

# Safety and Efficacy of Lidocaine with Adrenaline for Ring Block Anesthesia in Finger Surgeries

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## ABSTRACT

**Objective:** To determine the safety and efficacy of Lidocaine (Xylocaine) with adrenaline (1:100,000) for ring block anesthesia in finger surgeries.

**Study Design:** Descriptive case series study.

**Place and Duration of Study:** This study was conducted at the Plastic Surgery Unit, Liaquat National Hospital, Karachi from October 17, 2015 to April 16, 2016.

**Materials and Methods:** All 18- 60 years patients of either gender with post traumatic injuries to fingers with duration of trauma <1 week or elective surgeries of fingers with presence of pathology less than 1 year were enrolled. Patients received lidocaine 1% with 1:100,000 epinephrine on the finger/fingers to be operated. Efficacy and safety of anesthetic combination was noted.

**Results:** Mean age of the patients was 32.93±11.17 years. Mean time since trauma was 62.64±99.73 days. Male preponderance was found to be higher. Type of injury was RTA in 17 (26.2%) patients, door entrapment 11 (16.9%), machine 11 (16.9%) and other injuries in 26 (40%) of the patients. Safety was observed in all 65 (100%) patients whereas efficacy was observed in 60 (92.3%) fingers of the patients.

**Conclusion:** Safety and efficacy of Lidocaine with adrenaline was found satisfactory for ring block anesthesia in finger surgeries.

**Key Words:** Safety, Efficacy, Lidocaine with adrenaline, Ring block anesthesia, Finger Surgeries

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## INTRODUCTION

Digital nerve block is a widely used method for hand surgeries which is typically less painful and provides a greater duration of consistent anesthesia in the operative field<sup>1,2,3</sup>. Different techniques have been studied and those with rapid onset of action were found to be more beneficial<sup>4,5</sup>. Studies have shown adrenaline when used in combination with lidocaine increases the duration of action of the anesthesia, enabling longer procedures to be undertaken, larger amount of Lidocaine that can be given and also ensuring post-operative pain relief<sup>6</sup>. Adrenaline due to its vasoconstrictive effect causes constriction of the digital arteries, ensuring a relatively bloodless field and obviating the need of finger tourniquets<sup>7</sup>.

Also adrenaline enables surgery with lower dosage of sedatives and also facilitates in certain other procedures like tenolysis and tenorrhaphy. Bashir et al has 80% effectiveness with lidocaine and epinephrine with dorsal approach however 100% effectiveness with volar blocks<sup>8</sup>.

Chowdry et al in 2010 in a retrospective study has found 98% oxygen saturation in patients administered lidocaine with epinephrine compared to lidocaine group alone 96%<sup>9</sup>. Bashir M et al in 2015 in a prospective randomized study found that an interval of 25 minutes between injection of lidocaine with epinephrine and beginning off procedure provides vastly superior operative field visibility<sup>10</sup>.

Conventionally surgeons in our local community and internationally were hesitant to use lidocaine with adrenaline due to the misconception that adrenaline being a vasoconstrictor of vessels would cause intense vasoconstriction of digital arteries leading to impaired blood flow and subsequent finger ischemia. However this misconception has been invalidated by recent clinical studies and trials and has now become a widely used method internationally. Epinephrine with local anesthetic had no increased risk of skin necrosis. Wide awake hand surgery is a new perspective employing the combined administration of lidocaine with adrenaline. It is a safe method and enables surgery to be undertaken without the use of tourniquets, sedation and regional anesthesia<sup>11,12</sup>.

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Since these misconceptions widely exist in our community, and due to scarcity of clinical data in our society including the center where this study was conducted, we have aimed our study to determine the safety and efficacy of lidocaine with epinephrine for finger block anesthesia and provide current and local statistics of efficacy of both drugs administered as a combination and to spread awareness of its effectiveness and safety, and if its efficacy and safety is found to be higher, than same modality would be advocated to surgeons for future finger procedures.

## MATERIALS AND METHODS

Descriptive case series study was conducted in Department of Plastic Surgery Unit at Liaquat National Hospital, Karachi from October 17, 2015 to April 16, 2016.

**Sample Size:** Assuming proportion of adequate visual field 91%<sup>12</sup>, Confidence level 95%, absolute precision 7%, the sample size came out to be 65 fingers.

**Sampling Technique:** Non Probability Consecutive

**Sample Selection:**

**Inclusion criteria:** Age 18- 60 years

**Either Gender:** Post traumatic injuries to fingers with duration of trauma less than one week or elective surgeries of fingers with presence of pathology less than 1 year.

**Exclusion criteria:**

Patients with allergy to local anesthetics.

Patients with bleeding disorders, (confirmed on history.)

Previous vascular insufficiency, previous digital replantation or peripheral neuropathy. Confirmed on history and presence of surgical scars.

Patients with poor peripheral perfusion before the surgery, (capillary refill >2 secs)

Those who did not give written consent for inclusion in the study.

**Data Collection Procedure:**

Patients was selected on the basis of inclusion and exclusion criteria, the risks and benefits of the study was explained to them and after their consent to take part in the study, a detailed Porforma was filled. After all preoperative assessment, patients received lidocaine 1% with 1:100,000 epinephrine between the dorsal and palmar surfaces, at the base on both the radial and ulnar sides of the finger/fingers to be operated. The blocks were given by 3ml syringes with 1.5cms 27 gauge needles. Efficacy (bloodless field) was rated as adequate if the procedure was successfully finished without application of a finger tourniquet, or inadequate, if procedure needed application of a finger tourniquet to be successfully finished. 2.5 hours after application of lidocaine with epinephrine finger was assessed for presence/absence of capillary refill and colour (pink/pale-blue). The presence of capillary refill

and a pink finger denotes good finger perfusion and proves safety of anesthetic combination.

**Statistical Methods:** The statistical analysis was performed by using SPSS.20. Mean and standard deviation was calculated from age and time since trauma. Frequencies and percentages were calculated for type of injury, gender, number of fingers involved, efficacy and safety. Effect modifiers like age, gender, number of fingers, duration since trauma and type of injury was stratified to see the effect of this on outcome. Chi square test was applied taking 'p' value less than or equal to 0.05 as significant.

## RESULTS

Mean age of the patients was 32.93±11.17 years. Majority of the patients 35 (53.8%) were presented with ≤30 years of age.

**Table No.1: Demographics**

Factors	Mean with SD
Age (in years)	32.93 ± 11.17
≤ 30 years	35
> 30 years	30
Time since trauma (days)	62.64±99.73
≤ 60 days	47
> 60 days	18
Gender	
Male	41
Female	24

**Table No.2: Type of injury, indication of surgery and safety and efficacy of anesthetic agent**

Factors	No. of patients
No. of fingers involved	
1 finger	48
2 fingers	17
Type of Injury	
Machine	11
RTA	17
Door entrapment	11
Others	26
Indication for Surgery	
Emergency	39
Elective	26
Safety of local anesthetic agent	
Yes	65
No	0
Efficacy of anesthetics agent	
Yes	60
No	5

Mean time since trauma was 62.64±99.73 days. Majority of the patients 47 (72.3%) were presented with ≤60 days of duration since trauma. Male preponderance was found to be higher 41 (63.1%) as compared to females 24 (36.9%). (Table1)

Majority of the patients i.e. 48 (73.8%) presented with only 1 finger of injury. Cause of injury was RTA in 17

(26.2%) patients, door entrapment in 11 (16.9%), machine in 11 (16.9%) and other injuries in 26 (40%) of the patients. Indication of surgery was trauma in majority 39 (58.9%) patient whereas elective indication of surgery was found in 26 (42.1%) patients. Safety was observed in all 65 (100%) patients whereas efficacy was observed in 60 (92.3%) patients (Table 2).

Stratification was done to see the effect of age, gender, time since trauma, numbers of finger involved, type of injury and indication of surgery on the outcome. Results are shown in Table 3.

**Table No.3: Results**

Factors	Efficacy		P Value
	Yes	No	
Age in Years			0.112
≤ 30 years	31	4	
> 30 years	29	1	
Gender			0.644
Male	37	4	
Female	23	1	
Time since trauma			0.125
≤ 60 days	45	2	
> 60 days	15	3	
No. of fingers involved			0.745
1 finger	44	4	
2 fingers	16	1	
Injury type			0.253
Machine	11	0	
RTA	16	1	
Door Entrapment	11	0	
Others	22	2	
Indication			0.148
Trauma	38 (63.3)	1 (20.0)	
Elective	22 (36.7)	4 (80.0)	

## DISCUSSION

The idea that epinephrine should never be injected into fingers originated sometime between 1920 and 1940, when procaine was used with and without epinephrine, with resulting reports of finger necrosis. Nearly all of the 48 reported cases of finger necrosis attributable to procaine local anesthesia occurred before 1950, with most implicating procaine injected without epinephrine<sup>13</sup>.

Procaine is quite acidic, with a pH of 3.6, and it further acidifies to a pH as low as 1 with prolonged storage; this acidity, not the addition of epinephrine, is likely responsible for the historical reports of finger necrosis<sup>14</sup>.

Lidocaine, by contrast, has been used safely both with and without epinephrine. An extensive review of the literature from 1880 to 2000 revealed no documented cases of finger necrosis resulting from local anesthesia

with lidocaine plus epinephrine. **Error! Bookmark not defined.**

Clinical evidence demonstrating the safety of lidocaine mixed with epinephrine is extensive and was well-summarized by Mann and Hammert<sup>15</sup>.

In 2001, Wilhelmi et al<sup>16</sup> reported that epinephrine plus lidocaine injection was safe in all 29 fingers injected with it. In 2010, Chowdhry et al<sup>17</sup> reported no epinephrine-induced complications in a clinical series of 1,111 consecutive cases of digital block anesthesia with lidocaine plus epinephrine. A multicenter trial known as the Dalhousie project prospectively reviewed 3,110 consecutive cases of lidocaine with epinephrine ≤1:100,000 injected electively into fingers and hands<sup>18</sup>. No cases of digital necrosis or need for phentolamine rescue were reported.

In our study it was found that oxygen saturation in patients administered lidocaine with epinephrine remains normal. It was also found that if time is given between injection of lidocaine with epinephrine and beginning off procedure, it provides clear operative field.

The Cochrane review 2014 has found monotherapy or even combination therapy of local anesthetics to be of benefit in terms of short term anesthesia and in reducing the complications related to post procedural anesthesia<sup>19</sup>. Lidocaine was superior in efficacy than bupivacaine in terms of shorter mean onset of anesthesia, less pain at the site of injection and less cardiotoxic potential in hand surgeries<sup>20</sup>.

Studies have shown adrenaline not only increases the duration of action of lidocaine when used in combination but also provides clear operative field due to its vasoconstrictive effect and it enables longer procedures to be undertaken due to larger amount of Lidocaine that can be safely given and it also ensures post-operative pain relief<sup>21</sup>.

During early days, adrenaline was not used in areas having end arteries as it was a common misconception worldwide that when lidocaine was used with adrenaline it could lead to impaired blood flow and eventually to finger ischemia as fingers have end arteries and adrenaline being vasoconstrictor can cause intense vasoconstriction of digital vessels. However recent clinical studies and trials has proved that indeed using lidocaine with adrenaline is useful in terms of longer duration of action, clear field, increases maximum dose and has now become a widely used method internationally.

This has led to the concept of wide awake anesthesia for surgeries which help in those patients who cannot undergo general anesthesia due to different medical conditions as well as those in which patients reflexes needs to be checked. This approach now a days is used for multiple procedures including tendon repair, tendon transfer, carpal tunnel release, trigger finger release, ganglion excision, de Quervain release, and soft-tissue

mass excision. Among hand surgeons, the wide awake approach is frequently referred to as the wide-awake local anesthesia technique (WALANT). In addition to the aforementioned indications, WALANT has also been used in conjunction with hand fractures, trapeziectomy, Dupuytren contracture, and wrist arthroscopy/ triangulofibro cartilage complex repair.

One must also know the contraindications for performing these anesthetic blockades. These are as follows: absolute, such as patient's refusal to undergo the procedure, peripheral vascular disease in the region, and infection next to the injection site. Relative, when it is absolutely necessary to test nerve function early in the postoperative period due to blockade establishment of sensory and motor conduction whenever this condition can mask the establishment of a postoperative compartment syndrome. And in a patient already with nerve damage or paresthesia, due to the always present possibility of causing nerve injury<sup>22</sup>. There are several techniques with minor modifications that vary from author to author<sup>23,24</sup>.

## CONCLUSION

Safety and efficacy of Lidocaine with adrenaline was found satisfactory for ring block anesthesia in finger surgeries. No difference was observed in safety and efficacy with respect to age, gender, number of fingers, and duration since trauma and type of injury.

### Author's Contribution:

Concept & Design of Study: Fahad Mirza  
 Drafting: Moiz Sadiq, Batool Urooj Rajput  
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 Final Approval of version: Fahad Mirza

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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