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The efficacy of percutaneous A_1 pulley release for trigger finger treatment

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Background : *Percutaneous soft tissue release is an alternative treatment of trigger fingers after it has failed conservative treatment. This technique is, convenient, safe, taking short surgical time, and can be performed on out patients without requiring any special instrument and well tolerated by patients. But because of its limited surgical exposure, some surgeons have questions on the completeness of soft tissue releasing, its outcomes, recurrent rate and adverse effects. We study recurrent rate and efficacy of percutaneous soft tissue release in comparison to open soft tissue release including post-operative pain, complications of the technique and time to return to work.*

Material and Method : *A randomized control trial study was performed on 62 fingers at Chainat Hospital and the Department of Orthopedics, King Chulalongkorn Memorial Hospital from May 2004 to October 2005. Demo-graphic data were described as descriptive. The mean and SD of pain VAS before and after operation were computed with 95 % confidence interval. The statistical analysis was summarized by unpaired T-test. The patient's global assessment and satisfaction index were analyzed by Mann-Whitney test. The frequencies of recurrence of snapping and adverse events were presented with descriptive statistics and Chi-square test.*

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Results : *No statistic significantly difference of recurrent rate and efficacy including average VAS pain and snapping between open group and percutaneous group (p>0.05). The average VAS pain score between the two groups in the time both before and after surgery (before surgery: open group and percutaneous group=4.043 ± 2.072 and 3.408 ± 1.616, respectively (P=0.191); week 1 post-operative= 1.560 ± 1.196and1.783 ± 1.020, respectively (p=0.44); week 12 postoperative=0.291 ± 0.64 and 0.291 ± 0.988, respectively (P=0.26). All cases had clinical improvement of snapping movement after surgery and no significant difference (P=0.150). For secondary outcomes, there were no statistically significant difference in patient's global assessment and satisfaction index between both groups (P=0.686 and 0.172, respectively). However there were strongly statistically significant difference in number of paracetamol used, time to return to work and evidence of surgical site morbidity (P<0.001).*

Conclusion : *This study demonstrates that efficacy and recurrent rate of percutaneous soft tissue release has no statistically significant difference in comparison with conventional open soft tissue release. Nevertheless, it has superiority over the conventional in terms of complication of the technique and time to return to work.*

Clinical relevance : *The percutaneous soft tissue release of A1 pulley in trigger finger is an effective treatment with low recurrent rate. This technique is convenient, safe and minimally invasive procedure. Patients can return to work quickly and have fewer surgical wound problems and absence of surgical scar.*

Keywords : *Open soft tissue release, Percutaneous soft tissue release, Snapping, Trigger finger.*

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ความรู้พื้นฐาน : *การผ่าตัดโดยวิธีเจาะรูผ่านผิวหนังเป็นวิธีหนึ่งที่ใช้รักษาโรคนิ้วล็อค แต่เนื่องจากไม่ได้เห็นพังผืดโดยตรง ทำให้อาจเกิดปัญหาเรื่องตัดพังผืดได้ไม่หมด ซึ่งมีผลให้เกิดเป็นซ้ำ หรือเกิดอาการแทรกซ้อนได้ การศึกษานี้มุ่งศึกษาอัตราการเป็นซ้ำ และประสิทธิภาพของการรักษาโดยวิธีนี้เมื่อเปรียบเทียบกับการผ่าตัดแบบเปิดตามปกติ รวมทั้งดูผลในแง่ความปวดหลังการผ่าตัด โรคแทรกซ้อนและระยะเวลาที่ผู้ป่วยสามารถกลับไปทำงานได้*

ระเบียบวิธีวิจัย : *เป็นการศึกษาแบบ randomized control trial โดยศึกษาในผู้ป่วย 62 นิ้ว ที่โรง พยาบาลชัยนาทและโรงพยาบาลจุฬาลงกรณ์ ในระหว่างเดือนพฤษภาคม 2547 – ตุลาคม 2548 ใช้ visual analog scale (VAS) ในการประเมินความปวดก่อนและหลังผ่าตัด และเก็บข้อมูลประสิทธิภาพโดยรวม ความพึงพอใจ การเกิดซ้ำของการล็อค และอาการแทรกซ้อน ประเมินความสำคัญของข้อมูลโดยวิธีทางสถิติ*

ผลการศึกษา : *ไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติในแง่ของความเจ็บปวด การเกิดซ้ำและอาการล็อค ระหว่างกลุ่มที่รักษาแบบผ่าเปิดตามปกติและเจาะรูผ่านผิวหนัง ($p > 0.05$) ค่า VAS ก่อนผ่าในกลุ่มที่เปิด = 4.043 ± 2.072 และกลุ่มเจาะรูผ่านผิวหนัง = 3.408 ± 1.616 ($p=0.191$) หลังผ่าตัด 1 สัปดาห์ เป็น 1.560 ± 1.196 และ 1.783 ± 1.020 ตามลำดับ ($p=0.44$) หลังผ่าตัด 12 สัปดาห์ เป็น 0.291 ± 0.64 และ 0.291 ± 0.988 ตามลำดับ ($p=0.26$) ผู้ป่วยทุกคนมีอาการดีขึ้นในเรื่องการล็อค โดยไม่มีความแตกต่างกันใน 2 กลุ่ม ($p=0.150$) ส่วนเรื่องประสิทธิภาพโดยรวมและความพึงพอใจ ก็ไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p=0.686$ และ 0.172 ตามลำดับ) แต่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติในเรื่องของการใช้ยาพาราเซตามอล ระยะเวลาที่สามารถกลับไปทำงานได้และผลแทรกซ้อนเฉพาะบริเวณที่ผ่าตัด ($p<0.001$)*

สรุป : *การศึกษานี้ได้แสดงให้เห็นว่าประสิทธิภาพ และอัตราการเป็นซ้ำของการเกิดนิ้วล็อคในการรักษาโดยวิธีเจาะรูผ่าตัดผ่านผิวหนัง ไม่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติกับการรักษาโดยการผ่าตัดเปิดตามปกติ แต่กลับจะได้ผลดีกว่าในแง่ของอาการแทรกซ้อนและระยะเวลาที่สามารถกลับไปทำงานได้*

การนำไปใช้ทางคลินิก : *การผ่าตัด A1 pulley โดยเจาะรูผ่านผิวหนังในการรักษาโรคนิ้วล็อคเป็นวิธีที่มี ประสิทธิภาพและมีอัตราการเป็นซ้ำต่ำ วิธีการผ่าตัดนี้สะดวก ปลอดภัย ผู้ป่วยสามารถกลับไปทำงานได้เร็วขึ้นและมีปัญหาเกี่ยวกับแผลผ่าตัดน้อย ไม่มีแผลเป็น*

คำสำคัญ : *ผ่าตัดนิ้วล็อค, ผ่าตัดผ่านผิวหนัง, นิ้วล็อค, นิ้วไกปืน.*

Trigger finger is a disorder characterized by abnormal movement of flexor digital tendon (Figure 1). Its etiology is highly repetitive movement of the finger that is found in some occupations or abnormal collagen in some systemic diseases. This disorder is one of the most common reasons for disability to work and a major economic problem among the populations.[1-3] The pathology of the disease is the formation of fibrosis on the surfaces of the tendon sheaths especially A1 pulley area followed by thickening of sheath or nodule on flexor tendon. The result is the difficult passing of the tendon through the pulley. It is characterized by snapping or locking of the fingers (with or without pain).[4, 5] Clinically this can present as it passes through the tight constricting tendon sheath, especially the thickened area in the A1 pulley.[6] Some studies concluded that the underlying patho-biological mechanism for triggering at the A1 pulley is characterized by a fibrocartilage metaplasia. [7] Treatment interventions are aimed to reduce pain and triggering and to extend flexed finger. The treatments include both conservative and operative approaches. The conservative treatments are provided to patients with minimal symptom, short duration and good cooperation for rehabilitation. This includes stretching, night finger splint, [8] physical therapy, analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), steroid injection. [9-11] NSAIDs are the commonest symptomatic treatments for trigger finger but they also have major adverse effects and high rate of recurrence. Local steroid therapy is another conservative treatment but its success rate is only 50 to 60 % and often requires repeated injections. [9,10,12] Adverse effects of steroid injections, such tendon rupture, may result from excessive use. The major disadvantage of local corticosteroids is their short duration of action and high recurrence.[14,15] Surgery is the definite treatment for trigger finger; it suits the patients with severe symptom, prolonged duration or failure to conservative treatment. At first, the conventional technique for soft tissue release was open method via palmar skin incision which is made by surgical knife. Its result is excellent [16,17] but it also has disadvantages such as invasive surgical wound, nerve injury,[18] bowstringing (due to excessive sheath release), [19] prolonged recovery time and rehabilitation.

A new technique of percutaneous release of the trigger finger is described by Eastwood et al in 1992. The technique is effective, convenient, safe, requiring short surgical time, and can performed on outpatients, without any need of special instrument and it is well tolerated by the patients. [20,21] Several reports claimed that it could release soft tissue completely without adjacent organ injury. [22-25] Nevertheless evidence of some studies revealed that A1 pulley was completely released in only 38 % and the flexor tendon was damage in 73 % in cadaveric studies. [23,24] Even without snapping or triggering, many patients, however, came back with remaining pain. Moreover some of them complained of recurrent triggers. This means that some undesired consequence of the outcome might occur after this minimal invasive technique. However, there were no significant complications and low recurrences and the patients' quicker return to normal life. [20,26-28]

After reviewing the literature, there was not previous RCT study in Thailand of percutaneous soft tissue release in comparison with the conventional open release in the standpoints of recurrence rate,

post-operative pain, clinical complication of the technique and time to return to work.

We hypothesized the percutaneous soft tissue release of A1 pulley in trigger finger is an effective treatment. The probability of recurrence rate of clinical symptoms in trigger finger patients who have percutaneous soft tissue release is not different from those who have open soft tissues release.

Material and Method

The study was performed at the Outpatient Clinic, Chainat Hospital and Department of Orthopedics, King Chulalongkorn Memorial Hospital from May 2004 to October 2005. Research design was a randomized controlled trial study. The study populations were patients who have clinical symptoms of mechanical blocking movement (including snapping or locking) and Quinell's classification > grade II (Table 1), who had failed conservative treatment or those who could not tolerate medical treatment. Research administration is shown in figure 2.

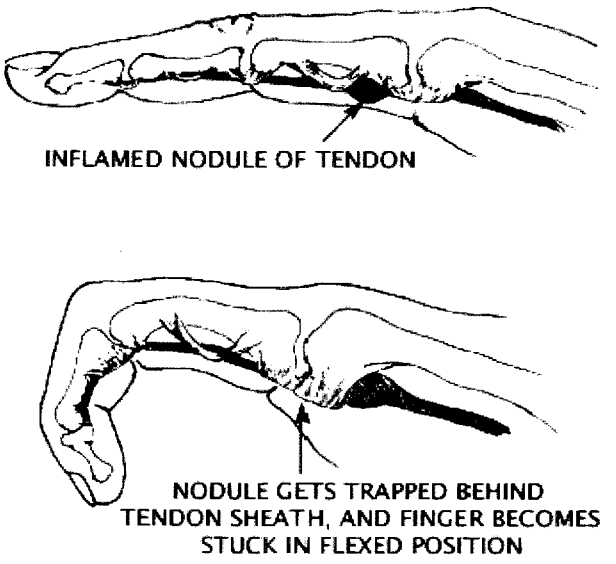

Figure 1. Trigger finger anatomy and gross pathology.

Table 1. Degree of severity (By Quinell's classification).

Grading	Mode of gliding
O - normal	Normal
I - mild	Tender or snapping sensation
II - moderate	Active correctable
III - severe	Passive correctable
IV - lock	Lock in flex/extension

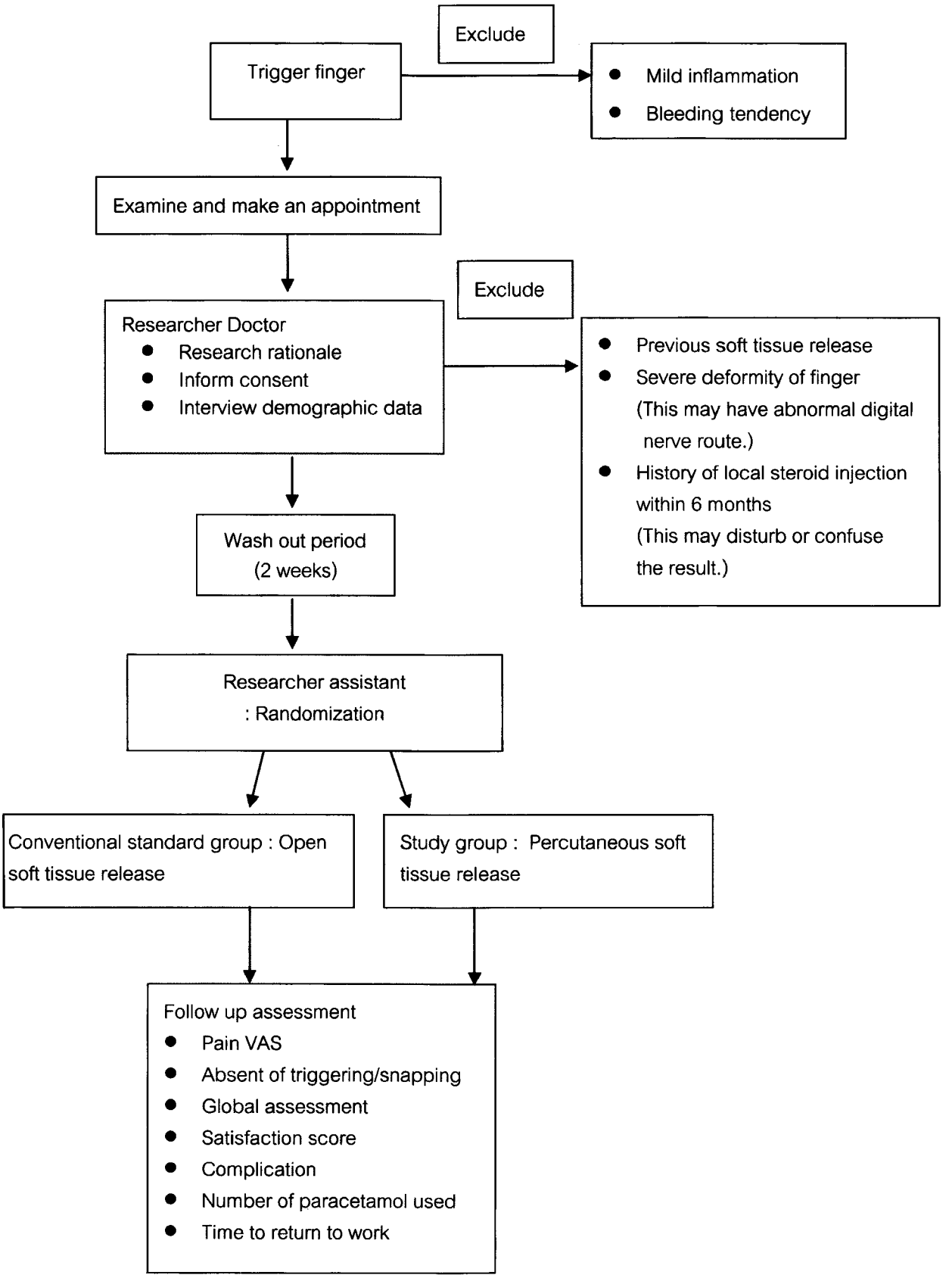

Figure 2. Research administration.

Sixty-two fingers (Fifty-eight patients) were recruited for this study. They were divided into two groups by simple random table technique. Demographic data were described as descriptive data. The mean and SD of pain VAS before and after operation were computed with 95 % confidence interval. The statistical analysis was summarized by unpaired T-test. The patient's global assessment and satisfaction index were analyzed by Mann-Whitney test. The frequencies of recurrence of snapping and adverse events were presented with descriptive statistics and Chi-square test.

Intervention

Pre-operative planning

: Patients were asked to discontinue all current medications except paracetamol as a rescue medication for pain relief. They were interviewed on their demographic and baseline data including severity and hand function. They were randomized to be recruited to each group.

Study group (percutaneous soft tissue release)

: local anesthesia by 1-2 cc of xylocaine injection at the A1 pulley, then the no.18 gauge needle was inserted through the skin at the same point and the transverse fibers of A1 pulley was cut by the tip of the needle. A grating sensation could be felt when the needle tip cut through the horizontal fiber of the pulley. The grating sensation ceased when the pulley was completely divided then confirmed by surgeon's palpation. The patient was then asked about triggering sensation on active finger movement.

Control group (open soft tissue release)

: local anesthesia was done by the same technique, an open skin incision about 1 to 2 cm was done at the distal palmar crease then the surgeon explored the A1 pulley by a knife no.11 until the pulley was completely released. The wound was closed by Nylon 4/0 (simple interrupted suture)

Post-operative planning

The patients were asked to start the using of their hands as soon as they could tolerate the pain and were scheduled to return for follow up at 1 week and 3 months later for outcome assessments in addition to demographic data collection.

Subjects would have no other treatment except paracetamol which researcher prescribes for pain relief. They would be asked to bring medicine back at the follow up sessions to be count for the remaining tablets. In addition, they were expected to report undesired side effects that happened after the therapeutic session (potential adverse effects).

The intervention would be stopped, under the following criteria:

1. There are serious complications such as worsen ROM, intractable pain or infection.
2. The patient rate him/herself as much worse.
3. The patient decided to withdraw from the study.

Data collection

The outcome was assessed and examined by the same doctor at all visits.

Baseline variables

: Age, gender, occupation, education level, dominant hand, duration of pain and triggering,

affected fingers and side, severity (Quinell's classification), hand function and underlying disease.

Primary outcome variables

Triggering was employed as a measurement of the primary outcome. Both patient and evaluator's feeling of triggering were required. The evidence of recurrence was evaluated by physical examination and observation (including the pain and snapping/locking during active and passive movement). The outcomes will be measured at the first week after receiving the treatment and at the end of the 3rd months (week 12) because most of the recurrences would then occur.

Secondary outcome variables

Postoperative pain:

will be assessed by visual analog scale.

The patients' global assessment score:

at the end of the study, patients in both groups would be asked to evaluate the effect of treatment on 6-point **Likert scale**: complete recovery, marked improvement, moderately improvement, slightly improvement, no improvement, or getting worse.

The patients' satisfaction:

at the end of the study, one question would be asked concerning the patients' satisfaction on the treatment by 5-point **Likert scale**: very satisfy, moderately satisfy, slightly satisfy, indifferent and unsatisfied.

Complications

Complications will be reported. Every patient would be asked whether they have more pain or difficulty to extend finger after the surgery. The investigator would examine for incomplete release, digital nerve injury, tendon injury and others, (including swelling, more disability in 24 hours, persistent pain more than 7 days, scar, numbness, joint stiffness, worse function of finger and infection).

Co-intervention

Numbers of drug used (analgesic) for pain relief and time to return to work from both groups were recorded at the end of the study. Subjects were asked to have no other treatment except paracetamol given by the researcher. The on shelf medications from any drug store or traditional medicine are not allowed to be used. Physical therapy of any type was supposed to be reported.

Results of study

Flow of study participants

Sixty-two patients were enrolled. All patients came back for first visit but 2 cases were lost to the second visit (due to inaccessible). There were two cases of percutaneous method group who dropped out from the study, as they were getting worse and were converted to open method before second visit. Therefore, data of 30 and 30 cases were finally included in the first and twelfth week analysis.

Demographic data

The data variables of the subjects were summarized as mean, SD, minimum, maximum as follows: age (53.18 ± 7.8 years), sex (female: 51 (85.0 %),male: 9(15.0 %)), underlying disease (DM 16.7 %, CTS 16.7 %, rheumatoid 1.7 %, thyroid 1.7 %, cardiovascular 21.7 %), occupation (house maid: 45.0 %, hand users (cooks, teachers, drivers):

18.3 %, tailors:18.3 %, merchants:13.3 %, heavy lifters: 6.7 % and others: 17.7 % (Fig. 3), education level (illiterate: 3.3 %, primary school: 30.0 %, secondary school: 48.3 %, university: 18.3 %), duration of disease (8.78 ± 8.4 months), dominant hand (right side: 95.0 %, left side: 5.0 %), affected finger (thumb: 8.4 %, index: 15.0 %, middle: 53.3 %, ring: 23.3 %, small: 0 %) (Fig.4), severity score (grade I : 0 %, grade II : 53.3 %, grade III : 45.0 %, grade IV : 1.7 %) and hand grip strength (grade I : 0 %, grade II : 0 %, grade III : 0 %, grade IV : 11.7 %, grade V :88.3 %).

Efficacy and outcome

The comparisons of average pain score and pain on different activities between before and after the treatment in each group were performed by parametric test (paired t-test). At first, the average outcomes of open technique group changed the pain score from baseline: 1.625 ± 0.158 and 2.87 ± 1.48, p <0.001 and p<0.001 in week1 and week 12 respectively. The detail of pain score reduction in certain activities were as follows: pain reduction on working were 2.27 ± 1.143 and 4.23 ± 2.029, p = 0.002 in both week1 and week 12, pain reduction on hand griping were 2.77 ± 1,073 and 5.13 ± 1.525, p < 0.001 in both week1 and week 12, pain scores at night were 0.93 ± 1.874 and 1.73 ± 2.227, p<0.001 in both week 1 and week 12 and pain scores at rest were 0.43 ± 1.040 and .93 ± 1.413, p=0.030 and p<0.001 in week1 and week 12 respectively. The pain scores in this group on all activities, including at night and at rest, improved statistically significant in both week 1 and 12 follow-ups. However, while pain score in all activities strongly statistically significant improved in week 1 after surgery but the pain score at rest did not. This pain score showed strongly statistically significant improvement in week 12 after surgery.

As for the other group, the percutaneous technique changed the average pain scores from baseline: 2.48 ± 1.69 and 3.751 ± 2.024, p <0.001 and p <0.001 in week 1 and week 12, respectively. The detail of pain score reduction in certain activities were as follows: pain reduction on working were 3.80 ± 2.041 and 5.37 ± 2.385, p <0.001 in both week 1 and week 12, pain reduction on hand griping were 4.00 ± 2.133 and 5.90 ± 2.203, p < 0.001 in both week 1 and week 12, pain scores at night were 1.77 ± 2.555 and 2.80 ± 2.952, p<0.001 in both week 1 and week 12, and pain scores at rest were 1.03 ± 2.205 and 1.73 ± 2.545, p=0.016 and p <0.001 in week1 and week 12 respectively. In the same way of previous group, there were statistically significant reduction of pain score for the pain on all activities both in week 1 and week 12. But this pain reduction at rest was strongly statistically significant in both week 1 and week 12 and not in week 12 only.

Although, the VAS pain score in each period of the same method group were different depending on the time of follow up but in comparison between open and percutaneous method which were analyzed by unpaired t-test. We found statistically significant reduction only pain on hand grip in week 1. The data analysis is shown on table 2. As for pain in other activity, there were no statistically significant difference of average VAS pain score in the time both before and after surgery (before surgery: open group =4.0433 ± 2.0727; percutaneous group =3.4083 ± 1.616 (p=0.191); week 1

postoperative: open group =1.560 ± 1.1960, percutaneous group =1.7833 ± 1.0207 (p=0.440); week 12 postoperative: open group =0.2917 ± 0.6401, percutaneous group =0.2917 ± 0.988 (P=0.266). All cases had improvement of symptoms of snapping movement after surgery in both groups. But two cases of percutaneous method group had recurrent of pain and snapping during study. They were converted to open technique and later got complete recovery. The operative findings of these two patients were the same problem, which is incomplete releasing at the proximal part of A1 pulley. We found only some scratches on the flexor tendons. When they were compared, we did not find any statistically significantly difference of recurrent rate between open group and percutaneous group (p >0.05). The second efficacy outcome of study comprised global assessment index, patient's satisfaction index, number of paracetamol use after surgery and time to return to work. There were no statistically significant difference in global assessment index and patient's satisfaction index between the two groups (p=0.686 and p=0.172, respectively). However, there were statistically significantly differences in the numbers of paracetamol use, and time to return to work (p<0.001 both). The data in both groups were analyzed by Mann-Whitney U test. The events are shown in table 3.

Adverse events

We found a strongly significant difference for evidences of surgical site morbidity more in the open technique group including soft tissue swelling around the wound, more disability of hand in the next morning, persistent pain > 7days after surgery and surgical

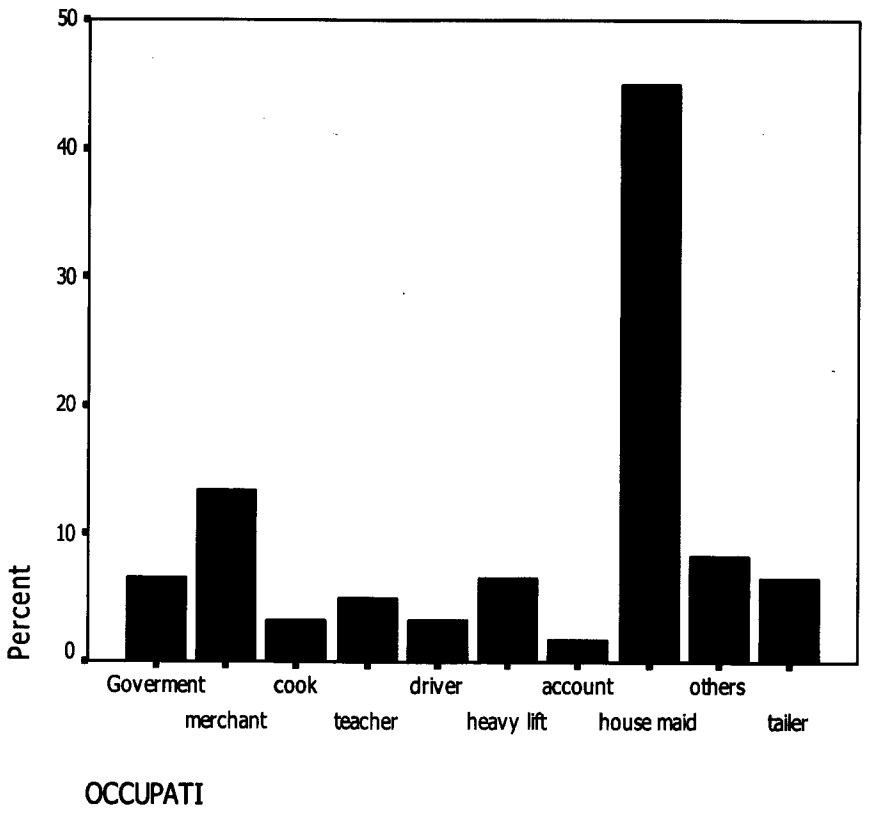

Figure 3. Occupation and trigger finger.

scar on palmar side of the hand which might affect the hand grip function and sensation. However, there were not statistically significant differences of evidence of joint stiffness, worse function of affected finger, postoperative infection and numbness of finger due to digital nerve injury. The data were analyzed by Chi-square test and shown in table 4.

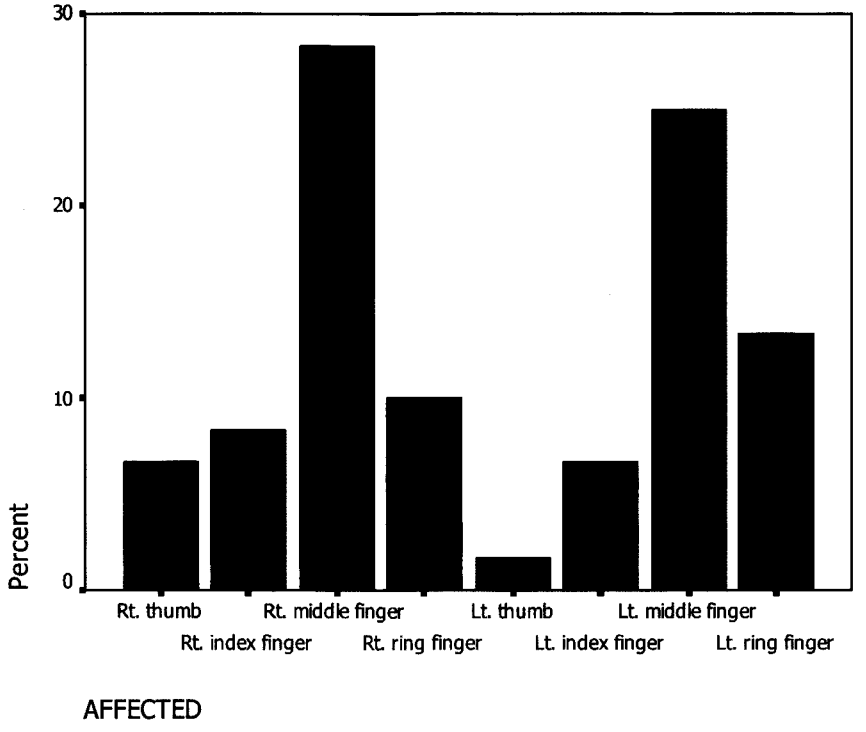

Figure 4. Affected fingers and trigger finger.

Table 2. Average pain scores compared between open STR and percutaneous STR.

Efficacy variables	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
				Lower	Upper
Pain at working (wk1 post-op)	.474	-.30	.416	-1.133	.533
Pain on hand grip (wk1 post-op)	.032*	-.83	.378	-1.591	-.076
Pain at night (wk1 post-op)	.832	.07	.313	-.560	.694
Pain at rest (wk1 post-op)	.566	.13	.231	-.329	.595
Pain at working (wk12 post-op)	.612	.10	.196	-.293	.493
Pain on hand grip (wk12 post-op)	.164	-.37	.260	-.888	.154
Pain at night (wk12 post-op)	.203	-.17	.129	-.426	.092
Pain at rest (wk12 post-op)	.471	-.07	.092	-.250	.117
Average pain score (pre-op)	.191	.6350	.47994	-.32571	1.5957
Average pain score (wk1 post-op)	.440	-.2233	.28708	-.79798	.35131
Average pain score (wk12 post-op)	.266	-.2417	.21503	-.67210	.18876

Note: Unpaired t-test

* Statistically significant

Table 3. Numbers of paracetamol used and time to return to work compared between open STR and percutaneous STR.

Efficacy variables	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Nmbers of Paracetamol (tablets)	<0.001*	-2.10	0.660	-3.421	-0.779
Time to return to work (days)	<0.001*	-7.60	0.735	-9.070	-6.127

Note: Unpaired t-test

* Statistically significant

Table 4. Adverse effects compared between open STR and percutaneous STR.

Adverse event frequency	Open STR N (%)	Percutaneous STR N (%)	P-value@
Swelling	25	10	<0.001*
More disability in next morning	30	19	<0.001*
Persistent pain >7 days after surgery	27	6	<0.001*
Scar	30	1	<0.001*
Numbness of finger	2	1	.554
Joint stiffness	4	4	1.000
Worse function of finger	1	2	.554
Infection	0	0	-
Recurrent of snapping	0	2	.150

Note: Chi-square test

* Statistically significant

Discussion

Historically, treatment of trigger fingers failed to conservative treatment was only the open soft tissue release of A1 pulley which still be widely accepted as the gold standard. But there were many problems about this procedure such as invasive surgical wound, prolong recovery time and rehabilitation, difficult for wound care, retained surgical scar at palmar surface of hand that may cause pain during hand gripping or cosmetic problem.

So an alternative procedure was created to resolve these problems. The new technique was percutaneous soft tissue release of A1 pulley. Advantages of this new technique were its convenience to use and minimally invasive surgical wound. It did not require advanced facility because it could be made in out-patient room by local anesthesia and could operate by gauge needle no.18 that was easily available in general hospitals. Because of its minimal invasion, patients can return to work faster and have

smaller or none of surgical scar after operation. However, some authors have questions concerning its results because this technique cannot evaluate A1 pulley directly both during releasing and after finishing operation to confirm the completeness of soft tissue releasing. Some authors classified this technique as a blind procedure. They concerned whether soft tissue releasing was incomplete, the disease could return. Bain et al[22] studied the outcome of percutaneous soft tissue release which measured completeness of STR in cadaveric specimen, and they found the A1 pulley was completely released in only 68 % while the remaining 32 % were incompletely released. It could induce clinical recurrence of trigger finger.

Moreover, several authors have indicated the proximity of the digital nerves in the thumb that can be a considerable risk of nerve injury when the percutaneous technique is done.[20,22,24] The radial digital nerve of the thumb passes diagonally across the tendon of flexor pollicis longus from the ulnar to the radial side, a few millimeters proximal to the metacarpophalangeal flexion crease, where the proximal part of A1 pulley lies. Distally, the nerve is located on the far lateral side of the thumb. Ha KI et al have advised that when this percutaneous technique is used care must be taken not to extend releasing too proximally than the proximal end of A1 pulley of the thumb.[28] As for the little finger, Bain GI et al have demonstrated in cadaver that this percutaneous technique can make the release within 2 mm of the ulnar digital nerve of the little finger. They advise to abduct the little finger when doing percutaneous releasing to increase this distance and then decrease the risk of nerve injury.[22]

In the present study, the efficacy of percutaneous soft tissue release for trigger finger treatment was estimated from the prevalence of clinical recurrence in term of postoperative pain and snapping movement of affected fingers. We compared its results with the gold standard procedure that was the open soft tissue release of A1 pulley. Additionally, we studied the advantage and disadvantage in each procedure including adverse effects, recovery time and patient's satisfaction. We did not find any statistically significantly difference of recurrence rate after operative treatment and the patients' satisfaction index of treatment between open and percutaneous technique. Considering the secondary outcomes, we found significantly smaller number of paracetamol used after surgery (average 5.97 vs 8.07 tablets) and shorter time to return to work (average 4.03 vs 11.63 days).

Regarding the adverse effects, we found a strongly significant difference for evidence of surgical site morbidity more in the open technique group including soft tissue swelling around the wound, more disability of hand in the next morning, persistent pain > 7days after surgery and surgical scar on the palmar side of hand which may affect the hand grip function and sensation. However, there were not statistically significant difference of evidence of joint stiffness, worsened function of affected finger, postoperative infection and numbness of finger due to digital nerve injury. Unfortunately, we found some un-satisfaction of outcomes in percutaneous technique. Two patients had stiffness of affected finger and limited flexion after operation. But these symptoms were resolved after rehabilitation within two weeks. No serious complication was found in both groups.

Conclusion

The percutaneous soft tissue release of A1 pulley in trigger finger is an effective treatment. The advantages of this technique are convenient, safe, easy, shorter surgical time, can be performed by outpatients, without requiring any special instrument and it is well tolerated by patients. Because it is minimal invasive procedure, patients can return to work quickly with fewer surgical wound problems and absence of surgical scar.

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