Comparison between intraarticular triamcinolone acetonide and methylprednisolone acetate injections in treatment of frozen shoulder

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ABSTRACT

Objective: To compare the effectiveness of triamcinolone acetonide (40 mg) and methylprednisolone acetate (60 mg) in Iraqi patients with primary and secondary frozen shoulder.

Methods: A total number of 135 (93 males and 42 females) patients with frozen shoulder, allocated at outpatient clinic of rheumatology in Al-Yarmook Teaching Hospital (Baghdad-Iraq) from January 2004 to December 2005, were enrolled in non-controlled clinical trial. The diagnosis of frozen shoulder was made using the guidelines for shoulder complaint issued by the Dutch College of General Practitioners. Intraarticular injections of 40 mg triamcinolone acetonide (46 males and 22 females) or 60 mg methylprednisolone acetate (47 males and 20 females) were given every 3 weeks (not more than 3 injections) by using posterior route.

Results: Both triamcinolone acetonide (81.8%) and methylprednisolone acetate (83.3%) were equally effective in primary frozen shoulder. Triamcinolone acetonide is significantly improved diabetic frozen shoulder in comparison to methylprednisolone acetate (69% versus 39%). Also patients on triamcinolone acetonide required less number of steroid injections and higher percent of severe cases were significantly improved by triamcinolone acetonide in comparison with methylprednisolone acetate.

Conclusion: We conclude that triamcinolone acetonide is a good rescue for painful stiff shoulder particularly for resistant cases as with diabetes mellitus, and with long duration of illness. Also, its efficacy can be observed with less frequent injections.

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The term "frozen shoulder" was first introduced by Codman in 1934 and the term adhesive capsulitis was coined by Naviesar in 1945.[1] It is a well defined nosologic entity characterized by retraction of the anterior portion of the glenohumeral joint capsule leading to pain and restriction of motion. Frozen shoulder is a common complaint in primary health care; estimates of the annual incidence in general practice vary from 6.6 to 25 cases per 1000 patients.[1-3] It tends to occur in patients older than 40 years of age and most common in patients in their 50s and more in women. Fifteen percent of patients develop bilateral disease. Complete recovery, however, is not infrequent, and 7-15% of patients permanently lose their range of abduction motion.

It is frequently treated with intraarticular steroid injections, physical therapy, and surgical manipulation under general anesthesia. These therapies provide limited benefits and most patients slowly improve over 12-24 months.[4]

Systematic review have shown that the effectiveness of corticosteroid injections remain questionable.[5-7] Hazleman[8] performed a meta-analysis on the use of intraarticular steroids, and found that the success of the treatment depended on the duration of symptoms. Patients who received the injections earlier in the course of the disease recovered more quickly. Recent meta-analysis conducted on randomized controlled trial showed that subacromial injections of corticosteroids are effective for painful shoulder to a 9-month period.[9]

Intraarticular steroid injections are not indicated in the adhesive phase as the inflammatory stage of the disease has passed.[10] In stage 2 and 3, the cured rate of intraarticular triamcinolone acetonide (40 mg) was 5-8 times higher than oral triamcinolone tablet at week

one of treatment.[11] Van der Windt et al[12] showed that steroid injections is more effective than physiotherapy alone at 6 weeks.[12] Moreover, single intraarticular steroid injection in combination with physiotherapy is effective in reducing both pain and disability.[13]

This study is aimed to compare the effectiveness of intraarticular injections of 2 corticosteroid preparations; triamcinolone acetonide (40 mg) and methylprednisolone acetate (60 mg) in Iraqi patients with primary, and secondary (post-traumatic or type 2 diabetes mellitus) frozen shoulder in rather early and late stages of frozen shoulder.

Methods. Consecutive patients who consulted the specialist of rheumatology at outpatient consultant clinic of rheumatology, Al-Yarmook Teaching Hospital (Baghdad, Iraq) from January 2004 to December 2005, were considered for participation. The main inclusion criteria were that patients had a painful restriction of glenohumeral mobility, were age ≥18 years, and gave informed consent. Patients were excluded if they had bilateral symptoms; if they had treatment with corticosteroids injections or physiotherapy during the preceding 6 months; if they had contraindications to treatment; if they had surgery, dislocation, or fractures in the shoulder area; if they had insulin-dependent diabetes mellitus, systemic disorders of the musculoskeletal system such as rheumatoid arthritis or neurological disorders. The study protocol was approved by the Scientific Committee of the College of Medicine in the Al-Mustansiriya University.

The diagnosis of frozen shoulder (capsular syndrome) was made using the diagnostic guidelines for shoulder complaint issued by the Dutch College of General practitioners,[2,14] that is, passive glenohumeral mobility must be painful and limited, lateral (external) rotation must be relatively more restricted than abduction and medial rotation, and there must be no clear signs rotator cuff lesion or rupture, or subacromial bursitis (painful arc, positive resistance tests, loss of power) and that the shoulder pain was not caused by another conditions. The normal range of glenohumeral joint movements were considered normal as the following; 90º abduction, 90º external rotation and 90º internal rotation. The following investigations were performed; chest and shoulder x-rays, complete blood picture, erythrocyte sedimentation rate and fasting blood sugar.

After enrollment, prognostic indicators and baseline values of outcome measures were assessed.

Intraarticular injections of 40 mg triamcinolone acetonide (Kenacort-A-, Squibb) (46 males and 22 females) or 60 mg methylprednisolone acetate (Depomederol, Upjohn) (47 males and 20 females) were given every 3 weeks interval by the author using posterior route.[15] No more than 3 injections were given and all patients were assessed by 8 weeks.

Patients were allowed to continue taking drugs for pain if they had started before enrollment; drugs could also be prescribed if pain was severe. Also, the patients were encouraged to continue physical exercise of the involved joint at home by performing flexion, abduction and external rotation movements many times a day as hard as they can.

Table 1 - Baseline characteristics of patients with frozen shoulder by treatment received.

Variable	Patients treated with triamcinolone acetonide (40 mg)		Patients treated with methylprednisolone acetate (60 mg)	
Number	68		67	
Gender				
Male	46	(67.6)	47	(70.1)
Female	22	(32.4)	20	(29.9)
Age (year)				
Male	51.9 ± 9.9		51.2 ± 12.2	
Female	53.1 ± 11.2		55.2 ± 10.6	
The involvement side				
Right	27	(39.7)	25	(37.3)
Left	41	(60.3)	42	(62.7)
Cause				
Diabetes mellitus	39	(57.3)	41	(61.2)
Post-traumatic	18	(26.5)	14	(20.9)
Primary (idiopathic)	11	(16.2)	12	(17.9)

Values are numbers (percentages) and mean ± SD

Table 2 - Baseline pain scores and disability of patients with frozen shoulder by treatment received.

Variable	Patients treated with triamcinolone acetonide (40 mg) (n = 68)		Patients treated with methylprednisolone acetate (60 mg) (n = 67)	
Pain scores				
0 (no pain)				
1 (mild)				
2 (moderate)	13	(19)	8	(12)
3 (severe)	30	(44)	40	(60)
4 (severe night pain)	25	(37)	19	(28)
Rating of shoulder disability (degree of range mobility restriction of glenohumeral)				
Abduction				
21 – 40	23	(34)	14	(21)
41 – 60	36	(53)	48	(72)
61 – 80	9	(13)	5	(7)
Lateral (external) rotation				
21 – 40	26	(38)	17	(25)
41 – 60	42	(62)	48	(72)
61 – 80			2	(3)
Duration of illness (months)	5.81 ± 2.75		4.97 ± 2.28	

Values are number (percentage)

The outcome of intervention was assessed at 8 weeks. For the analysis of success rates for each treatment patients as having made a complete recovery or as having much improvement were counted as successes. The assessment of pain was by using scores of; 0 (no pain); 1 (mild); 2 (moderate); 3 (severe); 4 (severe night pain that interferes with night sleep). The assessment of disability was in term of regaining full activity of daily living that included grooming, combing, washing, and others.

The changes in scores of pain symptom and disability at the end of trial was calculated for each patient and compared with those at baseline. The percent of recovery was computed. Statistical analysis of the differences in improvement between the 2 groups of treatment was carried out using Student's "t" test (paired, 2 tailed) and Chi-squared test, taking the probability (p) ≤0.05 as the lowest limit of significance.

Results. A total number of 135 patients with frozen shoulder were enrolled in the trial. Sixty-eight patients were allocated randomly to intraarticular injections with triamcinolone acetonide (40 mg) and 67 patients with methylprednisolone acetate (60 mg). There were no significant differences between intervention groups in regard to gender, age, the involvement side, and the cause of painful stiff shoulder (**Table 1**).

Although there were differences between intervention groups in regard to pain scores and the range of movement restriction as well as the duration of illness,

Table 3 - Number (percentage) of patients with frozen shoulder that showed improvement* in outcome measures in regard to the causes of painful stiff shoulder.

The causes of painful stiff shoulder	All (n=135)		Patients treated with triamcinolone acetonide (40 mg) (n = 68)		Patients treated with methylprednisolone acetate (60 mg) (n = 67)	
Diabetes mellitus	43	(53.8)	27	(69.2)	16	(39)
Post-traumatic	29	(90.6)	16	(88.9)	13	(92.9)
Primary (idiopathic)	19	(82.6)	9	(81.8)	10	(83.8)
Total	91	(67.4)	52	(76.5)	39	(58.2)

*Improvement is considered if the patient is pain-free irrespective of the movements range

Table 4 - Number of patients with frozen shoulder that showed improvement in outcome measures in regard to the number of injections.

Causes of painful stiff shoulder	All	Patients treated with triamcinolone acetonide (40 mg) Number of injections			All	Patients treated with methylprednisolone acetate (60 mg) Number of injections		
		1	2	3		1	2	3
Diabetes mellitus	27	0	8	19	16	0	1	15
Post-traumatic	16	1	9	6	13	0	7	6
Primary (idiopathic)	9	2	2	5	10	2	4	4
Total	52	3	19	30	39	2	12	25

Table 5 - Number (percentage) of patients with frozen shoulder that showed improvement in outcome measures in regard to the pain scores.

Pain scores	All (n=135)		Patients treated with triamcinolone acetonide (40 mg) (n = 68)		Patients treated with methylprednisolone acetate (60 mg) (n = 67)	
2 (moderate)	21	(100)	13	(100)	8	(100)
3 (severe)	52	(74.3)	25	(83.3)	27	(67.5)
4 (severe night pain)	18	(40.9)	14	(56)*	4	(21.1)
Total	91	(67.4)	52	(76.5)	39	(58.2)

*p<0.01 in comparison with methylprednisolone acetate injections

but they did not reach to the level of significance (**Table 2**). The median rating range of glenohumeral abduction for each of the intervention groups was 60 degree and that of lateral rotation was 50 degree.

There was a statistically significant difference (χ^2 = 5.12, df =1, p<0.025) between the 2 intervention groups in favor with triamcinolone acetonide injections in regard to the improvement outcome measures (**Table 3**). Further analysis revealed that diabetic patients significantly responded better to triamcinolone acetonide injections in comparison with methylprednisolone injections (69.2% versus 39%, t=2.82, p<0.01) (**Table 3**). Also, diabetic patients responded to less frequent injections of triamcinolone acetonide when they compared with those received methylprednisolone acetate injections (**Table 4**). The success rate of 2 injections of triamcinolone acetonide was 29.6% (8 out of 27) in comparisons with 6.25% (1 out of 16) treated with methylprednisolone acetate (p<0.05) (**Table 4**). However, there was no significant advantages of triamcinolone acetonide injections in post-traumatic or primary capsular syndrome in respect to number of injections (**Table 4**).

Triamcinolone acetonide injections were significantly more effective than methylprednisolone injections in patients with frozen shoulder presented with high pain scores (**Table 5**). The effectiveness of corticosteroid injections were clearly observed in patients with short duration of illness (≤3 months) and this efficacy declined as the duration of illness became longer. The efficacy of triamcinolone acetonide injections was significantly higher than that of methylprednisolone acetate in patients with longer duration of illness (4-12 months) (χ^2 = 7.17, df =1, p<0.01).

Discussion. This trial showed that intraarticular triamcinolone acetonide injections for treatment of painful frozen shoulder are superior to methylprednisolone acetate injections. The baseline characteristics of 135 Iraqi patients are differed from those reported in other studies in regard to gender and the involvement of non-dominant shoulder,[2,16] but they are in agreement with age and the causes of painful stiff shoulder.[2,16] In this trial, the male: female ratio is 2.2 and the left shoulder (such as, the non-dominant shoulder) is involved by more than 1.5 times of the right one. Also, we observed that secondary painful stiff shoulder due to diabetes mellitus is reported in higher frequency (80 out of 135) than post-traumatic and primary (idiopathic) painful stiff shoulder. The incidence of frozen shoulder in diabetes mellitus patients is reported to be 10-36%.[17]

Although there were no significant differences in baseline pain scores and degree of shoulder movement disability between the 2 intervention groups, these outcome measures tended to be a little bit more in patients received triamcinolone acetonide. Despite of theses differences, patients treated with triamcinolone acetonide are significantly responded better than those treated with methylprednisolone acetate, and, in

Table 6 - The pharmacodynamic and pharmacokinetic profile of triamcinolone acetonide and methylprednisolone acetate.

Pharmacodynamic and pharmacokinetic properties	Triamcinolone acetonide	Methylprednisolone acetate
Intermediate acting	+	+
Anti-inflammatory, immunosuppressant	+	+
Potency in reference to glucocorticosteroid activity (dose 4 mg)	5	5
Potency in reference to mineralocorticosteroid activity	0	0
Routes of administration	IM, IA, IB, IL, IT	IM, IV, IA, IL, ST
Onset	Very slow	Slow
Peak effect	24-48 hours	7 days
Duration of action	Several weeks	1-5 weeks
Protein binding	Very high	Very high
Elimination half life	> 3.5	2- >5
Biological tissue half life	18-36	18-36

IM - intramuscular, IV - intravenous, IA - intra-articular, IB - intrabursal, IL - intralesional; IT - intraturbinal, ST - intra-soft tissue

particular diabetic patients. It is well known that frozen shoulder in diabetic patients is more severe and resistant to treatment,[18] but in this trial, we observed that the success rate with triamcinolone acetonide reached to 69.2% that is significantly higher than success rate of methylprednisolone acetate, which mounted to 39%. As with other studies, corticosteroid injections of whatever preparations are effective in higher percent in management of painful stiff shoulder of primary type or post-traumatic cause.[19-23]

In this trial, we observed that the effectiveness of corticosteroid injections has declined as the severity of illness gone up, and this decline in effectiveness is significantly higher in patients treated with methylprednisolone acetate. Therefore, triamcinolone acetonide injections can help patients with moderate to severe frozen shoulder. Such observation has not been mentioned in previous literatures.

Most studies agreed that the effectiveness of corticosteroid injections were observed in painful freezing (10-36 weeks) phase and useless in adhesive phase (4-12 months).[10,24,25] In this trial, the effectiveness of the 2 corticosteroid preparations decline as the history of illness is prolonged, but this decline is significantly more with methylprednisolone acetate injections.

Rizk et al[26] 1991 found that intraarticular methylprednisolone injections had no advantage in restoring shoulder motion but partial, transient pain relief occurred in two-third. From our results, it seems that the effectiveness of triamcinolone acetonide injections may be extended to adhesive phase in addition to painful freezing phase.[27] It is well known that intraarticular injections of steroids are not indicated in adhesive phase, and aggressive stretching exercise is considered, aiming to regain the range of movements.

It is unlikely to attribute these findings, firstly, to the difference in dosage form as fixed dose is used in this trial. Secondly, from the pharmacological point of view, there were no pharmacokinetic or pharmacodynamic differences between triamcinolone acetonide and methylprednisolone acetate (**Table 6**).[28] And thirdly, some studies believed that better clinical outcome is related to the accurate intraarticular injections[29,30] and they advised to do it under fluoroscopy.[13]

In this trial, the intraarticular injections were carried out using posterior not anterior approach as more than half missed the intended location in the glenohumeral joint were reported by using the anterior approach.[30] Moreover, the technique of needle mobility is helped the rheumatologist for the accurate placed injections.[31] Therefore, the possibility of the bias is less likely to occur.

We conclude that triamcinolone acetonide is a good rescue for painful stiff shoulder particularly for resistant cases as with diabetes mellitus, and with long duration of illness. Also, its efficacy can be observed with less frequent injections.

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Related topics

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