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Comparison between Percutaneous release and Corticosteroid injection in the management of trigger digits

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Abstract
Background: Trigger finger is basically caused by the mismatch between the volume of the flexor tendon sheath and its contents resulting in a narrowed tunnel for tendon excursion. Treatment modalities includes conservative management and Surgical management (open or percutaneous A1 pulley release).
Aim: To compare clinical and functional outcome of percutaneous release and corticosteroid injection in management of trigger digits.
Materials and Methods: Inclusion criteria- Adults aged more than 18 years with Quinnell grade I – III**.** Sixty patients were divided into two groups, Group 1 (n = 30) treated with percutaneous release and Group 2 (n = 30) treated with percutaneous triamcenolone injections.
Results: Mean age of patients in group 1 was 43.83 years and in group 2 was 41.87 years. Thumb was the most commonly affected digit and little finger, the least commonly affected digit. Significant improvement (p value <0.001) in the VAS score was seen in group 1 when compared with group 2 from 1st week of follow up till the end of the study.
Conclusion: Percutaneous release was found superior to Corticosteroid group in regards of VAS score, Roles and Maudsley score and residual triggering.

Keywords: Percutaneous release, Corticosteroid injection, Trigger digit

Introduction
Trigger digit or Stenosing Tenosynovitis is a common cause of pain and disability in the hand. This disorder has an incidence of about 28 cases per 1 lakh population per year with a life time risk of 2.6% in the general population [1]. It most commonly occurs in the dominant hand of individuals resulting in social and economic implications. Middle aged women are mostly affected and thumb is the most commonly involved digit [2]. Women to men ratio is about 6:1 and right hand to left hand ratio is about 3:2 [2]. Trigger finger is basically caused by the mismatch between the volume of the flexor tendon sheath and its contents resulting in a narrowed tunnel for tendon excursion and ultimately lead to block in movement associated with pain. Triggering most commonly involves the A1 pulley owing to high pressure gradient and high local forces in this area at maximal flexion and tight hand grip [3]. Regarding incidence, two peaks occur. The first peak occurs in the age group of less than 8 years and the second peak occurs in the fifth and sixth decades of life. Children below ten years of age predominantly showed changes in the tendon whereas in adults tendon sheath was predominantly involved. Trigger finger may be primary or secondary based on the aetiology. Vast majority of trigger digits are primary (idiopathic) whereas small proportion fall into secondary group, where triggering occurs secondary to amyloidosis, rheumatoid arthritis, mucopolysaccharidosis, diabetes, repeated minor trauma to the hand [4]. Treatment options start from conservative management to surgical procedures. Conservative management includes activity modification, passive stretching of fingers, non-steroidal anti-inflammatory drugs, splinting of the finger, Corticosteroid injection and Surgical management include - (open and percutaneous release of A1 pulley).
AIM: To compare the clinical and functional outcome of percutaneous release and corticosteroid injection in the management of trigger digits.

Materials and methods

This study was carried out at the Central Institute of Orthopaedics (CIO), Safdarjung Hospital, New Delhi from October 2012 to March 2014. The Institutional Ethical Committee approved the study. This prospective study was randomized by closed envelope method with a follow up of 6 months. Inclusion criteria were- Any adult of age more than 18 years with Quinnell grade I – III**,** Consent for participation in the study and Exclusion criteria were- Age < 18 years, Uncontrolled diabetes mellitus, hypertension and immunosuppressive diseases, Coagulation disorder, Fixed flexion contracture, Fixed trigger finger (Quinnell grade IV), Rheumatoid arthritis. Quinnell grading of triggering [5] is - Grade 0 - Mild crepitus in the non-triggering digit, Grade 1- No triggering, but uneven digit movements, Grade 2 - Triggering is actively correctable, Grade 3 - Triggering is usually correctible passively by the other hand, Grade 4 - the digit is locked.

All patients with trigger finger presented to OPD of our hospital, who satisfied the inclusion criteria and did not meet any exclusion criteria, were included in the study until the planned number of 60 patients were reached. Sixty patients with trigger finger who presented to our OPD, after full written and informed consent and randomization, were apportioned to two treatment groups: group 1 and group 2. Group 1 included thirty patients (n = 30) who were treated with percutaneous release. Group 2 also included thirty patients (n = 30) who were given a single corticosteroid injection of triamcinolone into the tendon sheath and around the nodule. A thorough clinical examination was done which included the number of digit involved, side, grading of triggering and looked for nodule at the base of the affected digit.

Patients were investigated with complete haemogram with platelet count, random blood sugar and bleeding time and clotting time. X ray of the affected hand with fingers in antero-posterior, lateral and oblique views were also taken. After attaining the consent and randomization, baseline VAS and Roles Maudsley score was assessed with the help of questionnaires. Patients were called for the procedure at their convenience. The procedure was done in the outpatient department under local anaesthesia. The surface landmarks of the A1 pulley were marked. These are located at the proximal palmar crease for the index finger, halfway between the proximal and distal palmar creases for the middle finger, the distal palmar crease for the ring and little fingers, and the metacarpophalangeal crease for the thumb. Proper painting and draping of the affected hand was done. A 26 gauge 0.5 inch needle was used to anesthetize the area around the A1 pulley and the tendon sheath with 1 ml of 2% lignocaine without adrenaline. The affected finger was held in hyper extension at the metacarpophalangeal joint. For the fingers, but not the thumb, the fine hooked knife was introduced a few millimetres distal to the distal edge of the pulley, which coincide with a point approximately 1.5 cm distal to the landmarks of the proximal edge of the pulley. The knife was advanced to the proximal edge by palpating the surface of the pulley with its tip. When the margin of the pulley got identified, the blade was hooked around it and the pulley sectioned by moving the knife from proximal to distal. On withdrawal of the knife the relief of clicking or locking was confirmed by repeated flexion and extension of the digit.

For percutaneous release of a trigger thumb, the location of the pulley was carefully outlined by positioning the thumb in abduction, slightly flexing the wrist and supinating the forearm. The fine hooked knife was inserted 1 cm distal to the metacarpophalangeal crease, in the centre of the thumb. The proximal edge of the pulley identified with the tip of the knife at the level of the metacarpophalangeal crease and pulley was subsequently divided. Care was taken not to extend the tip too proximally because of the proximity of the radial digital nerve [8]. Antiseptic dressing done and the site was compressed for three minutes to prevent
hematoma.

For Corticosteroid injection, 1 ml of triamcinolone mixed with 1ml of 2% lignocaine without adrenaline and injected into the tendon sheath and around the nodule at the level of A1 pulley. The position of the needle was ascertained by asking the patient to wiggle the finger. If the needle was in the tendon proper then the needle would exhibit a paradoxical movement.

A small sterile dressing was applied and patient allowed to return to normal activity. Outcome analysis was measured by - 100 mm Visual Analog Scale for pain, Roles and Maudsley score, Adverse reactions, Residual triggering, Recurrence. Before intervention, patient's records were noted in the proforma which included patient's- Demographic data, Brief history, Examination findings, Quinnell grading of triggering, Laboratory and X - ray findings, Roles and Maudsley score / VAS scale. Patients were followed up at 1st week, 2nd week, 3rd week, 4th week, 3rd month and 6th month after procedure. During every follow up visit, the following were noted- VAS score and Roles and Maudsley score, Adverse reactions, Recurrence, Residual triggering. None of the patients withdrew from the study before the study time of six months.

Statistical Analysis Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. $P<0.05$ was considered statistically significant.

Results

Patients included in our study were in the age group of 28 – 56 years. Mean age group of patients in group 1(percutaneous release) was 43.83 years and in that of group 2 (corticosteroid injection) was 41.87 years. In group 1, most of the patients were in the age group of 31-40 years (40.0%). In group 2 most of the patients were in the age group of 41-50 (40.0%) years. Comparison of age distribution between group 1 and group 2 was shown in table 1.

Table 1: Comparison of age distribution between group 1 and group 2

Age Groups	Group 1		Group 2		P Value
	Frequency	%	Frequency	%	
<=30 years	1	3.3%	5	16.7%	0.052
31 - 40 years	12	40.0%	8	26.7%	
41 - 50 years	6	20.0%	12	40.0%	
51 - 60 years	11	36.7%	5	16.7%	
Total	30	100%	30	100%	
Mean ± SD	43.83 ± 8.42		41.87 ± 8.52		0.372

Group 1 comprised of 18/30 (60.0) % male and 12/30 (40.0) % female patients. Group 2 comprised of 16/30 (53.3) % male and 14/30 (46.7) % female patients with predominance of males in both groups. Thumb was the most commonly affected digit in both the groups (group 1 – 33.3%, group 2 – 40.0%). Little finger was the least commonly affected digit in both the groups (group 1 – 3.3%, group 2 – 0.0%). Comparison of digits distribution between group 1 and group 2 were shown in table 2.

Table 2: comparison of digits distribution between group 1 and group 2

Digit	Group 1		Group 2		P Value
	Frequency	%	Frequency	%	
Thumb	10	33.3%	12	40.0%	0.832
Index	4	13.3%	3	10.0%	
Little	1	3.3%	0	0.0%	
Middle	6	20.0%	5	16.7%	
Ring	9	30.0%	10	33.3%	
Total	30	100%	30	100%	

In both, group1 and group 2, most of the patients had Quinnell grade 1 and the percentages were 14/30 (46.7) % and 12/30 (40.0) % respectively, followed by grade 2. Right side was affected in 26/30 (86.7) % of group 1 and 25/30 (83.3) % of group 2 patients. Left side was affected in 4/30 (13.3) % of group 1 and 5/30 (16.7) % of group 2 patients. Comparison of VAS score between group 1 and group 2 were shown in table 3**.**

Table 3: comparison of vas score between group 1 and group 2

VAS	Group 1		Group 2		P Value
	Mean ± SD	Min - Max	Mean ± SD	Min - Max	
Baseline	6.10 ± 0.88	5 - 8	5.83 ± 1.31	4 – 8	0.361
Ist week	1.20 ± 0.38	0.50 - 2.00	3.23 ± 0.95	1.50 - 5.50	<0.001
2nd week	0.85 ± 0.23	0.50 - 1.50	2.31 ± 0.86	1.00 - 4.00	<0.001
3rd week	0.67 ± 0.31	0.30 - 2.00	1.87 ± 0.88	0.50 - 4.00	<0.001
4th week	0.66 ± 0.53	0.30 - 3.00	1.66 ± 0.97	0.50 - 4.00	<0.001
3rd Month	0.54 ± 0.71	0.00 - 3.50	1.99 ± 1.39	0.00 - 5.00	<0.001
6th month	0.49 ± 0.89	0.00 - 4.00	2.13 ± 1.63	0.00 - 5.00	<0.001

Significant improvement (p value <0.001) in the VAS score was seen in group 1 when compared with group 2 from 1st week of follow up till the end of the study.

Comparison of VAS score in grade 1 triggering among two groups was shown in table 4.

Table 4: comparison of vas score in grade 1 triggering among two groups

VAS	Group 1 (n=14)		Group 2 (n=12)		P value
	Mean ± SD	Min - Max	Mean ± SD	Min - Max	
Baseline	4.93 ± 0.61	4 – 6	4.67 ± 0.65	4 - 6	0.304
1st wk	1.14 ± 0.41	0.50 - 2.0	2.48 ±0.69	1.50 - 4.00	<0.001
2nd wk	0.74 ± 0.20	0.50 - 1.0	1.74 ± 0.56	1 - 2.50	<0.001
3rd wk	0.56 ± 0.14	0.30 - 0.80	1.24 ± 0.45	0.50 - 2.00	<0.001
4th wk	0.44 ± 0.14	0.30 - 0.80	0.91 ± 0.35	0.50 - 1.50	<0.001
3rd Mon	0.26 ± 0.25	0.0 - 0.80	0.87 ± 0.55	0.00 - 1.80	<0.001
6th mon	0.14 ± 0.21	0.0 - 0.50	0.83 ± 0.81	0.00 - 2.00	0.013

In grade 1, there was a significant better outcome in group 1 from the first week of follow up (p<0.001).

In grade 2 of triggering, the VAS at the end of the study in group 1 was 0.37 and in group 2 was 2.27 (p<0.001) (table 5).

Table 5: Comparison of vas in grade 2 triggering among two groups

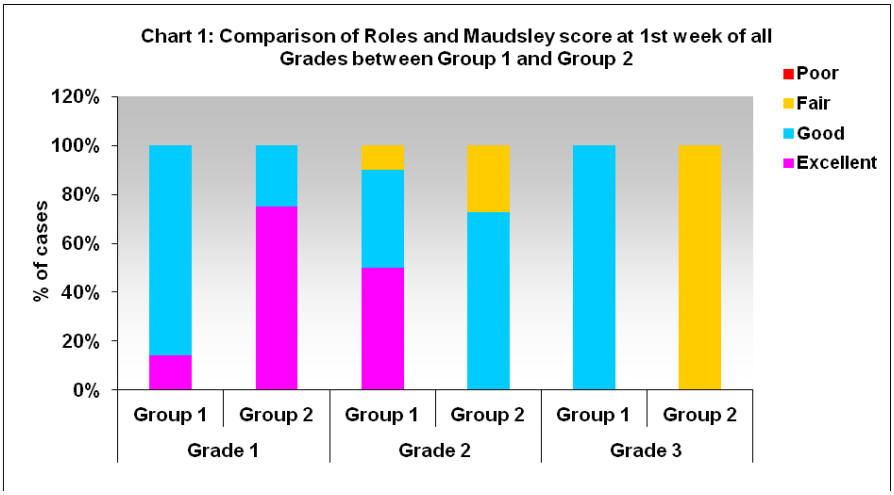
VAS	Group 1 (n=10)		Group 2 (n=11)		P value
	Mean ± SD	Min - Max	Mean ± SD	Min - Max	
Baseline	5.90 ± 1.10	5 - 8	6.00 ± 0.63	5 - 7	0.799
Istwk	1.18 ± 0.35	0.70 - 2.00	3.32 ±0.59	2.20 - 4.20	<0.001
2nd wk	0.93 ± 0.10	0.80 - 1.00	2.20 ± 0.61	1.20 - 3.50	<0.001
3rd wk	0.69 ± 0.20	0.50 - 1.00	1.84 ± 0.72	1.00 - 3.20	<0.001
4th wk	0.65 ± 0.31	0.50 - 1.50	1.73 ± 0.83	0.80 - 3.50	<0.001
3rd Mon	0.44 ± 0.40	0.00 - 1.50	2.14 ± 1.18	0.50 - 4.70	<0.001
6th mon	0.37 ± 0.61	0.00 - 2.00	2.27 ± 1.35	0.00 - 5.00	<0.001

In grade 3 triggering, the VAS score at the end of the study in group 2 was 4.14 which were fairly high whereas in group 1 it was 1.52. (p <0.001) (table 6).

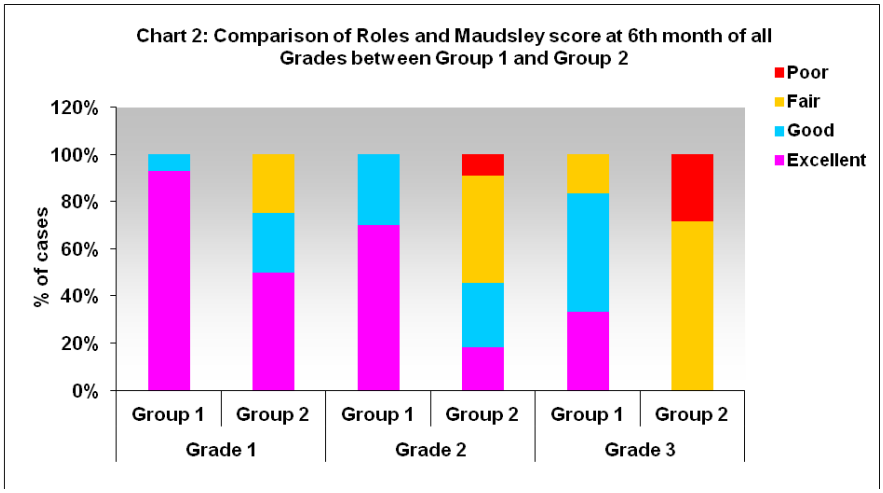
Table 6: Comparison of vas score in grade 3 triggering among two groups

VAS	Group 1 (n=6)		Group 2 (n=7)		P value
	Mean ± SD	Min - Max	Mean ± SD	Min - Max	
Baseline	6.83 ± 0.75	6 - 8	7.57 ± 0.79	6 - 8	0.113
Istwk	1.38 ± 0.38	1 - 2	4.37 ± 0.53	4 - 5.50	<0.001
2nd wk	0.98 ± 0.35	0.50 - 1.50	3.46 ± 0.42	3 - 4	<0.001
3rd wk	0.91 ± 0.57	0.50 - 0.95	3.00 ± 0.51	2.50 - 4.00	<0.001
4th wk	1.21 ± 0.95	0.50 - 3.00	2.84 ± 0.60	2.10 - 4.00	0.003
3rd Mon	1.33 ± 1.21	0.30 - 3.50	3.66 ± 0.82	2.50 - 5.00	0.002
6th mon	1.52 ± 1.46	0.30 - 4.00	4.14 ± 0.69	3 - 5	0.001

Comparison of roles & maudsley score at 1st week between two groups was shown in chart 1.



All of the patients with grade 3 triggering in group 1 fell under the good category, whereas in the group 2, all fell under the fair category. Comparison of roles & maudsley score at 6th month follow up between two groups was shown in chart 2.



At 6th month follow up, 28.6% of patients in Group 2 with Grade 3 triggering scored Poor, whereas none in Group 1 scored Poor.

Discussion

Trigger finger is a common cause of pain and disability in the hands of adults. It can affect any digit, though most frequently affects the thumb and ring fingers of the dominant hand [4]. The condition usually presents with triggering, but may cause pain, swelling and loss of movement. The symptoms are caused by a tendon nodule which catches the proximal edge of the flexor tendon pulley (A1 pulley) [3]. Although often considered a consequence of tenosynovitis, the prime pathology is probably degenerative thickening of the A1 pulley [6]. Various non - operative treatments have been reported, including extension splinting, anti-inflammatory medications and steroid injection, with success rates of 50–92% [7]. Open surgical release of the A1 pulley through a small palmar incision is a simple procedure, with a success rate of up to 100% [4]. However complication rates of 7–28%, have been reported. Infection, digital nerve injury, finger stiffness, hand weakness, scar tenderness and bowstringing of the flexor tendon can all occur [9].

Percutaneous release of the A1 pulley avoids a potentially painful palmar incision and can be performed as OPD Procedure. Lorthioir was the first describe a technique of subcutaneous release of the A1 pulley using a fine tenotome passed through the skin. He reported good results in 52 digits [11]. More recently many other authors have also reported favourable results following percutaneous release [12, 13].

Our study was a prospective randomized study with 60 patients and 6 months follow up. Patients were consigned to

either of the two groups, after written and informed consent. In group 1 (n=30), patients were treated with percutaneous release. In group 2 (n=30), patients were treated with local corticosteroid injection. Follow up was done for 6 months from the date of intervention. The baseline demographic features such as age, sex, side and digit involved, grade of triggering and mean duration of symptoms in both groups were statistically comparable.

In our study, we used a commercially available hooked knife that had a pointed end to facilitate its passage through the skin without the need for an incision, and a blade on the inner side of its hook-shaped end for the percutaneous release procedure. The first minimally invasive surgical technique for the treatment of trigger digits was described by Lorthioir in 1958, where he used small tenotome to cut the A1 pulley. In the study by Eastwood *et al*, 19- or 21-gauge needle was used. Gilbert *et al* used an 18-gauge needle for percutaneous release in their study. Lyu performed closed tenotomy of the AI pulley using a custom made pulley hook and curved blade. Tanaka *et al* used a fine scalpel blade and performed subcutaneous release in 116 thumbs and 94 fingers [10, 11, 12].

In the study by Zyluk *et al*, triggering of the thumb was the most common – in 39 (37%) patients, followed by the ring finger in 35 (33%), middle in 22 (21%), little in eight (8%) and index in only one patient (1%) [17]. In our study, Thumb (n = 22) was the digit more commonly involved, followed by ring finger (n = 19). Little finger was the least involved (n = 1). The base line VAS score before intervention in group 1 and group 2 were 6.1 and 5.83 respectively and were statistically comparable.

There was uniform fall in VAS score in group 1 from the first week of follow up till the end of the study. In group 2, there was fall in VAS score from the first week (VAS – 3.23) till the 4th week (1.66) of follow up, following which there was deterioration in the 3rd month (1.99) and 6th month (2.13) of follow up. Yet the VAS score in group 2 at the end of the study was still far better than the baseline score.

There was also improvement in the Roles and Maudsley score in both groups. In group 1, there was slight decrement in the score in the 6th month follow up when compared with the third month scores. In group 2, there was a drop noted from the fourth week follow up, till the end of the study. Yet the Roles & Maudsley score at the end of follow up was well above the baseline levels. In the study by Chao *et al*, 46 digits treated with percutaneous release (group A) and 47 digits treated with corticosteroid injection (group B) had a similar fall in VAS, with a better response in the percutaneous group. (Baseline Group A VAS Baseline -7.4, 1st month - 0.8, 12 month follow up – 0.4, Group B VAS Baseline -7.3, 1st month – 4.6, 12 month follow up – 6.9) [16].

In our study, there was statistically significant difference between the two groups from the first week of follow up till the end of the study ($p < 0.001$)

In the study by Zyluk *et al*, at the 1 month assessment, both treatments were equally effective in terms of clinical improvement, even favouring steroid injection with respect to stronger grip. In the period between 1 and 6 months, patients treated by percutaneous release experienced slight improvement, whereas those after steroid injection deteriorated slightly [17].

In the study by Park *et al*, none of the 98 digits with a follow-up of more than 6 months showed evidence of residual triggering or locking and all had an improved range of motion [15]. In the study by Fu *et al*, there was 4% of residual triggering in the patients who underwent percutaneous release [18].

In our study, there were two recurrences in group 1(baseline grade 2 and 3) and three recurrences (two patients with baseline grade 3 and one with grade 2) in group 2.The recurrences that occurred in group1 were of grade 0 and grade 1, and in group 2 were of grade 0, 2 and 3.

In the study by Zyluk *et al*, at the final assessment at 6 months, six recurrences (11%) were noted in the group treated by steroid injection (59 digits) and none in the group treated operatively (46 digits) with P =0.005 [17]. Blumberg *et al*, in their study of 29 patients with 31 trigger digits were treated by percutaneous release. One patient was lost to follow up, and the remainder were examined at a mean follow-up of 14 months. One patient (one thumb) experienced recurrent symptoms, and required an open release [14].

In our study, there were no adverse effects in group 2 whereas there were two incidences of finger stiffness in group 1 which got resolved at the 6th month follow up.

In the study by Park *et al*, in a follow up of more than 6 months, after percutaneous release in 98 digits, they found mild pain and stiffness in 10 digits at the proximal interphalangeal joint [15].

In our study, VAS scores at the end of the study were well below the baseline in both groups in all the three grades with statistically significant better outcome in group 1 compared to group 2 from the first week of follow up till the end of the study. In grade 1, there was significant fall of VAS score in both groups (group1 baseline VAS - 4.93 and 6th month VAS - 0.14, group 2 baseline VAS - 4.67 and 6th month VAS - 0.83). In grade 2, there was significant fall of VAS score in both groups (group1 baseline VAS – 5.90 and 6th month VAS - 0.37, group 2 baseline VAS - 6 and 6th month VAS - 2.27). In grade 3, even though there was fall of VAS score in both groups, VAS score at 6th month follow up in group 2 was fairly high (group1 baseline VAS – 6.83 and 6th month VAS - 1.52, group 2 baseline VAS - 7.57 and 6th month VAS - 4.14). In all three grades of triggering, Percutaneous release was found superior to Corticosteroid group in regards of VAS score, Roles and Maudsley score and residual triggering.

Conclusion

To conclude, both percutaneous release and triamcinolone corticosteroid injection were effective in the management of trigger digits.

There was significant improvement in the VAS score and Roles and Maudsley score in both the groups, but percutaneous release group had a significantly better outcome from the first week of follow up till the end of the study. Percutaneous release group had no incidence of residual triggering, whereas corticosteroid group had 6 occurrences which was statistically significant.

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