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Hand

Nonpalmar Endoscopic versus Open Trigger Finger Release: Results from a Prospective Trial

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Background: The most common complaint after open surgical release for trigger finger is of pain and scarring at the surgical site. We hypothesized that use of a new nonpalmar endoscopic approach for release of the A1 pulley through an incision at the proximal digital crease would result in decreased scarring and faster recovery compared to those treated with standard open release.

Methods: Patients with trigger finger were prospectively enrolled and treated with a nonpalmar endoscopic versus open surgical technique. Outcome measures included scar assessment based on the Patient and Observer Scar Assessment Scale (POSAS) administered 1 week, 1 month, and 6 months postoperatively, time before return to work, occupational therapy visits, and overall satisfaction. Additional outcomes included pain medication use, operative time, and complication and recurrence rates.

Results: POSAS scores were better in the endoscopic treatment group than in the open group at all time points with a statistically significant difference seen at 1 week and 1 month postoperatively. The endoscopic group returned to work sooner, required fewer occupational therapy visits, and had better overall satisfaction compared to the open group, but the differences were not statistically significant. Complication and recurrence rates did not differ significantly between groups.

Conclusions: Patients treated for trigger finger with a nonpalmar endoscopic release through an incision at the proximal digital crease demonstrate significantly better scarring in the early postoperative period compared to patients treated with the open surgical approach. Treatment for trigger finger with this technique is as effective as the standard open technique. *(Plast Reconstr Surg Glob Open 2022;10:e4603; doi: 10.1097/GOX.0000000000004603; Published online 7 October 2022.)*

INTRODUCTION

Trigger finger occurs secondary to stenosing tenosynovitis of the flexor tendon at the A1 pulley.[1,2] It is one of the most common causes of pain and disability in the hand, and patients present with pain, and clicking or locking of the digit which, in severe cases, may lead to limitations in daily function.[1,3] Initial treatment is conservative, but definitive treatment most often requires release of the A1 pulley through an open, endoscopic, or percutaneous approach.[3–7]

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Success rates are overall high and major complication rates are low, no matter the technique.[8–11] Minor complications, however, are reported to occur in approximately 6%–30% of cases treated with open surgical release and include swelling, pain, scarring, contracture, and infection.[12–14] The most common of these complaints is pain and tenderness associated with the surgical scar.[12,13,15] Open surgical release requires incision of the palmar fascia, which can lead to scarring and disabling pain that lasts for months after surgery.[13] We believe the pain is analogous to the pain and tenderness experienced with open treatment for carpal tunnel syndrome, which is lessened with use of a nonpalmar incision during endoscopic release.[16]

As such, we hypothesized that retrograde endoscopic release of the A1 pulley through a nonpalmar incision at the digital crease at the base of the proximal phalanx would result in decreased scarring, faster recovery, and

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higher overall satisfaction compared to those treated with standard open release. The feasibility of the technique was demonstrated in cadaveric specimens and published previously.[17]

MATERIALS AND METHODS

Inclusion and Exclusion Criteria

The trial was conducted in accordance with International Conference on Harmonisation Good Clinical Practice and the applicable United States Code of Federal Regulations with approval from the institutional review board (IRB). Patients with trigger finger, not previously treated surgically, recommended for release of the A1 pulley were screened for inclusion and exclusion criteria and prospectively enrolled (13 in each arm) for treatment with a nonpalmar endoscopic versus open surgical approach. Patients were enrolled, based on patients' and surgeon's preference, after a full discussion of the two techniques. Patients 18 or older with trigger finger willing to follow all aspects of the study protocol were included in the study. Current smokers and patients with uncontrolled diabetes, regional sympathetic dystrophy, collagen-vascular, connective tissue, or bleeding disorders were excluded. The patient was considered enrolled once the IRB-approved informed consent form and the Authorization for Use and Release of Health and Research Study Information (HIPAA) form were dated and signed and all questions were answered. During their initial evaluation, a full history was obtained and physical examination performed. The patient was then scheduled for surgery to be performed in the operating room under local with intravenous (IV) sedation.

Open Surgical Technique

For subjects in the open surgical treatment arm, an incision was made directly over the A1 pulley of the affected digit. Blunt dissection proceeded down to the level of the A1 pulley and the pulley was incised under direct visualization. The flexor tendons were delivered into the wound for inspection and range of motion was tested. The surgical site was then irrigated and closed in the usual fashion.

Endoscopic Surgical Technique

For subjects in the nonpalmar endoscopic treatment arm, the digital crease at the base of the proximal phalanx of the affected finger was identified and incised transversely. Blunt dissection was then performed down to the level of the flexor tendon sheath (Fig. 1). With the finger held in extension, a 2.7-mm arthroscope with EndoSleeve attachment (A.M. Surgical, Inc., Smithtown, N.Y.) was inserted retrograde (Fig. 2) and placed on the distal edge of the A1 pulley. The endoscope was advanced proximally, cutting the length of the pulley (Fig. 3). The blade was well visualized throughout the release (Fig. 4). The instrument was advanced to a point just before the distal palmar crease. The surrounding tissue was inspected, and the instrument removed. The flexor tendons were then delivered into the wound and inspected, and range of motion was assessed to ensure no triggering occurred (Fig. 5). The surgical site was then irrigated and closed in the usual fashion.

Takeaways

Question: Does a nonpalmar retrograde endoscopic release of the A1 pulley result in better scarring than the standard open approach?

Findings: Patients with trigger finger were prospectively treated with a nonpalmar endoscopic versus open release. Postoperative POSAS scores were better in the endoscopic treatment group at all time points.

Meaning: Patients treated for trigger finger with a nonpalmar endoscopic release through an incision at the proximal digital crease demonstrate significantly better scarring in the early postoperative period compared to patients treated with the standard open approach. The new technique is as effective as open surgical release.

Outcome Measures

All evaluations, procedures and information obtained during preoperative and postoperative visits were performed in the surgeon's standard manner, no matter the treatment arm, with the exception of the Patient and Observer Scar Assessment Scale (POSAS) questionnaire. The POSAS questionnaire contains a patient scale to be completed by the patient and an observer scale completed by the surgeon-of-record's physician assistant. The

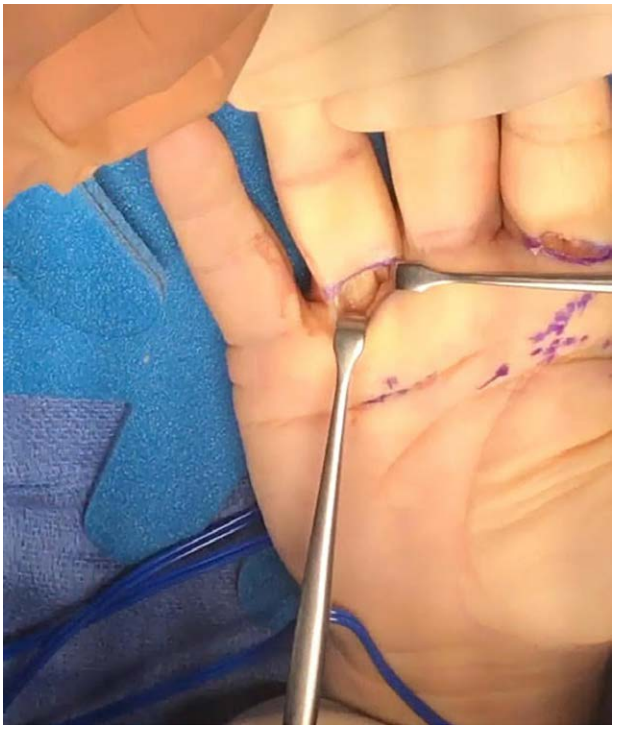

Fig. 1. The digital crease at the base of the proximal phalanx is incised transversely followed by blunt dissection down to the level of the flexor tendon sheath, exposing the interval between the A1 and A2 pulleys.

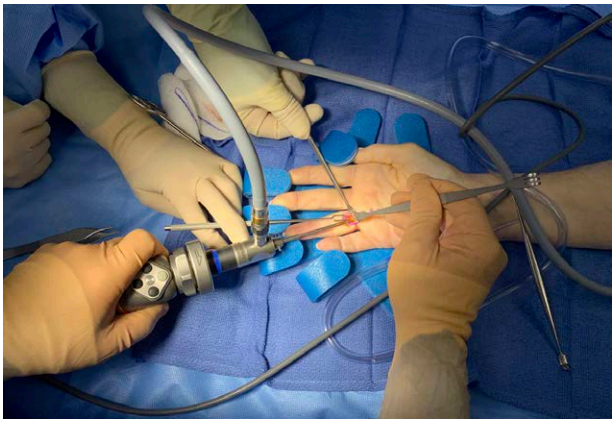

Fig. 2. Surgical setup using 2.7-mm arthroscope with EndoSleeve attachment, inserted retrograde.

Fig. 3. The scope-mounted knife is advanced along the length of the A1 pulley, proximally.

patient scale comprised six questions regarding pain, itching, color, stiffness, thickness, and irregularity of the scar scored numerically from 1 to 10 (1 is best, 10 is worst). The observer scale has six parameters, scored from 1 to 10 (1 is best, 10 is worst), and includes vascularity, pigmentation, thickness, irregularity, pliability, and surface area. There is a seventh question on each survey, also on a scale of 1 to 10, which asks the patient and provider for their overall opinion of the scar (1 is best, 10 is worst). The POSAS questionnaire was completed at the 1-week, 1-month, and 6-month postoperative visits. Patient and observer scores were combined for each visit, for a total POSAS score ranging from 12 (best) to 120 (worst). The overall opinions of the scar by the patient and observer were also combined for each visit, for a total score ranging from 2 (best) to 20 (worst).

Additional outcome measures included overall satisfaction (scale of 1 to 10, with 10 being best), time before return to work, and the number of postoperative occupational therapy visits. All patients were instructed to begin at-home range of motion exercises immediately after surgery. Patients with poor compliance and/or those indicated for additional guided therapy were referred to an occupational hand therapist once the sutures were removed.

Secondary outcome measures included pain medication use (opioids) and operative time. Complication rates were also obtained and included injury to tendons, nerves and digital vessels, surgical site dehiscence, and surgical site infections requiring antibiotics or wound care. Recurrence, defined as triggering on physical examination by the treating physician, requiring reoperative intervention was also noted.

Statistical Analysis

Descriptive statistics were generated for all continuous outcome measures (mean + SD). Two-tailed t-tests were used to compare means between groups for continuous outcome measures and Wilcoxon rank sum tests were used for distribution free numerical paired values with more than one empirical group. Chi squared analysis was

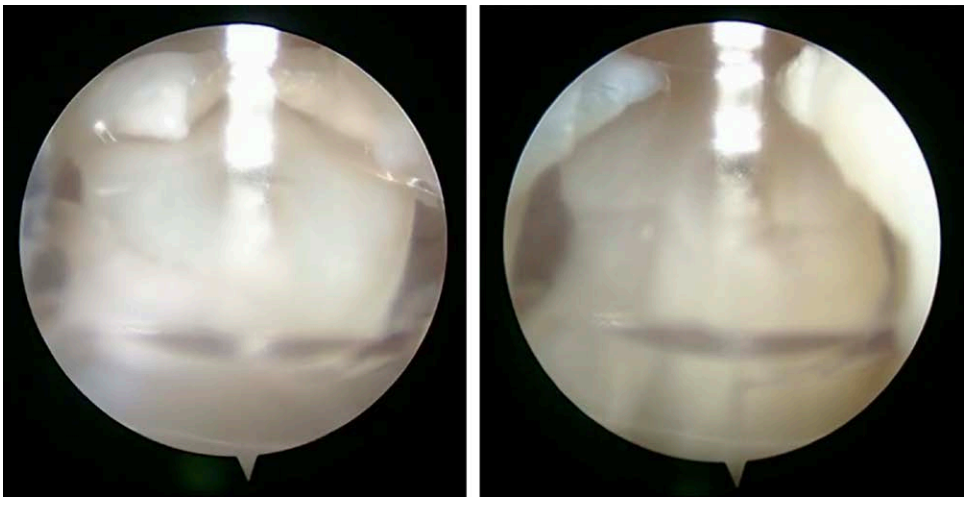

Fig. 4. Complete release of the A1 pulley is well visualized with the endoscope.

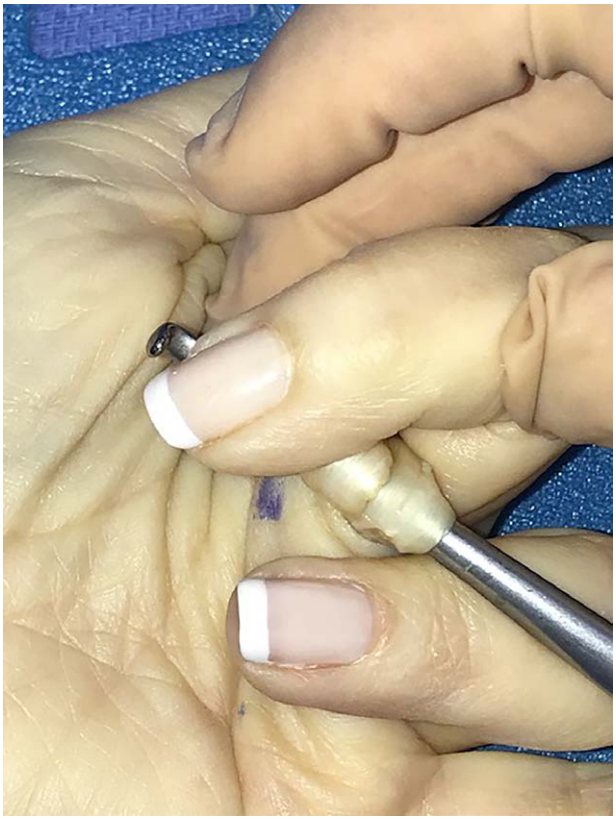

Fig. 5. After release of the A1 pulley, the flexor tendons are checked to ensure full release.

used to analyze proportion differences between groups. Statistical analysis was performed using the R system for statistical computing. A *P* value less than 0.05 was considered statistically significant.

Sample Size Justification

Total POSAS scores range from 12 to 120. Although the POSAS has not been used to assess scarring after trigger finger release, the tool is validated with high internal consistency and reliability.[18]

The trial was powered to detect a difference in POSAS score of 10, deemed to be clinically significant by the investigators. The POSAS SDs in studies previously published on carpal tunnel release and carotid endarterectomies range from 1.0 to 11.0.[19,20] To detect a mean difference in POSAS score of 10 points (SD = 8) with a two-sided significance level of 5% and power of 80% with equal allocation to two arms required 12 patients in each arm of the trial.

RESULTS

A total of 26 patients were enrolled in the trial (13 in each arm). One patient in the endoscopic group died from causes unrelated to the study and one patient in the open treatment arm did not complete the first postoperative survey. All enrolled subjects were included in the final statistical analysis.

The average age and gender distribution did not differ significantly between groups ($P = 0.699$; $P = 0.741$, respectively). POSAS scores were better in the endoscopic treatment group than those in the open treatment group at all time points (Table 1) with a statistically significant difference seen at 1 week and 1 month postoperatively (27.2 + 10.6 versus 45.0 + 19.8; $P = 0.013$ and 31.2 + 19.5 versus 44.8 + 13.1; $P = 0.007$). The patient's and observer's overall opinion of the scar was similarly better in the endoscopic treatment group at all time points and differed significantly at the 1-month follow-up visit (5.4 + 3.8 versus 7.8 + 2.5; $P = 0.014$). Postoperative date of follow-up did not differ significantly between groups for the 1-week, 1-month, or 6-month follow-up visit (Table 1). The average total length of follow-up was greater than 1 year and did not differ between groups (1.2 years + 0.9 versus 1.1 years + 0.8; $p = 0.861$) (Table 2).

The patients' overall satisfaction was high in both the endoscopic and open treatment arms (9.2 + 2.6 versus 8.2 + 3.0; $P = 0.142$) and did not differ significantly between groups (Table 2). The endoscopic treatment group returned to work, on average, 2.6 weeks after surgery (+3.0), and the patients in the open treatment arm returned to work, on average, 4.4 weeks after surgery (+5.7), but the difference was not statistically significant ($P = 0.561$). The endoscopic treatment group required fewer postoperative therapy visits than the open treatment group (3.9 + 3.7 versus 5.7 + 5.7), but these values were not found to be statistically significant ($P = 0.748$).

Average operative time was 30.3 minutes (+9.8) in the endoscopic group and 22 minutes (+4.2) in the open treatment group. These values were not found to be statistically different ($P = 0.073$). The average number of days of opioid use was lower in the endoscopic group (0) compared to the open group (0.3 + 0.8), but did not differ significantly ($P = 0.184$).

One patient in the open treatment group (7.7%) had recurrence of triggering requiring reoperation. No recurrences occurred in the endoscopic group (0%; $P = 0.382$). One patient in the open treatment arm had a wound dehiscence complicated by surgical site infection (7.7%). No complications occurred in those treated endoscopically.

Table 1. POSAS Scores and Overall Opinion of Scar at 1-week, 1-month, and 6-month Follow-up Visits

	POSAS Score (SD)	Overall Opinion (SD)	POD (SD)	POSAS Score (SD)	Overall Opinion (SD)	POD (SD)	POSAS Score (SD)	Overall Opinion (SD)	POD (SD)
	1 week			1 month			6 months		
Endoscopic	27.2 (10.6)	5.7 (2.6)	7.7 (2.5)	31.2 (19.5)	5.4 (3.8)	31.0 (20.1)	16.8 (6.7)	3.2 (2.8)	206.8 (90.0)
Open	45 (19.8)	8.2 (3.6)	8.1 (4.8)	44.8 (13.1)	7.8 (2.5)	36.2 (13.5)	18.3 (8.1)	3.2 (1.5)	250.5 (155.7)
P	0.013*	0.067	1.00	0.007*	0.014*	0.217	0.804	0.264	0.668

*Significance with *P* value less than 0.05.

Table 2. Secondary Outcome Measures Comparing Endoscopic versus Open Trigger Finger Release

	Endoscopic (n = 13)	Open (n = 13)	*P*
Satisfaction (SD)	9.2 (2.6)	8.2 (3.0)	0.142
Opioid use, d (SD)	0	0.3 (0.8)	0.184
Return to work, wks (SD)	2.5 (3.0)	4.4 (5.7)	0.561
Therapy, visits (SD)	3.9 (3.7)	5.7 (5.7)	0.748
Operative time, min (SD)	30.2 (9.8)	22 (4.2)	0.073
Complication rate, %	0	7.7	0.382
Recurrence rate, %	0	7.7	0.382
Length of follow-up, yrs (SD)	1.2 (0.9)	1.1 (0.8)	0.862

Complication rates did not differ significantly between groups ($P = 0.382$).

DISCUSSION

Reported complication and recurrence rates in the open treatment of trigger finger are low, and patients' overall satisfaction remains high. The most common complaint associated with the open treatment technique is of pain and tenderness associated with the scar, which may lead to significant morbidity lasting weeks after a successful surgery.[12,13,15,21] Investigations aimed at identifying the optimal surgical approach for open A1 pulley release have found no clear benefit of one incision over another, necessitating the need for an alternative approach.[15]

One alternative used by Pegoli et al[21] advocates use of an endoscopic technique that utilizes two incisions: one at the proximal digital crease and one at the proximal palmar crease associated with the metacarpophalangeal joint of the finger. They report that patients treated endoscopically had a better aesthetic result, fewer days of discomfort, and a faster return to work and daily activities compared to those treated with an open technique.[21] The same incisions are used in the endoscopic approach described by Duncan et al,[22] who anecdotally note favorable aesthetics of the incisions once healed. Their results are overall supportive of endoscopic release, but the technique requires incision of the palmar fascia, which the authors of this article believe to be a major contributor to a patient's postoperative pain and scar fibrosis.

The importance of scar placement is further supported by studies comparing outcomes after treatment for trigger finger versus trigger thumb. Cakmak et al[23] report that patients treated for trigger thumb had shorter duration of all postoperative symptoms compared to those treated for trigger digit, which included pain, scar tenderness, limitation of motion, and swelling. Our technique uses the same single incision utilized in trigger thumb release. Placement in the flexor digital crease avoids a palmar scar altogether.

Here, we demonstrate use of a nonpalmar endoscopic alternative that does not require a palmar incision. Although the scars in the endoscopic group appeared to be subjectively better to the authors (Figs. 6–12), our study sought to provide objective evidence of improved scarring in endoscopically treated patients through use of POSAS surveys. The results of our study demonstrate significantly better scarring in the nonpalmar endoscopic group compared to the open treatment group at 1 week and 1 month postoperatively. Six months after surgery, there appears to be no difference in scarring between groups. These findings suggest early benefit of the endoscopic approach that equalizes long term.

Our trial was powered to detect a difference in POSAS score of 10, deemed to be clinically significant by the investigators. The average POSAS scores between the nonpalmar endoscopic and open treatment arms differed by more than 17 at 1 week and by more than 13 at the 1-month follow-up appointment. These values are therefore thought to be both clinically and statistically significant between groups.

Patients in the endoscopic treatment arm returned to work sooner and required fewer postoperative occupational therapy visits compared to those treated with the open approach although these findings were not statistically significant. The reliability of these outcomes measures is debated, and some authors believe the desire to

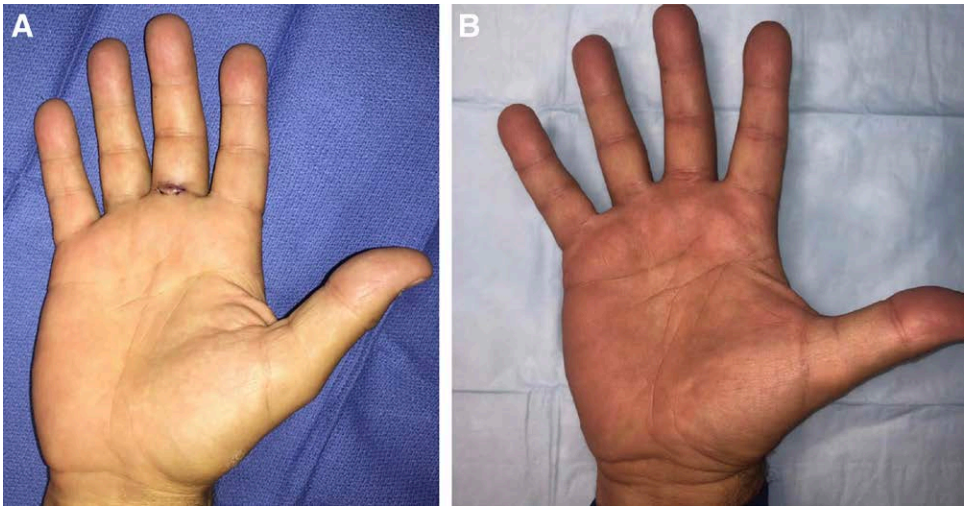

Fig. 6. Postoperative result. One week (A) and 6 months (B) status post right middle finger endoscopic trigger finger release.

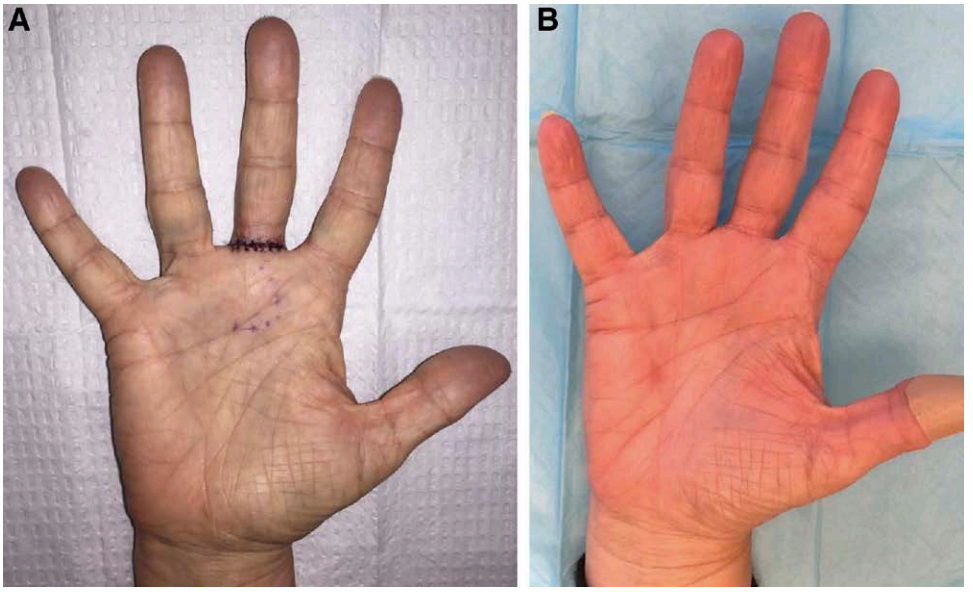

Fig. 7. Postoperative result. One week (A) and 6 months (B) status post right middle finger endoscopic trigger finger release.

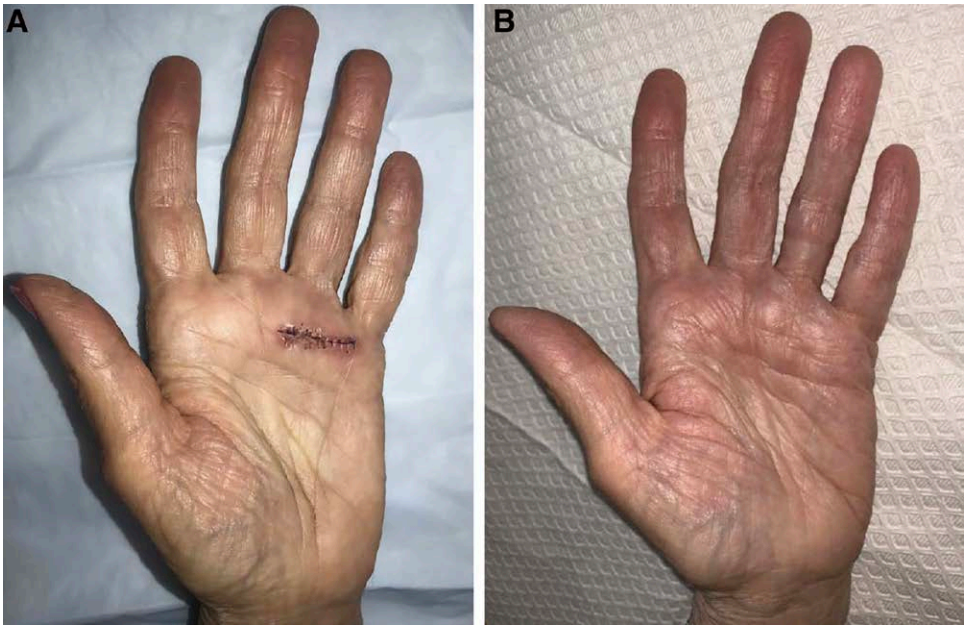

Fig. 8. Postoperative result. Two weeks (A) and 6 months (B) status post left ring finger open trigger finger release.

return to work is dependent on intrinsic patient characteristics and type of work.[24] It is also important to note that postoperative occupational therapy protocols after treatment of trigger finger differs between providers, which was certainly the case within our own group. The ease of access to a hand therapist and concomitant hand diagnoses is likely to impact a patient's compliance and need for hand therapy. As such, the importance of this outcome measure remains unclear. Enrollment of more patients in future studies is necessary to elucidate true differences in secondary outcome measures.

Average operative time was found to be more in the endoscopic treatment group although this difference was not statistically significant. We attribute the difference in operative time to definition (surgery start to surgery stop) and our limited sample size, as only data from single-digit surgeries were included in this analysis (n = 4 for endoscopic and n = 8 for the open treatment group). The values, furthermore, varied widely between subjects within the endoscopic treatment group and continued to shorten throughout the duration of the study, as the surgeon and surgical staff became more familiar with the technique. The current operative time for the senior author is less than 20 minutes from start to finish. Select studies comparing endoscopic versus open carpal tunnel release report longer operative times for patients treated

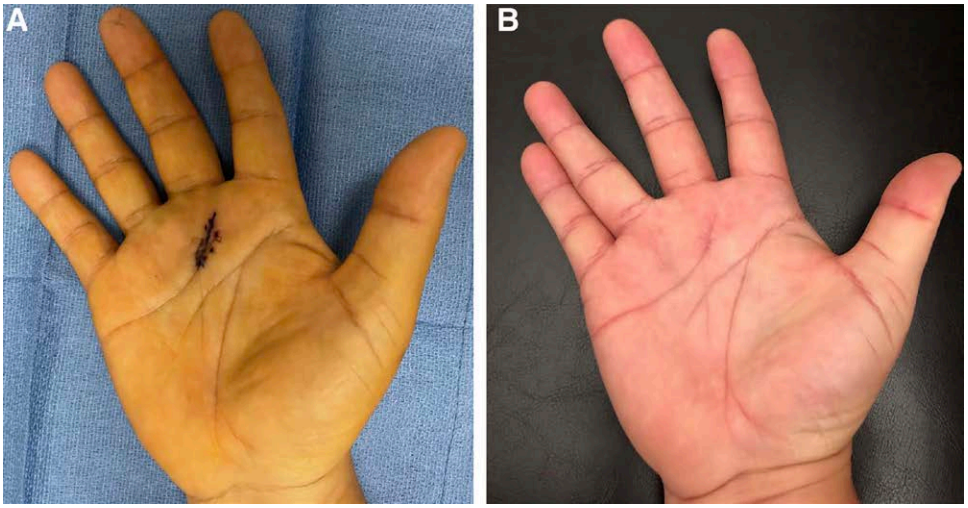

Fig. 9. Postoperative result. One week (A) and 6 months (B) status post right middle finger open trigger finger release.

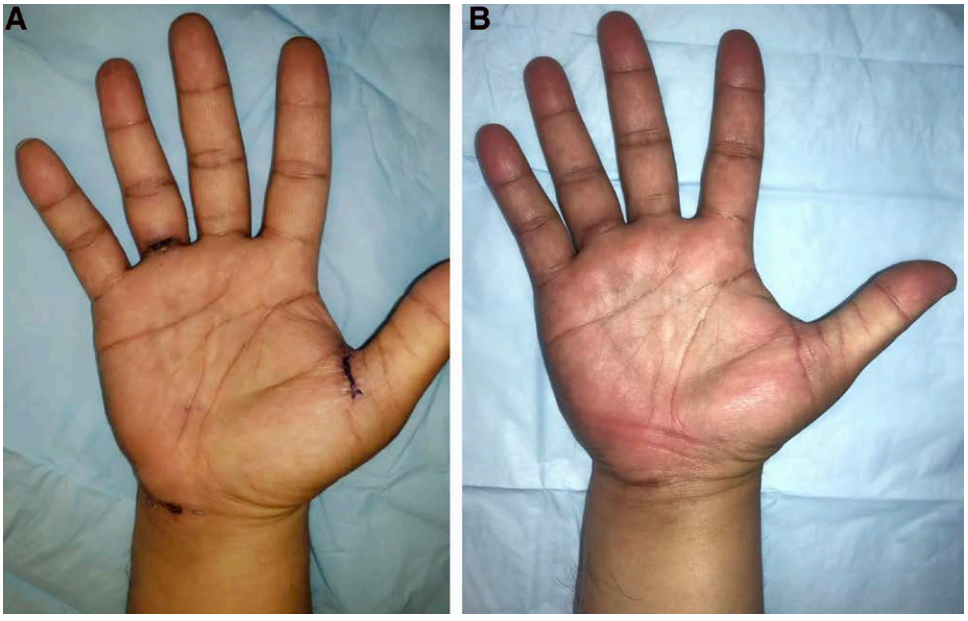

Fig. 10. Postoperative result. Two weeks (A) and 2 months (B) status post right ring finger endoscopic trigger finger release, open trigger thumb release, and endoscopic carpal tunnel release.

endoscopically.[25,26] Results of a recent meta-analysis comparing the two techniques, however, found no overall difference.[27] Comparison of operative time between the nonpalmar endoscopic and open surgical approach for trigger finger release, with cost analysis, is a topic for future study.

Patients' overall satisfaction, days of opioid use, and recurrence and complication rates did not differ significantly between groups. Our reported recurrence rate of 7.7% for the open treatment arm is slightly higher than the rates reported in the literature, which range from 0% to 3% for open surgical treatment.[9,12,13,28,29] We attribute this difference to our limited sample size and to variability in previously published follow-up length and definition. Bruijnzeel et al,[12] for example, defined recurrence as a return of triggering after a trigger-free period of 6 months. Our open recurrence patient presented with symptoms of triggering approximately 1 month after surgery and would not have met criteria for recurrence under this definition. Others with more limited follow-up report recurrences only within 6 months of surgery.[9,29] Our average length of follow-up was greater than 1 year for both treatment arms.

Our data demonstrate that the nonpalmar endoscopic approach is as effective as the standard open technique in the treatment of trigger finger and does not differ significantly from the open treatment approach in almost all measured outcomes. Where the two techniques differ is early in the postoperative course, where treatment with the nonpalmar endoscopic approach results in better

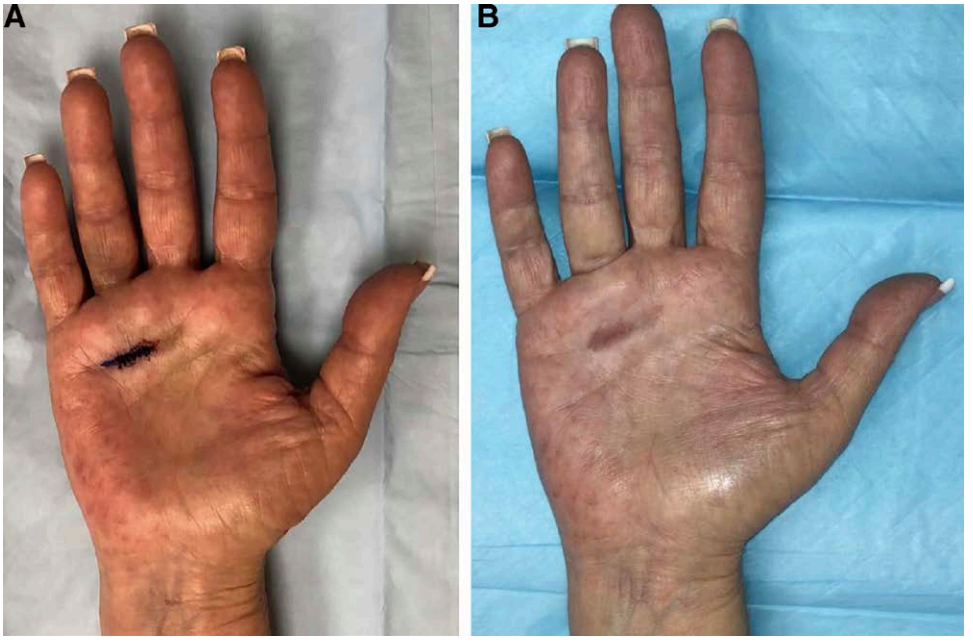

Fig. 11. Postoperative result. One week (A) and 2 months (B) status post right ring finger open trigger finger release.

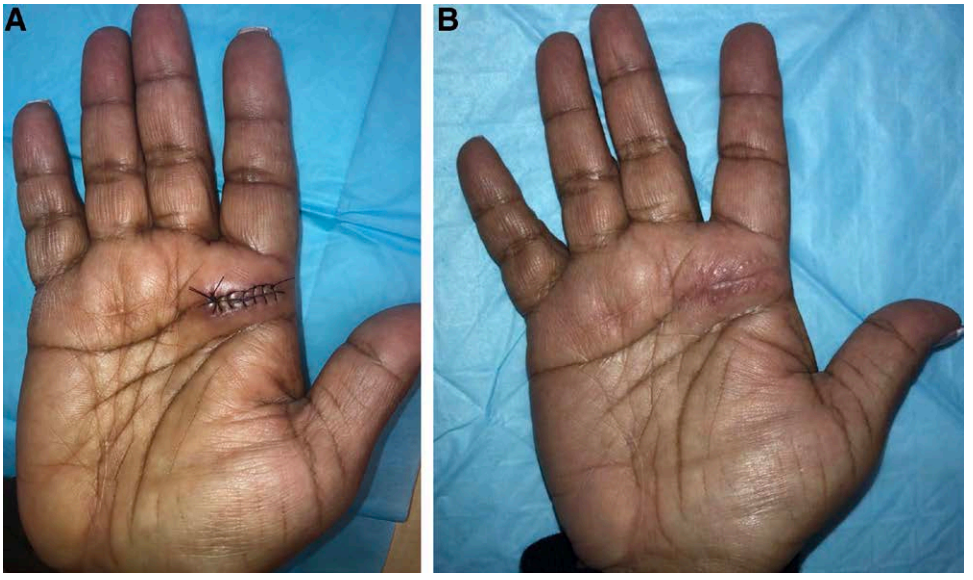

Fig. 12. Postoperative result. Two weeks (A) and 2 months (B) status post right index finger open trigger finger release.

scarring compared to the open treatment group. Similar findings are reported in the comparison of endoscopic and open carpal tunnel release.[16,27,30,31] Use of the nonpalmar endoscopic technique, furthermore, uniquely allows for identification of triggering at the A2 pulley, as this can be easily inspected with the endoscope. A slip of the FDS may be removed through the same incision, at the base of the proximal phalanx, if indicated.

Our study is limited by our small sample size as well as a lack of blinding, as it is not possible to blind the patient, surgeon, or healthcare staff to the patient's treatment group. Future studies will be aimed at comparing the aesthetics of scarring between the nonpalmar endoscopic and open treatment techniques.

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