ANAESTHESIA FOR DIAGNOSTIC IMAGING

Diagnostic Imaging (DI) includes CT scan, MRI, PET scan, MIBG and angiography.

There are CT, MRI and Angiography facilities in KKH. Cerebral angiography procedures or CT (before radiotherapy) scan may be done in NNI or SGH. PET scan (oncology and neurology imaging) and MIBG scan (oncology imaging) for children are performed in Nuclear Medicine facility in SGH.

The CT and MRI Facility are located in the DI department at Basement I and the Angiography suite is located next to the Major operating theatre suite on Level 2 Children's Tower in KKH.

Nuclear Medicine facility is located in SGH basement 1, block 5.

Patient Listing

Elective patients

All patients are listed through Diagnostic Imaging, KKH at 6 394 2250 / 2253
Diagnostic Imaging faxes the list of patients to the Major Operating Theatre, Children's Reception; 63942227.

For MIBG, PET scan and CT scan (before radiotherapy), arrangement will be made between KKH and SGH, Paediatric Anaesthesia Service will be informed when arrangement is finalized.

Emergency requests for MRI / CT scan / Angiography suite
All emergency requests requiring GA are to be directed to the Anaesthetic Consultant on-call.

Patients who can be listed as Outpatients

- ASA 1 and 2 patients
- Full term healthy infants who are 6 weeks of age and older

Patients requiring anaesthetic assessment:
Patients with stable but complex medical/ congenital heart disease who are currently stable should be referred to the Anaesthetic Consultant doing the list.

The child can be reviewed such as at Children's Operating Theatre Reception area (as a non-urgent consultation, for example, on the same day that the child is seen at the Specialist Outpatient Clinic and listed for the imaging/procedure). All relevant case-notes should accompany the patient and the anaesthetist reviewing the child must record in the anaesthesia chart relevant history, physical exam / investigations. This chart MUST be stapled to the DI investigation form so that it accompanies the child when he/she presents for the DI procedure.

Fasting guidelines

See fasting guidelines in chapter 2 (guidelines for paediatric anaesthesia)

For PET scan patients, only water to be given as clear feeds. Do not give dextrose/glucose or caloric laden beverage for at least 4 hours before injection of isotope. This is because hyperglycemia results in poor uptake of radioactive isotope FDG (Fluorodeoxyglucose) into tissues and affect the quality of imaging. If glucose is given before procedure, inform the Nuclear medicine department as this may likely result in cancellation of the scan. .

Laboratory investigations

No investigation are required if patient is a day case and or if child is otherwise fit and well.

Intravenous access

For PET scan, intravenous cannulae placement should be established before child is transported from KKH to SGH

Consent

KKH DI has a separate procedural consent form. Anaesthesia consent must be separately obtained.

For out of hospital services, informed consent is obtained using KKH anesthesia consent document for KKH in-patients. When diagnostic imaging is performed as outpatient in SGH, informed consent is obtained using SGH anesthesia consent document.

Anaesthetic Management

The CT Scan, MRI and Angiography suites in KKH as well as MIBG, CT scan and PET scan room in SGH are equipped for general anaesthesia and sedation/monitored anaesthesia care.

Generally, assistance for cardiac catheterization in the Angiography suite is provided by AU nurses from major OT. For all other diagnostic and interventional radiological procedures, assistance is provided by AU nurses from DI. For anaesthesia service outside KKH, assistance is provided by AU nurses from major OT, KKH.

For children undergoing CT/ MRI under GA, there is a separate induction and recovery area located just outside the MRI.

Equipment check

As in the operating theatre, all equipment should be checked prior to induction of anaesthesia. For remote out of hospital sites, check the type of equipment and drug available and their place of storage.

CT Scan & MRI Induction room

The Induction area is located in zone 2 of restricted public access (supervised) within the MRI facility

This induction area also serves as reversal and immediate recovery for CT and MRI patients. Equipment includes:

- Drug trolley
- Anaesthesia machine Airway equipment including Ayre's T piece
- Monitors; 2 pulse oximeters, NIBP and capnograph and anaesthesia agent monitor
- Suction apparatus
- Patient warming devices
- Infusion pumps

MRI room

The current anaesthesia machine is Drager Fabius MRI which is MRI conditional and mounted with sevoflurane.

Strict observation of MR safety rules i.e. no metallic objects, which may cause injury to both patients and staff.

Monitoring

There is a central physiologic and respiratory agent monitor that sends signals to a remote monitor in the control room.

PET and MIBG facility in Nuclear Medicine SGH

These rooms have no Nitrous oxide wall source.

Anaesthesia machine and physiology monitoring equipment are checked and maintained by SGH major operating theatre. Drugs, syringe pumps, syringes and needles, resuscitators are provided by SGH Nuclear Medicine department.

Airway equipment and breathing tubes to be used for the cases are brought to SGH from KKH by KKH anesthesia nurses. Anaesthesia plan including the use of equipment should be discussed and planned prior to going to remotes sites.

For repeat scans such as MIBG, handover of the anaesthesia should be performed between anesthesia teams.

Conduct of anaesthesia

General considerations

For patients undergoing CT scan or MRI, induction and reversal *must* be done in the induction area, *on a trolley that allows Trendelenburg position.*

General anaesthesia is the preferred technique; usually spontaneous respiration with an LMA. Intubation / IPPV may be required in small infants or children at risk of raised intracranial pressure or in any child in whom spontaneous respiration is inadequate.
Sedation techniques may occasionally be used.

All airway devices must be well secured.
The child must be well oxygenated and sufficiently deepened before transfer from induction area to scan room.

MRI

Transfer of patients

For the heavier children > 20kg or with unstable cervical spine, avoid carrying the patient in and out of the scanning rooms.
The MRI bed can be pushed out into the induction area for the child to be transferred directly onto the table.

The CT scan room is situated at a separate location a short distance away from the induction room (MRI facility). For CT scan, the trolley carrying the child can be pushed into the room and child transferred onto the scanning table. Should there be anticipated delay in the transfer from induction room to the CT scan room, consider ventilating the patient during transit (ambu bag/ T piece with O_2 cylinder) and prepare for equipment.
Smaller children may be carried into the scanning room.

In the scan room

IV drip flushed and tested to ensure smooth flow.
The position of airway must be re-checked.
All monitors are placed and checked for good signals.
All pressure points must be protected.

Blankets and plastic wraps should be used to keep patient warm.
Patient's mask and oral airway should be brought into the room together with the child in the event of accidental dislodgement of LMA or ETT.

MRI considerations

Check that the patient has no metal pieces on e.g. earrings, religious bangles or on the clothes before transferring into the MRI scan room.

Intubated patients from ICU may have endotracheal tubes secured with zinc oxide tape that might interfere with imaging and has to be replaced with silk tape.

In MRI patients, the skin must be cleaned and prepared with a special abrasive gel before application of ECG leads. (allows good adhesion of ECG leads). This is a very important step taken to reduce the incidence of burns at this site.

Soft earplugs are inserted and eyes taped and protected.
In the scan room, when ECG leads are placed ensure that the leads do not cross each other.

Consider temperature monitoring.

All monitors must be placed and good signals are obtained in both the main and slave monitors.

Intravenous infusion can be continued if deemed necessary, in the MRI room using MRI-conditional infusion system. The infusion administration line is extended, typically using two 200cm fine bore intravenous extension.

Breathing tubing, Carbon dioxide sampling line and intravenous lines must be checked for adequate length before mobilizing the MRI bed into the scanning position within the scanner.

Common problems

1. Desaturation

This can occur with dislodgement of the LMA or ETT. The patient must be removed from the coil and patency and position of the airway checked and appropriate management instituted.

2. Hypotension
   This is uncommon and can be due to prolonged fasting and inappropriately high levels of volatile agents. Boluses of crystalloid can be given and volatile depth adjusted.

In the event of a critical cardio-respiratory event (especially in the MRI scanning room), the patient should be quickly transferred to the induction area for resuscitation. **No resuscitation is to be done in the MRI room!!**

Special note for Neurology PET (epilepsy)
Document any seizure event during the anesthesia for the PET and inform the neurology primary physician.

Recovery

KKH MRI and CT scan

Patients are observed in the induction / recovery area till they wake up.
The outpatient can be transferred to the waiting area till the discharge criteria are met.
In the event of complications that require admission of the child, arrangements with the referring physician must be made and the parents informed.

Remote Site (SGH)

Identify the recovery room designated for recovery of patients post general anaesthesia.
Recovery room should be checked and prepared to enable suctioning and delivery of oxygen before the start of each case.

Critically ill patients

Presence of accompanying physician for In-patient scans:
All ICU patients will require the presence of a suitably qualified physician during transport to and from the Diagnostic Imaging areas.

For all other categories of patients, the primary physician will decide on the necessity of an accompanying doctor.

Accompanying staff members and equipment of ICU / HD patients – on ventilator or otherwise – will need to be assessed for MRI safety before entry into the scan room.