MATHEWS

Review Article

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Role of Wide Awake Local Anaesthesia in Soft Tissue Injury of Hand

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ABSTRACT

Study hypothesis: We conducted a quasi-experimental study which includes the data from 79 patients enrolled from March 2015 to November 2016. Injury repair was done under WALA. Visual analogue pain scale was calculated before, during and after repair. Blood loss was measured during repair. Follow up was done to look for functional disability and complications following treatment. SD and mean were calculated for visual pain analogue scale. p-value was calculated to look for the significance of this study. **Results:** Of the 79 patients enrolled in the study 76 were presented with clean lacerated wound while 3 were having associated tendon injuries. The mean pain score on VAS before repair was 4.6, during repair were 2.23 and after repair was 1.44. The average blood loss during repair (mean + SD) came out to be 4.95 + 2.44, with only 4 patients having a loss of > 10 ml. There was significant decrease in VAS score (p value <0.001), patients were discharged within a short interval of repair and on follow-up none of the cases were having complications. **Conclusion:** In this study, we found that in hand repair done under WALA there is significant decrease in pain scale. Also amount of bleeding was minimum. WALA may be safely used in digital and peripheral sites as it has no complications with recommended dose. The use of WALA may simplify the way of treatment in repairing hand injuries and may have a role in early disposition of patients in the crowded emergency department.

Keywords: Hand injury, Emergency department, Adrenaline, Lidocaine, Visual analogue scale, Quick DASH score, Mayo wrist score

INTRODUCTION

Study hypothesis

Hand injuries are among the most frequent injuries worldwide, about 1.8

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million people go to the emergency department each year due to hand injuries, constituting between 6.65% to 28.6% of all injuries and 28% of injuries to the musculoskeletal system [1]. The choice of anaesthesia is important while doing primary repair. Emergency Physicians and surgeons hesitate in using epinephrine as a part of local anaesthesia because of the myth that it can cause vasoconstriction leading to ischemia, necrosis and gangrene. The wide-awake local anaesthesia (WALA) describes the role of adrenaline with lignocaine in providing bloodless field without need of any tourniquet in selected patients and procedures. It minimizes duration of stay in hospital as there is no need of intravenous sedation or general anaesthesia. It reduces pre-anaesthetic investigations and has better outcome in hand surgeries [2].

Importance

WALA is being used as standard method by Hand surgeons for elective hand surgery and now being for emergency surgeries [3,4]. At present most of the studies shows that epinephrine has a definite role in wide awake approach in decreasing pain, providing bloodless field, cost-effective and minimizes time duration of treatment without affecting the quality of treatment. Most of the studies done until have been performed in elective settings. But in emergency settings only two literatures were published [3,4]. The purpose of this study is to use this method in emergency settings and hence the most of the soft tissue injuries of hand can be handled in emergency itself. This study aims at checking safety and efficacy of WALA (Wide awake local anaesthesia) in soft tissue injuries of the hand.

Goals

We conducted the role of wide awake local anesthesia in emergency settings in a prospective study. We also analyzed VAS (visual analogue scale). We checked amount of blood loss during procedure. And we measure functional outcome of hand during follow up by mayo wrist score and Quick DASH score which were unique to our study.

METHODS

Study design and setting

We conducted quasi-experimental study in patients with hand injury coming to our emergency department over period of 20 months from March 2015 to November 2016.

The primary objective of the study was to assess efficacy of WALA on pain scale in hand injuries. Secondary objectives were to estimate the amount of blood loss in milliliters during surgical repair of hand injury under WALA. To assess functional outcome of hand using Quick DASH score and Mayo wrist score at 3 months.

Selection of participants

The patients between the age groups of 18 to 60 years presenting to the Emergency Department with hand injury within 24 hours of incident were examined focused history was taken and hand injuries which came under inclusion criteria were recruited for repair under wide awake local anesthesia. We did not include patients with neuro-vascular injury of digits, those with metacarpal or phalanx fractures and those with a known hypersensitivity to lidocaine. Patients who did not give consent or were lost to follow up were also excluded from the study.

Methods of measurement

After initial clinical examination consent was taken from the patients, following which they were shifted to minor procedure room of emergency department. Full aseptic precautions was taken during whole the procedure. Wounds were initially washed by running water and then betadine was applied, than epinephrine with 1:100,000 concentration with not more than maximum 7mg/kg dose of 1% lidocaine was taken and infiltrated over the wound area slowly. Techniques used for administration of anesthesia are listed in table 1.

Table 1. Different techniques of administration of anesthetic agent

Technique	Site	Volume	Concentration
Infiltration in fingers(5)	Proximal and middle phalanx	2ml	1% lidocaine with epinephrine 1:100,000
	Distal phalanx	1ml	1% lidocaine with epinephrine 1:100,000
Infiltration in palm(5)	Volar aspect just below metacarpophalangeal joint of each phalanx	5ml	1% lidocaine with epinephrine 1:100,000
	Dorsal aspect above wrist joint in the line of index finger and ring finger at two sites	5ml	1% lidocaine with epinephrine 1:100,000
Simple block(6)	Midline of proximal phalanx	2ml	1% lidocaine with epinephrine 1:100,000

After the field was completely anaesthetized, injuries were repaired. Suturing of the wounds was done. Pain scale was assessed using visual analogue score (VAS) three times before injury repair, during injury repair & after injury repair (Figure 1).

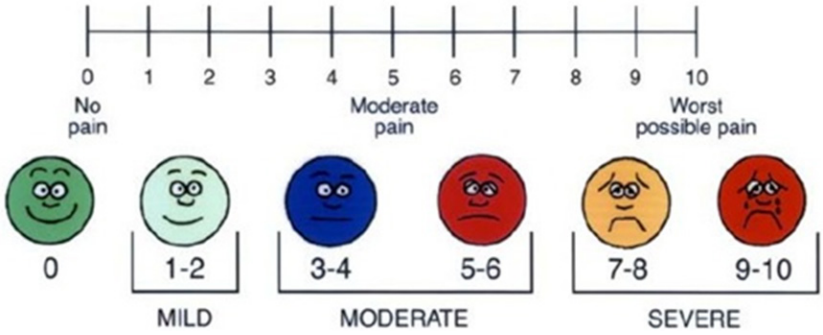

Figure 1. Visual analogue scale.

The patients were observed for 2 hours after the procedure for any side effect i.e. ischemic changes bluish discoloration. Patients were counseled for follow up and danger signs were explained like signs of ischemia, necrosis and gangrene and were advised to attend Emergency Department immediately. Wound inspections were done at one week and sutures were removed after 2 weeks. At 1 week and 3 months after initial presentation we assessed functional outcome of repair using Mayo wrist score [5], and Quick DASH Score [6]. For interpretation of Mayo, score of 90-100 = Excellent 80-89 = Good 65-79 = Satisfactory <60 Poor. Quick Dash has 11 divisions and each division is given points 1 to 5. The assigned values for all completed responses were simply summed and averaged, producing a score out of five. This value was than transformed to a score out of 100 by subtracting one and multiplying by 25. This transformation was done to make the score easier to compare to other measures scaled on a 0-100 scale. A higher score indicates greater disability. Quick DASH score = {[(sum of n responses)/n]-1} x 25, where n is equal to number of completed responses.

For measurement of blood loss we used Gravimetric method in which we took sponges, standard weight of sponges was measured in electronic weighing machine in grams. 1 gram of blood was taken as 1 milliliter of blood. Electronic weighing machine was used for weight measurement. We weighed the sponges soaked in blood and weight of dry sponge was reduced from total weight and amount of blood loss was calculated.

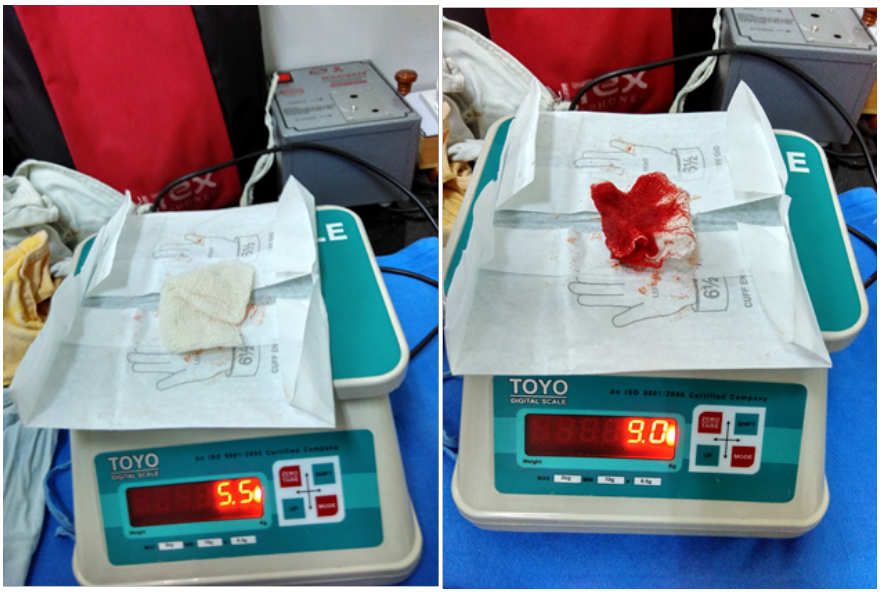

Figure 2. Blood loss measurement A: Standard weight of gauge B: Weight of gauge soaked with blood.

Sample size calculation

Considering base line average mean+- SD as preoperative-anxiety 2.3+-2.68, intraoperative anxiety 2.1+-2.49 and postoperative as 1.4+-2.12 in visual analogue scale, standard deviation of 2.7 was taken, power of 90% and level of significance 5% was taken. We required 64 patients to be enrollred in this study. But considering 10% loss to follow up we had taken a sample size of 75. Sample size was 75 but additional 4 cases were recruited due to anticipated dropout rate. Data for sample size calculation was taken from study by Davison et al. [7].

Statistical analysis

Data was recorded on a predesigned proforma and managed on excel spread sheet. Categorical variables were summarized by frequency (%). Quantitative variables has been summarized by mean+/-standard deviation. Primary and secondary quantitative outcomes before and after the intervention, was compared using paired t test and mean difference and its 95% confidence interval has been calculated. Strata 12.0 statistical software was used for data analysis. In this study ($p<0.05$) has been considered statistically significant.

RESULTS

Characteristics of study subjects

A total of 85 cases of traumatic hand injury were recruited and repaired in minor operation room of our emergency department. Six cases did not turn up for follow up and the available patients for statistical analysis were 79. Fifty two percent (41/79) were between the age groups of 21 to 30 and 92% (72/79) were males. Road traffic accident and machinery injury were two common modes of injury (Table 2).

Table 2. Mode of injury

Mode of injury	Frequency	Percentage
1. RTA	26	32.91%
2. Machinery and glass cut injury	25	31.65%
3. Assault	18	22.78%
4. Self-inflicted wounds	5	6.33%
5. Injury by hard object	5	6.33%

VAS score and blood loss in each techniques

Infiltration in fingers technique was used in 17 patients. The mean pain score on VAS before repair was 5.06, during repair was 2.41 and after repair was 1.41 (Table 3). The average blood loss during repair (mean +/- SD) came out to be 4.82 +/-2.16 by this technique.

Table 3. VAS score of patient given WALA by infiltration in fingers technique

	VAS score before repair	VAS score during repair	VAS score after repair	P value
Mean ± SD	5.06+/-1.34	2.41 + 1.42	1.41 +1.50	
Median	5	2	1	
Min.-Max.	03-08	0-5	0-4	<0.001
Inter quartile Range	03-06	0-4	0-2	
95% CI for mean	4.50-5.72	1.73-3.09	0.69-2.13	

Infiltration in palm technique was used in 45 patients. The mean pain score on VAS before repair was 4.91, during repair was 2.53 and after repair was 1.56 (Table 4). The average blood loss during repair (mean +/- SD) came out to be 5.49 +/- 2.63 by this technique.

Table 4. VAS score of patient given WALA by infiltration in palm technique

	VAS score before repair	VAS score during repair	VAS score after repair	P value
Mean ± SD	4.91+/-2.04	2.53 + 1.94	1.56+1.60	
Median	5	3	2	
Min.-Max.	01-08	0-6	0-4	<0.001
Inter quartile Range	03-06	0-4	0-3	
95% CI for mean	4.30-5.52	1.95-3.11	1.09-2.03	

Simple block techniques was used in 17 patients. The mean pain score on VAS before repair was 3.35, during repair was 1.24 and after repair was 0.89 (Table 5). The average blood loss during repair (mean +/-SD) came out to be 3.65 +/- 1.59 by Simple block.

Table 5. VAS score of patient given WALA by simple block

	VAS score before repair	VAS score during repair	VAS score after repair	P value
Mean ± SD	3.35+/-1.16	1.24 + 1.44	0.89 +1.22	
Median	3	0	0	
Min.-Max.	02-06	0-4	0-4	<0.001
Inter quartile Range	2.5-4	0-2.5	0-2	
95% CI for mean	2.79-3.91	0.54-1.94	0.29-1.49	

The overall mean pain score on combining all techniques before repair was 4.6, during repair was 2.23 and after repair was 1.44 (Table 6) (Figure 3).

The average blood loss during repair (mean +/- SD) came out to be 4.95 + 2.44, with only 4 patients having a loss of > 10 ml.

Table 6. Overall VAS score of patient combining all techniques

	VAS score before repair	VAS score during repair	VAS score after repair	P value
Mean ± SD	4.61+/-1.86	2.23 + 1.8	1.44 +1.52	
Median	4	2	2	
Min.-Max.	01-08	0-6	0-4	<0.001
Inter quartile Range	03-06	0-4	0-2	
95% CI for mean	4.192-5.023	1.824-2.632	1.103-1.783	

The (mean + SD) Quick Dash score at one week was 38 + 11.06 and at 3 months post repair 0.23 ± 1.48 (p <0.001). Mayo wrist score (The mean + SD) at 1 week was 80 ± 11.68 and at 3 months was 99.49 ± 3.54 (p <0.001) for overall cases. None of the 79 patients had complication, like distal gangrene with use of adrenaline and systemic toxicity due to use of lidocaine and adrenaline.

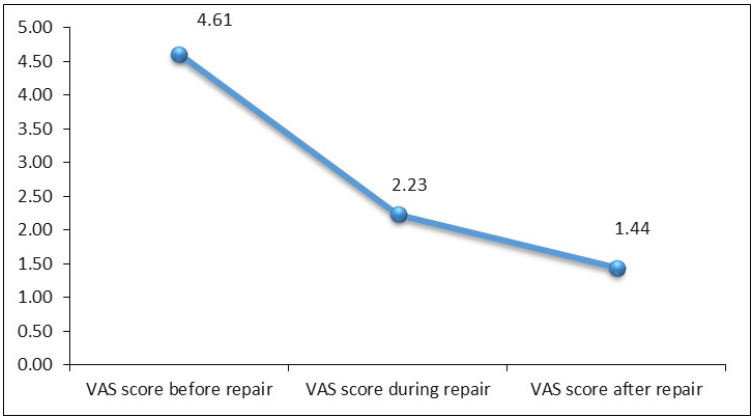

Figure 3. VAS score Trend.

LIMITATIONS

The main limitation of our study is the relatively small sample size. Our study was single-centric and was performed only on adult patients. There was no comparison group for blood loss measurement & VAS score. The majority of cases were simple to clean lacerated wounds. Bony injury and nerve injury cases were not involved in this study.

DISCUSSION AND CONCLUSION

This study intended to look into role of adrenaline with lidocaine in providing local anaesthesia in peripheral site i.e. hand injuries with good outcome in emergency department. Vasoconstrictors are used in local anaesthetic solutions to retard their systemic absorption. This enhances the local anaesthetic effect by localizing it to the site of injection, decreases toxicity by retarding systemic absorption, prolongs the duration of anaesthesia, and may decrease the total dose of the local anaesthetic drug required [8]. Another secondary advantage to the use of vasoconstrictors in local anaesthetic solutions is in the control of bleeding or haemostatic effect that the vasoconstrictor provide9. Digital necrosis is the greatest potential complication of injecting epinephrine into the finger. However, no finger loss has been reported in association with the injection of lidocaine and adrenaline into fingers [10,11]. In our study we used recommended dose of adrenaline (1:100000) and lidocaine 1% with less than 7 mg/kg maximum dose [2,12].

Our study revealed that majority of the patients were between the age group of 21 to 30 years, with males being involved more than females. RTA was the major mode of injury. Our study reports 79 consecutive cases of hand injury with elective low dose adrenaline with lidocaine injection for local anesthesia into 34 fingers and 48 hands without a single case of digital tissue loss, necrosis, gangrene or infarction.

Visual analogue scale (VAS) has been reliably used to assess acute pain in emergency department [13]. In our study we calculated the VAS score 3 times, before, during and after the procedure which showed a decreasing trend from 4.61 to 2.23 to 1.44 which was similar to a study by Davison et al. [7] where the mean VAS decreased from 2.3 to 2.1 to 1.4 with use of WALA.

Study done by Tang JB et al. [3] was the largest study till now using WALA technique, but they included both emergency as well as elective cases whereas ours study only includes emergency cases. Also VAS score and blood loss were measured for different techniques separately in our study. Functional outcome were measured in our study by Mayo wrist score and Quick DASH score.

Pain score has been calculated in study done by OM Okur [4] by different techniques but blood loss and functional outcome has not been assessed. Although it includes only emergency cases sample size was only 50.

Estimating blood loss might be difficult, especially if most of the blood is absorbed by surgical gauze and not collected in the suction bottle [14]. There are many techniques to estimate intraoperative blood loss [15], we used gravimetric method (weighing of the pre and post-procedure gauze). Lidocaine with adrenaline has been demonstrated to reduce blood loss due to the vasoconstrictive effect of adrenaline in different surgeries [16-18] and have proven their role in hand surgeries too [19]. In our study, most cases had only 3-6 ml of blood loss and only 4 cases had >10 ml. blood loss. The evidence in literature indicates that addition of adrenaline to lidocaine may prolong the duration of anaesthesia and reduce the risk of bleeding during surgery, although the quality of the evidence is low [20].

Mayo score and the Quick DASH score have been used to determine functional outcome post hand surgeries [21,22]. In our study we used both these scores and found significant improvement in the disability scores at 1 week and 3 months post-surgery.

With the use of WALA in hand surgeries in our emergency Department, we could see the following advantages

1. Minimal pain felt by the patient (Measured by VAS scoring scale), significant decreasing trend of VAS score.
2. Minimal blood loss (Measured by electronic weighing machine).
3. No need of tourniquet for the proper vision of the operative field.
4. Cost effective (No need of sedation, less hospital stay).
5. No complications with recommended dose.

In summary, we found that in cases of hand injury, repair done with lidocaine and adrenaline (1:100000) there is significant decrease in pain scale after using WALA and also amount of bleeding is minimum. WALA may be safely used in digital and peripheral sites as it has no complications with recommended dose. The use of WALA may simplify the way of treatment in repairing traumatic hand injuries and may have a role in the early disposition of patients.

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