

Percutaneous surgery using Admix NoKor™ Non-Coring 16 G needle in cases with trigger finger

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Abstract

In this study mid- and long-term outcomes of the cases with trigger finger we treated using Admix NoKor™ have been presented. Percutaneous release procedures were applied for 24 fingers of 22 (19 female, 3 male patients; mean age, 57; range, 39-72) patients between May 2009 and May 2011. Preoperatively US was performed so as to confirm the presence of trigger finger. Diameters of the tendons of the affected and intact hands measured using US, were compared so as to be able to demonstrate thickening of the tendon of the trigger finger. The patients were monitored for an average period of 25.2 (range, 14-36) months. During surgery, clinically loss of the catching sensation was observed. In two patients percutaneous trigger finger release failed, so we have to proceed with open surgery. During open surgery, we observed longitudinal wounds on the tendon. One patient developed unilateral radial digital nerve damage. Percutaneous release of the trigger finger using Admix NoKor™ 16-G gauge needle can be preferred in the treatment of trigger finger. Trigger finger of the first digit requires more attentive approach and one should be aware of the complications. If required open surgery can be preferred.

Keywords: Trigger finger; percutaneous surgery, 16G Admix NoKor™ needle, radial digital nerve damage

Introduction

Trigger finger is an easily diagnosed and frequently encountered stenosing tendovaginitis, which causes painful dysfunction of the hand. This condition occurs because of the dysfunctional relationship between A1 pulley and flexor tendon passing through. This stenosing tenosynovitis leads to an extension deficit which causes locking (triggering) of the finger at flexion and it is usually seen after age of 45 [1]. It is more prevalently seen in women and advanced ages [2]. With time, if the patient refrains from extending his/her fingers so as to avoid feeling pain, secondary development of contracture of the proximal interphalangeal joint can be seen [3].

When associated with collagen tissue disease, trigger finger can be observed concurrently in more than one finger and more often ring and middle fingers are involved [1]. Though its etiology has not been clarified fully yet, nodular consolidations on tendons and/or narrowing of tendon sheath (incompatibility between the tendon and tendon sheath) restrict movements of the tendon. The greatest change is visible hypertrophy of the pulley per se [4]. Conservative or open and closed surgical release

procedures are treatment methods applied. For patients with non-complicated trigger finger disease who consulted a short time after the onset of symptoms conservative treatment is recommended. Among conservative treatments, injection of corticosteroids, stretching exercises, application of night splint, hot-cold applications and their combinations can be enumerated [1].

We have demonstrated outcomes of the patients we treated in our clinic using percutaneous release method, which yielded successful results in recent years as reported in the literature. In this study, we present short- and midterm outcomes of the cases with trigger finger whom we performed percutaneous trigger finger surgery using Admix NoKor™ needle.

Materials and Methods

Patients who applied to the Polyclinics of Orthopedics and Traumatology between May 2009 and May 2011 and diagnosed as trigger finger were classified based on Quinell classification system [5].

Quinell Grade 1 and 2 patients underwent conservative treatment. For Quinell Grade 3, 4 and 5 patients. Percutaneous release procedure was performed for trigger fingers of Quinell Grade 3, 4 and 5 patients. Patients completed forms containing items inquiring height-weight of the patients, chronic diseases (diabetes mellitus,

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hypertension, hypothyroidism, hyperthyroidism, gout, renal failure, rheumatic diseases, and heart disease), chronic drug use, symptoms of Dupuytren's contracture, de Quervain tenosynovitis, carpal tunnel syndrome, smoking and alcohol use and these forms were used during pre- and post-op follow-up of the patients. Preoperatively, using ultrasonographic (US) techniques, tendon diameters of the

trigger finger and corresponding intact fingers were comparatively measured. Tendon diameters at flexion and extension were measured separately to observe corresponding changes in tendon diameters both at flexion and extension (**Figure 1,2**). Consequently, increase in the tendon diameter was detected and diagnosis of trigger finger was confirmed.

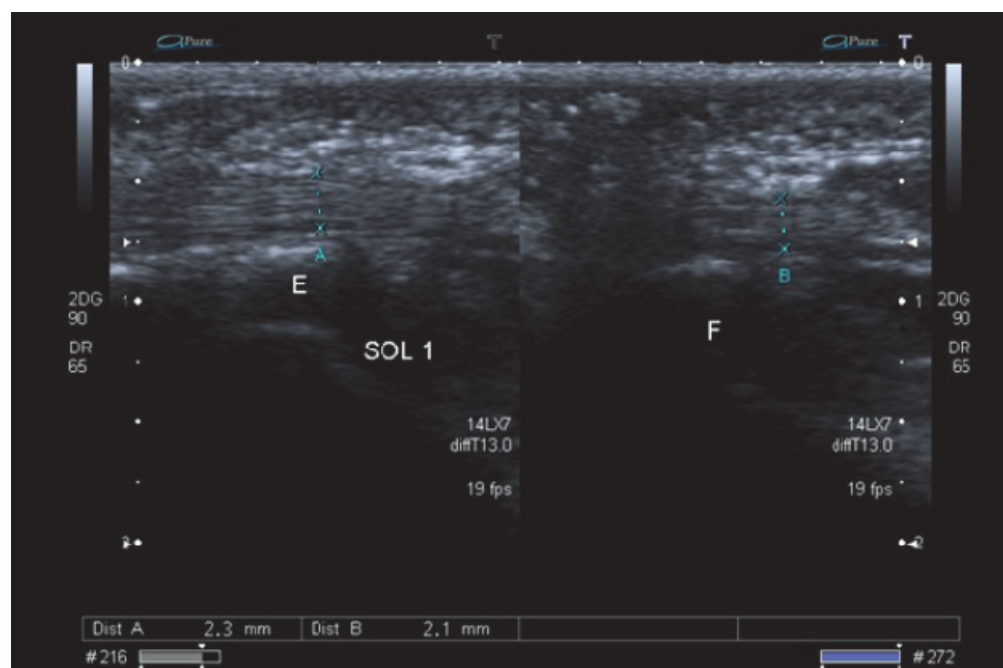


Figure 1. Measurement of diameters of tendons of the intact finger in a trigger finger patient with US both in extension (E) and flexion (F).

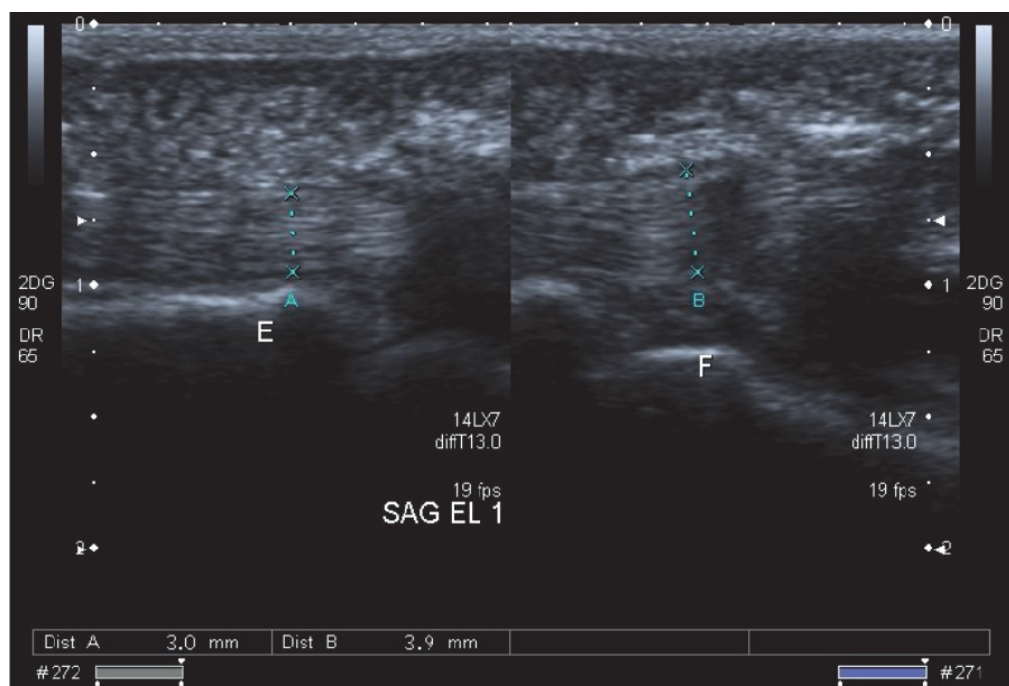


Figure 2. Measurement of diameters of tendons of the trigger finger in a trigger finger patient with US both in extension (E) and flexion (F).

Surgical technique: Local anaesthesia was applied with lidocaine HCl. Sterile surgical field was prepared up to the wrist and a green drape with a central hole was covered and surgical procedure was applied in compliance with anatomic landmarks indicated in the literature [1]. Local anaesthetic agent was injected in the flexor fold at the level of MCP joint of the thumb and for other fingers it was injected into the distal palmar fold at the level of MCP joint using BD (Becton, Dickinson and Company) Admix NoKor™ 16G needle (**Figure 3a**).



Figure 3a. Preoperative palpation of the nodule at the level of A1 pulley before percutaneous surgery

BD (Becton, Dickinson and Company) Admix NoKor™ 16G needle has been used in the hair implantation and treatment of cellulitis in plastic surgery, in eye surgery (as a scalpel) and injections of radio-opaque agents (**Figure 3b**) [6]. Admix NoKor™ needle was adapted to a 10-cc injector. The cutting edge of the needle was set in the same direction of the finger stretching apparatus, thus it was possible to determine shear direction of the needle tip when it was in the tissue. Injector was held like a pen and Admix NoKor™ needle was used like a subcutaneous scalpel and the layers were cut from distal to proximal with light sweeping and reeling movements. Meanwhile we took care to direct the Admix NoKor™ needle towards the proximal phalanx and thus maintained the cutting edge of the needle parallel to the flexor tendons. With this approach, we tried to ensure that if injury of the tendon occurs, it would be not more than an insignificant longitudinal tendon injury (**Figure 4**).

During surgical procedure, we performed trigger finger release operations for 1. and 2. digits while these digits were at flexion, however 3.-5. digits were held in hyperextension during this procedure. During the procedure, we felt the straightening of the locked finger. Therefore, we could decide the success of the operation during the procedure. Especially for the 1. and the 2. digits, we did not make more than 2 attempts. If despite two

percutaneous trials, catching sensation did not disappear, then we proceeded with the open surgery.



Figure 3b. Tip of the Admix NoKor™ injector needle in the percutaneous surgery



Figure 4. Percutaneous access parallel to the finger at the level of A1 pulley while the thumb is at flexion

Postprocedural suturing was not performed and bleeding was not encountered. Synthetic cotton plaster bandages were snugly wrapped around the dressing after termination of the procedure. For 5 days, anti-inflammatory drug therapy was administered. Antibiotherapy was not instituted. On the first postoperative day, snugly wrapped bandage was released and finger flexion and extension exercises were recommended. The patients were controlled at postoperative 1., 6., and 12. months on an ambulatory basis. Then phone interviews were made with all patients at postoperative 18., 24., 30., and 36. months and patient's satisfaction, complaints, restricted finger movements, pain and locking sensations were interrogated based on Quinell classification [5].

Results

Percutaneous release procedures were applied on 24 trigger fingers of 22 patients. Percutaneous release procedures were successful in 20 (22 fingers) patients, while it failed in 2 (2 thumbs) patients which necessitated switching to open surgery. Median age of the patients (female, n=19 and male, n=3) was 57 (range, 39-72) years. Mean follow-up period was 25.2 months, while median follow-up period was 25 (range, 14-36) months.

In 10 patients dominant hand was involved, while in two patients more than one finger was locked. Distribution of trigger fingers are shown in **Table 2**. Percutaneous release procedure failed in two patients (2 thumbs) and open surgery was performed (8.3%). During open surgery, only a few abrasions were seen on the surface of the tendons. Any tendon injury or laceration was not observed. Complications such as infection, digital artery injury, recurrences, induration on the percutaneous access site were not seen. In one patient, at first control visit, following percutaneous release of the 1. digit, radial nerve injury was detected. Since patient was hardly compliant, this patient did not attend follow-up visits on an ambulatory basis. However, during phone calls, we learnt that the patient was free of triggering symptoms, but finger numbness continued.

Table1. Quinell Classification System

Grade 1	Normal ROM, no pain
Grade 2	Normal ROM, frequent episodes of pain
Grade 3	Irregular movements
Grade 4	Occasional locking, active improvement
Grade 5	Locking present and only passive improvement

Table 2. Distribution of trigger finger among patients.

Digit	Right	Left	Total (n)
1. digit	8	4	12
2. digit	0	1	1
3. digit	1	7	8
4. digit	1	2	3
5. digit	0	0	0
Total	10	14	24

Discussion

Firstly, in the year 1850, Dr. A. Notta described trigger finger as a nodule on the flexor tendon, which restricts normal movements of the affected digit (s) in four adult patients aged between 20 and 60 years [7].

Increase in the number of chondrocytes and fibrocartilaginous metaplasia in A1 pulleys of the patients with trigger finger have been held responsible for this pathology [8]. Clinically compressions on hand tendons can result in tenosynovitis. Restricted mobility, pain, tenderness, swelling and crepitation can be seen. Gradually, tendon becomes edematous and thickens. Tendon becomes nodular as a result of fusiform swelling of the tendon, fibrocartilaginous metaplasia or attrition of the tendon [9].

Among treatment alternatives for trigger finger, hand splint, nonsteroidal inflammatory drugs and steroid injections are generally preferred treatment modalities for Quinell Grade 1 and 2 trigger finger patients.. In patients with Quinell Grade 3, 4 and 5 trigger fingers, open A12 pulley release surgery is an accepted mode of treatment [10]. For open surgical interventions, almost perfect outcomes have been reported. However, during open surgical interventions, complications as painful tissue scars, inflammation, neurovascular injury, recurrences, tendon bowstring have been reported. For percutaneous release procedures very successful outcomes and nearly "zero" complication rates have been reported. In a study by Eastwood *et al.* the authors applied 35 A1 percutaneous pulley release procedures using 21-Gauge hypodermic needles and reported 94.2% (n=33) success rate. Symptoms of their two patients were partially relieved without any complete improvement. They did not encounter any complication in any of their patients [11]. Tanaka used a special scalpel 4 cm in length and 1 mm in diameter with a 3 mm-long cutter to perform percutaneous A1 pulley release in 95 fingers of 85 patients. They achieved 100% success rate in all of their patients without encountering any complications [12].

Park *et al.* used a specially designed scalpel to perform 118 percutaneous release procedures. The patients had undergone percutaneous release procedures in outpatient clinics for their trigger fingers locked in flexion (n=35), extension (n=79) and semiflexion (n=4). The procedure was successful in 107 patients (success rate, 90.6%), while the remaining 11 patients were switched to open surgery without encountering any neurovascular injury [13]. Blumberg *et al.* performed percutaneous release under local anaesthesia using 18 G injector needles and reported a 93.5% (n=29) success rate. One patient was lost to follow-up and one patient underwent open surgery because of recurrent trigger finger [14].

Wang *et al.* performed percutaneous release operations for 40 trigger fingers in 33 children under local (n=26 fingers) and general anaesthesia (14 fingers) and indicated lack of any statistically significant difference between groups of local and general anaesthesia. (p=0.66). They used hypodermic 19 G injector needles and reported 90% success rate [15]. In our series, the procedure failed in two (8.3%) patients. Our success rate was found to be 91.7% (22/24 fingers) in compliance with the literature. However, it should be acknowledged that this method is not 100% safe. Inability to release the tendon adequately, vascular, nerve and tendon injuries and their risks of recurrence should not be forgotten. Based on our experience, procedural failure and possibility of recurrent surgery should be taken into consideration. Since lower success rates (38%) reported in the percutaneous trigger finger surgery are taken into account, one can say that the learning curve of this surgical method is very challenging. However generally success rates of $\geq 90\%$ have been reported [16,17].

In the literature, higher risk of digital nerve damage has been reported especially for the repair of the 1. and 2. trigger fingers, respectively [18,19]. In a study performed by Carrozzella *et al.* the authors reported digital nerve damage in 4 patients. As reported by many researchers especially if the scalpel is stuck between the 1. digit and sesamoid bone, then inevitably nerve damage occurs [20]. Bain *et al.* used 14 Gauge Angiocath to percutaneously release 17 thumbs of cadavers and became successful in 10 thumbs. In the same study, they reported that during percutaneous release of the thumb, needle tip passes 2 mm closer to the digital nerves and for thumbs percutaneous release is a risky procedure [21]. In a cadaver study performed by Buldu *et al.*, the researchers reported that since radial digital nerve crosses over the tendon of the thumb proximal to the A1 pulley, radial digital nerve is under the risk of injury during percutaneous release procedures. They indicated that during open surgeries ulnar digital nerve is more frequently exposed to risks [22].

In the literature, it has been reported than during percutaneous A1 pulley release performed for the 1. and 2. digits, digital nerve and artery are under great jeopardy, however in none of the percutaneous A1 release studies, as a complication, digital nerve damage has not been reported so far. Jongjirasiri *et al.* performed percutaneous release operations on 338 fingers of 248 patients [23]. These operations were performed on the 1. digit of 69 patients, and the authors mentioned about suspect loss of sensation radial to the thumb in one patient which they attributed to probable radial nerve damage. Ragoowansive *et al.* used "lift-cut" technique for percutaneous release operations in 240 patients and proceeded with open surgery in 10 patients [10]. During open surgery, they detected minimal lacerations on tendons in 10 patients.

In our series, we had to switch to open surgery in two cases with failed percutaneous release and detected multiple longitudinal lacerations on tendon surfaces. In parallel with our study, in cases operated with percutaneous release procedures, similar tendon injuries have been reported in the literature [24-26].

Conclusion

Percutaneous method has great advantages over open surgery in that it does not create an open surgical wound and require surgical instruments apart from a needle. Besides, it is accomplished under local anaesthesia and in a very short time. The patient starts to use his/her hand on the first postoperative day, which enables the patient to return to his/her work as soon as possible. No need for suturing and dressing is also one of the advantages of percutaneous release. Provided that it is performed with experienced hands and surgeons with perfect knowledge of the anatomy of the surgical field, it is a reliable, safe and an appropriate procedure. However to be able to refrain from potential complications as tendon, digital nerve and vascular injuries, surgical treatment should be performed after a failed medical therapy. Percutaneous release using Admix NoKor™ 16 G needle can be an easily preferred technique in the treatment of trigger finger. In trigger finger of the first digit, surgeon should be more attentive and aware of complications. In case of need, switching to open surgery should be also considered.

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Ethical approval

Prior to the undertaking of the study, ethical approval for the study was provided by the local Institutional Ethics Board in accordance with the standards of the Declaration of Helsinki.

References

1. Canale ST, Beaty JH. Canale & Beaty: Campbell's Operative Orthopaedics, 11th edition. Philadelphia, Pennsylvania, 2008.
2. Fleisch SB, Spindler KP, Lee DH. Corticosteroid injections in the treatment of trigger finger: a level I and II systematic review. *Am Acad Orthop Surg.* 2007;15(3):166-71.
3. Wolfe S. Green's Operative Hand Surgery. Philadelphia, PA, Churchill Livingstone, 2011.
4. Weilby A. Trigger finger. Incidence in children and adults and the possibility of a predisposition in certain age groups. *Acta Orthop Scand.* 1970;41(4): 419-27.
5. Weinzweig J. Hand and Wrist Surgery Secrets, Hanley & Belfus, Inc., Philadelphia, 2000.

6. Pereira Filho OJ, Bins-Ely J, Granemann AS, Bertelli JA, Abdalla SC. Closed Inverted nipple treatment through a microincision procedure. *Plast Reconstr Surg*. 2001;108(4):1000-5.
7. Notta A. Recherches sur une affection particuliere des gaines tendineuses de la main. *Arch Gen Med*. 1850;24:142.
8. Sampson SP, Badalamente BA, Hurst LC. Pathobiology of the human A1 pulley in trigger finger. *The J Hand Surg Am*. 1991;16(4):714-21.
9. Rozmaryn LM, Bartko JJ, Isler ML. The Ab-Adductometer: a new device for measuring the muscle strength and function of the thumb. *J Hand Ther*. 2007;20(4):311-24.
10. Ragoowansi R, Acornley A, Khoo C. Percutaneous trigger finger release: the lift-cut technique. *Br J Plast Surg*. 2005;58(6): 817-21.
11. Eastwood D, Gupta K, Johnson D. Percutaneous release of the trigger finger: an office procedure. *J Hand Surg*. 1992;17(1):114-7.
12. Tanaka J. Percutaneous trigger finger release. *Tech Hand Up Extrem Surg*. 1999;3(1):52-7.
13. Park M, Oh I, Ha K. A1 pulley release of locked trigger digit by percutaneous technique. *J Hand Surg*. 2004;29(5):502-5.
14. Blumberg N, Arbel R, Dekel S. Percutaneous release of trigger digits. *J Hand Surg*. 2001;26(3):256-7.
15. Wang HC, Lin GT. Percutaneous release for trigger thumb in children under general and local anesthesia. *Kaohsiung J Med Sci*. 2004;20(11):546-51.
16. Dierks U, Hoffmann R, Meek MF. Open versus percutaneous release of the A1-pulley for stenosing tendovaginitis: a prospective randomized trial. *Tech Hand Up Extrem Surg*. 2008;12(3):183-7.
17. Griggs SM, Weiss APC, Lane LB, Schwenker C. Treatment of trigger finger in patients with diabetes mellitus. *J Hand Surg*. 2005;20(5):787-9.
18. Flatt AE. Notta's nodules and trigger digits. *Proceedings*. 2007;20(2):143-5.
19. Turowski GA, Zdankiewicz PD, Thomson JG. The results of surgical treatment of trigger finger. *J Hand Surg*. 1997;22(1):145-9.
20. Carrozzella J, Stern PJ, Von Kuster LC. Transection of radial digital nerve of the thumb during trigger release. *J Hand Surg*. 1989;14(2):198-200.
21. Bain GI, Turnbull J, Charles MN. Percutaneous A1 pulley release: A cadaveric study. *J Hand Surg*. 1995;20(5):781-4.
22. Buldu H, Çepel S, Kır N. Başparmak tetik parmak gevşetmelerinde olası komplikasyonlardan kaçınma yolları: Kadavra çalışması *Acta Orthop Traumatol Turc*. 2004;40(4):311-4.
23. Jongjirasiri Y. The Results of Percutaneous Release of Trigger Digits by Using Full Handle Knife 15°: An Anatomical Hand Surface Landmark and Clinical Study. *J Med Assoc Thai* 2007;90(7):1348-55.
24. Benson LS, Ptaszek AJ. Injection versus surgery in the treatment of trigger finger. *J Hand Surg*. 1997;22(1):138-44.
25. Gilberts E. Prospective randomized trial of open versus percutaneous surgery for trigger digits. *Journal Hand Surg*. 2001;26(3):497-500.
26. Lange-Rieb D. Long-term results of surgical release of trigger finger and trigger thumb in adults. *Arch Orthop Trauma Surg*. 2009;129(12):1617-9.