

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### A clinical guideline recommended for use

<b>In:</b>	Enhanced Recovery Programme for Primary Hip and Knee Replacements in Adults
<b>By:</b>	All Staff
<b>For:</b>	For use in operating theatres, Pre-admission clinic, all Orthopaedic wards
<b>Key words:</b>	Enhanced Recovery Programme
<b>Written by:</b>	Dr Lindsay Barker
<b>Supported by:</b>	Mr N Chirodian, Mr J Wimhurst, Norwich Enhanced Recovery Programme (NERP) Liaison K Wyatt and Dr M Sanders
<b>Approved by:</b>	<b>Clinical Guidelines Assessment Panel    September 2010 (CGAP)</b>
<b>Reported as approved to the:</b>	<b>Clinical Effectiveness Committee Clinical Governance Committee</b>
<b>Date of approval</b>	September 2010
<b>To be reviewed before:</b>	September 2013
<b>To be reviewed by:</b>	Dr Lindsay Barker
<b>Guideline supersedes:</b>	
<b>Guideline Reg. No:</b>	CA4091

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Index

3	Objectives
3	Rationale/background
4	Broad Recommendations
4	Anaesthetic technique
4	Local Infiltration technique - Knee Arthroplasty
5	Local Infiltration technique – Hip Arthroplasty
5	Hip Arthroplasty – catheter placement
6	Post-operative infusion
6	Post-operative medications
7	Post-operative observations
8	Physiotherapy
8	Discharge
8	Clinical audit standards
8	Summary of development and consultation process undertaken before registration and dissemination
8	Distribution list/ dissemination method
9	References/ source documents
11	Appendix 1 - Local Anaesthesia Infiltration
12	Appendix 2 - Anaesthetic technique – Norwich Enhanced Recovery Programme (NERP)
13	Appendix 3 - Ropivacaine in orthopaedic surgery-summary of literature
15	Appendix 4 - Information on Ropivacaine
16	Appendix 5 - Peri-operative medications
17	Appendix 6 - Information for Nurses looking after patients with Local Anaesthetic Infusions for knee and hip replacements as part of the Enhanced Recovery Programme

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Objective/s

To enhance the recovery of patients having primary hip and knee replacements by a multimodal programme which facilitates early mobility and discharge.

### Rationale/Background

Approximately 600 hip and 600 knee arthroplasties are performed at NNUH each year. Currently our average length of stay is 8 days. Other centres<sup>1</sup> in the UK and abroad have introduced enhanced recovery programmes. These focus on the provision of safe effective analgesia with minimal side-effects which then enable early mobility. Centres adopting the enhanced recovery programme have reduced their length of stay significantly.

The majority of NNUH patients undergoing joint replacement surgery receive continuous epidural analgesia for post-operative pain relief. This can provide good pain control in many patients, but has unwanted side-effects such as hypotension, urinary retention and impaired mobility. More worryingly, the risk of haematoma and infection in the epidural space is a rare but catastrophic event which can lead to permanent neurological damage. It is for this reason that we are exploring other forms of pain relief. The technique of high volume peri-articular infiltration is enjoying increasing popularity internationally. Many publications demonstrate its efficacy and lack of serious side-effects.

A multidisciplinary group of clinicians from NNUH visited the Golden National Jubilee Hospital in Glasgow where a technique involving injecting local anaesthetic around the joint, as part of an enhanced recovery programme, has been used successfully in over 3000 patients. After this meeting it was decided to establish a working group and perform the technique on 30 patients initially. Our technique has been modified from theirs in order to accommodate local practices. NNUH orthopaedic wards have both elective and emergency patients on them and therefore it was felt that any local anaesthetic given on the ward should be delivered through a closed system. In this way the risk of infection is minimised.

Enhanced recovery programmes are multimodal and focus on the following elements.

- 1 Educating GPs and community support services
- 2 Patient education and support
- 3 Pre-operative physiotherapy and Occupational Therapy assessment and education
- 4 Pre-operative anaesthetic and surgical assessment
- 5 Utilising surgical and anaesthetic techniques which facilitate early mobility
- 6 Excellent post-operative analgesia allowing early patient mobilisation
- 7 Intensive post-operative physiotherapy
- 8 Early discharge with appropriate back-up and follow-up

Early discharge results in improved patient satisfaction and probably lessens infection and thromboembolism

## **Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement**

### **Broad recommendations**

The patient is admitted on the day of surgery.

Patients have surgery performed under spinal anaesthesia supplemented by a target controlled infusion of propofol or a light general anaesthetic.

Post-operative pain relief is provided by peri-articular injection of 0.2% Ropivacaine solution followed by an infusion administered through a catheter placed under direct vision at the end of surgery.

The patient is mobilised on the same day of surgery, preferably after four hours. Physiotherapy is continued three times a day thereafter. The patient can be discharged home when they are independently mobile and their pain is controlled by oral analgesia.

### **Anaesthetic technique**

Pre-medication

Gabapentin 300 mg 2 hours orally pre-op (Omit pre-op dose in those with renal impairment)

Paracetamol 1g orally.

Single shot spinal 2.5-3.0 mLs Bupivacaine plus target controlled infusion propofol for sedation (OR a light GA if anaesthetist prefers)

Ondansetron 4mg iv

Dexamethone 8 mg iv

Diclofenac 75 mg iv if tolerated

Tranexamic acid 1 gram to minimise blood loss- has 120 minute half-life so give just before tourniquet goes down for TKR and just after incision is made for THR

No opiates

No urinary catheter.

Limit fluids to ~ 1 litre intraoperatively if possible.

Surgeon infiltrates with 150 -200 mls of 0.2% ropivacaine at end of operation.

Surgeon places peri-articular catheter Catheter must be clearly labelled "peri-articular catheter"

Infusion set up with McKinley pump.

Ropivacaine 0.2% 200 mLs.

Give 20 mL bolus and set at 8 mLs/ hour-

### **Local Infiltration technique**

#### **Knee arthroplasty.**

150–170 mL of ropivacaine is used for Total Knee Replacement. The injection is made in three stages. The first injection is done after the bone surfaces have been

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

prepared, but before the components have been inserted since access to the posterior capsule is limited once the components are in place. About 30–50 mL is injected through the joint from the front to a depth of 3 mm into the tissues around the posterior joint capsule, using a systematic sequence from one side to the other to ensure uniform delivery to these tissues. The second injection is done after the components have been inserted, but before both wound closure and tourniquet release. About 35–50 mL is injected into the deep tissues around the medial and lateral collateral ligaments and the wound edges. The third injection of 25–50 mL of the same Ropivacaine solution is made into the subcutaneous tissue. Multiple injections are made in a systematic sequence, approximately every 25 mm around the wound. The needle is inserted each time perpendicular to the wound edge to a depth of about 25 mm and injection is done as the needle is withdrawn.

### **Catheter placement.**

Immediately before wound closure, a Touhy needle is inserted about 10 cm above the incision through the skin, subcutaneous tissue, and quadriceps muscles. The tip of the catheter is then inserted through the hub of the needle into the surgical field from the outside to the inside. The catheter is then led along the medial femoral condyle usually on raw bone, medial to the metal femoral component and adjacent to the medial capsule. Using an artery forceps, the tip is then passed posterior to the medial femoral condyle, so that the tip lies immediately anterior to the posterior capsule. Finally, the needle is removed, the slack is taken up and the catheter is cut to a convenient length such that only about 20 cm protrudes from the skin.

The hub and bacterial filter are then connected and about 1–2 mL is injected through the pain catheter to ensure patency. After wound closure, a further 10–15 mL is injected through the catheter to flood the joint with Ropivacaine. The catheter and bacterial filter must be secured firmly to the limb under a sterile transparent adhesive dressing

### **Hip arthroplasty.**

Depending on the size of the surgical incision, 150–200 mL of injectant is injected in stages—in 3 equal 50–70-mL doses. The first injection is made after completion of the acetabular surgery, the second one after insertion of the femoral component, and the final one immediately before the skin is sutured. The first injection is made into the tissues around the rim of the acetabulum, focusing on both the joint capsule if it remains, and around the exposed gluteal and adductor muscles. The injection is done using a systematic sequence around the acetabular rim to ensure uniform delivery to these tissues. The second injection is made into the external rotators, gluteus tendon, and iliotibial band. Multiple injections are done in a systematic sequence every 25 mm or so along the length of the exposure. Care is taken to infiltrate in a fan-wise fashion around the apices of the wound, so that traumatized tissues in these locations are covered. The third injection is made into the subcutaneous tissues under the wound. Multiple injections are performed in a systematic sequence every 25 mm around the wound. The needle is inserted each time perpendicular to the edge of the wound to a depth of about 25 mm and injection is done as the needle is withdrawn.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### **Catheter placement**

Immediately before wound closure, a Touhy needle is inserted about 10 cm below the inferior apex of the incision through the fascial layers and iliotibial band. The tip of the catheter is then inserted through the hub of the needle from the outside into the surgical field, advanced to the superior apex of the wound, and placed with forceps above the piriformis tendon such that its tip lies antero-superior to the joint (within the capsule for a posterior approach. For an anterior approach the catheter is inserted into the joint anteriorly under the gluteus medius). The slack is taken up so that the catheter lies over the long axis of the wound in the plane over the external rotator muscles. The needle is then removed so that the catheter exits through the skin about 10 cm below the distal end of the incision, and the catheter is cut to a convenient length such that only about 20 cm protrudes from the skin. The hub and bacterial filter are then connected and 1–2 mL is injected through the catheter to ensure patency. After wound closure, a further 10–15 mL is injected through the catheter to flood the joint with Ropivacaine solution. The catheter and bacterial filter are then secured firmly to the limb under a sterile transparent adhesive dressing (Tegaderm or bio-occlusive)

### **Post-operative infusion**

The surgeon infiltrates the wound as described above and places a wound infiltration catheter.

This will be primed and run through a McKinley Infusion Pump or an elastomeric infusion device.

The anaesthetist will prescribe a continuous infusion of ropivacaine 0.2% at 5-8 mLs hourly.

If patient is in pain in recovery a further bolus of 20 mLs can be given through the pump.

### **Post-operative medications**

#### **Regular**

Paracetamol 1g PO qds

Gabapentin 300 mg bd for 3 - 5 days –100 mg bd in >70 years  
**(Omit in renal impairment )**

Oxycontin MR tablets 10 mg bd – review need at 48hours maximum course 3 – 5 days  
**(5mg bd in >80 years/renal impairment (eGFR < 30mL/min))**

Ibuprofen 400 mg tds (If NSAIDS tolerant – i.e. no recent history of NSAID induced asthma, GI problems; renal impairment or heart failure)

Laxatives if necessary – Senna 15mg ON and Lactulose 10mL BD

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

→ **Then after 3 days** or on discharge stop oxycodone and prescribe

Codeine phosphate 30 - 60mg qds or dihydrocodeine 30mg 4-6 hourly

### PRN

Oramorph 5 -10 mg prn 2 hourly for breakthrough pain

(5mg prn 2 hourly > 80 years)

(2.5-5 mg prn 4hourly if eGFR <15mL/min and titrate according to response)

Cyclizine 50mg TDS po/im/iv prn

Ondansetron 4mg bd/tds po/iv prn (maximum of 2 doses)

Ephedrine 30mg PO prn (for dizziness on attempting to mobilise as per protocol.

No history of IHD and Hb > 8.0g/dL)

Please also prescribe sc/im morphine 5mg max 4hourly prn for escape analgesia

### On discharge

### **Gabapentin and Oxycontin must be stopped**

Codeine phosphate 30-60mg QDS initiated if not already

→ Dihydrocodeine 30mg 4-6hourly as alternative if necessary

Laxatives if necessary – Senna 15mg ON

**Chronic pain patients** (i.e patients who have been taking opiates for some time prior to the operation) are managed differently. These patient's should still receive the intra-articular wound infusion but they should be prescribed Patient Controlled Analgesia rather than the Oxycontin tablets. This is because these patients have unpredictable analgaesic requirements and their needs are better served by Patient Controlled Analgesia. These patients should also continue their pre-existing opiates into the post-operative period. It is most important that analgesia patches stay in place and are re-applied as prescribed. If in doubt please contact the Enhanced Recovery Sister on bleep 1233 within normal working hours.

**Sleep apnoea patients** These patients receive the intra-articular Ropivacaine infusion but should have a Patient Controlled Analgesia device instead of the Oxycontin. If their sleep apnoea is severe they should be managed on HDU.

### **Post-operative observations**

Are recorded as follows:-

Pulse, blood pressure, respiratory rate

Pain score (0-3)

Sedation score

Nausea and vomiting score

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

At the following intervals:

- On return to ward
- 30mins after return to ward
- Hourly for 2 hours
- 2 hourly for 4 hours
- Thereafter 4 hourly whilst infusion in progress

### Physiotherapy

Providing that the patient's systolic blood pressure is within 10% of its pre-operative reading the patient will be mobilised **four** hours after surgery (Day 0)

On the first postoperative day and thereafter, if a patient feels dizzy on attempting to mobilise, provided their haemoglobin is above 8g/dl, intramuscular ephedrine 15mg is given and mobilisation is attempted again after 30 minutes.

The patient will be mobilised three times on the first post-operative day. Once the patient is stable on crutches without support, they will be encouraged to mobilise independently.

The patient will receive physiotherapy three times a day until discharge.

### Discharge

If appropriate the patient will be discharged on day 3-4.

The discharge criteria will be

- Able to mobilise independently
- Pain well controlled on oral analgaesics

The patient will be telephoned at home on day 7 post discharge.

### **Clinical audit standards**

All patients will be audited for quality of analgaesia, mobility, length of stay, and complications including infection. The database will be reviewed quarterly by the Enhanced Recovery Team and will be presented annually to the Trust Board, the Orthopaedic department and the Anaesthetic department.

### **Summary of development and consultation process undertaken before registration and dissemination**

During its development this guideline has been circulated for comment to: the anaesthetic department, the orthopaedic department, the pharmacy department, the Acute Pain Service, Ward sisters on Denton, Gateley, Earsham and Cringleford, the Physiotherapy department, the Occupational Therapy department.

This version has been endorsed by the Clinical Guidelines Assessment Panel.

### **Distribution list/ dissemination method**

Trust Intranet, Orthopaedic wards, orthopaedic theatres Recovery, Orthopaedic surgeons, orthopaedic anaesthetists, Acute Pain Team, physiotherapy department, occupational therapy department.



## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### References/ source document

Andersen KV. Pfeiffer-Jensen M. Haraldsted V. & Søballe K. Reduced hospital stay and narcotic consumption, and improved mobilization with local and intraarticular infiltration after hip arthroplasty. A randomized clinical trial of an intraarticular technique versus epidural infusion in 80 patients. *Acta Orthopaedica* 2007, 78 (2), 180 – 186.

Busch CA. Shore BJ. Bhandari R. Ganapathy S. MacDonald SJ. Bourne RB. *et al.* Efficacy of periarticular multimodal drug injection in total knee arthroplasty. A randomized trial. *J Bone Joint Surg Am*, 2006, 88, 959 – 963.

Husted H. Holm G. & Jacobsen S. Predictors of length of stay and patient satisfaction after hip and knee replacement surgery: Fast-track experience in 712 patients. *Acta Orthopaedica* 2008, 79 (2), 168 – 173.

Isaac D. Falode T. Liu P. l'Anson H. Dillow K. Gill P. Accelerated rehabilitation after total knee replacement. *Knee*, 2005, 12, 346 – 350.

Kerr DR. & Kohan L. Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery: A case study of 325 patients. *Acta Orthopaedica* 2008, 79 (2), 174 – 183.

Piper SL. and HT. Comparison of ropivacaine and bupivacaine toxicity in human articular chondrocytes. *J Bone Joint Surg Am* 2008, 90, 986 – 991.

Rasmussen S. Kramhøft MU. Sperling KP. & Pedersen JHL. Increased flexion and reduced hospital stay with continuous intraarticular morphine and ropivacaine after primary total knee replacement: Open intervention study of efficacy and safety in 154 patients. *Acta Orthop Scand* 2004, 75 (5), 606 – 609.

Röstlund T. & Kehlet H. High-dose local infiltration analgesia after hip and knee replacement—what is it, why does it work, and what are the future challenges? *Acta Orthopaedica* 2007, 78 (2), 159 – 161.

Toftdahl K. Nikolajsen L. Haraldsted V. Madsen F. Tønnesen EK. & Søballe K. Comparison of peri- and intraarticular analgesia with femoral nerve block after total knee arthroplasty; A randomized clinical trial. *Acta Orthopaedica* 2007, 78 (2), 172 – 179.

Vendittoli P. Makinen P et al A multimodal Analgesia protocol for Total Knee Arthroplasty. A Randomised Controlled Study *J Bone Joint Surg Am* 2006; 88:282-289

Bianconi M, Ferraro L, et al Pharmacokinetics and efficacy of ropivacaine continuous wound instillation after joint replacement surgery. *British Journal Of anaesthesia* **91 (6)** 830-5 ( 2003)

Wiedermann D, Muhlnickel B, Staroske E, Neumann Rose w. Ropivacaine plasma concentration after 120 hour epidural infusion *Br J Anaesth* 2000 ; **85**: 830-5

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

Wulf H, Worthmann F, Behnke H, Bohle A S. Pharmacokinetics and pharmacodynamics of ropivacaine 2mg/mL, 5mg/mL, or 7.5mg/mL after ileoinguinal blockade for ileoinguinal hernia repair in adults *Anesth Analg* 1999; **89**: 1471-4

Burm AGL, Stienstra R, Browwer R, et al Epidural infusion of ropivacaine for postoperative analgesia after major orthopaedic surgery. *Anaesthesiology* 2000; **93**:395-403

Petterson N, Emanuelson BM, Reventlid H, Hahn RG. High-dose ropivacaine wound infiltration for pain relief after inguinal hernia repair: a clinical and pharmacokinetic evaluation. *Reg Anaes Pain Med* 1998; **23**: 189-96

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Appendix 1

#### Local Anaesthesia Infiltration

##### Total Knee Replacement

A 200 mL 2 mg/mL (0.2%) infusion bag of ropivacaine is split as follows:-

50 mL of ropivacaine is split through the posterior capsule and intracondylar area.

50 mL is infiltrated into the anterior capsule, quadriceps muscles, collateral ligaments and along the anterior aspect of the femur

An epidural catheter is passed through the skin several centimetres from the wound and laid into the posterior-medial aspect of the knee joint and connected to a bacterial filter.

50 mL ropivacaine is infiltrated into the subcutaneous tissues.

20 mL ropivacaine is injected through the epidural catheter.

##### Total Hip Replacement

A 200 mL 2 mg/mL (0.2%) infusion bag of ropivacaine is split as follows:-

50mLs to the anterior capsule, inferior capsule & gluteus minimus tendon after insertion of acetabular component.

50mL to the posterior capsule/short external rotators (SERs)/gluteus medius tendon & IT band after insertion of femoral component.

50mL subcutaneously prior to wound closure.

Catheter inserted & laid on top of SERs & above piriformis (under posterior aspect of gluteus medius/minimus & 20mL injected after wound closure.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Appendix 2

### Anaesthetic technique – Norwich Enhanced Recovery Programme(NERP)

Gabapentin 300 mg 2 hours orally pre-op (Omit pre-op dose in those with renal impairment)

Paracetamol 1g orally

Single shot spinal 2.5-3.0 mLs Bupivacaine plus TCI propofol for sedation (or a light GA if anaesthetist prefers)

Ondansetron 4mg iv

Dexamethone 8 mg iv

Diclofenac 75 mg iv if tolerated

Tranxenamic acid 1 gram to minimise blood loss - has 120 minute half-life so give just before tourniquet goes down for TKR and just after incision is made for THR

No opiates

No urinary catheter.

Limit fluids to ~ 1 litre intraop if possible.

Surgeon infiltrates with 150 -200 mLs of 0.2% ropivacaine at end of operation.

Surgeon places peri-articular catheter Catheter must be clearly labelled “peri-articular catheter

Infusion set up with McKinley pump.

Ropivacaine 0.2% 200 mLs.

Give 20 mL bolus and set at 5-8 mLs/ hour-

Written by Dr L S Barker

Updated 26/06/10

Bleep 1235

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Appendix 3

### Ropivacaine in orthopaedic surgery - summary of literature

#### Knee Surgery

Rasmussen *et al* (2004) open study of 154 patients – 4 groups, 3 of which received intra-articular morphine and ropivacaine. Primary outcome – range of motion and LOS reported as improved and reduced respectively (statistically but no numeric data provided).

Isaac *et al* (2005) randomised 50 patients undergoing total knee arthroplasty to either standard care or a technique using a local anaesthetic infiltration. Along with this technique there was a restructuring of the service; prior to this the median length of stay was 10.5 days. The median length of stay after the restructuring in the control group was reduced to 6.6 days whereas the infiltration was reduced down to 3.6 days.

Busch *et al* (2006) randomised 64 patients to infiltration or standard care. They report better analgesia and reduced opioid analgesic requirements.

Toftdahl *et al* (2007) randomised 80 patients receive either a femoral nerve block (using ropivacaine) or peri-/intra-articular local anaesthesia infiltration. The latter comprised of 50mL of 0.2% ropivacaine into both the anterior and posterior capsule and then 50mL in to the subcutaneous tissue around the surgical field. Outcomes measured on postoperative day 1 showed increased ability to mobilise with the new technique and this continued to day 2 (outcome results for after POD 2 are not reported)

On day 1 there was a reduction in opioid consumption but over a 4 day postoperative period there was a non-significant difference.

Median length of stay for infiltration was 1 day less than nerve block (5 versus 6 days (non-significant))

#### Hip Surgery

Andersen *et al* 2007 compared the local infiltration technique against epidural in patients undergoing total hip replacement. Morphine consumption was significantly reduced during the first 20 hours post-operative (26 mg for the epidural group versus 17.5mg for the infiltration group ( $p=0.004$ )). Length of stay was also significantly reduced from 7 to 4.5 days. They also monitored motor function using the Bromage scale and this indicated no reduction in motor function with the infiltration technique but significant effects from the epidural (50% of patients affected).

Husted *et al* (2008) followed 712 patients undergoing hip or knee surgery and report a median length of stay of 3.8 days with 41% of patients being discharged by day 3 and 92% of patients being discharged by 5.

Kerr & Kohan (2008) followed 325 patients and also report 67% of their hip patients being discharged on day 3 or before and 84% of their knee patients. They also report that a significant amount of their patients did not require extra morphine.

## **Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement**

### **Chondrocyte toxicity**

Intra-articular local anaesthetics have been associated with toxicity to the chondrocytes and to the cartilage. Piper and Kim (2008) using an in vitro study looked at ropivacaine versus the other most common local anaesthetic used in this technique, bupivacaine. In cartilage explants chondrocyte viability was shown to be 94.4% for ropivacaine and 78% for bupivacaine (viability in 0.9% sodium chloride was 95.8%). They also looked at cultured chondrocytes and the viability for ropivacaine was 63.9% versus 37.4% for bupivacaine.

### **Costs**

Ropivacaine 0.2% ampoules 10mL – £9.50 for 50mL (£38.00 for 200mL)

Ropivacaine 0.2% infusion 200mL – £16.78 for 200mL

The studies that have been performed using this technique indicates that there is reduced opioid requirements, increased mobility, reduced length of stay, and those that have measured it there is also an increase in patient satisfaction.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Appendix 4

### Information on Ropivacaine

**Ropivacaine (Naropin)** was introduced onto the market in 1995 as a long acting amino-amide local anaesthetic, similar in onset, potency and duration of action to that of Bupivacaine. It offers a greater margin of safety when compared to racemic bupivacaine in terms of its cardiotoxic and central nervous system toxic effects. Studies show that the threshold for CNS toxicity for ropivacaine is approximately twice the plasma concentration than the threshold for bupivacaine.

It is for this reason that it has become the drug of choice when using it for the large volumes of dilute local anaesthetic that are used with peri-articular infiltration.

It is well demonstrated that the site of administration and consequently rate of plasma absorption is the most important indicator of the potential for local anaesthetic toxicity. For example, the rate of absorption from the brachial plexus is thought to be far greater than that from periarticular tissues. Most cases of acute local anaesthetic toxicity described in the literature arise from inadvertent intravascular injection of the local anaesthetic. Again this occurs most commonly in brachial plexus blocks. The potential for inadvertently injecting toxic amounts of ropivacaine intravascularly with this technique is minimal as it is injected under direct vision in aliquots of 50-70 mLs over a period of 30 minutes.

These factors explain why large numbers of cases worldwide have been reported using 300-400mg of Ropivacaine injected peri-articularly with no adverse effects. In all studies using periarticular injections of doses greater than the manufacturers recommendations measured plasma levels were below toxic limits and no symptoms of toxicity occurred. The safety of periarticular administration can be attributed to its sequestration in the tissues and hence a slow uptake into plasma and also the rise in alpha globulins after surgery which binds the drug molecule and leaves less unbound drug to cause toxicity.

- Vendittoli et Al measured plasma levels in 22 patients receiving 400 mg Ropivacaine peri-articularly and all the plasma levels measured were lower than 1.5 micrograms/mL. Some studies have reported mild central nervous system toxicity at 1.5 micrograms/mL but this was after **intravenous** administration.
- Wiedermann et Al reported no symptoms of systemic toxicity after epidural administration with plasma concentrations of 6.08 micrograms/mL.
- Burm et Al reported a very high total plasma ropivacaine concentration (7.1 micrograms/mL ) with no systemic adverse effects during 72 hours of epidural ropivacaine infusion.
- Wulf et Al reported no symptoms of toxicity with a cmax of 3.7 micrograms/mL after iliohypogastric block
- Petterson et al evaluated wound infiltration of ropivacaine for hernia repair surgery with 375 mg of ropivacaine. The highest recorded maximum plasma concentration was 3.0 micrograms/ mL with no evidence of systemic adverse events.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### Appendix 5

### Peri-operative medications

**STAT** dose of Gabapentin 300mg (Omit in those with renal impairment)

PLUS Paracetamol 1g PO pre-op

#### Post op Caledonian medications

**Regular** – NB if patient on regular opiates pre-admission ask pain team for advice

Paracetamol 1g PO qds

Gabapentin 300 mg bd for 3 - 5 days – **Omit in renal impairment** – for individual assessment)

**(100 mg bd in >70 years)** (Stop on discharge or before if drowsy)

Oxycontin MR tablets 10 mg bd – review need at 48hours max course 3 – 5 days  
**(5mg bd in >80 years/renal impairment (eGFR < 30mL/min))**

Ibuprofen 400 mg tds (If NSAIDS tolerant – i.e. no recent history of NSAID induced asthma;

GI problems; renal impairment or heart failure)

Laxatives if necessary – Senna 15mg ON and Lactulose 10mL BD

→ **Then after 5 days** or on discharge stepdown analgaesia

Codeine phosphate 30 - 60mg qds or dihydrocodeine 30mg 4-6 hourly

### PRN

Oramorph (morphine sulphate 10mg/5mL solution) 5 -10 mg prn 2 hourly for breakthrough pain

(5mg prn 2 hourly > 80 years)

(2.5-5 mg prn 4hourly if eGFR <15mL/min and titrate according to response)

Cyclizine 50mg TDS po/im/iv prn

Ondansetron 4mg bd/tds po/iv prn (maximum of 2 doses)

Ephedrine 30mg PO prn (for dizziness on attempting to mobilise as per protocol. No history of IHD and Hb > 8.0g/dL)

Please also prescribe sc/im morphine 5mg max 4hourly prn for escape analgesia

#### On discharge

### Gabapentin and Oxycontin must be stopped

Codeine phosphate 30-60mg QDS initiated if not already

→ Dihydrocodeine 30mg 4-6hourly as alternative if necessary

Laxatives if necessary – Senna 15mg ON and Lactulose 10mL BD



## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

Appendix 6

### Information for nurses and junior doctors looking after patients with Local Anaesthetic Infusions for knee and hip replacements as part of the Enhanced recovery Programme

Your patient has had a catheter inserted into their joint by the surgeon. He/she has had 150-200 mLs of 0.2% Ropivacaine injected around the joint at the time of surgery and we are infusing 5-8 mLs/hour of Ropivacaine 0.2% via the wound infusion catheter for 24 hours postoperatively.

#### The potential benefits are:

##### 1) Good pain relief

Most patients receive excellent pain relief from this method. It is thought that the blocking of noxious stimuli from the start (with the combination of spinal anaesthesia followed by the local anaesthetic infiltration and infusion) prevents central nervous system sensitisation. This often results in patients requiring minimal pain relief throughout their post-operative period.

Some patients may require a top-up bolus of local anaesthetic solution last thing at night or in the morning before physiotherapy. (Some may require a top-up bolus in recovery. If this is the case call the patients anaesthetist) The McKinley pump is programmed so that 2 or 3 post-operative boluses can be given by an anaesthetist. If you feel your patient needs a bolus please inform the enhanced recovery sister on bleep 1233, in working hours, or the anaesthetic registrar on 0900 at night.

The local anaesthetic infusion is one part of a multimodal technique which includes a cocktail of drugs. These are:

- a) **gabapentin** – this is thought to prevent the pain associated with cut nerves (neuropathic pain). It is used commonly in chronic pain and is now gaining in popularity in post-operative pain. It can make the patient sleepy so it may need to be stopped if your patient seems sedated.
- b) **Oxycontin** - this is the controlled-release formulation of oxycodone (oxynorm). Oxycodone is a synthetic opioid and is popular in enhanced recovery programs because of its quick and reliable onset. Oxycontin gives peak pain relief in approximately 45 minutes and the effects last for 12 hours. The controlled release formulation Oxycontin is given twice a day. Any breakthrough pain can be treated with standard oxycodone (oxynorm) or oromorph. (We have chosen oromorph preferentially because it only requires one nurse to administer it). If for some reason the patient can't take oral morphine they can have intramuscular morphine. Oxycodone has the same side effects as other opiates and so nausea and vomiting, sedation and respiratory depression may occur.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

- c) **Paracetamol/ibuprofen.** Patients will be prescribed both these drugs regularly (unless they are intolerant of NSAIDs or have renal problems) Please give these tablets regularly whether the patient is in pain or not.

Some patients are reluctant to take pain-killers if they are not in pain but explain to them that it is better to STOP the pain breaking through and then having to have morphine and all its side-effects.

It is very important the patient receives their oxycontin/paracetamol/ibuprofen on time as it is much easier to prevent pain than treat it once it has broken through.

- d) **Temazepam/Zopiclone** Some enhanced recovery programmes prescribe these drugs on the first and second post-operative night to help patients sleep It is felt that the more rested a patient is the more refreshed they will be in the morning for their mobilisation. If you feel your patient would benefit ask the doctor to prescribe it.
- e) **Lactulose** Please ensure that the patient has an aperient written up.

### 2) Good mobility

Unlike epidurals or femoral nerve blocks these infusions do not impair the patients ability to weight bear.

These patients are mobilised four hours after the operation and three times a day thereafter.

Providing that the patient's systolic blood pressure is within 10% of its pre-operative reading the patient will be mobilised four hours after surgery (Day 0)

On the first post-operative day and thereafter, if a patient feels dizzy on attempting to mobilise, or their BP drops to below 80 mmHG systolic im ephedrine 15mg can be given and mobilisation is attempted again after 30 minutes ( Provided that their Hb is greater than 8 g/dl)

Early mobilisation after joint surgery results in a better long term outcome, reduced risk of thromboembolism and possibly infection. Early mobilisation also leads to reduced length of hospital stay. If all is well these patients can go home on the 4<sup>th</sup> post-operative day.

### 3) No effect on blood pressure or respiration

These patients can have standard post-operative observations i.e hourly for 8 hours post-op and four hourly thereafter

### 4) Less nausea and vomiting

These patients have received little or no opiates and therefore less prone to nausea and vomiting. They are also less sedated.

## Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement

### 5) Reduced need for intravenous infusions/drains /urinary catheters etc

Generally the surgeon does not insert a drain.

The aim is to discontinue the intravenous infusion as soon as possible (I.V access is maintained)

Unlike with epidurals or spinal opiates, patients with local anaesthetic infusions should not need a urinary catheter. However, urine output should be monitored closely. If a patient has not passed urine 12 hours after their operation then a bladder scan should be performed and, if necessary the patient should be catheterised.

### 6) Patients can be encouraged to return to “normal” as soon as possible

These patients feel better because of the absence of drains, drips, catheters. Also with less sedation and nausea (hopefully!) we can encourage these patients to wear their own clothes, eat at a table instead of in a bed, go to the toilet instead of using a commode etc.

7) **Chronic pain patients** ( i.e patients who have been taking opiates for some time prior to the operation) are managed differently. Many of these patients will have a pre-operative plan written in the notes from when they were seen at the pre-assessment clinic. Generally chronic pain patients should still receive the intra-articular wound infusion but they should be prescribed Patient Controlled Analgesia ( PCA) rather than the Oxycontin tablets. This is because these patients have unpredictable analgaesic requirements. They may also require large amounts of oromorph after the PCA has been discontinued. These patients should also continue their pre-existing opiates into the post-operative period. It is most important that analgesia patches stay in place and are re-applied as prescribed. If in doubt please contact the Enhanced Recovery Sister on bleep 1233 within normal working hours.

8) **Sleep apnoea patients-** These patients receive the intra-articular Ropivacaine infusion but should have a Patient Controlled Analgesia device instead of the Oxycontin. If their sleep apnoea is severe they should be managed on HDU.

### Potential Hazards:

#### 1) Wound catheter migrating

Please check to see if the wound catheter has been properly secured. It should be under a transparent adhesive dressing.

#### 2) Local Anaesthetic toxicity

All the published studies suggest that local anaesthetic toxicity is very unlikely to occur .It is no more likely with epidural infusions.

## **Trust Guideline for the Enhanced Recovery Programme for Total Hip and Total Knee Replacement**

However the signs of local anaesthetic toxicity are:

- a) numbness and tingling around the mouth
- b) confusion/vagueness/restlessness
- c) twitching.

If any of the above signs occur- stop the infusion immediately and contact the anaesthetist.

Monitor NIBP, oxygen saturation and heart rate.

If cardiac arrest occurs commence CPR drill. Ensure that intralipid is available on the cardiac arrest trolley as this is a specific antidote to local anaesthetic toxicity.

Written by:  
Dr Lindsay Barker  
Consultant Anaesthetist  
NNUH  
April 2010