

Regional anaesthesia for orthopaedic procedures

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Abstract

Regional anaesthesia is well suited to orthopaedic surgery for anatomical reasons and can reduce complications from general anaesthesia. A reduction in pain scores, drowsiness and nausea can improve postoperative mobility and facilitate earlier hospital discharge. Disadvantages to regional anaesthesia include block failure, nerve injury and local anaesthetic toxicity.

Complications are rare but can 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 be seen postoperatively and any suspicious findings should be investigated promptly and followed up until there is complete resolution of symptoms.

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

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

Introduction

With the exception of spinal surgery, almost every orthopaedic surgical procedure can be carried out under or supplemented with a regional block. With the increasing emphasis on day case surgery 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 orthopaedic surgical patients have multiple co-morbidities such as hypertension, chronic respiratory problems, obesity or difficult airway such that regional anaesthesia can be a very useful option. It is associated with less airway manipulation, fewer cardio-respiratory depressant drugs, less acute postoperative confusion, less postoperative nausea and vomiting and improved analgesia. Uncontrolled pain in the postoperative period can also impair mobilisation and decrease the utilisation of physiotherapy. A multimodal approach of regional blocks and systemic analgesia provides the best balance

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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 needs for performing regional anaesthesia
- understand the different techniques for performing regional blockade
- be able to describe commonly performed blocks used in orthopaedic surgery
- be familiar with postoperative complications and their management

of satisfactory analgesia and side effects. Regional anaesthesia may also prevent or diminish the development of chronic pain syndromes as it reduces the 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 injection or injection directly into the spinal cord can cause direct damage to the nervous tissue or 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 confusion
- 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

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

Risks associated with injectate (Table 1, Box 4)

High volumes of local anaesthetics may be required for an adequate block. Miscalculation of maximum dose or inadvertent vascular injection can lead to local anaesthetic toxicity including seizures and cardiovascular collapse.

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. True local anaesthetic allergy is rare.

Patients on anticoagulants (Table 2)

There is no set guidance for the risks of performing peripheral nerve blocks in patients on anticoagulant drugs; however the risks are likely to be 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, perhaps the same guidance as for CNB should be used.

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 neurology 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

Table 1

Choosing the right patient

Ensure your block is appropriate for both the surgery and for the patient. Performing a block on a trauma patient may benefit pain scores, but may also mask the early signs of compartment syndrome. For surgical anaesthesia, ensure that your block will cover all necessary areas of the surgical field, including the tourniquet, and has sufficient time to be effective.

As with any anaesthetic, a full history and systemic review should be taken with extra focus on any coagulation disorders, anticoagulant therapy, neurological disorders and previous regional blocks. A full physical examination should include a neurological examination of the limb to be anaesthetised, and any pre-existing deficits noted and documented. Ensure that your patient is cooperative and will be able to lie still in the correct position for the duration of surgery.

Evaluate the risks and benefits and make sure you have had a full discussion with your patient beforehand. The sequence of events should be discussed and it should be explained to the patient that they might feel touch but not pain to avoid the patient panicking when surgery begins. Advice regarding keeping the anaesthetized limb away from extremes of heat and safe from excessive force or pressure should be given. The patient should understand that, as the block wears off, they will feel pain and pre-emptive analgesia should be given rather than waiting for this to become intolerable.

Specific risks and consequences of the block should be explained, for example Horner’s syndrome, a hoarse voice and difficulty coughing (phrenic nerve paralysis) with an interscalene

Recommendations for local anaesthetic use

- For surgical anaesthesia and rapid onset, use 1–2% lignocaine or prilocaine
- For prolonged postoperative analgesia, use levo-bupivacaine or ropivacaine
- Ensure you can see the spread of local anaesthetic if using ultrasound. If not, it may be intravascular
- Stop injection after every 5 ml to aspirate and check for intravascular injection
- Slow incremental injection of the local anaesthetic usually allows for signs of systemic toxicity to be detected before cardiorespiratory arrest occurs
- Stop injecting and reposition the needle if the patient complains of pain or if resistance is felt
- Never exceed the maximum dose of local anaesthetic

Box 4

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