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ORIGINAL STUDY

New anesthetic method for trigger finger surgery

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We use an uncommon anesthetic method for open trigger finger surgery in this study. We aim to decrease the risk for neurovascular / tendon injury and recurrence due to inadequate release by using tourniquet.

120 patients with trigger finger were treated and followed prospectively by using combination of musculocutaneous blockage and local anesthesia method between 2014 and 2016. All the patients had additional diseases like diabetes mellitus, hypertension, cardiac insufficiency, renal insufficiency.

The patients didn't have tourniquet pain during surgery. They could use drugs related with their additional diseases during preoperative and postoperative time. There were no complications and need for secondary surgery for all patients during follow-up time.

We think that combination of musculocutaneous blockage and local anesthesia is a quick, safe and effective anesthetic method in the trigger finger surgery. This method prevents risk for neurovascular / tendon injury and recurrence due to inadequate release by achieving bloodless surgical field.

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INTRODUCTION

The most important factor affecting the success during trigger finger surgery is the inability to fully perform the release thus increased the recurrence rate in early period *(13,15)*. It has been reported that incomplete visualization of A1 pulley during surgery can lead to recurrence and digital nerve damage *(16)*.

Our hypothesis is that A1 pulley can be seen clearly in bloodless surgical field with arm tourniquet while

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applying combination of musculocutaneous block and local anesthesia. We think this method is useful to prevent complications like recurrence because of inadequate release and the risk of neurovascular and tendon injury by achieving bloodless field.

METHODS

We used combination of musculocutaneous nerve and digital nerve block as anesthetic method for trigger finger surgery in our study. 120 patients with trigger finger were treated by using this anesthetic method between 2014 and 2016. All patients had additional diseases like diabetes mellitus, hypertension, cardiac insufficiency, renal insufficiency (Table 1). 70 women and 50 men aged 65 to73 (mean 68) years included in study (Table 2). Informed consent was obtained from all individual participants included. This study was approved by the Institutional Review Board of our hospital.

Table 1. — Additional diseases of the patients included in the study. Many of our patients had multiple chronic diseases

Diabetes	Hypertension	Renal Failure	Heart Failure
59(49.1%)	45(37.5%)	10(8.3%)	20(16.6%)

Table 2. — Demographic information of the patients included in the study

Patient number	120	
Age, mean±SD	68 (65-73)	
Gender n (%) Female Male	 70 (58.3%) 20 (16.6%)	
Right Hand	85 (70.8%)	Left Hand 35 (29.1%)
Thumb Index Middle Ring	56 (65.8%) 10 (11.7%) 8 (9.4 %) 9 (10.5%)	25 (71.4%) 5 (5.8%) 3 (3.5%) 2 (2.3%)

We used Green classification system to classify our patients. Classification system consists of 4 grades : Grade 1 palm pain and tenderness over A-1 pulley, Grade 2 catching of digit, Grade 3 locking of digit, but passively correctable and Grade 4 fixed, locked digit. According to the Green classification system all our patients were grade 3. All patients were treated conservatively but failed. However, none of the patients had previously received steroid injection.

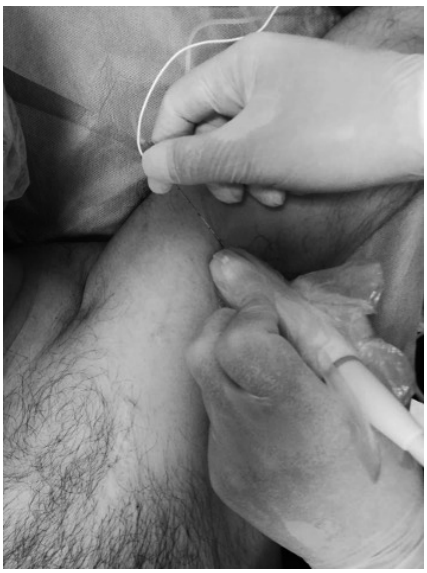

Figure 1. — The ultrasound probe was placed horizontally on the patient's anterior axillary line, where the pectoralis major muscle and bicep brachii muscles intersect.

Patients were prepared so that the arm where the blockage was to be applied was abducted and external rotated. Peripheral oxygen saturation probe, non-invasive sphygmomanometer and electrocardiogram palettes were inserted to the patients and standardized monitoring was performed. The ultrasound probe was placed horizontally on the patient's anterior axillary line, where the pectoralis major muscle and bicep brachii muscles intersect (Figure 1). A cross-sectional view of the axillary artery and axillary vein and the sonoanatomic view of the coracobrachialis muscle and biceps brachii muscles were obtained in this region. For this block, a high-resolution ultrasound system is required, which may indicate correctly musculocutaneous nerve. The ultrasound probe was shifted towards the biceps brachii muscle, resulting in the appearance of the musculocutaneous nerve, usually seen as a hypoechoic flattened oval structure with a bright hyperechoic edge, located within the biceps muscle or between the coracobrachialis muscle and the biceps brachialis muscles *(7)*. Ultrasound guided in-plane technique (with the ultrasound probe and

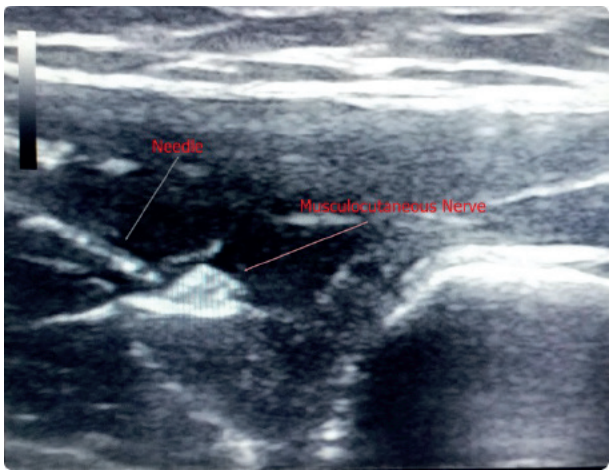

Figure 2. — Musculocutaneous blockage was performed by the help of ultrasound

needle in same plane) applied with a 22-gauge, 50 mm blocking needle (Stimuplex ; B. Braun) at 45-degree angle to the skin. 5 ml 0.5 % bupivacaine was given around the nerve (Figure 2). 7-10 mL of local anesthetic was given to subcutaneous tissue to create superficial anesthesia.

The distribution of the local anesthetic given by ultrasound was monitored. Sensory block follow-up was provided with an ice battery from the anterolateral region of the forearm. The duration of sensory block was 4.2 ± 0.5 min. All musculocutaneous blockage was performed by two anesthesiologists (VO and MM).

A tourniquet was applied over the arm and prepared at 250 mmHg pressure. Prilocain was used as local anesthetic in all patients. Longitudinal incision was made with reference to the palpable nodule over the A1 pulley of involved digit. Blunt dissection carried down over the tendon sheath. Maximum care was taken to protect the neurovascular bundles on the ulnar and radial side of the flexor tendon. Active flexion and extension of the finger were checked before the surgical wound is closed. While cutting the A1 pulley, care must be taken to prevent the incision from extending into the A 2 pulley. The duration of the surgery was not longer than 5 minutes.

RESULTS

All patients were discharged in operation day. The patients did not complain about tourniquet pain during surgery. We could control of our surgery's results to prevent inadequate release during procedure, because there was only sensory blockage not motor blockage.

The sutures were removed on the 12th post-operative day. Post-operative active and passive flexion and extension movements have begun immediately after surgery. No additional bandages were made.

Treatment of triggering and no recurrence was accepted as the "success" per digit. Patients were assessed clinically with Vas score, Palm to pulp distance (Table 3), Quick dash score (Table 4). Palm to Pulp Distance (PPD) was determined by measuring the distance between the fingertip and the distal palmar fold during passive flexion of the fingers, while the wrists of the patients had neutral position and the metacarpophalangeal joint was flexed at 90 °.If the distance is less than 1 cm, it was

Table 3. — Follow-up parameters of the patients included in the study

Mean follow-up(months)		16(12-24)
Return to work(days)		11+-3
VAS score	preop	5
	postop	10
Palm to Pulp Distance (PPD)	preop	medium
	postop	excellent

Table 4. — Quick Dash Score of the patients included in the study

QUİCK DASH SCORE			
Pre op		Postop	
score from 21 to 40	80%	score up to 11	95%
score from 41 to 60	20%	score from 12 to 20	5

considered as excellent ; if it was between 1-2 cm, it was considered good and if it was 2-3 cm it was considered medium and if it was more than 3 cm it was considered as bad.

Postoperatively, controls were made at 2,4 weeks, 6 months and 24 months. The mean follow-up time was 16 (range : 12 to 24) months. There

were no wound related complications and need for secondary surgery neither of the patients. The time for range of motion recovery, return to normal social activities were assessed.

DISCUSSION

Different treatment options are available for trigger finger. Conservative therapies like non-steroidal anti-inflammatory drugs (NSAID) and physiotherapy may be first steps for treatment. Local corticosteroid injections may be preferable choice after failed conservative treatment. It has been shown that long-acting locally injectable corticosteroid administration provide relief of symptoms *(12).* However, after injection, complications such as tendon ruptures or recurrences are more common in elderly patients *(13)*.

Corticosteroids are known to cause impaired glucose metabolism. According to a study designed by Stepan et all there is a significant increase in fasting blood glucose levels limited to post-injection 1 and 2 days after local corticosteroid injection and this may affect treatment modalities for the patients with type 1 diabetes and insulin-dependent diabetics *(19)*. Close follow-up of these patients is required after injection.

Open surgery is a good option in elderly patients with additional diseases such as diabetes, which will have metabolic imbalances after corticosteroid injection. Therefore, we found it more appropriate to perform open surgery without injections to our patients after failed conservative treatment.

Surgical releasing of the A1 pulley is actually definitive treatment. Surgical release is also appropriate for patient comfort *(5,15)*. Open release is generally a low-risk procedure but complications such as persistence, recurrence, prolonged pain, stiffness, flexion contracture, wound infection, bowstringing and digital nerve injury may happen. *(2,9,21)*. We did not encounter such complications because our study was done by seeing tendon and sheath by the help of tourniquet.

The most important argument standing against surgical treatment is the recurrence risk. Recurrence defined as the return of the finger blocking during the six-months follow-up study. Both steroid injections and open surgery have a risk of recurrence. Although some surgeons reported a recurrence rate of 26% in trigger finger surgery *(18)* open surgical treatment may result in less recurrence rate compared to steroid injection 6 to 12 months after treatment *(5).* We followed up out patients at 2,4 weeks, 6 months and finally 24 months. We didn't encounter any recurrence.

Axillary block is preferred choice for upper extremity surgery and most common peripheral nerve block *(17)* used. The ulnar, radial and median nerves are in a common sheath surrounding the axillary artery. In contrast, the musculocutaneous nerve (MCN) is in the coracobrachialis (CB) muscle outside this sheath. MCN is a mixed motor and sensory peripheral nerve. It passes through CB muscle and innervates biceps, brachialis and CB muscle itself *(17)*. We made MCN nerve blockage with 5 ml 0.5 % bupivacaine under ultrasound monitoring. Since the motor block was not made in our study, the tendon motion examination could be performed, so the triggering examination could be easily performed during the operation. Our patients did not have recurrence in follow-up examinations. We think this is because we worked in a relatively bloodless area with the help of tourniquet.

The chance of developing a trigger finger in diabetic patients is higher than in the general population. The incidence of trigger fingers in the diabetic population is between 5% and 20%, while it is between 1% and 2% in the general population *(1)*. Treatment options in diabetic patients also vary. Several studies about effectiveness of corticosteroid injections at diabetic patients showed that success rates are lower *(4)*. Luther et all compared 4 treatment strategies : (1) 1 steroid injection followed by surgical release, (2) 2 steroid injections followed by surgical release, (3) immediate surgical release in the operating room, and (4) immediate surgical release in the clinic. They found that trigger finger with immediate surgical release in the clinic is the most cost-effective treatment strategy *(10)*. Since our patients were elderly and had musculocutaneous nerve blockage, we found it appropriate to perform our interventions at operating room under sterile conditions in order to monitor the patients.

Additional diseases like hypertension, diabetes mellitus was also present in patients with advanced age with trigger finger. Anesthesia type can lead to disease exacerbations *(3,11)*. All our patients had 2 or more additional illnesses. A total of 5 ml 0.5 % bupivacaine regionally and 5cc of Prilocain was applied locally. We believe that the combined administration of musculocutaneous block and digital block without any additional anesthetic load is an effective treatment method to prevent perioperative and early postoperative pain.

It has been mentioned in the current literature that in hand surgery, 250 mmHg pressure can be tolerated for 20 minutes *(6)*. In our study, the tourniquet was at 250 mmHg and the tourniquet usage time was shorter than 5 minutes.

In studies performed using epinephrine and lidocaine, it is believed that epinephrine is safe to use as an anesthetic or apply to surgical field, but in some cases, it has been reported that epinephrine causes fingertip ischemia and vasoconstriction *(8,14)*. We did not encounter any anesthetic complications with Prilocain in our study.

Yalcinkaya et all stated that the duration of hospital stay in patients with trigger finger surgery was short at their literature *(20)*. In our study, our patients' stay in hospital was less than 1 day. This was consistent with the literature.

The number of patients participating in the study is low, the lack of control group (injection, splint etc.), the absence of our patients with longer follow-up are the weak points of our study.

CONCLUSION

We think that the combination of musculo-cutaneous and digital block should be kept in mind to decrease the risk of complications especially in elderly patients with additional diseases, to prevent the risk of high anesthesia and to increase the surgical comfort and complete the operation in a shorter time.

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