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## Comparison of intra-articular corticosteroid and low level laser therapy in idiopathic adhesive capsulitis of shoulder

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### Abstract

**Objective:** To compare the relative effectiveness of intra-articular corticosteroid and low level laser therapy in idiopathic adhesive capsulitis of shoulder among 80 patients with the complaints of pain in shoulder joint and on clinical examination suspected of idiopathic adhesive capsulitis.

**Methods:** A total number of 80 patients with Adhesive capsulitis were divided into 2 groups of 40 each. One group received intra articular injection Triamcinolone while other group received Low level laser therapy. Pre and post intervention range of movements of shoulders and SRQ scores were recorded at 6 months.

**Results:** The improvement in abduction, external rotation and overhead elevation movement was significantly higher in steroid injection study group (37.30, 15.25, 57.75 degrees) as compared to Low laser therapy group (20.62, 7.12, 33.37 degrees) (P-value <0.001). However, for internal rotation movement improvement this comparison was not statistically significant (6.00 vs 4.50 degrees) (P-value=0.207).

**Conclusion:** There was improvement in post treatment passive abduction, passive external rotation and active overhead elevation movement in both the groups but it was significantly higher in steroid injection study group as compared to Low laser therapy group.

**Keywords:** Adhesive capsulitis, intraarticular injection, low level laser therapy

### Introduction

Adhesive capsulitis is a poorly defined entity. Despite extensive research the etiology is still unknown. As a consequence the management and evaluation of results in patients with stiff shoulders are confusing. The disease is characterised by a spontaneous onset of shoulder pain accompanied by progressive limitation of both active and passive glenohumeral joint movements<sup>[1]</sup>.

Adhesive capsulitis can be (i) Primary, insidious and idiopathic, or (ii) Secondary, which is typically the result of trauma or subsequent immobilization. Patients with primary adhesive capsulitis report a very slow, gradual onset and progression of symptoms, with no identified precipitating event or mechanism of injury, while those with secondary adhesive capsulitis notice their symptoms soon after an inciting trauma (fall, surgery) because their ROM does not recover after injury as expected<sup>[2]</sup>.

Many treatments have been devised for adhesive capsulitis and therapies include rest, analgesia, and simple range-of-motion (ROM) exercises; more active home exercises, low level laser therapy with mobilization; oral corticosteroids; corticosteroid injection; capsular distention; manipulation under anesthesia; and arthroscopic capsular release<sup>[3]</sup>.

We conducted a simple randomized prospective comparative study to evaluate the relative efficacy of intra-articular corticosteroid and low level laser therapy in idiopathic adhesive capsulitis of shoulder among all patients with the complaints of pain in shoulder joint and on clinical examination suspected of idiopathic adhesive capsulitis.

## Material and methods

After obtaining approval from the Institutional Ethical committee and written informed consent, a randomised, prospective trial was conducted. 80 patients of idiopathic adhesive capsulitis, in the age group 40-75 were taken for intra-articular injection of corticosteroid and low level laser therapy. 40 patients in each group were taken by Simple random sampling. The study was conducted at BPS Government Medical College, Khanpur Kalan between February 2017 to November 2018.

Patients included were those with with signs and symptoms of adhesive capsulitis with duration of symptoms for a minimum of 3 months and with a reduction of more than 30% of two of three shoulder movements i.e. abduction, external rotation and internal rotation [49].

Patients excluded were those with significant injury to ipsilateral shoulder or arm, uncontrolled hypertension or diabetes, systemic inflammatory joint disease, previous surgery or complete rotator cuff tear.

The patients were divided into 2 groups:

1. Group A: Intra-articular steroid injection in shoulder.
2. Group B: Low laser therapy

Both group were given supervised physiotherapy followed by home exercises program.

Details were recorded about the patient's age, sex, occupation and characteristics of pain, co-morbidities especially diabetes status and history of trauma to rule out secondary adhesive capsulitis.

All patients underwent a standardized history and physical examination of range of motions of both the shoulders with a goniometer.

Follow up of patients after treatment was done at 3<sup>rd</sup> month, 4<sup>th</sup> month and 6<sup>th</sup> month.

Final assessment was done 6 months after the intervention, in which re-examination of shoulder range of motion and recording of the post treatment score on Shoulder Rating Questionnaire (SRQ) was done [4].

**Intra-articular:** Triamcinolone acetate 40 mg (1ml) + Lignocaine 2% (9 ml) (total volume of 10 ml) was injected through posterior approach [5].

**Low-level laser therapy:** was applied around the shoulder joint [6]. The therapy system used was laser diode 500 mWGaAlAs (gallium aluminium arsenide) built-in visible LED red light guide, wavelength 808 nm, laser class 3B & CE certified working at 100-240V / 50-60 Hz / 3.2 W. The

duration of treatment per point was 30 sec. During total 8 weeks of treatment, the patients received 12 sessions of laser. For the first 4 weeks the subjects received 2 treatment sessions per week, and for the next 4 weeks they received 1 treatment session per week.

## Statistical Analysis

- For continuous data mean improvement in ROM in two groups  $\pm$  SD was calculated
- The data was entered into a Microsoft Excel and analysed using statistical software SPSS (ver 22).
- Categorical variables were analysed using Chi square test.
- Normally distributed variables were analysed using the student-t test.
- Analysis of variance (ANOVA) was used for demographic data.
- P value <0.05 was considered as statistically significant.

## Results

Males constituted 50% and 40% in steroid injection and Low Laser therapy group respectively. In total, males comprised of 45% and females comprised of 55% of total 80 subjects. There was no significant association between the gender and group distribution.

**Table 1:** Gender distribution of study population

Group	Male	Female	Total
Steroid injection	20 (50%)	20 (50%)	40
Laser therapy	16 (40%)	24 (60%)	40
Total	36 (45%)	44 (55%)	80

Right side was affected in 19 (47.5%) and left side in 21 (52.5%) patients in steroid injection group while in low laser group right side was affected in 18(45%) and left side in 22 (55%) patients. Mean age were 60.15 $\pm$ 9.08 and 56.78 $\pm$ 8.66 in steroid injection and low laser groups respectively. There was no statistical significance in the distribution of age categories.

**Table 2:** Age distribution among groups

Age categories	Steroid injection	Laser therapy
40-50 years	7 (17.5%)	13 (32.5%)
51-60 years	13 (32.5%)	14 (35%)
61-70 years	16 (40%)	11 (27.5%)
71-80 years	4 (10%)	2 (5%)
Total	40 (100%)	40 (100%)

**Table 3:** Comparison of measurements for various movements in steroid injection group

	Pre-intervention value	Post intervention value	p-value
Abduction	41.75 $\pm$ 13.28	79.05 $\pm$ 10.63	<0.001
External rotation	16.25 $\pm$ 10.96	31.50 $\pm$ 10.51	<0.001
Internal rotation	26.88 $\pm$ 11.58	32.88 $\pm$ 9.92	<0.001
Overhead elevation	86.50 $\pm$ 22.82	143.75 $\pm$ 23.60	<0.001

The increase in these readings in all the movements was statistically significant.

**Table 4:** Comparison of measurements for various movements in Low laser therapy group

	Pre-intervention value	Post intervention value	p-value
Abduction	39.38 $\pm$ 11.33	59.75 $\pm$ 10.25	<0.001
External rotation	16.25 $\pm$ 8.45	23.38 $\pm$ 8.27	<0.001
Internal rotation	24.50 $\pm$ 9.92	29.00 $\pm$ 10.26	<0.001
Overhead elevation	87.25 $\pm$ 23.53	120.63 $\pm$ 24.44	<0.001

The increase in these readings in all the movements was statistically significant.

**Table 5:** Improvement in measurements for various movements in steroid injection and low laser therapy groups

	<b>Steroid injection</b>	<b>Low laser therapy</b>	<b>p-value</b>
Abduction	37.30±9.27	20.62±5.33	<0.001
External rotation	15.25±7.06	7.12±2.74	<0.001
Internal rotation	6.00±6.71	4.50±3.16	0.207
Overhead elevation	57.75±18.60	33.37±8.72	<0.001

The improvement in abduction, external rotation and overhead elevation movement was significantly higher in steroid injection study group (37.30, 15.25, 57.75 degrees) as compared to Low laser therapy group (20.62, 7.12, 33.37

degrees). However, for internal rotation movement improvement this comparison was not statistically significant (6.00 vs 4.50 degrees).

**Table 6:** Comparison of SRQ score in steroid injection and low laser groups

	<b>Steroid injection</b>	<b>p-value</b>	<b>Low laser therapy</b>	<b>p-value</b>
SRQ pre score	36.32±6.35	<0.001	38.02±6.21	<0.001
SRQ post score	84.72±8.26		79.83±8.22	

SRQ score post intervention was statically significant higher in both steroid injection and low laser groups.

**Table 7:** Comparison of pre and post SRQ scores in steroid injection and low laser therapy group

	<b>Steroid injection</b>	<b>Low laser therapy</b>	<b>p-value</b>
SRQ score pre	36.32±6.35	38.02±6.21	0.228
SRQ score post	84.72±8.26	79.83±8.22	0.010

Pre-operative SRQ score was higher in low laser therapy group as compared to steroid injection group (38.02 vs 36.32) which was not significant. After the intervention in the two study groups, the SRQ score was higher in steroid injection group (84.72) as compared to low laser therapy group (79.83). This difference was statistically significant.

## Discussion

Frozen shoulder is a common clinical disease affecting middle-aged persons, often with comorbid conditions such as diabetes, some cardiac diseases, or other endocrine diseases. It usually has an insidious onset and follows a protracted course. The pathogenesis is unclear, but it is thought to be a progression of inflammation and fibrosis and has many similar features to Dupuytren disease, including the lack of adhesions [7].

The natural history of diseases follows an indolent course into four stages namely 1) inflammatory stage which is a stage of transient synovitis without contracture or fibrosis, 2) freezing stage which shows early formation of adhesions and capsular contracture, 3) frozen stage which is a stage of resolving synovitis with global profound loss of range of movements around the shoulder joint, and 4) thawing stage which shows persistent stiffness with slow improvement in shoulder mobility. Advanced adhesions and restriction of the glenohumeral joint space is observed [8].

In recent years, low-level laser therapy is increasingly being combined with exercise than exercise alone for management of pain and functions in various shoulder disorders [6]. In a recent survey of UK health professionals, only 3% recommended surgical procedures for the initial painful "freezing" phase. For the second and third phases of frozen shoulder, nearly 50% of the respondents suggested surgical treatment (including MUA and capsular distension injections). Operative treatment (i.e. manipulation under anaesthesia or arthroscopic capsular release) are generally considered only after conservative measures have failed [9].

Treatment for adhesive capsulitis of shoulder include non-operative and surgical treatment. Adhesive capsulitis is a common disorder in which definitive treatment is still

uncertain. Levine WN *et al.* showed that 90% of patients with idiopathic adhesive capsulitis can be treated successfully with a nonoperative regimen. Traditionally, nonoperative management of adhesive capsulitis is recommended for a minimum of 6 months before operative intervention [10].

Non-operative treatment for adhesive capsulitis of shoulder includes anti-inflammatories, or corticosteroids, conservative physical therapy, corticosteroid injection, capsular distension injection and manipulation under anaesthesia. Surgical treatment of adhesive capsulitis of shoulder include manipulation under anaesthesia with arthroscopic or open surgical release [2, 3, 11].

Simon *et al.* compared results of intraarticular steroids, supervised physiotherapy & a combination of the intraarticular steroids & supervised physiotherapy. They found that single intraarticular injection combined with simple home exercise programme was effective in treating the condition. They further concluded that supervised physiotherapy when used alone is less effective in the management of adhesive capsulitis [12].

Agarwal *et al.* conducted a study on 24 patients with hydroplasty revealed significant range of movements immediately post-procedure and at 4 weeks with 70% excellent results. Hence, he concluded hydroplasty acts as a low cost, effective and economical outpatient procedure for adhesive capsulitis of shoulder [13].

Rawat *et al.* conducted a study on 32 patients with intraarticular steroid injection in frozen shoulder showed a significant pain relief after 12 weeks of follow up which are statistically significant [14].

Kothari *et al.* compared the efficacy of PRP injection, corticosteroid injection and ultrasonic therapy in treatment of periarthritis shoulder revealed PRP therapy resulted in statistically significant improvements over steroid injections and ultrasonic therapy. Hence they concluded PRP therapy is superior and biological therapy than steroid injections and ultrasonic therapy for periarthritis shoulder [15].

Kim SH *et al.* studied the clinical efficacy of High-intensity laser therapy (HILT) in frozen shoulder and concluded that it provided significant pain relief at 3 and 8 weeks, but not at

the final follow-up of 12 weeks [16].

In our study, all patients were in the age group between 40 to 75 years. The mean age of the patients was 60.15 years in steroid injection group and 56.78 years in laser therapy group. However, this was not statistically significant (P-value=0.093). Male and female comprised of 45% and 55% of the study subjects respectively. There was no significant association between the gender and group distribution (P-value=0.369). Out of 80 shoulders right side was involved in 47.5% and 45% in steroid injection group and Low Laser therapy group respectively. Left side was involved in 52.5% and 55% of cases in steroid group and Low laser group respectively. There was no significance found in the distribution of side affected and study group (P-value=0.823). Large percentage of patients i.e. 54 out of 80 (67.5%) were in the age group of 51 to 70 years of age. However, incidence of adhesive capsulitis in the preceding years in the contralateral shoulder in our study was noted in only 6.25% (5 out of 80) of our patients.

Patients recruited in intra-articular steroid group in our study had resolution of pain immediately after injection application, probably as an effect of local anaesthetic given along with the intra-articular steroid, and it helped the patient to initiate physiotherapy immediately after the procedure. Complications like anaphylactic shock or local anaesthetic toxicity are theoretically possible, but were not encountered in any patient in our study. The procedure was rather easy and can be performed on outpatient basis. ROM measurements in pre and post treatment phase and gain in ROM is shown in table 1. The increase in these readings in all the movements was statistically significant (P-value <0.001). The comparison of pre and post scores of SR questionnaire in the steroid injection group was significantly higher in the follow up post-operative period at 6 months (84.72) as compared to SRQ score at pre-operative stage (36.32) (P-value <0.001).

The subjects of our study that received low-level laser treatment were improved with respect to pain and disability. The analgesia provided by laser treatment allows other therapeutic procedures, such as exercise, to be performed more comfortably. ROM measurements in pre and post treatment phase and gain in ROM is shown in table 2. The increase in these readings in all the movements was statistically significant (P-value <0.001). The comparison of pre and post scores of SR questionnaire in the Low laser therapy group was significantly higher in the follow up post-operative period at 6 months (79.83) as compared to SRQ score at pre-operative stage (38.02) (P-value <0.001).

Absolutely speaking, patients have been benefited by the treatment modality but there is relative superiority of intra-articular steroid injection over low level laser therapy. Table 3 shows comparison of improvement in various movement measurements by Goniometer in two study groups. The improvement in abduction, external rotation and overhead elevation movement was significantly higher in steroid injection study group (37.30, 15.25, 57.75 degrees) as compared to Low level laser therapy group (20.62, 7.12, 33.37 degrees) (P-value <0.001). However, for internal rotation movement improvement this comparison was not statistically significant (6.00 vs 4.50 degrees) (P-value=0.207). Though improvement in internal rotation movement in intra-articular steroid group were more as compared to low laser therapy group, the reason for statistical insignificance can be the small sample size. Large number of patients could have eliminated the extreme values and bought out the truth regarding these observation. Limitation of our

study is small sample size.

## Conclusion

On conclusion, our study is a randomised prospective comparative study which shows improvement in post treatment passive abduction, passive external rotation and active overhead elevation movement in both the groups but it was significantly higher in steroid injection study group as compared to Low laser therapy group. However, for internal rotation movement improvement this comparison was not statistically significant. Though improvement in internal rotation movement in intra-articular steroid group was more as compared to low laser therapy group.

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