

Reducing patient discomfort during digital blockade: The subcutaneous single injection digital block – A simple, safe and fast procedure

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BACKGROUND: Regional anesthesia of a single finger is commonly achieved by the traditional ring block, which requires at least two painful injections in the digit. Single injection digital block techniques have been described to avoid this problem. Among these, the subcutaneous technique described by Harbison appears to be safe and to allow most procedures to be carried out with good tolerance.

OBJECTIVES: A prospective study was designed to evaluate the results of the subcutaneous technique in terms of patient tolerance, distribution of anesthesia and efficiency.

METHODS: All blocks were performed by a single investigator. A visual analog scale was used to evaluate pain associated with the injection. Prick testing was used to evaluate the quality of anesthesia at the volar and dorsal aspects of the phalanges. Tolerance to the surgical procedure and the need for additional injections were also recorded.

RESULTS: This technique allowed surgery to be performed without complementary injection most of the time and was very well tolerated. The dorsum of the proximal phalanx, however, was unpredictably included in the anesthetized territory.

CONCLUSION: The subcutaneous single injection digital block is safe, efficient and easy to perform. It allows the treatment of all conditions on the volar aspect of the finger and on the dorsal aspect of the distal and middle phalanges. For surgery on the dorsal aspect of the proximal phalanx, a combined single injection technique or a supplementary dorsal block should be used.

Key Words: *Digital block; Finger; Single injection*

Regional anesthesia of a single finger is commonly achieved by the traditional ring block, which requires the injection of an anesthetic solution on each side of the base of the digit and on the dorsum of the first phalanx. Its major drawback is the need for at least two painful injections that are a source of discomfort to patients, particularly in stressful emergency situations or in children. Other techniques have been described to avoid these injections. In 1990, Chiu (1) proposed a single volar transthecal injection that uses the flexor sheath for infusion of the anesthetic solution. His technique was simplified by Whetzel et al (2), who use the proximal digital crease as a visual landmark for injection. Harbison (3) proposed a subcuta-

Anesthésie du doigt par une seule injection sous-cutanée : Technique simple, sûre et efficace pour réduire la gêne associée à l'intervention

CONTEXTE : L'anesthésie régionale d'un seul doigt se réalise généralement par le traditionnel bloc en bague, qui exige au moins deux injections douloureuses. Il semblerait que les techniques d'anesthésie à une seule injection résoudraient le problème. Parmi celles-ci, la technique d'injection sous-cutanée décrite par Harbison serait sûre tout en permettant à la plupart des interventions d'être bien tolérées.

OBJECTIF : Étude prospective visant à évaluer les résultats de la technique d'injection sous-cutanée au regard de la tolérance, de l'étendue de l'anesthésie et de son efficacité.

MÉTHODE : Toutes les anesthésies en bloc ont été effectuées par le même chercheur. L'intensité de la douleur associée à l'injection a été évaluée à l'aide d'une échelle visuelle analogue. Un test par piqûre a servi à évaluer la qualité de l'anesthésie sur les faces antérieure et postérieure des phalanges. La tolérance à l'intervention chirurgicale et le besoin d'injections supplémentaires ont également été notés.

RÉSULTATS : Dans la plupart des cas, l'intervention a été très bien tolérée, sans recours à une injection supplémentaire d'anesthésique. Toutefois, le dos de la phalange proximale était compris de façon imprévisible dans le territoire anesthésié.

CONCLUSION : L'anesthésie du doigt par une seule injection sous-cutanée s'avère simple, sûre et efficace. Elle permet de traiter tous les troubles sur la face antérieure du doigt ou sur la face postérieure des phalanges médianes et distales. Quant aux interventions pratiquées sur la face postérieure des phalanges proximales, il faudrait recourir à une technique mixte à une seule injection ou à une anesthésie complémentaire du dos du doigt.

neous single injection digital block that does not violate the flexor tendon sheath but is still very efficient and straightforward to provide finger anesthesia. The only disadvantage reported by Harbison is that the dorsal digital nerves are not always anesthetized. Unfortunately, he did not report his results. The aim of the present study was to evaluate Harbison's technique in terms of patient tolerance, distribution of anesthesia and efficiency. Special attention was paid to the inclusion of the dorsal nerves in the anesthetized territory. The information obtained may help health professionals select the most appropriate technique of digital block, depending on the surgical site.

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TABLE 1
Characteristics of the study group

Number of patients	29
Number of digits	30
Index: Middle: Ring: Little	9:15:3:3
Number of digits with total anesthesia	12

MATERIALS AND METHODS

A prospective study was designed to assess the adequacy of finger anesthesia for common surgical procedures using the subcutaneous single injection digital block. A single investigator performed all blocks (Table 1). Because the anatomy of the digital sheath and the pattern of innervation in the thumb are different, only long fingers were included in the study. The hands to be anesthetized were prepared with antiseptic solution. Two-millilitre syringes (which will accept 3 mL) with 27G needles were used. Three millilitres of 2% adrenaline-free prilocaine were injected into the subcutaneous tissue at the level of the volar proximal digital crease (Figure 1). As described by Harbison (3), the flexor sheath is not reached by the needle because the injection is administered superficial to it. The needle tip can be directed alternatively toward the two pedicles to facilitate diffusion. Pain associated with the injection was measured on a visual analog scale using a 10 cm pain scoring device, the slide algometer. Large needle (18G) prick testing was used to evaluate the quality of anesthesia at the volar and dorsal aspects of the first, second and third phalanxes. Failure of the digital block was defined as no loss, or only partial loss of pain sensation at the operation or prick test site 15 min after the injection, or if supplementary injection was required to proceed with surgery. The types of surgical procedures performed are described in Table 2. All patients were reviewed within 72 h after the procedure and followed for a minimal period of two weeks.

RESULTS

Distribution of anesthesia

Thirty fingers in 29 patients were anesthetized using Harbison's method. Anesthesia of the entire finger was achieved in 12 cases and adequate partial anesthesia in 14 cases. Three patients required additional injection for surgery on the dorsal aspect of the finger and one for surgery on the pulp (Hueston's flap – one patient; extensor tendon surgery – two patients; Atasoy's V-Y advancement flap – one patient). The distribution of anesthesia is described in detail in Table 3.

Pain scores

Mean pain score was 2.75 for the subcutaneous block.

Tolerance to the surgical procedure

Patients' tolerance to the surgical procedure was excellent. Additional injections were required in four cases.

Complications

Neither hematoma nor infection was noted.

DISCUSSION

The traditional ring block involves injecting 2 mL of anesthetic solution on each side of the base of the digit. It requires two



Figure 1) *The needle is inserted perpendicular to the volar skin at the level of the proximal digital crease*

painful injections and a total of 4 mL of mixture. Single injection digital block techniques clearly have advantages over the traditional ring block, including single versus multiple injections, particularly in children and anxious patients, and a smaller volume of anesthetic used. Several authors have reported very good results using a transthecal technique, achieving anesthesia of the entire digit in more than 90% of their cases (1,2,4-6). Anesthesia of the dorsal nerves, however, has not been reported consistently (7). Violation of the flexor tendon sheath and puncture of the tendon with a fine needle appear to be of little consequence provided strict asepsia is respected, because no complications have been reported in more than 700 cases published in the literature. However, Low et al (8) report that 50% of the fingers anesthetized with the transthecal technique had pain at the site of injection 24 h later, compared with a rate of 0% in the subcutaneous group. This difference is related to the injury to the sheath or to the tendon itself. In the present series, no patient reported any symptom related to the injection the day following the procedure. In Harbison's subcutaneous technique, the injection is given in the subcutaneous tissue only, and allows the anesthetic agent to diffuse through the low resistance soft tissues around the

TABLE 2
Operative procedures

Operative procedure	Number
Tenoarthrolysis	1
Arthrodesis of finger joint	3
Joint infiltration	0
Extensor tendons surgery	4
Local flaps	2
Excision of finger tumors or foreign bodies	6
Nail surgery	7
Fracture osteosynthesis	2
Repair of digital nerve	1
Laceration debridement and repair	2
Amputation	2
Operation zone: dorsal	
proximal: middle: distal phalanx	1:3:20
Operation zone: palmar	
proximal: middle: distal phalanx	1:4:7

digital nerves. Sometimes, the anesthetic agent diffuses sufficiently far around the finger to anesthetize the dorsal nerves, but this is not reliable (3). Patients reported very acceptable pain scores, which demonstrates that one volar digital injection with a 27G needle is very well tolerated. Regarding the distribution of anesthesia, we found that the volar aspect of the digit can be anesthetized with a very high success rate with this technique. As reported elsewhere, inclusion of the dorsal nerves (corresponding chiefly to the dorsal aspect of the first phalanx) was not reliable (7). It should be kept in mind that the innervation pattern of the dorsal aspect of the fingers is highly variable, as reported by Bas and Kleinert (9). The sensory supply to the dorsum of the distal phalanxes and nail beds can arise from both the proper digital nerves and the dorsal sensory nerves (the terminal branches of radial or ulnar sensory nerves). Despite this, we have achieved good results in anesthetizing the dorsal aspects of the second and third phalanxes with only one injection. Nevertheless, most surgical procedures can be carried out perfectly even if the entire digit is not anesthetized. It is worth mentioning that even when the dorsal

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TABLE 3
Distribution of anesthesia

n=30	
Volar aspect of first phalanx	30
second phalanx	30
third phalanx	29
Dorsal aspect of first phalanx	12
second phalanx	29
third phalanx	28
Rate of full digital block	12 (40%)

aspect of the proximal phalanx was partially anesthetized or not anesthetized at all, the digital tourniquet was never a source of discomfort to the patient.

CONCLUSIONS

Harbison's technique (3) requires only one injection to anesthetize most of the digit, allowing surgery to be performed without additional injection most of the time. We did not find anesthesia of the dorsum of the proximal phalanx to be reliable or predictable. The single injection digital block requires a small amount of anesthetic mixture, is easy to perform and teach, and is extremely safe. Pain experienced on injection, as measured by an analog scale, is very acceptable to patients. Among equally effective single injection techniques, clearly the least invasive and potentially harmful one should be preferred as the first choice. We feel that the subcutaneous digital block described by Harbison allows for the treatment of all conditions along the volar aspect of the finger and on the dorsal aspect of the distal and middle phalanxes without the need to enter the flexor tendon sheath. Associated risks are, therefore, avoided and, thus, the subcutaneous digital block should be preferred to the transthecal techniques. Compartmental syndrome at the base of the digit is unlikely because the use of 2% prilocaine allows for the reduction of the volume injected to only 3 mL. If surgery has to be performed on the dorsal aspect of the proximal phalanx, we recommend either a combined single injection digital block or a supplementary dorsal block.

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