Introduction

The Enhanced Recovery After Surgery (ERAS) Programme is a peri-operative care pathway designed to achieve early recovery for patients undergoing major surgery. The ERAS pathway provides guidance to all involved in peri-operative care, helping them to work as well-coordinated team to provide the best care to patients.

Purpose and Scope

This guideline aims to summarise the anaesthetic and analgesic regimes for patients undergoing Total Knee Replacement (TKR) under the ERAS programme at Lewisham Healthcare NHS Trust. The programme aims to optimise multimodal analgesia using opioid sparing techniques to minimise side effects and promote rapid patient recovery with early oral intake and early patient mobilization.

Clinical Guideline for Peri-Operative Anaesthesia and Analgesia in Total Knee Replacement – ERAS Orthopaedics

PLEASE NOTE: Dose adjustments may be required for patients who are frail, elderly, low weight, obese or with liver or renal impairment.

Pre-Operative Protocol

Patients can have carbohydrate drinks or clear fluids up to 2 hours before surgery. 1-2 hours before surgery patients should receive the following stat doses:
- Gabapentin 300mg PO (600 mg if young patient or opioid tolerant)
- Omeprazole 20mg PO if not already on PPI as part of their medication history
- Paracetamol 2g PO or 30mg/kg if patient <65kg

For patients with pre-operative anaemia, anticipated blood loss over 1L or where blood transfusion is contraindicated (e.g. Jehovah’s Witness) consider using Tranexamic Acid but only after discussion with the Surgeon and a Haematologist.

Intra-Operative Protocol

Before surgery begins and at induction:
- Give IV antibiotics as per Trust guidelines 30 minutes before skin incision.
- Ketamine may be considered at a dose up to 0.5mg/Kg IV pre-incision if the patient is likely to be opioid tolerant or has pre-existing chronic pain. This can be given as a single bolus injection post induction of GA or as divided doses if spinal anaesthesia is used.
Patient for Spinal Anaesthesia (SA) + Femoral Nerve Block (FNB) + Posterior Capsule Infiltration (PCI) +/- Sedation

SA: Anhydrous Bupivacaine Hydrochloride 0.5% with Glucose 80mg/ml (Marcaine Heavy) 2-3.0 ml with intrathecal Fentanyl 20-30micrograms. Use patient positioning to achieve predominantly unilateral blockade – operated side down 10 minutes.
FNB: 10-20ml of 0.25% Levobupivacaine
PCI: 40-50 ml of 0.25% Bupivacaine + Adrenaline 1:200,000 performed by the surgeon Sedation if required. 1% Propofol can be used as a target control infusion (TCI) or Midazolam in small boluses. Aim for fast recovery of patient consciousness level.

Consider Combined Spinal and Epidural (CSE) if surgery is expected to last > 2.0 hours (e.g. complex surgery, morbid obesity, high risk for GA). Aim to remove epidural catheter at the end of surgery after top–up with opioid free low concentration local anaesthetic solution e.g. plain Levobupivacaine or Ropivacaine. Do not perform an FNB and PCI in this case.

Patient for General Anaesthesia (GA) + Femoral Nerve Block (FNB) + Posterior Capsule Infiltration (PCI) +/- IV Opioids

Use if spinal anaesthesia is contraindicated e.g. patient refusal, abnormal clotting or recent anticoagulation, severe spinal pathology or the spinal anaesthesia fails.

GA: Aim to rapid recovery of conscious level. Use FNB and PCI as stated above IV opioids: e.g. Fentanyl 50-100micrograms or Morphine 5-10 mg. Titrate intra-operatively along with multimodal analgesia. Prescribe IV opioids for rescue analgesia as per recovery protocol: Alfentanil 1mg plus Morphine 10mg diluted with 0.9% Sodium Chloride to a total volume of 10ml. Titrate with 1-2 ml given every 5 minutes according to pain severity.

Aims for both Spinal and General Anaesthesia
- IV fluids: avoid high volumes of crystalloids in uncomplicated cases.
- Avoid urinary catheterisation.
- Aim patient temperature to normothermia – use warming blanket and fluid warmer

Towards the end of surgery:
- Give 1g IV Paracetamol if not given pre-operatively – check anaesthetic chart.
- Give IV NSAIDs e.g. Diclofenac 75mg or Parecoxib 40mg if not contraindicated (risk of post op haemorrhage, renal impairment, peptic ulcer)
- Give 4 mg IV Ondansetron, consider a second antiemetic if GA + IV opioid technique is used intra-operatively.
- Check timing and dose of VTE prophylaxis to be prescribed at the end of operation - discuss with the surgeon if there are to be any changes in prophylaxis post-operatively.

Post-Operative Protocol

In Theatre Recovery:

Prescribe post-op IV fluids:
Crystalloids: e.g. Compound Sodium Lactate (Hartmann’s solution) as IV maintenance until 08:00am the following day. The required rate of infusion will vary between patients.
Colloids: e.g. Isoplex, consider a single bolus of 250ml IV stat to treat symptomatic hypotension when patient first mobilises.

Patients should be encouraged to start drinking and eating in main recovery post-op. Oxygen therapy if required should be given post-op overnight only.

Check long acting nerve block is effective before patient leaves recovery - if nerve blocks have failed and/or pain scores are high (≥4/10 at rest or ≥6/10 on movement) titrate IV opioids in recovery and adjust post-op oral analgesic prescription if necessary. See section below ‘Post-Op Pain Control Inadequate’. Consider to repeat nerve block in recovery if patient likely to require high dose of opioids.

First Five Days Post-Op - Starting the Day of Surgery

Regular prescriptions:
- Post-op IV antibiotic prophylaxis as per Trust Guidelines
- VTE prophylaxis as per VTE risk assessment and surgeon agreement
- Paracetamol 1g PO 6 hourly and Ibuprofen 400mg qds PO 6 hourly.
- Omeprazole 20mg PO once daily for duration of regular NSAIDs unless patient was on PPI prior to admission
- Oxycodone Modified Release 10 mg PO every 12 hours for 3 doses starting the night of the operation and then 5 mg PO every 12 hours until the end of Day 5
- Ondansetron 4mg IV or PO 8 hourly while on regular opioids
- Senna 2 tablets PO once a day and Lactulose 15ml PO twice a day until fully mobile

As required prescriptions:
- Oxycodone Immediate Release 5-10mg PO, maximum every 3-4 hours
- Cyclizine 25-50mg IV/IM/PO, maximum of TDS

Always document on medicine charts the review date for opioids and NSAID prescriptions.

Inadequate Pain Control: Patient pain score at rest ≥4/10 or pain on mobilization ≥6/10.

Consider increasing regular Oxycodone Modified Release dose by 10mg daily. Consider switching opioids from Oxycodone to Morphine Sulphate if patient is experiencing intolerance side effects with Oxycodone.
Consider adding regular Gabapentin if not already prescribed.
Refer to the Acute Pain Algorithm or acute pain team for advice.

Step Down Analgesia and/or Discharge Analgesia after the First Four Days:

Regular prescriptions:
- Review patient analgesia requirements before stepping down analgesia and consider restarting analgesia used prior to admission unless this is contraindicated.
- Alternatively Codeine Phosphate 30 mg PO QDS or Dihydrocodeine 30mg PO QDS or Tramadol 50mg PO QDS
- Paracetamol 1g PO QDS
- Senna 2 tablets PO at night
- Continue adjunctive analgesics if added for pain management during hospital admission (e.g. Gabapentin)

As required prescriptions:
- Morphine Sulphate immediate release (Oramorph) 10-30mg PO maximum 3-4 hourly
- Cyclizine 25-50mg IV/IM/PO, maximum of TDS
Consider low dose regular Morphine Sulphate Modified Release and as required Morphine Sulphate Immediate Release if patient has high opioid requirements during admission.

**Monitoring of the patient**

Patients are seen post-op by the pain team for the first 48 hours. Side effects experienced are usually opioid-related and these are reviewed during pain team visits. Ward monitoring of ERAS patients on a ward is no different to any other surgical patient.

**References**

- Perioperative Comparative Effectiveness of Anesthetic Technique in Orthopedic Patients; Stavros G. Memtsoudis, Xuming Sun; Anesthesiology, V 118: No 5 1046 May 2013
- Utilization of Critical Care Services among Patients Undergoing Total Hip and Knee Arthroplasty; Epidemiology and Risk Factors; Stavros G. Memtsoudis, Xuming Sun, Ya-Lin Chiu, Michael Nurok, Ottokar Stundner, Stephen M. Pastores, Madhu Mazumdar: Anesthesiology, V 117: No 1 107 July 2012
- http://www.18weeks.scot.nhs.uk/service-redesign-and-transformation/enhanced-recovery/orthopaedics
- The Role of the Anesthesiologist in Fast-Track Surgery: From Multimodal Analgesia to Perioperative Medical Care; White PF, Kehlet H; Anaesthesia and Analgesia Vol. 104, No. 6, June 2007

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