

# Outcome of Single Injection Volar Subcutaneous Block in Hand Surgery

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## ABSTRACT

**Aim:** To evaluate efficacy of single volar subcutaneous digital block in terms of onset and duration of anesthesia.

**Methods:** This descriptive study was conducted at Plastic and Reconstructive Surgery Department, Hayatabad Medical Complex Peshawar from Dec. 2009 to Dec. 2010. A total of 60 patients were included in the study. All patients had pathology distal to the first palmer digital crease like tumors, trauma, contracture, fractures etc. All the patients received the volar subcutaneous digital block. Efficacy of digital block was measured in terms of time of onset of anesthesia, which was the total time duration after administering local anesthetic to loss of pinprick sensation and total duration of anesthesia, which was defined as the time period from onset of block (loss of pinprick sensation) till the appearance of pain which required additional local anesthetic or postoperative analgesia.

**Results:** A total of 60 patients were studied. Of the total patients, 45(75%) were male and 15(25%) were female with mean age of 27yrs (16-61). Index finger was the most commonly involved finger as seen in 23(38.3%) patients, followed by ring finger in 20(33.3%) and long finger in 17(28.3%) of patients. The mean time of onset of anesthesia for volar single injection subcutaneous block from injection till the loss of pin prick sensation was  $3.32 \pm 0.42$  minutes and the mean total duration of anesthesia was  $271.9 \pm 29.34$  minutes for volar subcutaneous injection.

**Conclusion:** The volar subcutaneous single injection digital block is safe, efficient, and easy to perform with no danger of damaging the neurovascular bundle as might be happened with the dorsal injection block because of the proximity of the neurovascular bundles. It allows treatment of all conditions on volar aspect of the finger and on the dorsal aspect of the distal and middle phalanxes.

**Key words:** Volar digital block, dorsal digital block, local anesthesia

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## INTRODUCTION

Digital nerve block is a commonly used and effective method of anesthesia for a variety of minor out patient's surgical procedures on the digits like trauma, tumor/lump, contractures, phalangeal fractures etc. Like other nerve blockade methods, digital nerve supplying anatomy has led to the development of many different techniques of digital nerve blockade, the classic method of two injection dorsal digital block is widely used, initially proposed by Harris and Brown<sup>1</sup>. Harbinson described a newer method for digital nerve blockade, almost 10 years ago was the subcutaneous volar block, thus introducing volar approach in the armamentarium of hand surgery. This technique utilized single injection and thus an alternative to the traditional two injection dorsal block<sup>2</sup>.

There are two basic variations of volar blockade, the transthecal digital block method in which the anesthetic drug is delivered to finger through volar single injection into the flexor tendon sheath, however previous studies showed that this method is

not much appropriate due to unpleasant feeling and pain caused by the needle entrance into the tendon sheath<sup>3,4</sup> and the other method of digital blockade, recently described is subcutaneous volar block with single injection into the base of finger at level of proximal phalangeal crease subcutaneously.<sup>5</sup> In this study we have basically studied the outcome of single injection volar subcutaneous block in patients in terms of onset of anesthesia and duration of anesthesia, operated for different type of hand pathologies.

## PATIENTS AND METHODS

After approval from hospital ethical committee, this prospective descriptive study was performed in the department of Plastic and Reconstructive surgery Department, Hayatabad Medical Complex Peshawar from Dec. 2009 to Dec. 2010. A total of 60 patients were included in this study and all the patients were enrolled from outdoor patients department or referral from other wards. After explaining the study protocol, informed consent was taken from all the patients. All the patients included in this study were above the age of 16yrs and were having pathology distal to first palmer digital crease like trauma, tumor/lump, burn contractures, phalangeal fractures etc. Volar block

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was performed by placing the patient hand in supine position on flat surface and metacarpophalangeal joint flexed to 45 degrees to relax palmer skin. Then 25 gauge needle was introduced at the center of proximal digital crease and 3ml lignocaine with adrenaline having concentration of 2% in a 5ml syringe 2-3 mm deep to the skin. Patients were instructed about how to identify sharp touch and to rate the severity of pain using visual analogue scale (VAS). After injection, patients were assessed for sensory blockade using pin prick with an 18 gauge needle over the radial, ulnar, palmer and dorsal aspects of the involved digits. The end of injection was considered as time zero and stopwatch started at the same time, sensory evaluation were done at 30sec interval until distil sensation were abolished. Time to complete anesthesia (complete sensory blockade) was defined as the time between injection and the complete development of anesthesia (no sensations appreciated to pin pricking). Duration of block was noted as the time taken between the onset of block and the appearance of pain requiring additional local anesthetic intraoperatively or analgesic post-operatively. Pain was assessed using visual analogue scale where 0(no-pain) and 10 (worst possible pain). SPSS 10 was utilized to analyze the data.

**RESULTS**

A total 60 patients were studied, of the total patients 45 (75%) were male and 15(25%) were female with mean age of 27yrs (16-61). Index finger was the most commonly involved finger as seen in 23(38.3%) patients, followed by ring finger in 20(33.3%) and long finger in 17(28.4%) of patients. Among the operated fingers distil phalanx was involved in 39 subjects (65%) while middle and proximal phalanx in 19(31.7%) and 2(3.3%) patients respectively. The most common indication of surgery was trauma in 47(78.4%) of patients, followed by burn contractures, tumor, and removal of foreign body in 9(15%), 3 (5%), and 1(1.6%) of patients respectively. The mean time of onset of anesthesia for volar single injection subcutaneous block from injection till the loss of pin prick sensation was 3.32±0.42 minutes, and the mean total duration of anesthesia was 271.9±29.34 minutes for volar subcutaneous injection (Tables 1-4).

Table 1: Frequency of Finger Involvement

Finger involvement	n	%age
Index finger	23	38.3
Ring finger	20	33.3
Long finger	17	28.4
Small finger	-	-

Table 2: Phalanx involving the pathology

Phalanx involving	n	%age
Distal phalanx	39	65.0
Middle phalanx	19	31.7
Proximal	2	3.3

Table 3: Indications of surgery

Incidence of disease	n	%age
Trauma	47	78.4
Burn contracture	9	15.0
Tumour	3	5.0
Removal of foreign body	1	1.6

Table 3: Onset and duration of anaesthesia

	No.	Mean	Std. Deviation
Onset	60	3.32	0.42
Duration of anaesthesia	60	271.90	29.33

**DISCUSSION**

Digital nerve block for hand surgery offers significant benefits, which includes superior intra-operative pain control, attenuation of the surgical stress response, minimal systemic impairment, lower incidence of post-operative nausea and vomiting, excellent localized post operative analgesia, and decreases hospital discharge time and cost<sup>6,7</sup>. For minor hand injuries involving the fingers, a number of techniques for digital anesthesia have been described. A digital block is easy to perform and provides a mean duration of anesthesia of 24.9 hours with bupivacaine 0.5% compared with 10.4 hours for lignocaine 2% with epinephrine (1:100,000) and 4.9 hours for plain lignocaine 2%<sup>8</sup>. Epinephrine results in a temporary reduction in digital blood flow but with preservation of digital perfusion. Wilhelmi et al demonstrated in a prospective randomized double- blinded study that the addition of epinephrine to lignocaine reduces the need to repeat blocks and the need for a digital tourniquet to control bleeding<sup>9</sup>.

Two commonly used blocks are the two injections dorsal digital block techniques and the volar single injection subcutaneous block. An advantage of single injection volar subcutaneous block involves only a single injection, has a faster onset time and better proximal and radial digital anesthesia than the two injection dorsal digital block<sup>10</sup>. However the two injection dorsal digital block technique has been considered as the technique of choice among the health care providers<sup>11</sup>, this attitude is due to the persistence claim that palmer skin of hand and fingers is more glabrous and so more painful to injection then the dorsal pliable and soft skin<sup>12</sup>. However several studies showed that there is no difference in pain due to injection on palmer and dorsal skin<sup>4</sup>, which has led to the consideration of

different volar single injection digital block to anesthetize the fingers.

Our study showed, that single injection volar subcutaneous block has comparatively quick onset of anesthesia, i.e.,  $3.32 \pm 0.42$  minutes, which is consistent with the results of the study carried out by Knoop et al (1994). In this study subcutaneous block was compared with the dorsal block by performing the two techniques on the opposite sides of the same injured digit, though there was no difference in the injection pain of two techniques. The traditional block took significantly longer time to achieve abolition of sensations (6.35 minutes as might be due to the fact that volar subcutaneous block is easier to execute as one has to follow more readily identifiable landmarks (subcutaneous injection in the midline of the phalanx at the level of first palmer digital crease. This observation has been noticed by various other authors that technical failures are more common with the traditional dorsal two injection block<sup>13</sup>.

Similarly, though both these techniques involve the administration of anesthetic solution into the subcutaneous plane, but due to the proximity of the adjacent digital nerves of the uninvolved fingers, there is equal chance of diffusion of the anesthetic solution to those areas. This renders less amount of anesthetic solution for involved digit, thus might account for the comparatively delayed onset of anesthesia for the traditional block. In fact this observation has been supported by the findings that in many cases, the uninvolved fingers were also found anesthetized and numb.

In the current study comparatively increased mean duration of anesthesia for the volar subcutaneous block was observed. The mean total duration of anesthesia for the volar subcutaneous block was  $271.9 \pm 29.34$  minutes, which matches with the results of the study done by Bashir et al<sup>2</sup>. In this present study, we did not face any case of failure of injection or incomplete block requiring further injections.

## CONCLUSION

The volar subcutaneous single injection digital block is safe, efficient, and easy to perform with no danger of damaging the neurovascular bundle as might be happened with the dorsal injection block because of the proximity of the neurovascular bundles. It allows treatment of all conditions on the volar aspect of the

finger and on the dorsal aspect of the distal and middle phalanxes. For surgery on the dorsal aspect of the proximal phalanx, a supplementary dorsal block should be used. The limitation of this study is that it is a single centre limited series. Therefore multi-centered randomized controlled trials are suggested to consolidate the findings.

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