Sciatic nerve block: A useful procedure for diabetic foot surgery

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Article points

1. Patients requiring surgery for the management of diabetic foot ulceration have a range of comorbidites that increase the risks associated with general anaesthesia.
2. The authors describe the use of sciatic nerve block as an alternative to general anaesthesia.
3. A range of benefits to the patient are associated with eliminating the need for general anaesthesia in the presence of comorbidites.
4. The authors suggest that those involved in diabetic foot surgery consider the use of nerve block techniques as an alternative to general anaesthesia for suitable patients.

Keywords

- Amputation
- Comorbidity
- General anaesthesia
- Nerve block

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The range of comorbidities experienced by people who require lower-limb surgery to manage diabetic foot disease are many. These comorbidites make the undertaken of general anaesthesia both difficult and places them at high risk of complications during surgery or in the immediate post-operative period. In this article the authors present a description of a peripheral nerve block procedure as an alternative to general anaesthesia in patients undergoing lower-limb surgery. Two case reports are also presented.

People with diabetic foot disease regularly have severe comorbidities resulting in a high-risk profile for anaesthesia (American Diabetes Association, 2003; Prompers et al, 2007). General anaesthesia and neuroaxial blockade (e.g. spinal anaesthesia) may impair hemodynamic stability. In people with diabetes who require podiatric surgery, peripheral nerve blocks targeting at the sciatic nerve may be a useful alternative to general anaesthesia (Horlocker et al, 2006; Kocum et al, 2010).

The authors provide a detailed description of the sciatic nerve block technique, and two case reports.

Practical procedure

While in supine position, the sciatic nerve is identified by electric nerve stimulation through a lateral approach with an insulated needle being inserted at the middle of the patients' thigh (*Figure 1*). The correct position of the needle (we use NanoLine 22 g × 80 mm; Pajunk®, Germany) is confirmed by electric nerve stimulation. The electrical nerve stimulator (we use Stimuplex HNS 11®; Braun, Germany) produces an electrical current that depolarises the nerve membrane and causes contraction of the effector muscles of the relevant area. This confirms the proximity of the needle to the nerve. Foot flexion at 0.1 ms and 0.4 mA indicates adequate motor response and 40 mL of local anaesthetic (e.g. ropivacaine 0.5% or lidocaine 1.5%) are injected. If technical equipment and expertise are present, the sciatic nerve may also be localized by ultrasound.

Some regions of the lower leg belong to the saphenous nerve, which is the terminal branch of the femoral nerve. In order to achieve complete anaesthesia of the lower leg, this nerve has to be blocked by additional 10 mL of local anaesthetic (e.g. ropivacaine 0.5% or lidocaine 1.5%). Because the saphenous nerve only consists of sensory fibres, electric nerve stimulation may result in painful paraesthesia and is

Figure 1. Patient position and needle insertion for a sciatic nerve block.

Figure 2. The saphenous nerve is block by injecting a subcutaneous wall from the tuberositas tibia [1] to the medial caput of the gastrocnemius muscle [2].

counterproductive. It is sufficient to inject into the subcutaneous wall reaching from the tuberositas tibiae to the medial caput of the gastrocnemius muscle (*Figure 2*). However, the saphenous nerve can also be identified by ultrasound. Sufficient surgical anaesthesia is achieved 10–15 minutes after completion of injection. Characteristics of the block are related to the type of local anaesthetic used; lidocaine blocks have a fast onset and last from 2 to 3 hours, while ropivacaine blocks have a slower onset but regularly last >10 hours (Heavner, 2007). It is therefore suggested that lidocaine and ropivacaine be combined to achieve both fast onset and a long duration. With a sufficient block, additional post-operative pain control can usually be dispensed with.

Using this block technique does not impair the patient's protective reflexes (e.g. coughing, swallowing), meaning that there is no need for post-operative fastening and, for this reason, may make inpatient glycaemic control more manageable.

Case studies

As outlined before, diabetic patients regularly suffer from severe comorbidities, which contribute to a high risk profile according to American Society of Anesthesiologists patient classification status III (severe systemic disease – i.e. definite functional impairment [e.g. diabetes and angina with relatively stable disease, but requiring therapy]) or IV (severe systemic disease that is a constant threat to life [e.g. diabetes and angina and chronic heart failure; patient has dyspnea on mild exertion and chest pain]; American Society of Anesthesiologists, 2012).

Hence, surgical procedures to manage diabetic foot disease should be undertaken with a careful consideration of the anaesthetic techniques available. Regrettably, there is a widely held belief – among both patients and healthcare professionals – that all surgical procedures require general anaesthesia. In the authors' practice, the nerve block anaesthesia described above has

proven a useful addition to the management of some patients requiring surgery to manage diabetic foot disease. The following case reports illustrate the benefits of peripheral nerve blocks in this patient group.

Case 1

A 72-year-old man was scheduled for below-knee amputation due to infected diabetic foot ulceration. The patient had long-standing insulin-dependent diabetes (IDDM), renal insufficiency and severe coronary artery disease. He had a history of myocardial infarction during a femoro–popliteal bypass surgery, which led to intraoperative cardiopulmonary resuscitation. Given the patient's history general anaesthesia was not recommended. Due to absolute arrhythmia associated with atrial fibrillation, he was anticoagulated with high-dose enoxaparin and therefore spinal anaesthesia was contraindicated.

Following discussion, the patient consented to regional anaesthesia and the authors' team blocked the sciatic and the saphenous nerve as described above. Beside light sedation with 0.5 mg of midazolame he received no other systemic substance.

The surgery was uneventful with a heart rate between 60 and 80 beats/min and a

noninvasive blood pressure of 130/60 mmHg throughout. Postoperatively the patient was transferred to his normal ward to take lunch.

At 1-year follow-up the patient was doing well, with no major documented events.

Case 2

A 77-year-old man with a history of long-standing IDDM, renal insufficiency and arterial hypertension, was scheduled for forefoot amputation due to infected diabetic foot ulceration. The patient's left ventricular ejection fraction was significantly reduced (15%). Spinal anaesthesia (with possibly deleterious preload reduction) and general anaesthesia (with possibly hazardous positive-pressure ventilation) seemed unfavourable interventions.

The patient consented to a regional anaesthesia and the authors' team undertook the block described previously. Again, beside moderate intravenous sedation during the blocking procedure with midazolame and sufentanil (1 mg and 0.01 mg, respectively) no additional systemic medication was required. Surgery was uneventful, heart-rate ranged between 75 and 85 beats/min; blood pressure was stable at 130/80 mmHg.

Following the amputation, the patient was transferred to his normal ward.

At 1-year follow-up the patient was doing well, with no major documented events.

Discussion

The authors' experience indicates that people with diabetes may benefit from peripheral nerve blocks for surgical procedures of the lower leg. The authors' experience corresponds with previous investigations (Chia et al, 2002; Raith et al, 2008). Avoiding general anaesthesia in this population may be a central concern, and improve short-term outcomes following lower-limb surgery.

As long-standing diabetes impairs various body systems, these patients have low reserves to preserve against additional straining factors during general anaesthesia (Chance et al, 2008; Faglia et al, 2009). This includes:

- Preserving cardiopulmonary integrity, which is negatively influenced by positive-pressure ventilation during general anaesthesia (Pinsky, 1994).
- Negating the need for anaesthetic agents that reduce vascular tone and increase the need for vasopressive substances, which may impair capillary blood flow.
- Insufficient metabolic and excretory capacities may cause extended effects of muscle relaxants, inhalants and opioids, thereby impairing the early postoperative recovery period (Bower et al, 2012). The latter two additionally reduce the integrity of the immune system (Brand et al, 1997). Combinations of these factors are suspected to be responsible for increased pulmonary complications in people with diabetes (Morricone et al, 1999).

With the use of peripheral blocks, the drawbacks of general anaesthesia are not only omitted, but additional benefits added:

- By contrast to signal transduction under general anaesthesia, blocking a peripheral nerve means that afferent signals are stopped before they cause efferent endocrine stress responses (Kehlet, 1998).
- Patients do not require postoperative fasting, so that continued oral medication and nutrition may help in preserving blood glucose homeostasis during this vulnerable period (McCavert et al, 2010).

Conclusion

Healthcare professionals who are involved in surgical procedures of the lower limbs in vulnerable patients with diabetes may consider the use of peripheral nerve block in stead of general anaesthesia, in those in whom it is appropriate. ■

Authors

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