

ANAESTHESIA AND SEDATION FOR THE TREATMENT OF ACUTE ISCHAEMIC STROKE WITH INTRA-ARTERIAL MECHANICAL THROMBECTOMY - IAMT

Introduction

Intra-arterial mechanical thrombectomy (IAMT) is an endovascular technique that allows for the acute retrieval of intravascular thrombi and is increasingly being used for the treatment of acute ischaemic stroke (Ref1)

There is ongoing debate whether this procedure is best done under local anaesthetic/sedation or general anaesthetic. The literature that is available suggests on the whole general anaesthetic is associated with a poorer neurological outcome and conscious sedation is reasonable as the preferred option where adverse factors such as agitation are lacking (Ref 2,3). However it is unclear whether this poor outcome reflects patients with poor preoperative neurological status more likely to have had general anaesthesia. There is some anecdotal evidence that recanalisation may be more successful under general anaesthetic. Many centres that do large volumes of this type of procedure are tending to prefer General Anaesthesia.

Due to the high risk and complexity of managing these cases, input and support from the anaesthetic team will be required for most cases whether under local, sedation or general anaesthetic.

Factors that are important for good neurological outcome include:

- Possible avoidance of General Anaesthesia (pending further evidence)
- Time to treatment from onset of symptoms < 6hours
- Avoid Hypotension Systolic < 140 mmHg
- Avoid Hypertension Systolic >180mmHg
- Avoid Hyperglycaemia

Specific Considerations for providing Sedation / Anaesthesia for IAMT

- Isolated environment
- Restricted access to patient during the procedure
- Minimal time to assess patient – very little information may be available particularly if patient has come from out of area.
- Patient will have received thrombolysis
 - Invasive monitoring not possible
- High Risk Group – (Ref 2)
 - Embolic complications 8%
 - Haemorrhagic complications 14%
 - Mortality at 3 months ~20%

Before the patient is referred to Anaesthesia the patient must be clerked

This would normally be done by the admitting “Stroke Team”

Including documentation of:

- Demographic details
- Time last seen normal
- Significant Past Medical History
- Drugs / Medication
- Allergies
- Bloods sent to lab (FBC / U&E / Glucose) – do not wait for results before proceeding.
 - Intravenous Cannula on left side hand or ACF
- Ecg
- Blood Pressure and Heart Rate
- Weight
- Other investigations appropriate to the patient

The key to good neurological outcome is minimising the delay from onset of symptoms to treatment. Good communication between the stroke team, radiology and anaesthesia is therefore paramount to help achieve this.

After the Radiologist has agreed to consider the patient for IAMT the Stroke Team should contact the anaesthetic team through the senior duty anaesthetist and the case booked on to the CEPOD list (category 1).

The Anaesthetic team can be contacted directly through the “Vocera” system:

- Senior Duty Anaesthetist: 5555 40142 or from outside hospital 029 218 40142
- Junior Duty Anaesthetist: 5555 40141 or from outside hospital 029 218 40141
- CEPOD List – Theatre desk 743075

The above information should be available to pass on to the anaesthetic team at this stage. If the anaesthetic team are not available radiology need to be informed immediately so that arrangements can be made to either proceed under local / sedation or alternative treatments considered.

The best way to proceed needs to be discussed and agreed between radiologist and anaesthetist and will depend on a balance of the risks associated with the anaesthetic / sedation to the patient and that of possible suboptimal radiological conditions that may result from patient movement.

As a general guide to help decide on the best way to proceed the following can be considered:

- Awake cooperative patient → Proceed under local / Conscious Sedation
- Uncooperative / Restless patient → GA
- Pre Intervention Aspiration → GA
- Airway Obstruction → GA
- Decreased Level of Consciousness → GA
- Uncooperative & “Unfit for GA” → Consider Sedation / Alternative management

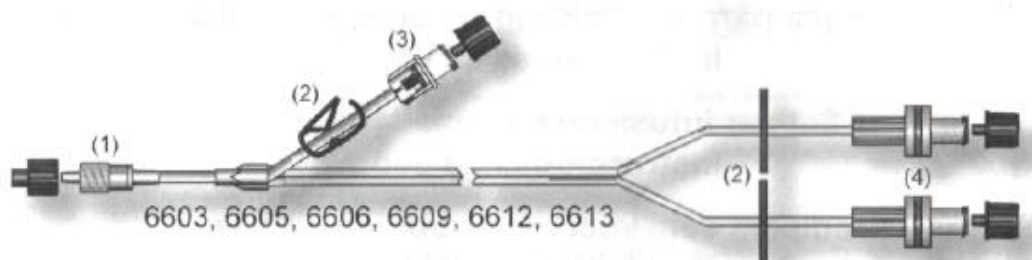
Suggested Guideline for Sedation and Anaesthesia for IAMT

Please also refer to Guidelines for Cerebral Embolisation – March 2015

No single sedation or anaesthetic regimen has been proved to superior to another for this procedure so use the anaesthetic technique you are most familiar with – this will probably be the safest.

Because there is restricted access to the patient, set up a Mediplus 3 way 3 metre extension kit and connect it to the intravenous access which the patient should already have in situ. (check patency) – illustrated below

Mediplus 3 way 3 metre extension kit (6606)



1. Male Luer lock connector
2. Clamps
3. Anti-Reflux Valve
4. Anti-siphon Valve

Note:

The dead space of infusion lines is 2mls

Because there is restricted access to equipment always have an oxylog portable ventilator and portable monitoring available.

Monitoring – All patients undergoing IAMT must have as a minimum the following monitoring irrespective of sedation or anaesthetic technique used.

- Ecg
- Pulse oximetry
- Non-Invasive Blood Pressure – recordings minimum every 5 minutes
- Continuous Capnography

Arterial and Central Venous Access –

This should only be considered in exceptional circumstances. The patient will have received intravenous thrombolysis which would make these procedures difficult.

Inserting these lines may cause an unacceptable delay to proceeding with IAMT with possible worsening neurological outcome. In these cases it is not possible to monitor blood pressure through the side arm of the femoral sheath.

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 Systolic BP above 140mmHg
 - Use other line for drug administration (dead space = 2mls).

Maintain Blood Pressure

- Control Blood Pressure by altering Phenylephrine infusion to achieve either:
 - a. Mean Blood Pressure (MAP) within 10% of base line or
 - b. Maintain Systolic BP between 140 – 180 mmHg
 - c. Target BP may be lowered after recanalisation has been achieved. (discuss with radiologist)
- **If unexpected episode of hypertension occurs inform radiologist immediately (this may indicate intracerebral bleeding)**
- Avoid swings in blood pressure by limiting use of boluses of short acting vasopressors.

Maintenance of 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.
- If pyrexial – treat with IV paracetamol and other cooling measures

Glycaemic Control

There is an association between hyperglycaemia and poor clinical outcome in this group of patients.

- All patients should have serum glucose checked at start of procedure
- Maintain Blood Glucose between 4 – 11 mmol/L
- Check glucose hourly

Management of Oxygenation and Ventilation

All patients undergoing IAMT must be monitored with pulse oximetry and capnography

- SpO₂ maintained > 92%
- Maintain normocapnia E_TCO₂ ~ 5kPa (GA)
- Avoid hypercarbia during sedation

DVT Prophylaxis (Ref 6)

Graduated Compression Stockings are NOT recommended for DVT prophylaxis in Acute Ischaemic Stroke

High Risk patients need to be managed on an individual basis

Provider of Care Sedation / Anaesthesia (Ref 5)

Patients presenting for IAMT are critically ill and need to proceed with treatment in a timely manner. It is recommended that an anaesthetist is available to provide care for haemodynamic monitoring, sedation, analgesia, airway management, Glycaemic control and management of complications etc whatever form of anaesthesia, sedation or local is employed.

- **Local Anaesthesia**

These patients are high risk and normally the presence of an anaesthetist is usually required. It is the responsibility of the anaesthetist to ensure that adequate monitoring and intravenous access has been established and documented. The patient should be managed appropriately in conjunction with the consultant radiologist in the same manner as if providing anaesthesia or sedation

- **Sedation**

These patients need to be managed by the anaesthetic team. In exceptional circumstances when there is urgent need to proceed and anaesthetic team not available this may be done under local anaesthetic only. If sedation is given, this will be the responsibility of the attending radiologist and may only be administered by a band 6 nurse or equivalent (as Radiology Protocol). The need to convert to general anaesthesia will occur on occasions and will require the input of the anaesthetic team.

- **General Anaesthetic**

Provided by Anaesthetist and Qualified Anaesthetic Assistant only

- **Patient Transferred from another hospital intubated and ventilated**

Provided by Anaesthetist and Qualified Anaesthetic Assistant only

The patient will arrive in A&E and require a CT scan either in A&E or the radiology department. Leave the patient on all transfer equipment (ventilator and monitoring) until the patient has had their CT scan and a final decision to proceed with cerebral thrombectomy has been made. The anaesthetist should go down to A&E to assist the transfer team while the anaesthetic assistant sets up the anaesthetic machine and runs through lines, drips etc (as outlined above) in the x-ray vascular suite ready to receive the patient. The transfer team cannot leave until after the CT is done because if the patient is not suitable for thrombectomy as a result of the scan findings they will be transferred back to the referring hospital.

Once the decision to proceed has been made the patient is then transferred to the Vascular suite and attached to the anaesthetic machine and monitoring. The transfer team can then leave with their equipment etc. and the patient managed as for general anaesthetic.

These patients are likely to need to go to intensive care post operatively. The stroke team will need to liaise with ITU in such cases.

SEDATION –

Sedation is a continuum passing through moderate to deep sedation and ultimately to general anaesthesia (ref 3).

The aim is to provide “conscious sedation” as the target state through careful titration of drugs to effect. Verbal contact with the patient must be maintained throughout the period of sedation. The practitioner providing “conscious sedation” must be able to rescue patients who enter a state of deep sedation/analgesia/anaesthesia.

Use a sedation technique you are most familiar with.

For example:

- Fentanyl / Midazolam
- Remifentanyl infusion (Anaesthetists only)
- Propofol Infusion – probably best avoided because of associated hypotension

The procedure can be painful especially during the placement of the femoral catheter and traction on the cerebral blood vessels during clot extraction. Including an opiate in the sedation technique is therefore likely to be helpful. Patient movement during clot extraction may be detrimental to good neurological outcome.

Fentanyl / Midazolam

Suggested technique:

- Monitoring –
 - Ecg / NIBP / Pulse Oximetry / Continuous Capnography
- Supplemental O₂ 2 litres /min via dual nasal cannula with CO₂ monitoring
- Dilute Midazolam 10mg into 10 mls N. Saline – labelled syringe
- Dilute Fentanyl 100mcg in 10mls N. Saline – labelled syringe
- Give an initial dose of Fentanyl 50mcg
- Wait 2 minutes
- Give initial dose Midazolam 2mg
- Give further increments
 - **Midazolam** -1mg at no more than 2 minute intervals
 - Titrate to effect – always maintaining verbal contact
 - **Fentanyl** – 10mcg at no more than 2 minute intervals
 - Only if patient is complaining of pain eg during catheter insertion / Clot extraction

In the elderly or compromised patient the doses of midazolam and fentanyl indicated should be halved.

Phenylephrine infusion may be required to maintain Blood pressure.

The target should be:

Either Systolic pressure 140 -180 mmHg

Or MAP within 10% of base line

Keep patient warm as for GA

Check Blood Sugar

Transfer patient to a recovery area post operatively until recovered from Sedation

Remifentanil sedation

As above.

Use the technique you are most familiar with eg TCI or standard infusion

General Anaesthesia – Suggested technique

- Premedication:** Do not premed
- Induction:** I.V. agent Thiopentone – 125 – 250mg
- Maintenance:** Sevoflurane/ O₂/ Air [Do *not* use Nitrous Oxide]
- Muscle Relaxant:** Atracurium / Cisatracurium – given by the clock
- Opiates:** Fentanyl 50 mcg to cover induction, intubation and initial placement of femoral arterial catheter.
Further 25 mcg increments of fentanyl during clot extraction if required
- Intubation:** Use South facing RAE tube: size 7 female
size 8 male
(avoids migration of the ET tube into Right main bronchus)
Consider (modified) rapid sequence induction in the unstarved patient

Note:

- The table in the vascular suite does not tilt head down and should not therefore be used for induction or extubation
- Cover patient with blanket and bubble wrap to help maintain body temperature (put bubble wrap over blanket to keep the patient and blanket dry).
- Check Glucose

Set up during induction of anaesthesia	During maintenance
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Extubation

- At end of procedure transfer onto tilting trolley
 - Consider in-out urinary catheter
 - Note large volumes of fluid may have been administered by the radiologist during the procedure
- 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 post operatively on Stroke Unit
- 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

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 – Elective lists

Monday-	Dr. Kinnari Mehta/ Christina Diaz-Navarro	-	3107
Wednesday-	Dr. Mike Drage	-	3105
Friday-	Dr. Christine McBeth / Mark Sandby-Thomas-		3107

Emergency Anaesthetic – Direct Contact through “Vocera” system:

Internal:

CEPOD Anaesthetic Consultant (Mon – Fri 0900 – 1700) -5555 40143
Senior Duty Anaesthetist – 5555 40142
Duty Anaesthetist – 5555 40141

Emergency Anaesthetic- Direct Contact through “Vocera” system:

External:

CEPOD Anaesthetic Consultant (Mon – Fri 0900 – 1700) -029 218 40143
Senior Duty Anaesthetist – 029 218 40142
Duty Anaesthetist – 029 218 40141

Stroke Unit – Contact Numbers

Consultants

Dr. Shakeel Ahmad

Dr. Hamsaraj Shetty

Stroke Team Bleep – 6432

Specialist nurse: Amanda Reed – Bleep - 6520

Acknowledgement: Thank-you to the above for their contribution to the development of this document

Useful References:

Ref 1 –

Is general anaesthesia preferable to conscious sedation in the treatment of ischaemic stroke with intra-arterial mechanical thrombectomy? A review of the literature
Neuroradiology Jan 2013, Volume 55, Issue 1 pp93-100

Ref 2

Mechanical thrombectomy in acute embolic stroke: results of a single centre retrospective analysis of 36 patients treated with the Solitaire FR device
The eJournal of the European Society of Minimally Invasive Neurological Therapy.
Titien Tuilier
EJMINT Original Article 2013:1305000102 (28 Jan 2013)

Ref 3

Procedural sedation for adult patients: an overview
Michael Blayney
Continuing Education in Anaesthesia, Critical Care & Pain Vol 12 Number 4 2012

Ref 4

Anesthetic Management and outcome in Patients during Endovascular Therapy for Acute Stroke.
Melinda J Davis et al
Anesthesiology Feb 2012 Vol 116 No. 2 pages 396 – 405

Ref 5

SNACC (Society of Neuroscience in Anesthesiology and Critical Care) Expert Consensus Statement: Anesthetic Management of Endovascular Treatment of Acute Ischemic Stroke (Draft 29 March 2013).

Ref 6

The CLOTS Trials Collaboration. Effectiveness of thigh length graduated compression stockings to reduce the risk of deep vein thrombosis after stroke (CLOTS trial 1): a randomised controlled trial. Lancet 2009;373:1958 – 65

A good overview

Developments in the management of acute ischaemic stroke: implications for anaesthetic and critical care management. Continuing Education in Anaesthesia, Critical Care & Pain 2013; Vol 13: 80-86