Digital nerve blocks

Introduction

The ability to obtain digital nerve blockade is a valuable tool in the armamentarium of the emergency practitioner. As well as providing reliable, effective analgesia it is simple to perform and therefore is commonly implemented for a variety of surgical problems involving the digits.

Digital anatomy

The sensory supply of each digit is provided by four nerve branches, two volar (palmar) and two dorsal (*Figure 1*).

- The volar supply of the little and ulnar half of the ring finger is derived from the common digital branches of the ulnar nerve. The median nerve supplies the common digital nerve branches to the remaining digits. In the region of the distal palmar crease, the common digital nerves divide into radial and ulnar branches supplying each digit, running either side of the flexor tendons, with the digital arteries, in the neurovascular bundles.
- The smaller dorsal digital nerves branch off from the radial and ulnar nerves and run along the dorsolateral aspect of each digit.

Indications

Digital nerve blocks are commonly required in the emergency setting, and can also be used in elective procedures, including:

- Wound debridement and repair of lacerations
- Reduction of fractures and dislocations
- Nailbed repairs
- Diagnosing ligament ruptures, e.g. skier's thumb
- Nerve repairs.

Equipment required

- 10 ml syringe
- 25- or 27-gauge needle
- 10 cm x 10 cm gauze
- Antiseptic: povidone-iodine or chlorhexidine
- Local anaesthetic (see below).

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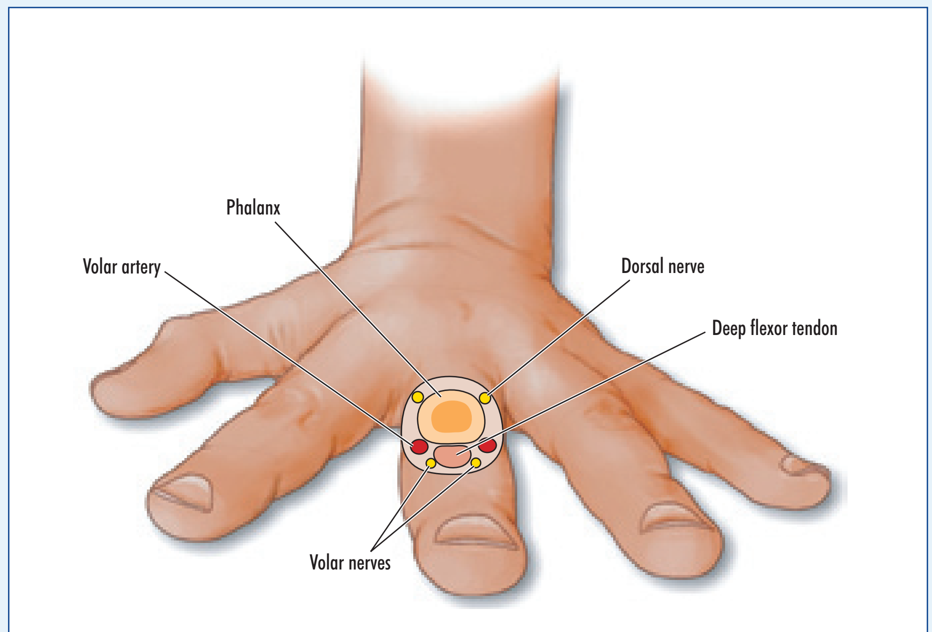


Figure 1. Digital anatomy.

Local anaesthetics

There are two commonly used local anaesthetics, which have different characteristics (*Table 1*). A combination of quick onset and prolonged analgesia can theoretically be achieved by using a 1:1 mixture of lidocaine 2% and bupivicaine 0.5%; however, in practice, bupivicaine alone can induce anaesthesia in a similar space of time (Valvano and Leffler, 1996). Patients should be made aware of initial pain of the injection; this can be minimized by warming and/or alkalinizing the infiltrate (Waldbillig et al, 1995; Cornelius et al, 1996).

Method

Conventional dorsal approach

The conventional dorsal approach is the most widely used method for obtaining digital anaesthesia (*Figure 2*).

- The patient's hand is placed on a firm surface in the prone position (palm down).
- Use an aseptic technique with gloves and antiseptic solution.
- Insert the needle on one side of the extensor tendon, proximal to the web space, and create a skin wheal using 1 ml of the anaesthetic (lidocaine 2%, bupivicaine 0.5%, or a 1:1 mixture) over the dorsum of the extensor tendon.
- Without withdrawing the needle, redirect it and advance the needle towards the volar aspect of the distal web space without puncturing the volar skin.
- Aspirate before infiltration to prevent intravascular injection. Insert a further 2 ml of solution to block the volar supply.
- Then withdraw the needle and introduce through the skin wheal created initially and advance to block the remaining volar digital nerve on the other side of the digit.

Transthecal block

The disadvantage of the conventional technique described above is that multiple

Table 1. Local anaesthetics for digital nerve blocks

Local anaesthetic	Maximum dose (mg/kg)	Time to onset (min)	Duration of action (hours)
Lidocaine	4.5	10 –15	1–1.5
Bupivicaine	2	15–30	6–8

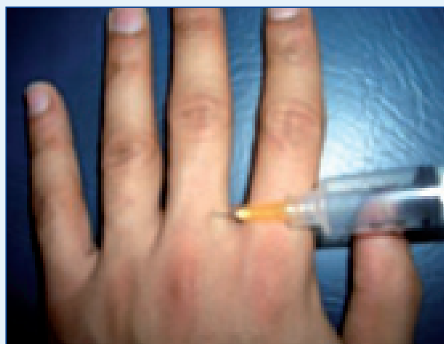
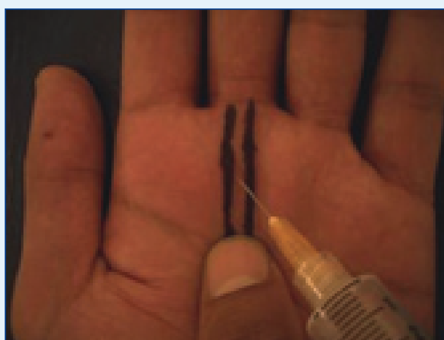


Figure 2. Conventional dorsal approach.

injections are required for each digit that requires anaesthesia. This is both painful for the patient and there is the risk of gangrene ensuing by administering excessive solution into a confined space creating a circumferential block. The transthecal block avoids this by injecting 2–3 ml of anaesthetic into the flexor tendon sheath with one single injection (*Figure 3*). The transthecal technique has been proven to be as effective as the conventional method in lessening the perception of pain (Cummings et al, 2004). Of note, this technique is contraindicated if the patient is anticoagulated.

- The patient's hand is placed on a firm surface in the supine position (palm up) and the affected digit is flexed and extended so that the flexor tendon can be palpated as it glides over the metacarpal heads, at the level of the distal palmar crease.
- Use an aseptic technique with gloves and antiseptic solution.
- Pierce the palmar skin sharply through the subcutaneous tissue into the flexor tendon sheath. If the flexor tendon itself has been entered instead, a difference in consistency will be apparent and it will be difficult to inject into the tendon substance itself; as the needle is slowly withdrawn, the solution will flow easily once in the space between the tendon and its sheath.
- While injecting, the operator should maintain the thumb of his/her opposite hand on the flexor tendon, proximal to the injection site, in order to direct the flow of the anaesthetic distally.
- After 5 minutes, adequate anaesthesia of the whole digit should be achieved (Chiu, 1990).

Figure 3. Transthecal block.



Aseptic precautions must be adhered throughout to prevent a flexor sheath infection.

Complications

As with any procedure there is risk of complications with digital nerve blocks.

- Intravascular injection can cause systemic effects of the anaesthetic, including the possibility of convulsions and arrhythmias. In practical terms, the total amount of local anaesthetic that is required to provide an effective blockade is far less than the toxic limits, and can be avoided by aspirating before injecting.
- Haematomas can be minimized by using a 27-gauge needle and by avoiding multiple skin punctures.
- Gangrene can ensue if a circumferential block is used around a digit. Although it is notoriously thought that the addition of epinephrine to local anaesthetic can cause gangrene, tissue death can actually occur in the absence of a vasoconstrictor. This is because the ensuing oedema following injection acts as a tourniquet in such a confined space and causes vascular compromise. Indeed, there is no clinical evidence to confirm the theoretical risk of gangrene from the use of epinephrine as an adjunct to local anaesthetic, as demonstrated in several studies (Wilhelmi et al, 2001).
- Neural injury can result in residual paraesthesias if the nerve is inadvertently penetrated. It is important to discontinue injecting if the patient complains of sharp pain or there is resistance upon infiltration.
- Infection is rarely caused by nerve blockade when an aseptic technique is used.

Conclusions

An understanding of the anatomy, the resources required coupled with instruction and guided practice will result in the development of confidence and competence in obtaining digital nerve blockade. **BJHM**

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KEY POINTS

- Digital nerve blockade is simple, safe and effective.
- Document the sensation before infiltration with local anaesthetic.
- There is more than one method of application; you should choose the approach that you feel most comfortable with.
- Warming and alkalinization of the local anaesthetic with sodium bicarbonate can reduce pain on infiltration.
- Always dispose of sharps or needles immediately in an appropriate waste disposal unit.