

LOCAL CORTICOSTEROID INJECTION VERSUS OPEN SURGICAL RELEASE IN THE TREATMENT OF THE TRIGGER FINGER

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ABSTRACT

Background: Trigger finger (stenosing tenosynovitis) is a common problem of the hand encountered in orthopedic practice. methods of treatment including conservative management, corticosteroid injection, Percutaneous surgical release and open surgical release. Objective: The aim of this study is to compare between the effectiveness of local corticosteroid injection and open surgical release in treatment of trigger finger in terms of symptomatic relief, patient's satisfaction and complications Patients and Methods: The study is prospective Clinical trial study carried out in orthopedic unit in Al-Jumhoori Teaching Hospital in Mosul from July 2019 to September 2020. The total number of patients were 44 patients with 46 trigger digits presented with grade II and grade III according to Green's classification of trigger finger. The patients were divided into two groups the first group (24 digits) patients who received local steroid injection and the second group (22 digits) patients who had open surgical release. Results: (55.5%) of digits were treated with CS injection had complete pain relief compared with (92.9%) of digits were treated with open surgical release. (37.5%) of digits were treated with CS injection had good recovery after one single injection compared with (91%) of digits were treated with open surgical release. The complication rate was (4.1%) in group of CS injection and (9%) in group of surgical release. Conclusion: Local CS injection has lower efficacy than surgical release in management of trigger finger. The open surgical release is a safe and effective procedure in management of trigger finger. The procedure has a few complications with a high success rate. Effectiveness of local corticosteroid injection decreases with increasing in the severity of the trigger finger and with increasing in duration of symptoms.

KEYWORDS: Corticosteroid injection, Open surgical release, Trigger finger.

INTRODUCTION

Trigger finger is commonly caused by inflammation and thickening of the flexor sheath, where the tendon glides back and forth to allow movement of the fingers or some time by thickening of the flexor tendon itself.^[1] The most common problem involves one of the ligaments that make up the tendon sheath, usually the first ligament (pulley A1) at the base of the finger. Because of its position, it is exposed to the most pressure in the hand, for example when you grip something. Over time this ligament can become thicker than it should be.^[2] As the ligament thickens, it partially blocks the opening (Entrance) of the sheath making it harder for the tendon to slide in and out of the sheath. Normally as one straightens the finger or thumb the flexor tendon should slide back up

the sheath into the finger, if the sheath is partially blocked the tendon cannot enter the sheath and the finger becomes temporarily stuck in a bent position. The stuck tendon may suddenly pop past the swollen ligament into the sheath releasing the finger like the release of a trigger.^[3] With time the flexor tendon may develop a knot (nodule) caused by irritation from rubbing against the narrowed tunnel walls of the sheath.^[4] With further attempts at digit motion, the tendon nodule pulls through the short tunnel and a snapping sensation (triggering) accompanied by pain may then be felt.^[5] initial management of trigger finger is conservative which involves activity modification nonsteroidal anti-inflammatory drugs for pain control and MCP joint immobilization (splinting).^[6,7,8,9] Injection of CS for treatment of trigger

finger was described as early as 1953.^[10] Injection of the involved flexor tendon sheath provides long-term relief of symptoms in 60% to 92% of affected digits; especially in non-diabetic patients with recent onset of symptoms and on affected digit with a palpable nodule.^[11] Betamethasone sodium phosphate is the steroid of choice because it is water soluble, does not leave a residue in the tendon sheath, is not known to cause tenosynovitis, and it causes less fat necrosis if the injection is placed in the tissue around the tendon sheath. Other CS such as triamcinolone and methylprednisolone also have been used successfully.^[12] Percutaneous release of the A1 pulley first was described in 1958 by Lorthioir.^[13] The technique has gained popularity recently and a number of studies have evaluated the safety and efficacy of percutaneous release. The main concerns with percutaneous release are digital neurovascular injury, incomplete division of the pulley and Painful tenosynovitis without triggering this may be a result of the longitudinal laceration to the superficial is tendon.^[14] Open release Open release of the A1 pulley has been used to treat trigger digits for more than 100 years. Some surgeons prefer to perform an open A1 pulley release under local anesthetic so the absence of triggering can be seen intraoperatively before closure of the wound. Others believe that local anesthetic distorts the surgical anatomy and therefore prefer a Biers block.^[6]

PATIENTS AND METHODS

A prospective study of forty-four patients with forty - six trigger digits was conducted in orthopedic department at Al - Jumhoori Teaching Hospital in Mosul from July 2019 to September 2020. Those patients presented to us with grade II and grade III according to Green's classification of trigger finger. patients who presented with grade I were treated conservatively and excluded from our study. any patients had previous treatment of the trigger finger with CS injection or surgical release were excluded from the study. The patients were divided into two groups; the first group (24digits) consisted of the patients who received local steroid injection and the second group (22digits) consisted of patients who had surgical release. In first group the distal palm in the area of the A1 pulley is cleansed with Povidone iodine

solution. A25- gauge needle was used to anaesthetize the area around the A1 pulley as well as the tendon sheath with 1ml of lidocaine without epinephrine. Then 1ml (40mg) of Methylprednisolone acetate (Depomedrol) is injected slowly. A small sterile dressing was applied for 1 day and the patient was allowed to return to normal routine activity. Analgesia is given for 3days. These patients are advised to return immediately if there were any sign to indicate infection. Those patients were assessed weekly for a month to observe the improvement in the grade of triggering, swelling, pain relief and patient's satisfaction, after that the assessment was done every two weeks for other 2 months in the second group, open surgical release of A1 pulley performed. A 1.5 cm transverse skin incision was done just distal to the distal palmar crease for trigger finger or just distal to the flexor crease of the thumb at MCP joint of trigger thumb. Care was taken to avoid digital nerves injury specially on the thumb. A1 pulley was incised longitudinally until the constriction of the tendon was released; the digit was flexed and extended to ensure complete release of the tendon. Only the skin was then closed and a small dry compression dressing was applied. In 5 patients the operation was done under general anesthesia and tourniquet, in other 17 patients the operation was done with Biers block anesthesia and tourniquet. Post operations; compression dressing is removed after 48 hours and a patch dressing is applied, normal use of the digit is then advised. Patients were seen every week for a month to observe the improvement in the grade of triggering, swelling, pain relief and patient's satisfaction; then every two weeks for the other 2 months. Only two patients presented with multiple digits involvement. One with bilateral middle finger involvement, this patient was treated with local injection of steroid on the one side and surgery on the other side, and the other patient with the thumb and ring finger involvement for the same hand treated with local injection of steroid on the one digit and surgery on the other digit.

RESULTS

Sex Distribution: Of these 44 patients included in our study there were 30 females (68.2%) and 14 males (31.8%) (Fig.1)

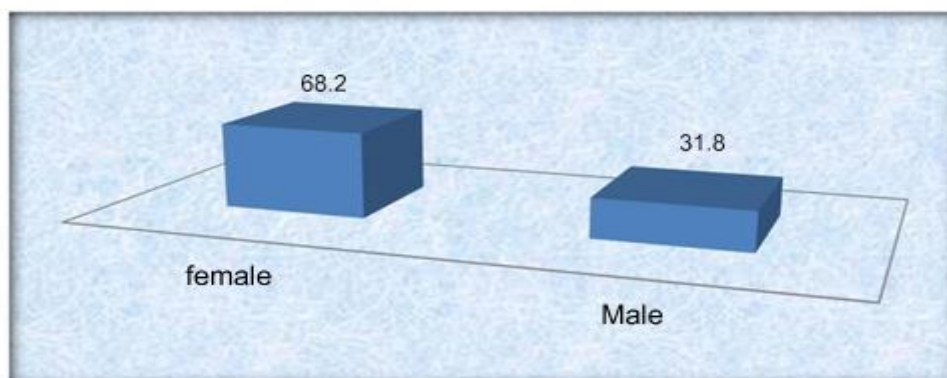


Figure (1): Female: Male ratio of involved patients.

Age Distribution

The mean age of the patients was 54 years (26 to 69) years. Patients with age less than 50 years (11 patients) those represent (25%). The commonest age group is

between 50-60 years (24 patients) those represent (54.5%). Patients with age more than 60 years (9 patients) those represent (20.5%) (Fig.2)

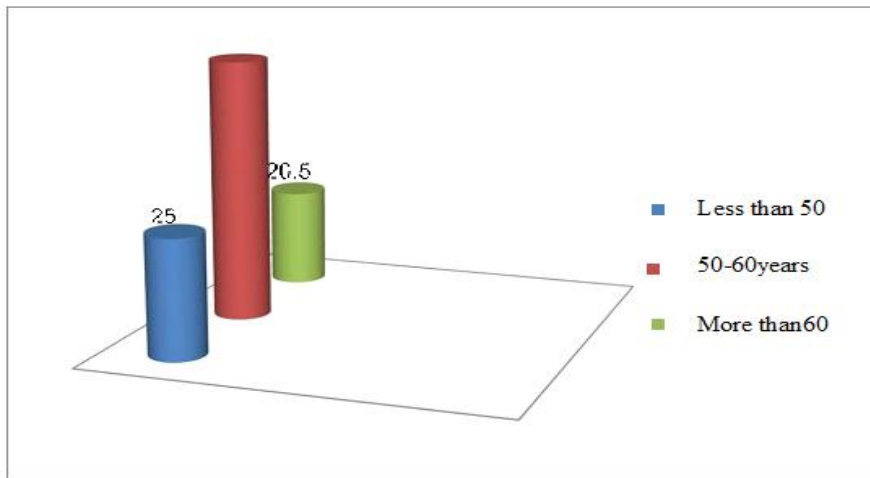


Figure (2): Age distribution of the involved patients.

Hand Dominance: Of the affected patients: 37 patients (84.1%) had right hand dominant and 7 patients (15.9%) had left hand dominant (Fig.3).

had left hand dominant (Fig.3).

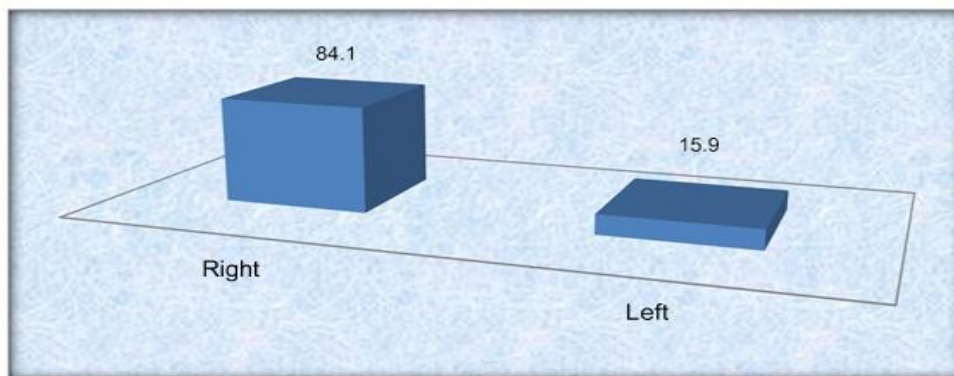


Figure (3): Hand dominance of the involved patients.

Side involved: Of the involved hands the right hand was involved in 33 patients (75%), the left hand was involved

in 10 patients (22.7%) and both hands were involved in one patient (2.3%). (Fig.4).

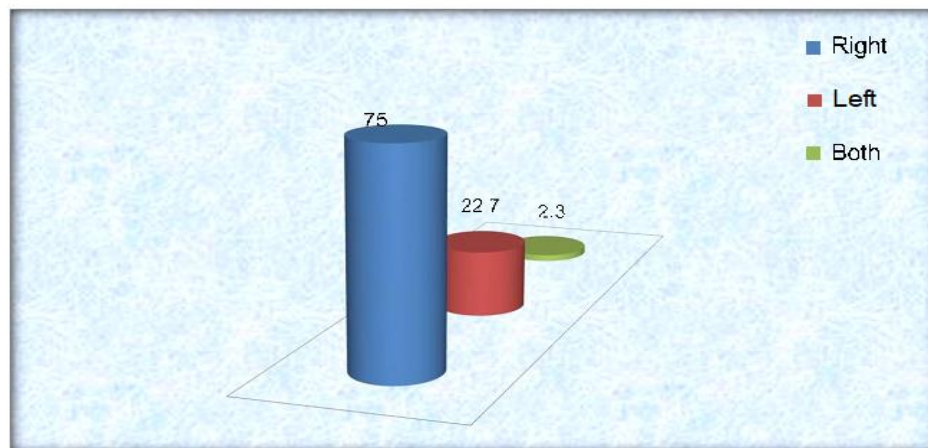


Figure (4): Side distribution of the involved hands.

Dominant hand affected of those 34 patients with right hand affected including the patient with both hands affected (the patient had right hand dominant) 33 patients had right hand dominant and one patient had left side dominant while those 10 patients with left hand affected 6

had left side dominant and 4 had right hand dominant. This mean that 39 patients (88.6%) with dominant hand affected and 5 patients (11.4%) with non-dominant hand affected (Fig.5).

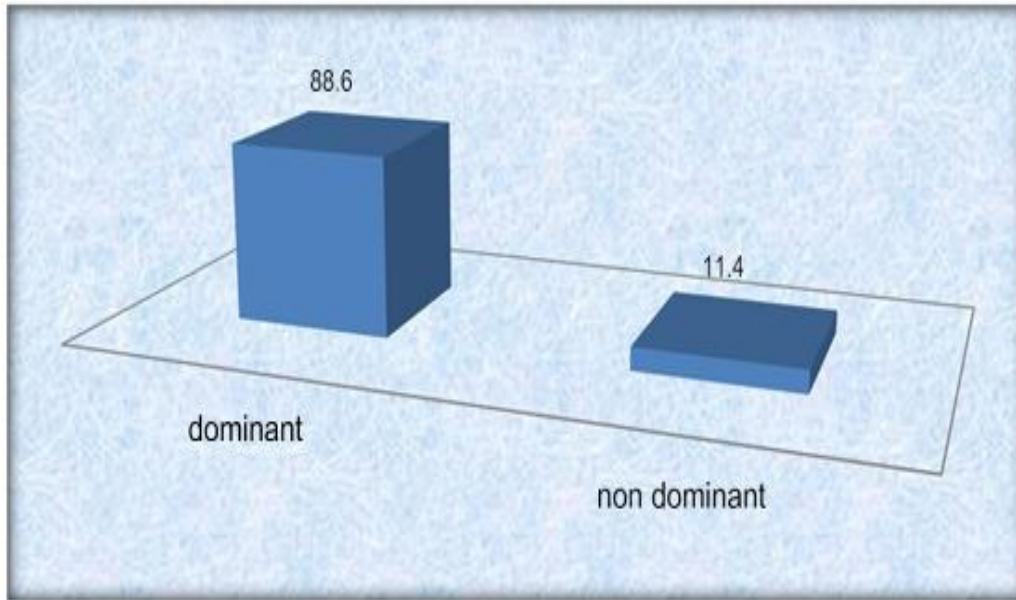


Figure (5): The dominant and non-dominant side involvement.

Digits distribution: Among the patient involved in the study 2 patients presented with multiple digits involvement. One with bilateral middle finger involvement and the other patient with the thumb and ring finger involvement for the same hand. Of the 46 digits involved in our study:

the commonest digit affected was the middle finger 16 digits (34.8%) followed by the ring finger 12 digits (26.1%) the thumb 11 digits (23.9%) the index finger 5 digits (10.9%) and the little finger was the least affected finger only 2 digits (4.3%) (Fig.6).

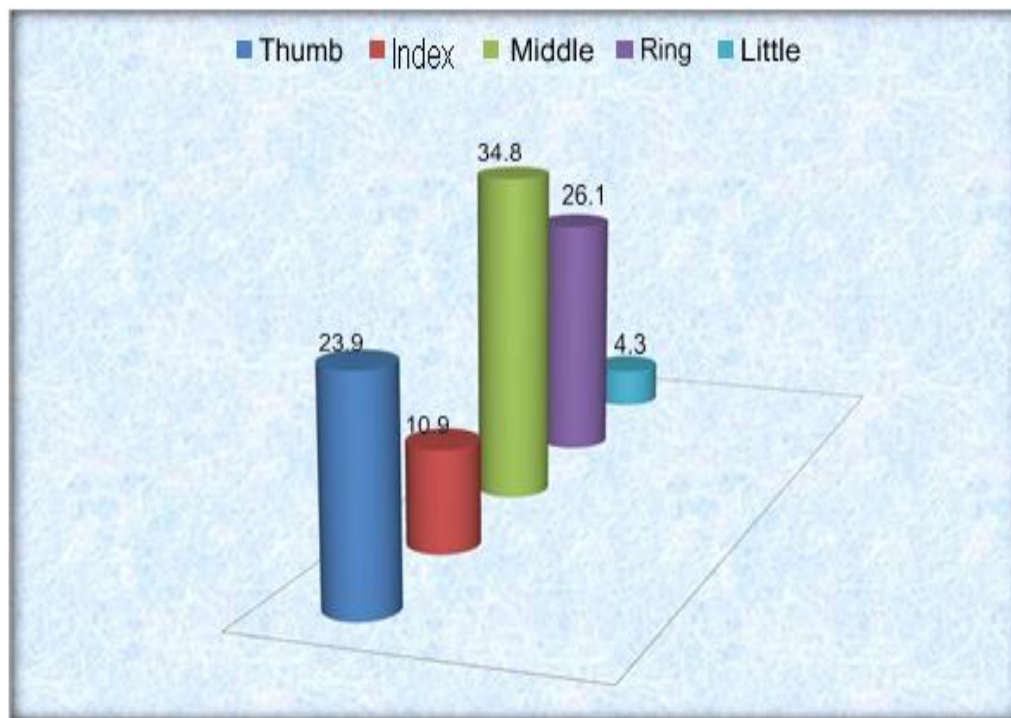


Figure (6): The distribution of the involved digits.

Patients' occupation: The majority of the female patients 25 (56.8%) were house wives. 14 patients (31.8%) had mechanical labor including agricultural

works and other manual works were grouped as laborers, other 5 (11.4%) patients were office worker. (Fig.7).

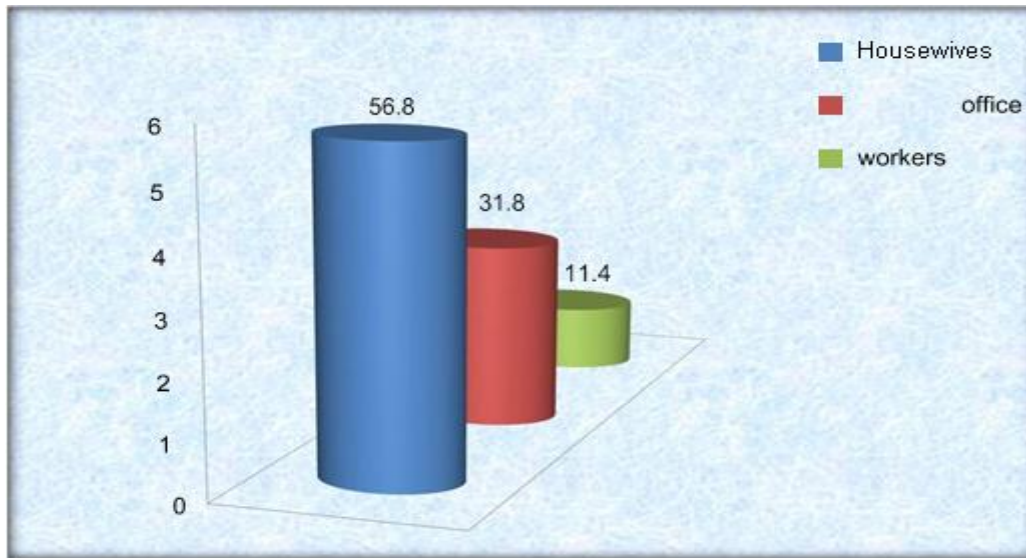


Figure (7): The occupations of the Patients involved.

Presenting complaints: The majority of the patients 32 digits (69.6%) presented with painful clicking or catching sensation with triggering that actively corrected by patients (Grade II). The pain and tenderness were felt in the region of the palmar surface of the MCP joint when the finger is moved from the bent position to straight.

Locking in flexion that was passively corrected presented in 14 digits (30.4%) (Grade III).

A palpable thickening nodule (swelling) was presented in all of the patient in the study; they were usually felt at the area of A1 pulley and some of them were tender to palpation (Fig.8).

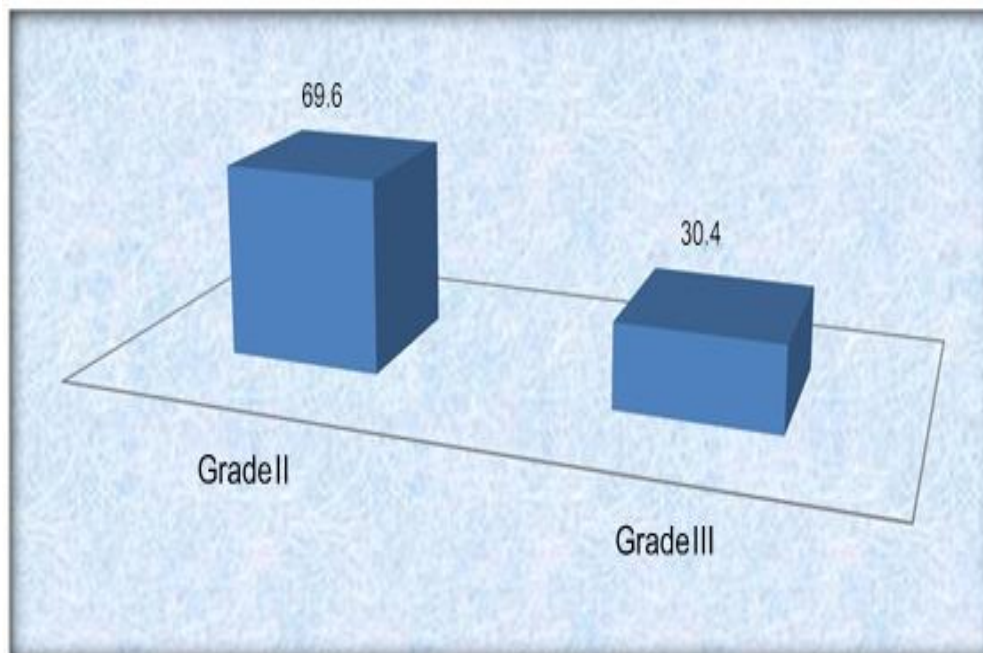


Figure (8): The Presenting complaints of the involved patients.

Duration of symptoms
Of the affected digits: 12 digits (26.1%) presented with symptom duration between 2 and 4 months; 30 digits

(65.2%) presented with symptom duration between 4 and 8 months and 4 (8.7%) digits presented with symptom durations more than 8 months (Fig.9).

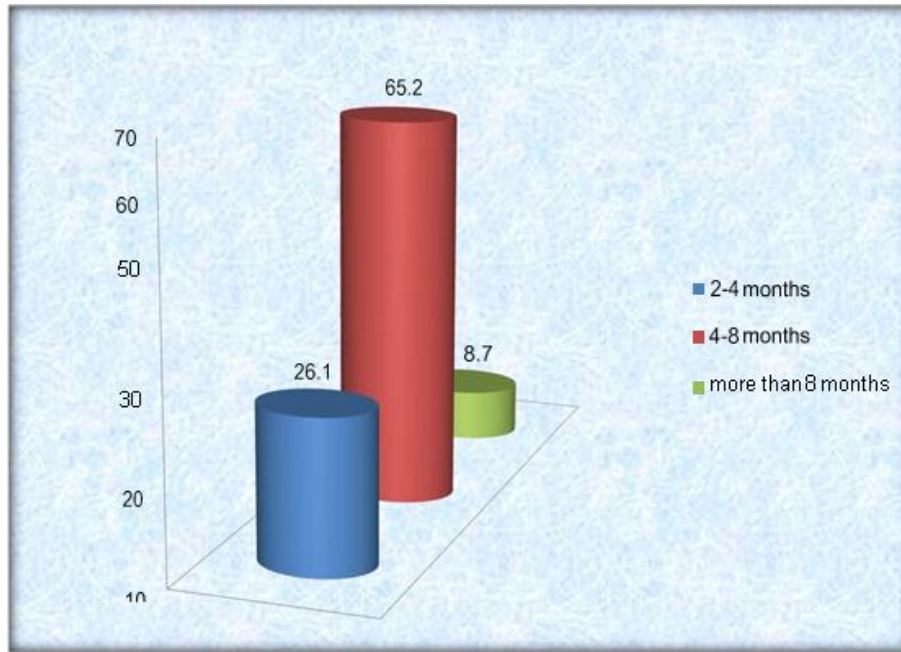


Figure (9): Duration of symptoms of the involved digits

Associated conditions

Among all the patients involved in our study: 26 patients (59.1%) did not have any significant associated conditions; 17 patients (38.6%) had an associated medical co-morbidities; 6 patients (13.6%) with 6 digits involved were known case of type I DM with different periods on regular management with Glibenclamide, Metformin and diet control 3 digits were treated with CS injection and

the other treated with open surgical release; 11 patients (25%) had other conditions including: CTS, Hypertension, Ischemic Heart Disease, Osteoarthritis of different joints. One patient (2.3%) presented with history of acute trauma to the thumb when he sustained a fall on his hand with hyper extension force to his thumb; 3 weeks later the patients developed pain with snapping sensation on the MCP joint of right thumb (Fig.10).

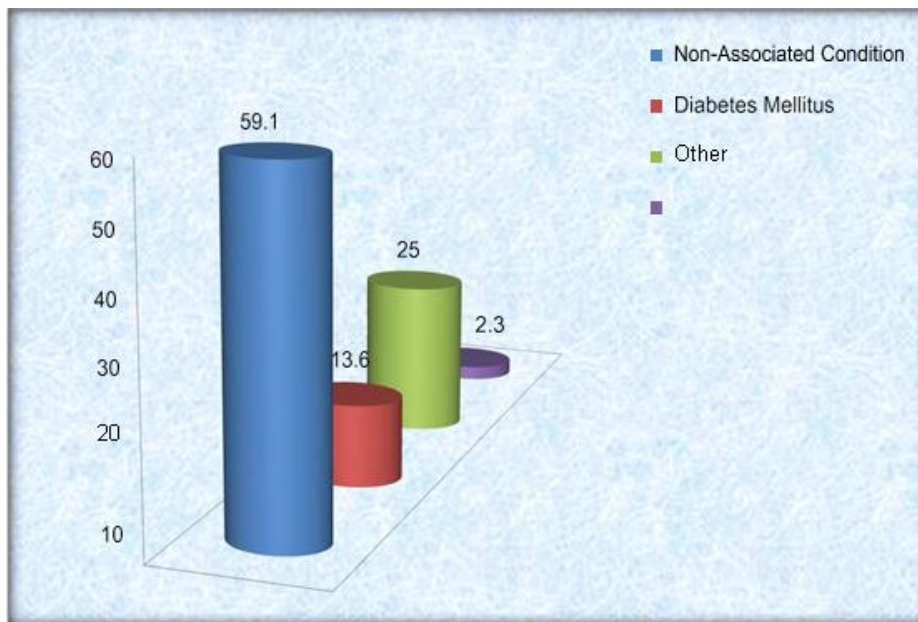


Figure (10): The Associated conditions of the involved patients.

Dominant hand affected: of the first group of the patients who received local CS injection (24 digits): This group included 18 digits presented with grade II of the condition and 6 digits presented with grade III of the condition. Regarding the duration of symptom; 9 digits presented with symptom duration between 2 and 4

months, 15digits presented with symptom duration between 4 and 8 months and no any digit with symptom duration more than 8 months was involved in this group. 3 diabetic patients with 3 affected digits were involved in this group (table 1 and2). Of the second group of the patients who had open surgical release (22) digits: This

group included 14 digits presented with grade II of the condition and 8 patients presented with grade III of the condition. Regarding the duration of symptom, 3 digits presented with symptom duration between 2 and 4 months, 15 digits presented with symptom duration between 4 and 8 months and 4 digits presented with symptom duration more than 8 months. 3 diabetic patients with 3 affected digits were involved in this group (table 1 and 2).

Table 1: Distribution of Digits according to the clinical complaints.

Clinical Complaints	C.S Group	Surgical Release Group	Total
Grade II	18	14	32
Grade III	6	8	14
Total	24	22	46

Table 2: Distribution of Digits according to the duration of symptoms.

Duration of Symptoms	C.S Group	Surgical Release Group	Total
2-4 Months	9	3	12
4-8 Months	15	15	30
> 8 Months	-	4	4
Total	24	22	46

Pain relief: There was significant improvement in the severity of pain in the first 4 weeks of follow up after treatment in both groups with more relief in surgical release group. At the end of the follow up period better improvement was noted in surgical release group than in the CS injection group; from the 18 trigger digits in the first group that associated with pain and tenderness 10 digits (55.5%) had pain relief while 13 digits (92.9%) from 14 digits that associated with pain and tenderness in the second group had pain relief (table 3).

Recovery: In the first group: 17 digits (70.8%) had a recovery by single one CS injection, 9 digits (37.5%) of them had a good recovery that is complete disappearance of clicking sensation and the triggering with free and full range of movement of the affected fingers and 8 digits (33.3%) had partial recovery with partial disappearance of

clicking and triggering and some restriction in their range of movement. The remaining 7 digits (29.2%) had no any improvement in the conditions and the trigger digits were not affected by the injection, we advise them for surgical release. For those not affected digits: 6 digits presented with symptom duration between 4 and 8 months; 4 digits presented with locking in flexion and 3 digits presented with clicking or catching sensation; with 2 digits for 2 diabetic patients. In the second group: 21 digits (95.5%) had a recovery by surgery; 20 digits (91%) of them had a good recovery that is complete disappearance of clicking sensation and the triggering with free and full range of movement of the affected fingers. The other 1 digit (4.5%) had fair recovery with occasional clicking and mild restriction in their range of movement. Only one digit (4.5%) had no any improvement and locking was not affected by the surgical release and the patient need revision surgery (table 3). Swelling: Regarding the effect of steroid and surgical release on the swelling (palpable thickening of A1 pulley): In the first group thickening disappeared almost completely from 14 digits (58.3%) while in second group thickening disappeared almost completely from all 22 digits (100%) (table 3). Complications: Of the first group: only one patient (4.2%) reported a skin hypo-pigmentation from the injection procedure. In the second group :2 patients (9%) reported complications from surgical release: one patient developed a superficial post-operative infection was treated successfully. Other patient suffered from transient radial-sided hypoesthesia the affected thumb that was treated conservatively and subsided uneventfully (table 3).

Satisfaction: In term of patient satisfaction with the results of the steroid injection and surgery at the end of follow up period. In the first group 15 patients (62.5%) were satisfied with the results of the injection and their ability to return to work and daily activities together with household chores while 9 patients (37.5%) were un satisfied with the results.

In the second group 21 patients (95.5%) were satisfied while 1 patient (4.5%) was un satisfied with the results of surgical release (table 3).

Table 3: The outcome of the local CS and open surgical release in treatment of trigger finger.

	Corticosteroid injection		Open surgical Release		P- value
	No. (%)	n	No. (%)	N	
Pain Relief	10 (55.5)	18	13 (92.9)	14	0.0235*
Complete Recovery	9 (37.5)	24	20 (91.0)	22	0.000
Partial Recovery	8 (33.3)	24	1 (4.5)	22	0.0158*
No Recovery	7 (29.2)	24	1 (4.5)	22	0.0319*
Swelling	14 (58.3)	24	22 (100.0)	22	0.035
Complications	1 (4.2)	24	2 (9.0)	22	0.466* (NS)
Satisfaction	15 (62.5)	24	21 (95.5)	22	0.0075*

*Fissure Exact test was used.

DISCUSSION

The trigger finger is a common hand problem encountered in the orthopedic practice. It is considered as a common cause of hand pain and disability. It's generally agreed that the decision of mode of treatment depends on severity (grade) of trigger finger and duration of symptoms. The majority of patients with mild trigger fingers (GREEN grade I) are treated conservatively with extension splints; gentle physiotherapy and non-steroidal anti-inflammatory drugs with successful rate up to 90%.^[15] While GREEN grade IV trigger finger should be treated by surgical release; the management of grade II and III trigger finger is still a subject of debate.^[16] The purpose of our study was to compare the outcomes and complications of local corticosteroid injection and open surgical release in the treatment of the grade II and III trigger fingers. In this study: (68.2%) of the patients were female and (31.8%) were male. Salim N., Abdullah S.^[15] reported that (73%) Of their patients were female and (27%) were male. Pramod DE., Shiraz A.^[17] reported that (56.1%) of their patients were female and (43.9%) were male. These results proved that the trigger finger is more common in female than male. In this study: The mean age was 54year (26 to 69) years with (54.5%) of the patients is between 51-60 years. Salim N., Abdullah S.^[15] reported that the mean age of their patients was 58.9 years with (52.7%) of the patients is between 51-60 years. Pramod DE., Shiraz A.^[17] reported that the mean age of their patients was 51.8 years (28 to 79) years. These results proved that the trigger finger is more common in 5th decade of the life. In this study: (84.1%) of patients had right hand dominant and (15.9%) of patients had left hand dominant. The right hand was involved in (75%) of the patients and the left hand was involved in (22.7%) and both hands were involved in one patient (2.3%). Also, we reported that (88.6%) of the patients had dominant hand affected and (11.4%) of the patients had non dominant hand affected. Ashraf S.^[18] reported that (91%) of the patients had had right hand dominant and (9%) of patients had left hand dominant. The right hand was involved in (88%) of the patients and the left hand was involved in (12%). And (93%) of the patients had dominant hand affected and (7%) of the patients had non dominant hand affected Bara T. and Dorman T.^[19] reported that (87.5%) of the patients had had right hand dominant and (12.5%) of patients had left hand dominant. The right hand was involved in (83.4%) of the patients and the left hand was involved in (16.6%). These results reflecting the fact that right hand generally being the dominant hand is more prone for repetitive and cumulative trauma. In this study: Only (4.5%) of the patients presented with multiple digits involvement and The commonest digit affected was the middle finger (34.8%) followed by the ring finger (26.1%) the thumb (23.9%) the index finger (10.9%) and the little finger was the least affected finger (4.3%).Salim N., Abdullah S.^[15] reported that (8.1%) of the patients presented with multiple digits involvement and The commonest digit affected was the middle finger (28.3%) followed by the ring finger (28.3%) and thumb (26.8%). The little finger

was the least affected finger (0.02%) the index finger was not affected. Pramod DE., Shiraz A.^[17] reported that middle finger was the most commonly affected (37.7%), followed by ring finger, thumb and index finger. Although these results proved that the middle and ring finger are the commonest finger affected by triggering; there are many studies showed that the thumb is the commonest finger affected by triggering.^[18-20] In this study: (56.8%) of patients were house wives; (31.8%) of patients were laborer and (11.4) were office worker (had clerical jobs). Singh VA.et al^[21] reported that (38.5%) were manual workers (30.8%) of patients were semiprofessional (26.9%) were house wives Ashraf S.^[18] reported that (44%) were laborers (40%) were house wives (9%) had clerical job and (7%) had sedentary job. Though most of the studies did not give emphasis on the occupation of the patients; a definitive relation of the occupation to the causation of the symptoms is evident from the above results and the result of our study are in excellent correlation with those of previous studies conforming the involvement of the repetitive and cumulative trauma as an important factor in the etiology of the trigger digit. In this study: we followed GREEN'S grading system of triggering. We excluding grade I triggering as the patient could not demonstrate triggering clinically, (69.6%) of the trigger digits were grade II presented with painful clicking or catching sensation with triggering that was actively corrected while (30.4%) of the digits were grade III presented with locking in flexion that passively corrected by other hand. Singh VA.et al,^[21] included only grad II and III in their study of which majority were of grade II. In this study: (38.6%) of the patients had an associated co-morbidity (13.6%) of them had DM. Pramod DE., Shiraz A.^[17] reported that (46.3%) of the patients had an associated co-morbidity (14.6%) of them had DM Gilberts EC et al.^[22] reported that (10%) of the patients had DM. These results proved that the incidence of trigger finger increased in DM. In this study: Regarding the efficacy of the CS injection, we reported that pain was relieved in (55.5%) of the digits who were associated with pain. Also, we reported that (70.8%) of the digits had a recovery from their symptom after single CS injection; from those only (37.5%) had good result with complete recovery of the symptom, the other (33.3%) had less accepted result with partial recovery from the symptom; we advised those patients to receive second local CS injection. While (29.2%) had no any recovery from their symptom and we advised those patients to do the surgical release. We noted that majority of those unaffected digits (6 from 7 digits) presented with symptom duration between 4 and 8 months; (4from 7digits) had grade III of triggering and 2 digits for a 2diabetic patients. The study reported also that palpable thickening of A1pulley were resolved only in (58.3%) of the digits that treated by injection. Dala-Ali et al,^[23] reported that (34%) success rate with the first injection;(54%) success rate with grade III and (57%) success rate with patients with DM. Nimigan AS^[24] reported that success rate of injection higher in grade I and II with duration less than 6

months. So, our study proved that the local steroid injection has limited efficacy if the patient receives only single dose and marked decrease in efficacy with increased severity (grading) of triggering; increased duration of symptom and in patient with DM. Regarding the efficacy of the open surgical release we reported that pain was relieved in (92.9%) of the digits who were associated with pain. Also, we reported that (95.5%) of the digits had a recovery from their symptom from those (91%) had complete recovery and (4.5%) had partial recovery. While (4.5%) had no recovery. The study reported also that palpable thickening of A1 pulley were resolved in (100%) of the digits that treated by surgery. Pramod DE., Shiraz A.^[17] reported that Symptoms resolved completely in patients treated open surgical release with efficacy rate of (100%). Lim et al^[20] reported the high success rate (97%) of trigger finger open surgical release in the long term follow up So our study proved that open surgical release has high efficacy in treatment of trigger finger. In this study: we reported that complication rate was lower in the patients with steroid injection (4.2%) (one patient reported a skin hypo- pigmentation) than the patients with surgical release (9%) (two patients, one patient developed a superficial post-operative infection, other patient developed a transient radial-sided hypoesthesia at the affected thumb) Singh VA. et al^[21] reported complication rate (10%) for patients were treated by steroid injection (one patient claimed numbness over distal phalanx after corticosteroid injection) Dala-Ali et al^[23] didn't report any complication for patients treated by injection Pramod DE., Shiraz A. S.^[17] didn't report any complication for patients treated by open surgical release while Lim et al,^[20] reported (1%) complication rate and these included superficial wound infection and residual stiffness. So, our study showed slightly higher complication rate in patients with open surgical release. Regarding the satisfaction of patients, we reported that (62.5%) of patients were satisfied with the results of the steroid injection and (95.5%) were satisfied with the results of surgical release which compiles the finding of other studies.^[17,20,21,23]

CONCLUSION

Although local corticosteroid injection is an easily applicable treatment modality, not expensive, more safe and less invasive than surgery but has lower efficacy than surgical release in management of trigger finger. The open surgical release is a safe and effective procedure in management of trigger finger. This procedure has a few complications with a high success rate. Although many authors believe that local steroid injection should be performed as the first line in the management of the moderate cases of trigger finger; we conclude that effectiveness of the local corticosteroid injection decrease with increasing of the severity of the conditions(grading) and with increasing the duration of symptoms.

RECOMMENDATIONS

It is better to start with surgical release in the management of the cases of trigger fingers that present with grade III or present with duration of symptoms more than 6 months.

REFERENCES

1. Makkouk AH, Oetgen ME, Swigart CR, Dodds SD. Trigger finger:etiology, evaluation, and treatment. *Curr Rev Musculoskelet Med*, 2008; 1: 92-6.
2. Moore JS. Flexor tendon entrapment of the digits (trigger finger and trigger thumb). *J Occup Environ Med*, 2000; 42(5): 526-45
3. Trezies AJ, Lyons AR, Fielding K, Davis TR. Is occupation an aetiological factor in the development of trigger finger? *J Hand Sur [Br]*, 1998; 23(4): 539-40.
4. Mooney V. Overuse syndromes of the upper extremity: rational and effective treatment. *J of Musc Med*, 1998; 15(8): 11–18.
5. Guyon-MA ; Honet – JC. Carpal Tunnel Syndrome Or Trigger Finger Associated With Neck Injury in Automobile Accidents , *Arch – Phys _ Med – Rehabil.*, 1977; 58(7): 325 – 7.
6. Ryzewicz M, Wolf JM. Trigger digits: principles, management, and complications. *J Hand Surg Am*, 2006; 31: 135-46.
7. Solomon L, Warwich D, Nayagam S. *Apley's system of Orthopedics and fractures.* Tenth ed. London:Arnold, 2018; 439-440.
8. Mark D. Miller. *Review of orthopaedics.* Eighth ed. Saunders, 2016; 558- 559.
9. S. Terry Canale. *Campbell's operative orthopedics.* Fourteen ed. Philadelphia: Mosby company, 2021; 3853-3855.
10. Howard LD Jr, Pratt DH, Bunnell S. The use of compound F (hydrocortone) in operative and non-operative conditions of the hand. *J Bone Joint Surg Am*, 1953; 35: 994–1002.
11. Akhtar S, Burke FD. Study to outline the efficacy and illustrate techniques for steroid injection for trigger finger and thumb. *Postgrad Med J.*, 2006 Nov; 82(973): 763-6.
12. Murphy D, Failla JM, Koniuch MP. Steroid versus placebo injection for trigger finger. *J Hand Surg [Am]*. 1995 Jul;20(4):628-31. Erratum in: *J Hand Surg [Am]*, 1995 Nov; 20(6): 1075.
13. Lorthioir J. Surgical treatment of trigger finger by a subcutaneous method. *J Bone Joint Surg Am*, 1958; 40: 793–5 26
14. Park MJ, Oh I, Ha KI. A1 pulley release of locked trigger digit by percutaneous technique. *J Hand Surg [Br]*, 2004; 29: 502–5.
15. Salim N, Abdullah S, Sapuan J, Haflah NH. Outcome of corticosteroid injection versus physiotherapy in the treatment of mild trigger fingers. *J Hand Surg Eur*, 2012; 37: 27–34.

16. Patel MR, Bassini L. Trigger fingers and thumb: when to splint, inject, or operate. *J Hand Surg [Am]*, 1992; 17: 110–13.
17. Pramod DE, Shiraz A: Surgical release of trigger fingers. *Brunei Int Med J.*, 2012; 8(5): 244.
18. Ashraf S Pasha : Out come Of Treatment Of The Trigger Fingers By Percutaneous Release; National Academy Of Med Science, 2008;
19. Bara T Dorman T.open versus Percutaneous release of Trigger Finger. *Chir Narzadow Ruchu Ortop Pol*, 2002; 67(6): 613-7.
20. Lim MH, Lim KK, Rasheed MZ, Narayanan S, Beng-Hoi Tan A. Outcome of open trigger digit release .*J Hand Surg Eur*, 2007; 32: 457- 9.
21. Singh VA, Chong S, Marriapan S. Trigger finger: Comparative study between corticosteroid injection and percutaneous release. *Internet J Orthop Surg*, 2006; 3: 2.
22. Gilberts EC, Beekman WH, Stevens HJ, Wereldsma JC. Prospective randomized trial of open versus percutaneous surgery for trigger digits. *J Hand Surg Am*, 2001; 26: 497-500
23. Dala-Ali et al. Efficacy of Steroid Injection for Trigger Finger Clinics in Orthopedic Surgery, 2012; 4(4).
24. Nimigan AS, Ross DC, Gan BS Steroid injections in the Rehabil, 2006; 85(1): 36–43.