Regional anaesthesia for orthopaedic procedures

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Abstract

Regional anaesthesia is apposite for orthopaedic surgery for anatomical reasons and to reduce complications from general anaesthesia. A reduction in pain scores, drowsiness and nausea can improve postoperative mobility and facilitate earlier hospital discharge. Disadvantages include block failure, nerve injury, possible loss of motor function and proprioception and local anaesthetic toxicity. Complications are rare but may be reduced by the use of ultrasound and nerve stimulation, performing the block on a conscious patient and stopping injection if there is pain or high resistance. Patients should be assessed preoperatively to rule out contraindications such as local infection or coagulopathy, and clear explanations of the procedure and any possible complications should be given. Patients should also be assessed postoperatively and any suspicious findings investigated promptly and followed up until there is complete resolution.

Keywords Analgesia; nerve injury; orthopaedic surgery; peripheral nerve block; regional anaesthesia; ultrasound

Royal College of Anaesthetists CPD Matrix: 2G01, 2G02, 2G03, 2G04

Learning objectives

After reading this article, you should:

- understand the uses and benefits of regional anaesthesia
- know the contraindications for regional anaesthesia
- understand patient preparation and monitoring for performing regional anaesthesia
- understand the different techniques for performing regional blocks
- be able to describe commonly performed blocks used in orthopaedic surgery
- be familiar with complications and their management

Introduction

With the exception of spinal surgery, almost every orthopaedic surgical procedure can be carried out under or supplemented with a regional local anaesthesia block. With the increasing emphasis on day case surgery, enhanced recovery protocols and a growing body of evidence to support improved outcomes, the role of regional anaesthesia is becoming increasingly important. Used in isolation for anaesthesia, and in combination with sedation or general anaesthesia, it has many advantages. Many patients undergoing orthopaedic surgery are elderly and have comorbidities such as hypertension, respiratory impairment, obesity or difficult airway such that regional anaesthesia can be a very useful option. It is associated with less airway manipulation, fewer cardiorespiratory depressant drugs, reduced acute postoperative delirium, reduced nausea and vomiting and improved analgesia. Uncontrolled pain in the postoperative period can also impair mobilization and decrease the utilization of physiotherapy. A multimodal approach of regional blocks and systemic analgesia provides the best balance of satisfactory analgesia and side effects. Regional anaesthesia may also prevent or diminish the development of chronic pain syndromes as it reduces sensitization of the central nervous system after acute tissue injury. The advantages of regional anaesthesia are set out in Box 1.

Disadvantages to regional anaesthesia (Box 2) include block failure, nerve injury and local anaesthetic toxicity. Contraindications are listed in Box 3.

What are the risks associated with performing regional blocks?

Direct damage

There may be inadvertent damage to the nerve or surrounding tissue by the needle. Depending on the location of the block, neurological injury after peripheral nerve block can range from 0.03% for supraclavicular to 0.3% for femoral nerve to 3% for interscalene blocks. Intra-neural or injection directly into the spinal cord can cause direct damage to the nervous tissue. Vascular injury may result in a haematoma with subsequent damage due to tissue compression. The brachial plexus lies close to many vascular structures and the risk of pneumothorax during supraclavicular blocks is also high due to the proximity of the parietal pleura.

Advantages of regional anaesthesia

- Less airway manipulation and cervical spine movement
- Better postoperative respiratory function
- Reduced physiological stress
- Reduced postoperative delirium
- Reduced postoperative nausea and vomiting
- Reduced blood loss (central neuroaxial techniques)
- Improved mobility and functional recovery postoperatively
- Reduced risk of deep vein thrombosis (central neuroaxial techniques)
- Facilitates patient communication
- Reduction in chronic pain syndromes
- Lower cost than general anaesthesia
- Decreased recovery room and hospital stay

Box 1

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Complications and disadvantages

- Intrinsic failure rate and technical difficulties
- Damage to surrounding structures
- Intravascular injection
- May not cover the whole operative area
- Sudden block recession with rebound pain
- Postoperative injury to the anaesthetized limb due to loss of sensation and proprioception or difficulty walking
- Local anaesthetic toxicity

Box 2

Contraindications to regional anaesthesia

- Patient refusal
- Confused/uncooperative patient
- Infection at point of injection
- Allergy to local anaesthesia

Specific to central neuroaxial blockade

- Raised intracranial pressure
- Uncorrected hypovolaemia/cardiac failure/hypotension
- Aortic stenosis/fixed cardiac output state

Relative contraindications

- Anticoagulation/coagulopathy
- Existing neuropathy
- Need to monitor neurologic function postoperatively e.g. compartment syndrome, or risk of intraoperative nerve injury

Box 3

Maximum dose of commonly used local anaesthetics

Local anaesthetic	Safe dose alone (mg/kg)	Safe dose with adrenaline (mg/kg)
Lignocaine	3	7
Levo-bupivacaine	2	2.5
Ropivacaine	3	4
Prilocaine	6	9

True local anaesthetic allergy is rare.

Table 1

Acceptable time after drug administration for CNB performance (adapted from AAGBI guidance Nov 2013)

Drug	Advice
NSAIDs (aspirin, diclofenac)	No additional precautions
Thienopyridines	Stop clopidogrel and prasugrel for 7 days
Dipyridamole	No additional precautions
GPIIb/IIIa receptor antagonists	Stop abciximab for 48 hours Stop eptifibatide and tirofiban for 8 hours
Unfractionated heparin-i.v.	Stop infusion for 2–4 hours and check APTT has returned to normal. Check platelets for HIT
Unfractionated heparin-s.c.	Wait 4–6 hours after last dose or check APTT is normal
Low molecular weight heparin	Prophylactic dose – wait 12 hours Therapeutic – wait 24 hours
Fondaparinux	Prophylactic – wait 36 hours (consider anti Xa levels) Therapeutic – Avoid
Danaparoid	Avoid
Warfarin	Stop for 4–5 days until INR is < 1.5
Oral thrombin blockers – Dabigatran	Creatinine clearance > 80 mls/minute 24 hours Creatinine clearance 50–80 mls/minute 72 hours Creatinine clearance < 50 mls/minute 96 hours
Direct Xa inhibitors – Rivaroxaban	Prophylactic 18 hours Treatment 48 hours

i.v., intravenous; NSAIDs, non-steroidal anti-imflammatory drugs; s.c., subcutaneous

Table 2

Risks associated with injectate

High volumes of local anaesthetics may be required for an adequate block. Miscalculation of maximum dose or inadvertent intravascular injection can lead to local anaesthetic toxicity including seizures and cardiovascular collapse (see Table 1 for maximum doses of local anaesthetics).

Injection into the wrong place, for example intra-thecal injection during epidural or interscalene block can lead to a total spinal block, causing rapid loss of consciousness and cardiorespiratory arrest.

With central neuroaxial blockade, sympathectomy can result in hypotension and bradycardia, especially if there is hypovolaemia. Post dural puncture headache occurs in approximately 1% of people and can be reduced with smaller and 'pencil point' needles. Introduction of infection into the epidural or dural space can, rarely, lead to meningitis or abscess formation.

Patients on anticoagulant drugs

There is no set guidance for the risks of performing peripheral nerve blocks in patients on anticoagulant drugs; however, the risks are likely comparatively less than with central neuroaxial blockade (CNB). In order to help guide decision making, it may be prudent to divide blocks into deep and superficial, and those with a high risk of venous or arterial puncture. When a catheter is used, the same guidance as for CNB should be used (Table 2).

Choosing the right patient

Ensure your block is appropriate for both the surgery and the patient. For surgical anaesthesia, ensure that your block will

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