# INFORMATION AND GUIDELINES ON THE USE OF SOLUTIONS CONTAINING MIDAZOLAM FOR INTRATHECAL INFUSION IN THE MANAGEMENT OF PAIN STATES

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## Rationale

Midazolam is a water-soluble benzodiazepine, which causes sedation, anxiolysis, and anticonvulsant effects when given intramuscularly or intravenously. When this drug is injected directly into the cerebrospinal fluid (CSF) as a single shot via a lumbar puncture needle or by infusion through a catheter placed in the lumbar intrathecal space, it causes analgesia. This was discovered by Professor Goodchild in 1984 and has been in clinical use since that date. It has been found that the drug binds with benzodiazepine receptors in the spinal cord grey matter so that the actions of the neurotransmitter gamma aminobutyric acid are potentiated. One of the roles of gamma aminobutyric acid in the spinal cord is to control spinal cord sensitisation or wind up. This is a neurophysiological phenomenon which results in the clinical syndromes muscle spasm, peritonism and difficulty with movement because of movement associated pain after injury or surgery. Logically, intrathecal midazolam is used in combination with small doses of an opioid such as morphine or fentanyl.

Unlike concentrated local anaesthetic solutions used intrathecally or epidurally, neither morphine nor midazolam or their combination blocks conduction in sympathetic nerves. Thus vasodilation and falls in blood pressure are not a feature of this technique whereas they are quite common with epidurals. This technique using this combination of drugs is therefore particularly indicated for sick patients, especially those who cannot compensate for vasodilatation such as those with cardiovascular disease and the elderly.

## The mixture

The solution is administered by IVAC P4000 syringe driver using a 60ml Terumo luer lock syringe.

midazolam 5 mg
morphine 500 micrograms (0.5 mg i.e. half milligram)
5 ml of 0.5% plain bupivacaine
Diluted with normal saline to a total volume of 50 ml

A 0.05% solution of local anaesthetic does not significantly affect sympathetic nerve function, nor should it cause motor block. There is the option of excluding bupivacaine from the solution if warranted.

**All solutions and syringes must be prepared by APS registrar (pager 177). Intrathecal bolus doses and rate changes are to be instigated and performed by APS only. To ensure minimal risk of contamination, syringes and minimum volume extension tubing are not routinely changed.**

## Techniques

Midazolam can be added to a single shot spinal via lumbar puncture. Such a technique is frequently used in transurethral resection of prostate of for an operation for a fractured neck of femur. In this instance 0.2 mg of morphine is injected with 2 mg of midazolam and a suitable volume of local anaesthetic to anaesthetise the area for surgery.

The above technique will provide analgesia for the lower limbs for 48-72 hours in most cases. However, for more major procedures such as thoracotomy and upper abdominal laparotomy and for more extensive lower limb procedures such as knee replacements, more prolonged analgesia may be needed and an intrathecal catheter is placed. This is performed under full aseptic conditions in a suitable environment such as an operating theatre. There are two types of set available. The first is an 18 gauge epidural set. This can be used to introduce a catheter into the subarachnoid space at the level of L2/3 in elderly patients who do not suffer from postdural puncture headaches as severely as younger patients. The second set is a 28 gauge catheter which is passed through a 23 gauge Crawford spinal needle. The smaller diameter hole made by this needle in the dura mater decreases the chances of postdural puncture headache. Once this catheter is inserted a sterile dressing is applied and a bacterial filter screwed on to the exteriorised end of the catheter. The intrathecal infusion is then attached to the bacterial filter.

## NURSING OBSERVATIONS (for your interest)

* Half hourly for 4 hours after commencement
  - Hourly for 8 hours
  - 2 hourly thereafter
  - Omit pain and sedation scores during normal sleeping hours
  - and
  - 6 hourly and/or as needed (PRN) assessment of lower limb motor function (Bromage Score) and for any abnormal signs/symptoms eg back pain, pain or paraesthesia or abnormal reflexes in the legs
  - 6 hourly assessment of insertion site for pain, swelling, redness, and leakage of fluid

For the duration of the infusion, and for 12 hours post the last intrathecal opioid dose:
- 2 hourly respiratory rate and sedation score during waking hours
- 2 hourly respiratory rate only during sleeping hours

Observations post intrathecal bolus:

Blood pressure, respiratory rate and effort, pulse rate, sedation, effectiveness of pain control and charting of pain
- 10 minutely for 30 minutes
- Half hourly for 2 hours
- Return to pre-bolus observations if stable

## Boluses

Boluses through the intrathecal catheter are performed by the APS only. The usual bolus and infusion regime is a 2 ml bolus followed by an increase in the infusion rate. No more than two boluses are allowed in any one hour and no more frequently than once every 10 minutes. The infusion rates and steps to be employed are:

- 0.5 ml per hour
- 1.0 ml per hour
- 1.5 ml per hour
- 2.0 ml per hour.

**No patient over the age of 60 should remain at 2.0 ml per hour for more than 24 hours without specific orders from medical staff to the contrary.**

**Throughout all of these infusions, other central nervous system sedatives such as night sedatives (temazepam etc) and other opioids are contraindicated since they may potentiate the sedative effects of the morphine which reaches the brain and results in severe respiratory depression. Please remember that significant amounts of morphine and midazolam are present in the patient 24 hours after stopping an infusion and thus such sedatives should be avoided for another 24 hours.**

## MANAGEMENT OF INTRATHECAL CATHETERS

### Anticoagulants

The same rules apply to withdrawal of intrathecal catheters as with epidural catheters as far as the use of warfarin and heparin is concerned. The intrathecal catheter should be withdrawn at a time when the patient's clotting status is approaching normal. The catheter should be removed not less than 12 hours after the last dose of low molecular weight heparin (Clexane, Fragmin) and subsequent doses should not be given for at least six hours after removal.

For unfractionated heparin/calciparine, heparin, the catheter should be removed not less than 6 hours after the last dose and wait for two hours before recommencing heparin. For patients on a heparin infusion, consult the medical practitioner before altering the infusion.

### Removal of the catheter

Postoperative intrathecal midazolam and morphine infusions are usually continued for 3-7 days postop. At the end of the infusion, ask the patient to turn on their side and curl into the foetal position prior to pulling out the catheter. All the catheters have centimetre markings approaching the end of the catheter; two marks together followed by single marks spaced at 1 cm for 10 centimeters. If you cannot see all of these after withdrawing the catheter, an X-Ray of the spine will be required to establish the presence of a foreign object.

*Accidental disconnection of the catheter*
*If the infusion line from the pump set becomes disconnected from the filter, it may be continued using a new giving set. If the catheter becomes disconnected from the filter, cover the end of the catheter with a sterile dressing before removing the catheter at an appropriate time in relation to anticoagulant medication.*

After removing the catheter, cover the site with band aid or op site.

**NOTE: If the patient is on any anticoagulant (heparins or warfarin) watch for neurological signs in the legs for 12 hours after intrathecal catheter removal.**

Colin S. Goodchild
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