<table>
<thead>
<tr>
<th><strong>Title:</strong></th>
<th>Rectus Sheath Catheter Infusion Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author:</strong></td>
<td>Dr Aidan Cullen / Dr P Merjavy / Mr D McKay</td>
</tr>
<tr>
<td><strong>Speciality / Division:</strong></td>
<td>Anaesthetics / ATICS</td>
</tr>
<tr>
<td><strong>Directorate:</strong></td>
<td>Acute</td>
</tr>
<tr>
<td><strong>Date Uploaded:</strong></td>
<td>3rd April 2017</td>
</tr>
<tr>
<td><strong>Review Date</strong></td>
<td>2nd April 2020</td>
</tr>
<tr>
<td><strong>Clinical Guideline ID</strong></td>
<td>CG0425</td>
</tr>
</tbody>
</table>
Rectus Sheath Catheter Infusion Guideline

DEFINITION

Rectus sheath catheter infusions are a recognised pain management technique when used as part of an overall multi-modal analgesic regime. Opioid medications are not used in these infusions and concurrent oral opioid and other adjuvant analgesics are recommended and encouraged.

Potential drawbacks associated with these infusions include catheter malfunction, catheter dislodgement, infection, local anaesthetic systemic toxicity, and anticoagulation issues with catheter placement or removal. Catheter removal is not as great an issue as it is for epidural catheters.

This guidance is aimed at the following situations:

1. Midline laparotomy (emergency and elective)
2. Large umbilical hernia repair (emergency or elective)
3. Large incisional hernia repair (emergency or elective)

PURPOSE

- To provide safe effective pain management utilizing rectus sheath catheter infusions.
- To provide a consistent method of assessing and caring for patients receiving rectus sheath catheter infusion.
- To safely remove rectus sheath catheters.

GUIDELINE

*Registered Staff Nurses* identified by their manager will undertake competency based training allowing them to care for patients receiving rectus sheath catheter infusions. This includes patient monitoring, changing infusion bags and removal of catheters with a written anaesthetist order.

*The Anaesthetist* will be responsible for all orders regarding rectus sheath catheter initiation, setting up the pump in theatre or recovery, dosage adjustments, maintenance, discontinuation and adjunctive analgesics, anti-emetics, and sedatives.

Oxygen, suction, and resuscitative equipment must be readily available.

The patient must have patent IV access.
ANATOMY

The rectus abdominis muscle is a paired muscle that originates on the pubic crest and symphysis and ascends vertically to insert on the xiphoid process and fifth to seventh costal cartilages (Fig 1). It is encased within the rectus sheath and is attached to the anterior aspect of the rectus sheath by 3 or 4 transverse tendinous insertions. These insertions divide the anterior rectus sheath compartment into separate sub compartments, giving the distinctive “6-pack” appearance in thin muscular subjects and consequently impeding cranio-caudal spread of injectate. The posterior rectus sheath compartment, by comparison, is unsegmented and is thus an ideal place for local anaesthetic injection.

Figure 1. Anatomy of anterior abdominal wall

The rectus sheath is formed by the blending of aponeuroses from the EOM, IOM, and TAM (External & Internal Oblique Muscle and Transversus Abdominis Muscle). In the superior three-quarters of the RAM, the anterior layer of the rectus sheath is formed by the EOM and IOM aponeuroses. The IOM aponeurosis splits into 2 layers and also contributes to the posterior layer of the rectus sheath together with the TAM aponeurosis. However, inferior to the level of the ASIS (at the arcuate line), all 3 aponeuroses pass anterior to the RAM and form the anterior layer of the rectus sheath. The inferior one-quarter of the RAM is therefore lined on its posterior aspect only by its epimysium and the transversalis fascia. As a consequence of that, local anaesthetic spread is limited to superior ¾ of RAM. Inferior ¼ of RAM (above pubic ramus) will not be covered by either single injection or infusion of local anaesthesia.
Within the rectus sheath, bilateral superior epigastric arteries (continuations of the internal thoracic arteries) anastomose with the deep inferior epigastric arteries (which arise from the external iliac arteries) and are at risk of accidental puncture during rectus sheath block.

PROCEDURE

Types of Catheters - This guideline applies to the use of bilateral rectus sheath catheters for the management of postoperative pain.

Infusion Pumps –
1. Electronic (Smiths Medical™ CADD Solis) will be employed to deliver continuous infusion.

Local Anaesthetic
0.125% L-BUPIVACAINE will be used as the local anaesthetic of choice run at 5ml/hr.

Initial Bolus and Infusions Rates

- Bolus can be delivered at discretion of anaesthetist prior to commencing infusion.
- Infusion rates of LEVOBUPIVACAINE 0.125% at 5ml/hr (up to a maximum of 10ml/hr)
- Alternatively if patient remaining in a HDU / Recovery intermittent top-ups can be prescribed instead of an infusion.

The Surgeon can:

- Place the rectus sheath catheters under direct vision during closure.
- Along with the anaesthetist ensure secure fixation of the device (see below).

The Anaesthetist can:

- Place the rectus sheath catheters under USS guidance at completion of surgery.
- Consider a bolus of local anaesthetic prior to commencing infusion.
- Secure the catheter in place. The Panjunk Rectus Sheath Catheter Kit contains a device to secure the catheters to the abdominal wall. Alternatively ‘Dermabond’ tissue glue on dry skin, covered with ‘Tegaderm’ clear dressing can be utilised.
- Setup the dedicated infusion pump with appropriate local anaesthetic bag and initiate infusion. Rate of infusion to be agreed between surgeon and anaesthetist. Usually 5ml/hr to start.
- Prescribe local anaesthetic in medicine KARDEX under ‘Regular Injectable Medicine’.
- Fill in ‘LOCAL ANAESTHESIA CATHETER BASED INFUSION’ documentation chart.
- Administer top-up doses of local anaesthetic as required.
The Registered Staff Nurse will:

- Ensure patient has established and patent IV access.
- Monitor and document the patient’s vital signs (HR, BP, RR and Sp02) in NEWS chart and sedation level, pain score, nausea score, insertion site, symptoms of LAST (local anaesthetic systemic toxicity) and infusion rate in ‘Local Anaesthetic Infusion Documentation Chart’.
- Assess and immediately report signs and symptoms of LAST/allergic reaction/adverse effects (See documentation chart) to the Pain Team/Aphaesthetist (Emergency Anaesthetist – out of hours – Bleep 1130).
- Change premixed medication infusion bags.
- Perform independent double checks for changing bags, mode and rate of infusion.

**USS-Guided Rectus Sheath Block – Single shot**

Beware a discrete fascial layer exists within the subcutaneous tissue and may be mistaken for the anterior rectus sheath, particularly adults with central obesity. In plane or out of plane technique can be used.

In the USS-guided rectus sheath block, the transducer is placed in a transverse orientation just superior to the umbilicus to visualize the linea alba and paired rectus abdominis muscles (Fig 2) and then slid laterally to visualize the lateral aspect of the rectus sheath and rectus abdominis muscles (Fig 3&4). The needle tip is placed between the hypoechoic RAM and the hyperechoic posterior rectus sheath. Injection in the correct plane will create a visible pool of local anaesthetic separating the rectus abdominis muscle from the posterior rectus sheath (Fig 5). The superior and inferior epigastric arteries may be visible as hypoechoic pulsatile structures deep in the muscle body and should be avoided. The recommended injection volume is 0.1 to 0.2 mL/kg (15–20 ml in adults) per side. Local anaesthetic concentration should be adjusted as necessary to avoid exceeding maximum recommended doses.

The main advantage of the USS-guided rectus sheath block is the ability to visualize the abdominal wall layers and appropriate plane for injection.

---

**Figure 2. U/S picture of linea alba and medial portion of RAM**
Figure 3. Transverse USS picture of RAM (Please note the double hyperechoic line deep to RAM. This is formed by posterior rectus sheath (superficial) and transversalis fascia (deep).

Figure 4. Transverse USS picture of lateral portion of RAM (asterix indicates place of LA injection)

Figure 5. USS guided single shot RSB – In Plane technique
Surgical Rectus Sheath Block

Local anaesthetic may be directly administered into the rectus sheath by the surgeon before wound closure, either as a single injection or through a catheter. Touted advantages include ease of performance, the lack of need for specialized anaesthetic equipment and expertise, potential reduction in operating room times and improved congruency with the incision site.

Continuous USS-Guided Rectus Sheath Block

For continuous rectus sheath block longitudinal ultrasound scan close to lateral edge of rectus abdominis muscles is recommended. (Fig 6). Needle is usually inserted using ‘in plane’ technique (blunt side towards posterior sheath – to minimise risk of perforation – Fig 7). Correct position of needle tip is confirmed by injection of 5ml of saline or local anaesthetic. Catheter is then inserted not more than 5 cm beyond the tip of the needle (Fig 8) and appropriate spread of LA confirmed by injecting through catheter under real-time ultrasound scan (Fig 9).
Figure 6. Longitudinal ultrasound scan of RAM with ‘in plane’ needle approach

Figure 7. In plane ultrasound approach of Tuohy needle with correct identification of posterior sheath
The catheters are secured using sterile dressing and (if required) can be tunnelled laterally using Tuohy needle from the kit. (Fig 10.) Make sure not to cover surgical wound dressing when applying sterile cover for rectus catheters as change of surgical dressing will lead to catheter dislodgement.
*** Please note ***

Rectus sheath catheters for upper midline laparotomy should be inserted below umbilicus and face cranially towards rib cage whereas catheters for middle and lower midline laparotomy (including umbilical hernia repair) should be inserted immediately below rib cage and facing caudally.

Insertion of rectus sheath catheters requires full asepsis - drapes, hat, mask, gown, sterile gloves and full size sterile cover for the ultrasound probe. Chlorhexidine or betadine may be used for skin antisepsis.

**Complications of Rectus Sheath Block**

Complications of rectus sheath catheter blocks include incomplete block and block failure (especially when blind-landmark technique used), local anaesthetic systemic toxicity, mesenteric tissue damage, injury to epigastric and other vascular structures and bowel perforation.
Local Anaesthetic

0.125% L-BUPIVACAINE will be used as the local anaesthetic of choice run at 5ml/hr

0.25%-0.375% L-BUPIVACAINE 15-20ml will be used as a first bolus for each side.

*** Please note maximum recommended doses of L-BUPIVACAINE ***

Maximum single dose 2.5mg/kg with/without adrenaline, but not more than 150mg.

- 50kg patient 125mg 50ml of 0.25% or 33ml of 0.375% L-BUPIVACAINE
- 75kg patient 150mg 60ml of 0.25% or 30ml of 0.375% L-BUPIVACAINE
- 100kg patient 150mg 60ml of 0.25% or 30ml of 0.375% L-BUPIVACAINE

Maximum daily dose is 400mg (320ml of 0.125% L-BUPIVACAINE)

Initial Bolus and Infusions Rates

- Bolus can be delivered at discretion of anaesthetist prior to commencing infusion.
- Infusion rates of L-BUPIVAICAINE 0.125% at 5ml/hr (up to a maximum of 10ml/hr)
- Alternatively if patient remaining in a HDU / Recovery intermittent top-ups can be prescribed instead of an infusion.

- Administer top-up doses of local anaesthetic as required.

Duration of Rectus Sheath Catheter Infusions

Infusions should be limited to less than 96 hours, except for extenuating circumstances on a case by case basis.

Breakthrough Pain

If patients complain of persistent pain > 2/3 despite continuous local anaesthetic infusion, consider managing the patient with oral multimodal therapy (see below) and evaluating the catheters by member of Acute Pain Team (APT) or Anaesthetist. Upon evaluation, several options for troubleshooting are available. A bolus top-up be given using either 5 -10 ml of 2% Lidocaine or 0.25% L-BUPIVACAINE. If the patient experiences improvement in their pain relief, the APT member or Anaesthetist should increase the background infusion usually in 2 mL/hr increments. If no improvement is experienced, the catheters should be considered incorrectly positioned and be removed. An alternative pain management strategy will be required.
*** Sudden onset of acute pain may be a sign of block infusion failure/catheter malfunction or an
ACUTE SURGICAL PROBLEM (In this case escalate and inform surgeons/acute pain team) ***

Multimodal Therapy

While rectus sheath catheters may diminish acute pain, patients undergoing extensive surgery,
particularly those who are opioid-tolerant, may require multimodal analgesia in addition to LA
infusion. Anaesthetist will consider and prescribe the following analgesics as appropriate:

- **PARACETAMOL 1g IV/PO QID**
- **Short -acting Opioids:** Most patients will be given short-acting oral opioids, most commonly
  OXYNORM (SHORTEC) 5-10mg 2-4 hourly PO.
- **NSAIDS:** After discussing with the surgeon, adding NSAID of your choice (eg IBUPROFEN 200
  – 400mg PO TID / BD IV PARECOXIB 40mg) will diminish the opiate requirement. Avoid
  traditional NSAIDS in patients with a history of gastritis, renal dysfunction, and/or bleeding
  diathesis.
- **Long-acting Opioids:** Challenging acute pain patients may require a short course of long-
  acting agents, such as modified release OXYCODONE 10-20 mg BD PO. Initiate therapy with
  the lowest possible dose with the intent to discontinue therapy after the infusion is
  discontinued.
- **MORPHINE SULPHATE PCA**
- **Other:** Co-administration of anticonvulsants (e.g. GABAPENTIN 300-600 mg PO TID) can be
  effective in reducing opioid requirements, particularly in opioid-tolerant patients in the
  acute pain setting.

Catheters and anticoagulation

The risk associated with anticoagulation and placement/removal of indwelling catheters depends on
the depth of placement. Placement within deeper tissue planes increases the risk. As there are no
specific data regarding rectus sheath catheters to date, assess individual patient for risk/benefit of
catheter placement and in general, do not place or remove catheters within 12 hours of the last
prophylactic LMWH dose. For more information see AAGBI guideline (Regional Anaesthesia and
Patient with Abnormalities of Coagulation – November 2013).

Care of the injection/insertion site.

- Observe site for redness, excessive bruising, swelling and infection (i.e. pain, warmth,
  discharge).
- Check dressing over insertion site 4 hourly and with each top-up injection.
- Do not routinely replace the primary dressing.
• Observe for a wet dressing indicating leakage of blood or medication. If dressing saturated, reinforce tape around dressing or replace dressing using aseptic technique. If concerned, notify acute pain team or anaesthetist.
• Ensure catheter is always securely taped.
• Be cautious when moving or turning the patient so the catheter is not dislodged.
• Check catheter tubing and pump connection for disconnection or kinking.
• If the catheter becomes disconnected, call the acute pain team/anaesthetist immediately.
• Patient should not bathe or shower while catheter in situ.

Removing Infusion Catheters.

Supplies:
• Clean gloves
• 2 x 2 gauze
• Sterile semi-permeable dressing (e.g. 4-sided Elastoplast, Opsite ... etc).
• If tip / site is to be cultured: Dressing tray, sterile scissors, sterile specimen container, microbiology swab, requisition and labels

Procedure:
• Perform hand hygiene.
• Position patient so that catheter sites are easily accessible.
• Turn off infusion pump.
• Place sterile field to receive catheter if tip culture is ordered.
• Use sterile gloves.
• Remove dressing and tape (if any). (Note: Catheter may come out with dressing)
• Gently withdraw catheter steadily and place on sterile field if tip is to be sent for C&S

Note: If unable to remove the catheter or there is any resistance upon removing catheter, stop and notify anaesthetist immediately.
• Assess the catheter site for unusual bleeding, bruising, swelling, or redness.

Note: If evidence of infection, obtain swab for C & S from the site and notify surgical team.
• After catheter removal clean site with appropriate antiseptic solution (eg. Chlorhexidine 2%, Betadine ...) and apply an occlusive dressing.

Note: Check catheter tip to ensure it is intact. If not intact notify the anaesthetist immediately.

If the rectus sheath catheter is suspected as a source of infection:

• Use sterile scissors to remove 5 cm from the distal end of catheter and place in sterile container and label specimen container at bedside.
• Recheck site one hour following catheter removal for any persistent fluid leakage, localized bleeding, expansion of bruising or hematoma. If present notify the anaesthetist immediately.
• Remove sterile semi-permeable dressing (e.g. 4-sided Elastoplast) in 24 hours.

Document:
• Date and time of removal
• Condition of insertion site
• Condition of catheter tip
• If any bleeding, fluid drainage, hematoma at catheter site present
• Whether tip / site was cultured
• Patient response to procedure
• Complications and intervention

**Report to the anaesthetist if:**

• If persistent fluid leakage, localized bleeding or expansion of bruising or hematoma is noted.
# AAGBI Safety Guideline

## Management of Severe Local Anaesthetic Toxicity

### 1. Recognition

**Signs of severe toxicity:**

- Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions
- Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur
- Local anaesthetic (LA) toxicity may occur some time after an initial injection

### 2. Immediate management

- Stop injecting the LA
- Call for help
- Maintain the airway and, if necessary, secure it with a tracheal tube
- Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
- Confirm or establish intravenous access
- Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses
- Assess cardiovascular status throughout
- Consider drawing blood for analysis, but do not delay definitive treatment to do this

### 3. Treatment

#### IN CIRCULATORY ARREST

- Start cardiopulmonary resuscitation (CPR) using standard protocols
- Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
- Consider the use of cardiopulmonary bypass if available

**GIVE INTRAVENOUS LIPID EMULSION**

(following the regimen overleaf)

- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 h
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

#### WITHOUT CIRCULATORY ARREST

Use conventional therapies to treat:

- Hypotension
- Bradycardia
- Tachyarrhythmia

**CONSIDER INTRAVENOUS LIPID EMULSION**

(following the regimen overleaf)

- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

### 4. Follow-up

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases as follows:
  - in the United Kingdom to the National Patient Safety Agency (via www.npsa.nhs.uk)
  - in the Republic of Ireland to the Irish Medicines Board (via www.imb.ie)
- If Lipid has been given, please also report its use to the international registry at www.lipidregistry.org. Details may also be posted at www.lipidrescue.org

---

Your nearest bag of Lipid Emulsion is kept

---

This guideline is not a standard of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in the light of the clinical data presented and the diagnostic and treatment options available.

© The Association of Anaesthetists of Great Britain & Ireland 2019
An approximate dose regimen for a 70-kg patient would be as follows:

**IMMEDIATELY**

Give an initial intravenous bolus injection of 20% lipid emulsion 100 ml over 1 min

AND

Start an intravenous infusion of 20% lipid emulsion at 1000 ml.h⁻¹

**AFTER 5 MIN**

Give a maximum of two repeat boluses of 100 ml

AND

Continue infusion at same rate but double rate to 2000 ml.h⁻¹ if indicated at any time

**Do not exceed a maximum cumulative dose of 840 ml**

---

This AAGBI Safety Guideline was produced by a Working Party that comprised:

Grant Cave, Will Harrop-Griffiths (Chair), Martyn Harvey, Tim Meek, John Picard, Tim Short and Guy Weinberg.

This Safety Guideline is endorsed by the Australian and New Zealand College of Anaesthetists (ANZCA).
REFERENCES

8. Willschke H. et al. Ultrasonography – guided rectus sheath block in paediatric anaesthesia – a new approach to an old technique. British Journal of Anaesthesia 2006, 97 (2); 244-9