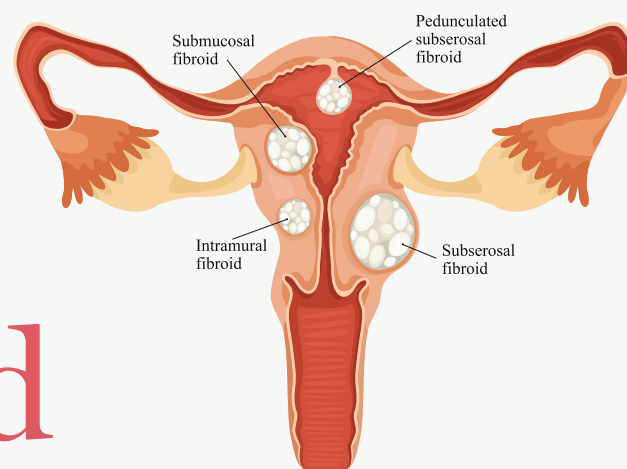
1. American Association of Blood Banks Technical Manual, 18th edition, 2014. Eds Mark Fung, Brenda Grossman, Christopher Hillyer, Connie Westhoff.
2. HSA-MOH Clinical Practice Guidelines 2011. Clinical Blood Transfusion.
3. HSA Haemovigilance Data, 2013 - 2016.
4. Health Sciences Authority. (2016). Blood Connects, Donors Unite [Press Release]. Retrieved from http://www.hsa.gov.sg/content/hsa/en/News_Events/Press_Releases.2016.2.10.html



Dr Joyce Lam, Senior Consultant, Haematology/Oncology Service, Department of Paediatrics Subspecialties, KK Women’s and Children’s Hospital

Dr Joyce Lam leads the haematology laboratory and blood bank at KKH, and her clinical and research interests include paediatric bleeding disorders and diagnostic aspects of paediatric haematology.

Non-Surgical Approach To Uterine Fibroid Management



UTERINE FIBROID

By Dr Jasmine Chua and Dr Luke Toh

Uterine fibroids (also known as leiomyomas or myomas) are the most common pelvic tumours in women, affecting one in five women during their reproductive years. While the prevalence increases with age during the reproductive years, these benign tumours only rarely develop into cancer.

Patients typically present with one or more symptoms such as abnormal uterine bleeding (heavy, prolonged or painful menstrual bleeding) and pelvic pain, or pressure-related symptoms that can interfere with their lifestyles. Large uterine fibroids can compress surrounding pelvic structures, causing urinary frequency, constipation and abdominal bloating. More uncommonly, they may cause dyspareunia and reproductive dysfunction, such as infertility or adverse pregnancy outcomes. The exact aetiology of uterine fibroids is unknown, although oestrogen stimulation is involved and uterine fibroids are known to grow rapidly in pregnancy but stop growing and shrink after menopause.

Asymptomatic fibroids may be followed without intervention. For symptomatic patients, medical therapy, in the form of hormonal drugs (such as progesterone or gonadotropin-releasing hormone) may provide adequate symptomatic relief from pain and abnormal bleeding for some women. When medical therapy fails or symptoms are debilitating, fertility-sparing myomectomy – surgery to remove the fibroid while leaving the uterus intact – has traditionally been the standard treatment option. A major surgery requiring up to six weeks for full recovery, myomectomy may be performed by various techniques and is associated with a 10 to 25 percent risk of fibroid recurrence. Patients who have completed their families may be offered total hysterectomy.

UTERINE ARTERY EMBOLISATION

Uterine artery embolisation is a minimally invasive treatment option that has matured over the past 20 years, offering select patients with uterine fibroids an alternative

to surgical intervention. It can also be performed as part of a staged procedure to reduce the size of the uterus prior to hysterectomy.

Compared to surgical intervention, patients undergoing uterine artery embolisation can expect to experience a shorter duration of hospitalisation, faster recovery and lower morbidity risk. Most patients (73-90%) report improvement or relief of heavy menstrual bleeding up to 10 years after treatment.

Patients who are eligible for uterine artery embolisation include those who do not have current or recent pelvic infection, are not pregnant and have no desire for future pregnancy.

The procedure is also a particularly attractive option for those who present with prolonged heavy and/or painful menstrual bleeding, but are averse to or unfit for surgery.

At KK Women's and Children's Hospital (KKH), uterine artery embolisation is performed by the interventional radiologist for patients with symptomatic fibroids.

Continued on page 14...

Continued from page 13...

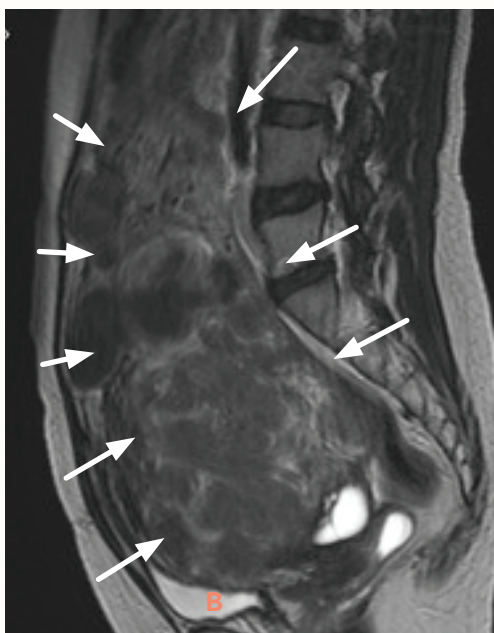


Figure 1. A pre-treatment sagittal image of a large uterine fibroid compressing the urinary bladder, taken through magnetic resonance imaging (MRI). The arrows indicate the uterine fibroid and B indicates the urinary bladder.

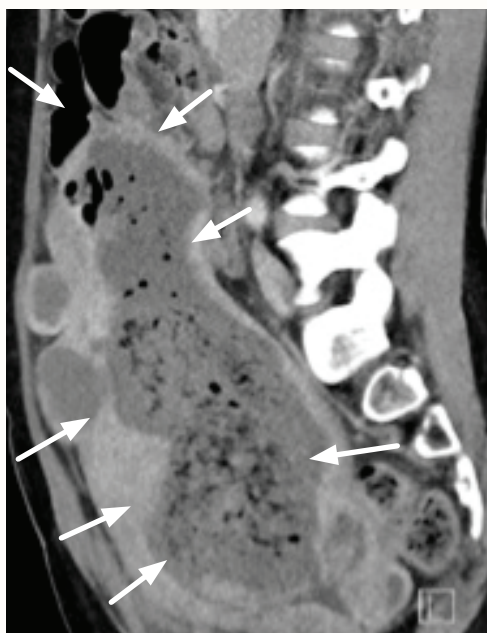


Figure 2. A sagittal enhanced computed tomography image taken two weeks after a uterine artery embolisation procedure. The large lobulated uterine fibroid is non-enhancing, with cavitation suggestive of infarction. Smaller fibroids are seen anteriorly.

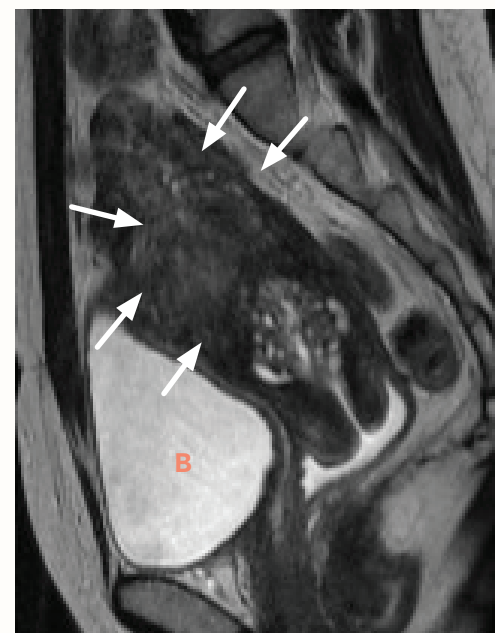


Figure 3. A sagittal image six months after a uterine artery embolisation procedure, taken through MRI. It shows significant reduction in fibroid size. The arrows indicate the uterine fibroid and B indicates the urinary bladder.

A small (< 5mm) skin incision is made at the groin region for access to the femoral artery. Using fluoroscopy, the radiologist manipulates a guide wire and catheter to the uterine arteries supplying the fibroid. Nanometre embolic particles are injected selectively into these arteries (Figure 4) to occlude the blood flow and induce fibroid ischaemia, necrosis and shrinkage. Light sedation is usually administered during the procedure in addition to patient-controlled analgesia.

After the procedure, oral analgesics are prescribed for pain management, and the majority of patients are usually discharged within one or two days. Patients will be reviewed regularly to monitor for post procedural effects, such as post embolisation syndrome – which can present as self-limiting fever, nausea, pain and malaise within the 10 to 14 days after the procedure. Vaginal discharge is also relatively common (in 16-20% of patients) and can persist for up to

12 months, though it is usually self-limiting, non-purulent and not associated with fever. Supportive management is usually adequate to manage these.

Fibroid shrinkage is an expected and desirable outcome of uterine artery embolisation; another possible desirable outcome is fibroid expulsion that may be accompanied by pain similar to labour pains. Recurrence of severe pain after a pain-free period may indicate impending fibroid expulsion; pain coupled with foul-smelling purulent discharge indicates infection. Patients presenting with these symptoms are recommended to seek prompt review and assessment at the Women's 24-hour Clinic at KKH, so that appropriate treatment can be administered.

After three months, patients will be assessed to determine the results of uterine artery embolisation, such as a reduction in menstrual flow, symptoms related to mass

effect, and to monitor for any remaining post embolisation syndrome. Patients will also undergo ultrasound after six months and magnetic resonance imaging after one year to provide continual assessment of symptoms and determine the size and extent of any residual fibroids.

Four to five patients undergo the procedure at KKH each year, with excellent technical and clinical success reported. Patients who had formerly experienced heavy menstrual flow have reported reduced flow, significant shrinkage of fibroids and even complete resolution in some cases.

A small proportion of patients (10-15%) may experience persistence of symptoms such as menorrhagia and anaemia, or recurrence of symptoms within four to five years, necessitating repeat embolisation. Subsequent hysterectomy may also be required in the case of refractory uterine fibroid occurrence, though this is rarely required.

CASE STUDY: NON-SURGICAL RESOLUTION OF UTERINE FIBROIDS

In her mid-forties, JC presented with severe anaemia (haemoglobin level of 5.6g/dl) and multiple large fibroids (Figure 1), accompanied by bloatedness, cramps, constipation and urinary frequency. She also experienced prolonged heavy menstruation lasting up to two weeks per cycle, which had progressively worsened over 10 years, and a history of multiple uterine fibroids even after undergoing a myomectomy more than a decade prior. At KKH, she was given a blood transfusion and prescribed iron supplements, after which her haemoglobin level hovered between 7 and 9g/dl.

As JC had multiple large fibroids, she was recommended to undergo a uterine artery embolisation to reduce the size of the fibroids, with the intent to follow with a hysterectomy. After undergoing the embolisation procedure, JC was reviewed regularly to monitor for post-procedural effects.

Twelve days after the procedure, JC presented with fever and abdominal pain characteristic of post embolisation syndrome. Blood tests indicated elevation of her white blood cell count and inflammatory markers, and a computed tomography scan of her pelvis showed non-enhancement of the fibroids with areas of gas cavitation, suggestive of infarction (Figure 2). She was admitted for treatment with intravenous antibiotics. After four days, the acute signs and symptoms abated, and she was discharged.

Four weeks after discharge, JC reported a desirable outcome of the expulsion of a large fibroid and multiple smaller fibroids per vaginam. She was reviewed and found to be clinically well. While small fibroids remained (Figure 3), she experienced significant improvement to her menstrual cycle and flow, with no bloatedness, cramps, constipation or urinary frequency. She also no longer required a hysterectomy.

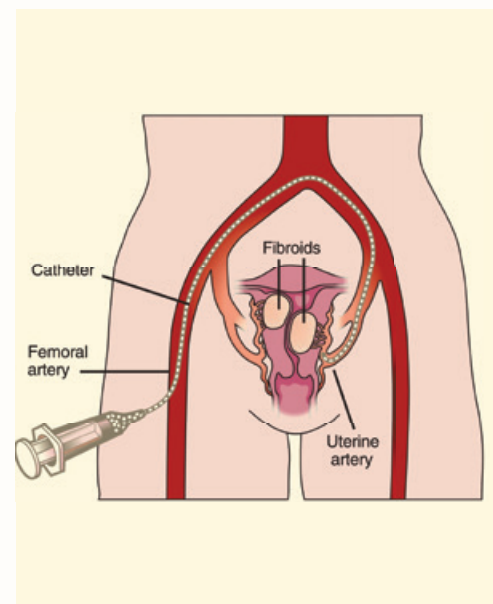


Figure 4. A catheter delivering embolics in a uterine artery embolisation procedure.

Image reproduced with permission from Sydney Fibroid Clinic, Australia

References:

1. de Bruijn AM et al. Uterine artery embolization vs hysterectomy in the treatment of symptomatic uterine fibroids: 10-year outcomes from the randomized EMMY trial. *Am J Obstet Gynecol.* 2016;215(6):745.e1-12;
2. Spies JB. Current evidence on uterine embolization for fibroids. *Semin Intervent Radiol.* 2013 Dec; 30(4):340-6
3. Worthington-Kirsch R, Spies JB, Myers ER et al. The Fibroid Registry for outcomes data (FIBROID) for uterine embolization: short-term outcomes. *Obstet Gynecol* 2005; 106(1):52-59



Dr Jasmine Chua, Senior Resident, Department of Diagnostic & Interventional Imaging, KK Women's and Children's Hospital

Dr Jasmine Chua graduated from the Yong Loo Lin School of Medicine and is currently pursuing subspecialty training in vascular and interventional radiology under the SingHealth Diagnostic Radiology Residency Program. Dr Chua's clinical interests include interventional radiology unique to children's and women's health.



Dr Luke Toh, Senior Consultant, Department of Diagnostic and Interventional Imaging, KK Women's and Children's Hospital

Fellowship trained in paediatric interventional radiology, Dr Luke Toh heads the interventional radiology service at KKH. He has a special interest in the management of vascular malformations and is actively involved in the management of fallopian tubal recanalisation, morbidly adherent placentae and embolisation for post-partum haemorrhage.

As Director, Talent Management, SingHealth Radiological Sciences Academic Clinical Programme, Dr Toh oversees mentorship programmes for the development of young radiologists. He is also Adjunct Assistant Professor with Duke-NUS Medical School, Singapore.

Dr Toh is also a visiting consultant with the Department of Diagnostic Radiology at Singapore General Hospital, and teaching faculty with the Singapore Medical Association's Centre for Medical Ethics and Professionalism.

PROVIDING HOLISTIC AND COMPASSIONATE CARE FOR WOMEN AND CHILDREN UNDER ONE ROOF



With 159 years of excellence in healthcare, KK Women's and Children's Hospital (KKH) has advanced medical innovation, research and education that has benefitted countless women and children in Singapore, the region and countries around the world.

In 1997, KKH made the historic move to its current premises, forming Singapore's first integrated women's and children's hospital, and uniting paediatric, neonatal, obstetric and gynaecological specialties together under one roof. KKH has evolved to become Singapore's largest tertiary centre providing specialised care for women and children with complex conditions, and a leader in high-risk obstetrics, newborn care and women's health services.

An accredited Academic Medical Centre, KKH has a distinguished legacy as a teaching hospital, and runs the largest specialist training programmes for obstetrics and gynaecology and paediatrics in Singapore. With numerous medical education and training programmes for clinicians, nurses and healthcare professionals, KKH is committed to improving the quality of healthcare for women and children in Singapore and beyond.

KKH is recognised internationally for clinical and research excellence in maternal fetal medicine, juvenile idiopathic arthritis, child development and genetics, among others. The hospital continues to seek innovative ways to provide excellent, integrated and person-centred care on our journey in transforming healthcare for women and children.

Visit our website at www.kkh.com.sg



GIVE HOPE MAKE POSSIBLE LIFE-GIVING BREAKTHROUGHS

Because every woman and child deserves good health www.kkh.com.sg/GIVE