**ANAESTHESIA FOR CEREBRAL ANEURYSM EMBOLISATION**

# Introduction

The “ISAT” trial reported in the Lancet in October 2002 demonstrated that survival free of disability is better with endovascular coiling when compared to surgical clipping following subarachnoid haemorrhage from cerebral aneurysm. Coiling has therefore become a frequently undertaken procedure. This group of patients however remain at considerable risk with overall 5 to10% risk of serious morbidity and 2% mortality. These risks may be higher in the emergency cases.

No single anaesthetic regimen has been proved to superior to another for this procedure so use the anaesthetic technique you are most familiar with.

The requirements are:

* Absolutely still patient
* Maintain cerebral blood flow
* Rapid emergence is desirable

**General Principles**

1. **Follow general principles of neuroanaesthesia – “the 6 ns”**
	* Normotension
	* Normovolaemia
	* Normoxia
	* Normocapnoea
	* Normoglycaemia
	* Normothermia
2. **Specific considerations for Cerebral Embolisation**
	1. Isolated environment – Vascular 2 Suite in X-ray Department
	2. Restricted access to patient.
		* Extensions on drip and injection lines required (use “Mediplus 3m extension kit).
		* Unable to monitor neuromuscular blockade.
		* All lines, ecg leads, ventilator tubes etc secured well and positioned away from head and anterior chest
	3. Restricted access to equipment
		* Always have oxylog portable ventilator and portable monitoring available.
		* Good communication between anaesthetist & radiologist is essential.

# Mediplus 3 way 3 metre extension kit (6606)

#

# Male Luer lock connector

1. Clamps
2. Anti-Reflux Valve
3. Anti-siphon Valve

# Set up in Vascular 2 in x-ray

**Note:**

* Position lead screen protection behind anaesthetic machine.
* X-Ray monitoring badge. Lead coat
* 2 pronged drip stand attached to foot of table – for Anaesthetic use
* Slave monitor on foot of bed can be used for transfers
* Drugs in drawer of anaesthetic machine
* Have tray of emergency drugs immediately to hand (in blue tray) check: protamine, dexamethasone, mannitol are available
* Sharps box
* Keep clutter to a minimum.

### Anaesthesia

**Premedication:** Lorazepam 2mg for elective cases only. Do not premed emergency cases even if conscious level is normal

**Induction:** I.V. agent Propofol or Thiopentone [Do ***not***use Ketamine]

**Maintenance:** Volatile Sevoflurane or Propofol TCI. [Do ***not*** use Nitrous Oxide]

**Muscle Relaxant:** Atracurium / Cisatracurium – given by the clock

**Opiates:** Fentanyl only to cover induction, intubation and initial placement of femoral arterial catheter.

**Intubation:** Use South facing RAE tube: size 7 female

 size 8 male

 (Smaller size helps avoids migration of the endotracheal tube into Right main bronchus with positioning).

**Note:**

* The table in the vascular suite does not tilt head down and should not therefore be used for induction or extubation
* There is a risk of awareness if anaesthesia is run very light in the presence of neuromuscular blockade.
* Cover patient with blanket and bubble wrap to help maintain body temperature (put bubble wrap over blanket to keep the patient and blanket dry).

**Set up during induction of anaesthesia**

# Management of Antihypertensive Medication

* Omit usual antihypertensive medication preoperatively and resume in the post-operative period unless hypertension is desirable.
* In elective cases it is probably best not to omit β-blockers to prevent rebound hypertension

**Heart Failure**

Patients in heart failure should normally have their cardiac medications continued during the perioperative period.

**Lines**

* Position all lines on patient’s left side if possible
	+ At least one good size iv cannula required – Left Hand
	+ Access to the right side is impossible during the procedure
* Use Mediplus 3 way 3 metre extension kit (6606)
* IV fluid giving set needs 3 way tap and extension connect to anti-reflux valve.
* Infusion lines:
	+ - Use one line for phenylephrine infusion (10mg in 50mls= 200mcg/ml) Infusion rate 0 – 40 mls/hr to maintain MAP as required
		- Use other line for drug administration (dead space = 2mls).

#### Central Venous access

* May be required in emergency cases. Use long line eg Drumcath in antecubital fossa

# Arterial

* Usually best inserted after induction to avoid pain and cardiovascular response to insertions under local anaesthetic.
* Emergency cases may need insertion of arterial line prior to induction and left in-situ during the post-operative period to allow close monitoring and control of blood pressure during induction, extubation and first 24 hours.

**Options:**

1. Left Radial Arterial line 20g Abbocath
2. If arterial access is difficult or it is anticipated arterial line is not likely to be required in postoperative period – It is possible to connect to the side arm of the femoral arterial sheath inserted by the radiologist. This needs to be discussed with the radiologist so that a larger sized sheath is inserted (if possible). If radial arterial line not possible and monitoring during post-operative period is required leave the femoral sheath in place

**Anticoagulation**

**Heparinisation**

* Ensure ACT machine is calibrated prior to use. (ITC Hemochron Signature Elite)
* Measure baseline ACT.
* Give Heparin at request of radiologist.
	+ Usually
		- After sheath has been inserted (SH)
		- After first coil has been deployed (YJ)
* Heparin 100units/kg (though less per kg in obese patients)
	+ Heparin 7000 units is usually sufficient (adults)
* Maintain ACT ~ 200 secs (or 1.5 - 2x baseline ACT)
	+ Repeat ACT measurements hourly
	+ Give additional Heparin as needed – but do not exceed 10,000 units
* Ensure Protamine is available to reverse Heparin
* Post-operatively – not usually required

**Tirofibran**

Patients who are having stent insertion receive aspirin and clopidogrel for one week preoperatively. Prior to the procedure a blood sample is required to test the effectiveness of the clopidogrel on platelets. If this has not been adequate a bolus followed by infusion of Tirofibran may be required. (protocol in vascular suite

# Maintain Body Temperature

* Keep temperature of room at comfortable level
* Cover upper and lower body (separately) with blanket and bubble wrap leaving groins accessible for radiologist.

# Maintain Blood Pressure

* Keep MAP at base line by altering Phenylephrine infusion.
* **If unexpected episode of hypertension occurs inform radiologist immediately (this may indicate rupture of the aneurysm and intracerebral bleeding)**
* Avoid swings in blood pressure by limiting use of boluses of short acting vasopressors.
* If vasospasm occurs hypertension may be needed to restore adequate cerebral blood flow. Titrate Phenylephrine and use colloids appropriately.
* Emergency cases may have an intavenous Nimodipine infusion running. The rate may need to be decreased intraoperatively because concurrent use of intracerebral Nimodipine may result in marked hypotension

# Extubation

* At end of procedure transfer onto tilting trolley
	+ Consider in-out urinary catheter if large volumes of fluid have been used
* Continue manual ventilation until spontaneous respiration has resumed.
* If patient obtunded or complications have occurred intraoperatively consider either transfer to recovery for extubation or to ICU.
* Monitoring can be detached from table for transfers

# Postoperative care

* Transfer patient to recovery
* Patient nursed on T4 Neuro HDU
* Postoperative antiemetic prophylaxis is essential
	+ Give Ondansetron intraoperatively
	+ Ondansetron 4mg tds for 48 hours post op
* Be aware of the possibility of retroperitoneal bleeding from the femoral arterial catheter site – prompt recognition and management is essential
* Analgesia
	+ Usually minimal requirement – Paracetamol +/- Codeine Phosphate
* Continue Heparin infusion post op if required

**Anaesthetic Management of Complications**

1. **Haemorrhagic**
2. **Ischaemic**
3. **Thrombotic**
4. **Haemorrhage:**

i] Reverse Heparin - Protamine 1 mg per 100 units Heparin given.

ii] Mannitol 0.5g/kg.

iii] Dexamethasone 16mg.

iv] Do not treat hypertension – (but do stop Phenylephrine infusion).

v] Prepare to transfer patient intubated & ventilated to: CT scan +/- ITU/Theatre/Recovery

* Propofol Infusion
* Oxylog ventilator
* Portable monitoring
1. **Ischaemic:**

Most commonly caused by vasospasm or dislodgement of coil

* + Elevate blood pressure
		- ⭡ infusion rate of Phenylephrine
		- Very small bolus of Ephedrine – 1.5mg ⭢3mg (exaggerated response with background Phenylephrine infusion)
		- Use colloids to help ⭡BP and haemodilution to maintain Cerebral Blood Flow
	+ Maintain heparisation
	+ Intra venous aspirin may be required (500mg in 5mls water) up to 1000mg.
		- Instructions available if required
	+ Keep an eye on radiological management –eg intracerebral Isoket, Nimodipine.
	+ Prepare transfer patient intubated and ventilated (as above).
1. **Thombotic**
* Make sure ACT is > 200 secs or 1.5 - 3 x control.
* Use colloid to help ⭡flow.
* Ensure MAP is adequate.
* Intravenous Aspirin may be required (500mg in 5mls water) up to 1000mg.
	+ Instructions available if required
* Reopro (Abciximab) may be requested. – Give this if specifically requested and check again before administration.
* Prepare transfer patient intubated and ventilated (as above).

**Useful Information**

**Telephone Numbers**

DVI Suite – “Vascular 2” - 2936

B4N Reception - 3493

T4 HDU Female - 5493

 Male - 5633

##### Radiologists

Dr. Shawn Halpin - 3039

Dr. - 8653

# Anaesthetists

Monday- Dr. Kinnari Mehta/ Christina Diaz-Navarro - 3107

Wednesday- Dr. Mike Drage - 3105

Friday- Dr. Christine McBeth / Mark Sandby-Thomas- 3107

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