International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 658-664 www.ijdmsrjournal.com ISSN: 2582-6018

Functional Outcome In Idiopathic Frozen Shoulder Treated With Manipulation Under Anesthesia – A Prospective Study

Dr. Padmaja Uppala, Dr. Venkata Sathyajith.U
Postgraduate in Orthopaedics,Department of Orthopaedics,Narayana Medical College and Hospital, Nellore.
Assistant Professor, Department of Orthopaedics, Narayana Medical College and Hospital, Nellore.

Submitted: 10-01-2021 Revised: 23-01-2021 Accepted: 26-01-2021

ABSTRACT: Frozen Shoulder is a self-limiting disease, but without treatment,it takes a longer period of time for the patient to regain normal movements affecting the day to day activities. Studies show that Manipulation under anesthesiaisfor faster recovery of symptoms and movements for frozen Shoulder (FS). This is a prospective clinical study performed in a tertiary care hospital. Twenty patients with idiopathic unilateral frozen Shoulder underwent interscalene block and intraarticular injection with Methylprednisolone acetate followed by Manipulation of the glenohumeral joint. Differences in range of motion and pain were assessed before Manipulation and at one week,six weeks, and 12 weeks. Passive range of motion increased significantly for Abduction, External Rotation, and Internal rotation. A significant decrease in visual analog pain (VAS) scores between initial and follow-up assessments was observed. Our results revealed that Manipulation under interscalenebrachial plexus block and intra-articular steroid injectionis a very simple, safe, cost-effective, and minimally invasive procedure for shortening the course of an apparently self-limiting disease and can improve shoulder function and symptoms quickly.

Keywords: Interscalane brachial plexus block, Frozen Shoulder,range of motion.

I. INTRODUCTION:

Frozen Shoulder is a self-limiting disease with pain and restricted movements leading to disabilityoccurring in the 40 to 60-year-old age group and affects 2.0 to 5.0% of the general population.[1]In 1872, Duplay was the first one to term "périarthrite scapulo-humérale,"apainful, stiffening condition of the Shoulder. He suggested Manipulation under anesthesia as its treatment.[2] In 1934,Codman coined the term"frozen shoulder" and stated that it was characterized by pain near the insertion of the deltoid, which was insidious in onset, inability to sleep on the affected side, painful and restricted abduction and external rotation, but normal radiological appearance.[3]In 1945, Neviaser introduced the term "adhesive capsulitis".[4]based on his findings of synovial changes in the glenohumeral joint. Frozen Shoulder is thought to be a self-limiting disease, with complete remission occurring within two years. However, Shaffer et al.showed that 50% of patients treated conservatively experienced either mild pain or stiffness, or both, after an average of seven years.[5] Etiology and the most suitable treatment condition is still not clear, but various modalities of treatments have been recommended, and a number of studies havedemonstrated successful results. Types of treatmentinclude Physiotherapy, oral steroids, Intra-articular corticosteroid injections, Manipulation under Anesthesia, Hydro dilatation of the capsule, Arthroscopic capsular release, and Open surgical release.[6-19]

In this study, we performed Manipulation after intra-articular corticosteroid Methylprednisoloneacetate with a local anesthetic, combined with Interscalane brachial plexus block using similar solution. The technique of Manipulation was also different from the conventional techniques described. After Manipulation, patients were trained with physical therapy and were advised to continue performing the exercises at home. We studied the improvement in terms of the range of motion and symptomatic relief.

II. MATERIALS AND METHODS

Patient selection and assessment

This is a prospective clinical trial conducted in the department of Orthopaedics in a tertiary care hospital. A total of 25 patients, who came to our Out PatientDepartment from December 2018 to December 2019, were selectedrandomly using computer-generated serial numbers after taking informed consent.

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 658-664 www.ijdmsrjournal.com ISSN: 2582-6018

INCLUSION CRITERIA:

Age above 40 years and below 65 years
No history of trauma in the same Shoulder,
Unilateral involvement, and contralateral normal Shoulder,
Normal blood sugar level,
Normal x-ray of the Shoulder.
We followed the criteria used by Rizk et al.[17] for the diagnosis of frozen Shoulder, which includes passive combined abduction< 100 degrees, external rotation of fewer than 50 degrees, and internal rotation of fewer than 70 degrees.[20]

EXCLUSION CRITERIA:

Age below 40 years and above 65 years
History of injection to the same Shoulder
History of allergy to local anesthetics
Patients who had a history of neurological involvement of the same side
And the patients who did not meet the criteria were excluded from the study.

Clinical assessment of both normal and affected shoulders wasdone, and range of motion and pain were evaluated. Pain at rest and at extreme shoulder movements wasevaluated using VAS. The scale consists of 10-centimeter lines anchored at one end by '0' means nopain, and at the other end, '10', which means severe unbearable pain with no intermediate indications.Rangeof motion was assessed in standing posture using a goniometer. Combined passive abduction was evaluatedby measuring the angle formed by the arm and thorax after passively abducting the Shoulder (Fig.1). With the arm adducted and the elbow at the side and flexed to 90degrees, the angle formed by the forearm and the sagittalplane of the body was measured as Passive external rotation. Passive internal rotation of the Shoulder was assessed by bringing the hand behind and determining the vertebrae level that they could reach by the thumb. All the movements were in degrees except internal rotation. Vertebral levels were given points for statistical purposes. If the thumb reaches to hip joint,then the score is 1, at S1 level it is 2, at L5 it is 3, similarly at L4-4, L3-5, L2-6, L1-7, T12-8, T11-9, T10-10, T9-11, T8-12, T7-13, T6-14, and T5-15.

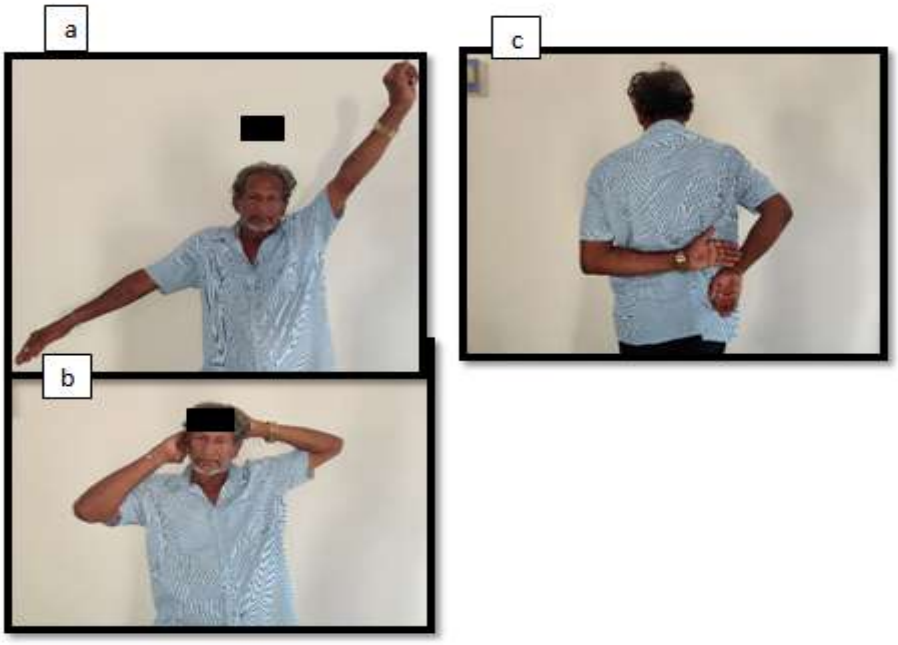

Figure 1(a) Abduction (b) External rotation (c) Internal Rotation before treatment

TECHNIQUES

All injections were administered by the same doctor. All the procedure was done in the operation theatre, underaseptic conditions as required for minor surgical procedure.

INTRA-ARTICULAR INJECTION

A mixture of 40 mg of Depot methylprednisolone, 7 ml of 1% xylocaine, and 4 ml 0.5% Bupivacaine was introduced into the glenohumeral joint using a 21G needle via an anterior approach. The patient was put supine, and

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 658-664 www.ijdmsrjournal.com ISSN: 2582-6018

the affected Shoulder was prepared with povidone-iodine solution. The coracoid process was palpated,the needle was inserted one centimeterinferolateral to the coracoid.The coracohumeral ligament was infiltrated with 2 ml of mixed solution. The same needle was then directed in the joint, and 10 ml of solution was injected.

INTERSCALENE BRACHIAL PLEXUS BLOCK

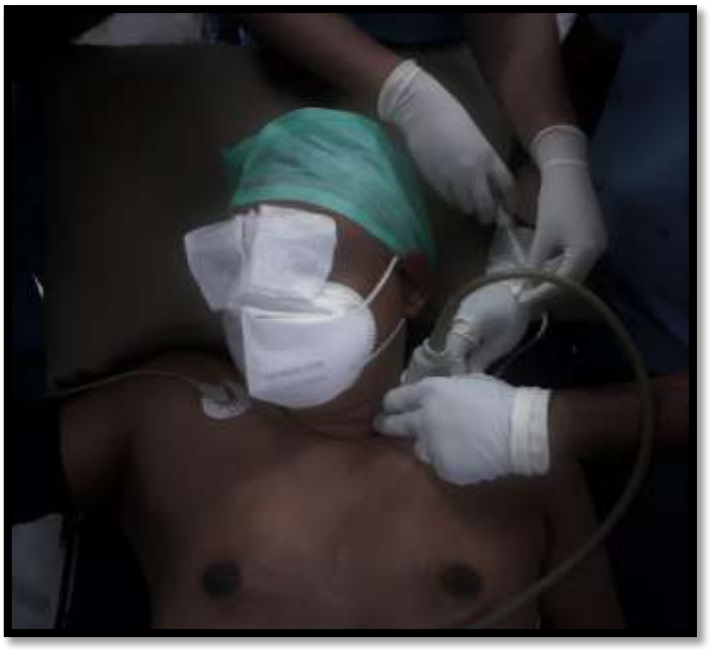

Figure 2: Showing Interscalene Brachial Plexus Block

The patient is placed in the supine position with the head turned to the opposite side.Patient's head is slightly elevated to bring the clavicular head of the sternocleidomastoid muscle into prominence. The index and middle fingers of the non-dominant hand are placed immediately behind the lateral edge of the sternocleidomastoid muscle. The patient is instructed to relax so that the palpating fingers can be moved medially behind this muscle and finally lie on the belly of the anterior scalene muscle.The palpating fingers are then rolled laterally across the belly of the anterior scalene muscle until they fall into the interscalene groove (formed by scalenus anterior and posterior muscles).With both fingers in the interscalene groove, a 1.5-in., 22- gauge, a short-bevel needle is inserted between the fingers at the level of C6 in a direction that is perpendicular to the skin in every plane.After a motor response is obtained, aspiration is carried out to rule out intravascular or intrathecal placement. While the patient is monitored closely for signs of local anesthetic toxicity or inadvertent subarachnoid injection, 15–20 mL of local anesthetic is slowly injected.It is a mixture of 40 mg of Depot methylprednisolone, 5 ml 1% xylocaine, and 4 ml 0.5% Bupivacaine using the classic technique of Winnie[20].

MANIPULATION

After 10 minutes, when the desired effect of the localanesthetic was achieved, Manipulation was donewith the patient supine. With the dominant hand, the distal arm of the affected side of the patient was held by the surgeon,and sequence of movements in the order of forwarding flexion, external rotation without abduction and external rotation with 90 degrees of abduction,internal rotation without abduction, and in 90 degrees of abduction,were done, and the sequence of movements was repeated until the crepitus of breakage of adhesion was heard and a full range of motion achieved.(Fig.2). Immediatelyafter Manipulation,the Range of Motion was evaluated.

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 658-664 www.ijdmsrjournal.com ISSN: 2582-6018

Fig 2: Showing Manipulation after interscalene Brachial plexus block

ANALGESIA AND HOME EXERCISES

Patients have been discharged with Indomethacin 25 mg thrice daily, Omeprazole 20 mg twice daily, and Amitryptyllin 10mg at bedtime for seven days. Additional 20 tablets of Paracetamol 500mg were also given to relieve pain on an SOS basis. All patients were given verbal and written instructions regarding exercises to be performed at home on a regular basis. Patients were advised to do the exercises three times a day without fail.

FOLLOW-UP AND DATA ANALYSIS

We followed up patients after one week, six weeks, and 12 weeks after the procedure. All the data were processed using SPSS for windows 11.5.

III. RESULTS:

A total of 25 patients ranging from 40 years to 65 years(mean 49.2) were evaluated, out of which 44% were male and 56% were female. Frozen Shoulder was affected
in 70% of non-dominant Shoulder. A marked restriction of Shoulder active ROM was observed in Frozen Shoulder patients before the procedure.

After one week of the procedure, there was an improvement inthe score of shoulder internal rotation, external rotation, and active abductionROM in FS patients for involved extremity ($p<0.05$) compared with the pre-treatment values.Thoughpain at rest was decreased ($p<0.05$) but the pain at activity was not decreased ($p>0.05$) (Table-1).

Table-1: Range of Motion and Pain before and after one-week of Manipulation

Observations	Pre-Manipulation	Post Manipulation one week	P-value
External rotation	18.64	42.74	0.000
Internal rotation	3.14	6.42	0.000
Abduction	65.72	150.12	0.000
Pain at rest (VAS)	7.52	2.52	0.003

After 12 week after the Manipulation, the score of Shoulderinternal rotation, external rotation, and active abductionROM in FS patients for involvedextremity wasincreased ($p<0.05$) compared with the pre-treatmentlevel. Both pain at rest and at activity were markedly decreased ($p<0.05$).Following the procedure with the home exercise program, there was a gradual improvement in the range of motion as well as the reduction in the VAS score(Table- 2).

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 658-664 www.ijdmsrjournal.com ISSN: 2582-6018

Table 2: Range of Motion and Pain before and after 12-weeks of Manipulation

Observations	Pre Manipulation	Post Manipulation (12 weeks)	P value
External rotation	16.70	60.70	0.000
Internal rotation	2.80	13.1	0.000
Abduction	59.20	169.26	0.000
Pain (VAS)	7.87	1.12	0.000

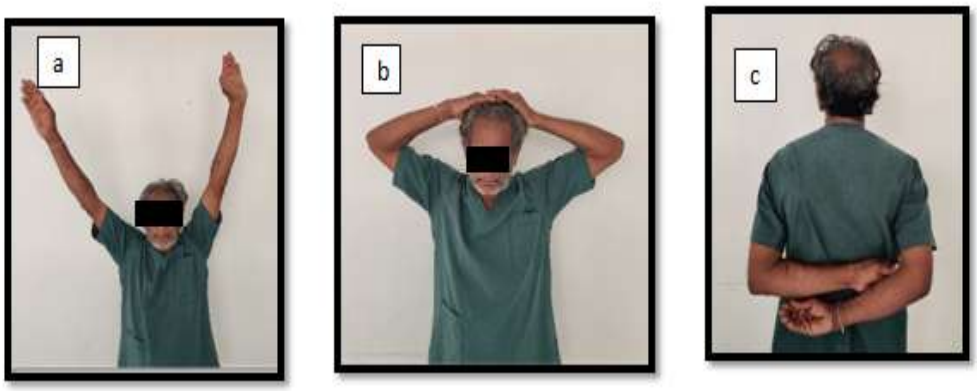

Fig 4: Showing (a) Abdcution (b) External rotation (c) Internal rotation 12 weeks after Manipulation under Anesthesia

IV. DISCUSSION

Frozen Shoulder is a common condition seen in middle-aged patients,characterized by pain and stiffness of the Shoulder. Though it is a self-limiting disease, the course of the disease is protracted, and thereis some limitation of movement.[21,5]Pathophysiologyseems obscure but, it was clearly described the stages of the disease based on the pathology occurring at the capsule and ligaments of the Shoulder.

The main anatomical change is thethickening of the coraco-humeral ligament. The coracohumeral and superior glenohumeral ligaments are considered to be structural contents of the rotator interval capsule, but each has separate origins and insertions.[22]Neer et al., in a cadaver study, observed that the coracohumeral ligament release had increased external rotation both with the Shoulderin neutral flexion and Shoulder in 90 degrees of forwarding elevation.[23]In an open release for frozen Shoulder,studies have recommended the release of the coracohumeral ligament to increase glenohumeral range of motion.[22-24] The interval capsule plays a major role in the range of certain motions, in the obligate translation, and in the allowed translation of the glenohumeral joint. The magnitude of these effects varied among shoulders, but the direction of the effect was consistent. Release or sectioning of interval capsule increased the ranges ofmovements, namely flexion, extension, adduction, and external rotation, and imbrication decreased these ranges of motion. Positions of abduction and internal rotation relaxed the interval capsule.[18,25]this ligament restrains the joint in the external rotation when the Shoulder isadducted.

In our study, the technique we performed gentle but firm external and internal rotation movements to stretch the shoulder capsule gently. The coracohumeral ligament was also infiltrated with 2 ml of local anesthetic mixture to anesthetize the ligament at the time of Manipulation.There is always pain and stiffness in the Shoulder, whichaltogether produces a vicious circle leading to progressive stiffness. The pain in the frozen Shoulder is typical of inflammatory pain,which is more severe during the night.[26].[27]Xylocaine relieved the pain immediately, andBupivacaine worked for 24 to 72 hours after that, methylprednisolone worked for weeks. Literature shows the addition of glucocorticoids in local anesthetic blocks transmission of nociceptive c

fibers. The block prolonging effect of the steroid is due to its local effect. The action of steroids has been related to the alteration of functions of the potassium channel on the excitable tissue.[28-31]All the manipulations were active and assisted. No passive manipulations were done as passive stretching of the joint produces pain, which evokes reflex contraction of antagonistic muscles.

All the range of movements were performed bypatients themselves at home. Thus all range of motions were possible without significant pain, and sometimes an audible pop could be heard as a result of breakage of adhesions. Patients were able to perform the same assisted active range of motion exercise at home regularly without pain.

Most noninvasive therapeutic strategies are based onstretching or rupturing the tight capsule by manipulative physical therapy with a success rate for achieving good to fair results nearing 100.0%.[7,27,36]The good result of physical therapy with intraarticular corticosteroid injections, with or without hydraulic distension, ranges from 44.0% to 80.0%. [32-35]More aggressive interventions, such as Manipulation under anesthesiaand arthroscopicor open release, are a popular form of therapy, especially for resistant frozen Shoulder.

In this study, we used a combined approach (Intraarticularinjection of local anesthesia with corticosteroid plus Interscalene brachial plexusblock plus gentle Manipulation and active-assisted range of motion exercises) to the management of FS. We have achieved significant improvements in the range of motion as well as relief of pain in our patients. We also prescribed low dose amitriptyline, which is effective in reducing night pain.The only adverse effect during the course of the trial was with one patient who experienced a vaso-vagal collapse following intra-articular injection. She recovered promptly after maintaining supine posture for
15 minutes.

V. CONCLUSION :

We conclude that Intraarticular injection of local anesthesia with corticosteroid plus inter scalene brachial plexus block plus gentle Manipulation and active-assisted range of motion exercises speeds the recovery of idiopathic frozen Shoulder and quickly improves shoulder function. This combined approach is safe and is reasonably effective forthe treatment of idiopathic frozen Shoulder in non-diabetic patients.

LIMITATIONS:
Longer follow-ups are needed
Needs larger sample

REFERENCES:

[1]. Wolf JM, Green A. Influence of comorbidity on self V assessment instrument scores of patients with idiopathic adhesive capsulitis. J Bone Joint Surg 2002; 84-A: 1167-72.
[2]. Duplay S. De la péri-arthrite scapulo-humérale et des raideurs de l'épaule qui en sont la conséquence. Arch Gen Med 1872; 20: 513-42.
[3]. Codman EA. The Shoulder: Rupture of the supraspinatus tendon and other lesions in or about the subacromial bursa. Boston, 1934.
[4]. Neviaser JS. Adhesive capsulitis of the Shoulder: a study of the pathological findings in periarthritis of the Shoulder. JBone Joint Surg 1945; 27: 211-22.
[5]. Shaffer B, Tibone JE, Kerlan RK. Frozen Shoulder: a long-term follow-up. J Bone Joint Surg 1992; 74-A: 738-46.
[6]. Diercks RL, Stevens M. Gentle thawing of the frozen Shoulder: A prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years. JShoulder Elbow Surg 2004; 13: 499-502.
[7]. Miller MD, Wirth MA, Rockwood CA Jr. Thawing the frozen Shoulder: The "patient" patient. Orthopedics 1996; 19: 849-53.
[8]. Buchbinder R, Hoving JL, Green S et al. Short course prednisolone for adhesive capsulitis (frozen shoulder or stiff, painful shoulder): a randomized, double-blind, placebo-controlled trial. Ann Rheum Dis 2004; 63: 1460-9.
[9]. Ryans I, Mongomery A, Galway R et al. A randomized controlled trial of intra-articular triamcinolone and/or physiotherapy in shoulder capsulitis. Rheumatology 2005; 44: 529-35.
[10]. Carette S, Moffet H, Tardif J et al. Intraarticular corticosteroids,supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the Shoulder. Arthritis Rheum 2003; 48: 829-38.
[11]. Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis: A prospective functional outcome study of nonoperative treatment. J Bone Joint Surg 2000; 82-A: 1398-1407.
[12]. Jürgel J, Rannama L, Gapeyeva H et al. Shoulder function in patients with the frozen Shoulder before and after 4-week rehabilitation. Medicina (Kaunas) 2005; 41: 30-8.

[13]. Dodenhoff RM, Levy O, Wilson A, Copeland SA. Manipulation under anesthesia for primary frozen Shoulder: effect on early recovery and return to activity. J ShoulderElbow Surg 2000; 9: 23-6.
[14]. Farrell CM, Sperling JW, Cofield RH. Manipulation for frozen Shoulder: Long-term results. J Shoulder Elbow Surg 2005; 14: 480-4.
[15]. Berghs BM, Sole-Molins X, Bunker TD. Arthroscopic release of adhesive capsulitis. J Shoulder Elbow Surg 2004; 13: 180-85.
[16]. Segmuller HE, Taylor DE, Hogan CS et al. Arthroscopic treatment of adhesive capsulitis. J Shoulder Elbow Surg 1995; 4: 403-4.
[17]. Omari A, Bunker TD. Open surgical release for frozen Shoulder: Surgical findings and results of the release. JShoulder Elbow Surg 2001; 10: 353-7.
[18]. Ozaki J, Nakagawa Y, Sakurai G, Tamai S. Recalcitrant chronic adhesive capsulitis of the Shoulder. Role of contracture of the coracohumeral ligament and rotator interval in pathogenesis and treatment. J Bone Joint Surg 1989;71-A: 1511 5.
[19]. Rizk TE, Pinals RS. Frozen Shoulder. Semin Arthritis Rheum 1982; 11: 440-52.)
[20]. Winnie AP: Interscalene brachial plexus block. Anesth Analg 1970;49:455–466.
[21]. Binder AI, Bulgen DY, Hazleman BL, Roberts S. Frozen shoulder: a long-term prospective study. Ann Rheum Dis 1984; 43: 361–4.
[22]. DePalma, A. F.: Surgery of the Shoulder. Ed. 3. Philadelphia. B. Lippincott, 1983.
[23]. Neer CS, Satterlee CC, Dalsey RM, Flatow EL. On the value of the coracohumeral ligament release. Orthop Trans 1989; 13: 235-6.
[24]. Leffert RD. The frozen Shoulder. In Instructional Course Lectures, The American Academy of Orthopaedic Surgeons.Vol. 34, pp. 199-203.St. Louis, C. V. Mosby, 1985.
[25]. . Harryman DT, Sidles JA, Harris SL, Matsen FA. The role of the rotator interval capsule in passive motion and stability of the Shoulder. J Bone Joint Surg Amer 1992; 74: 53-66.
[26]. Woolf CJ. Somatic pain pathogenesis and prevention. Brit J Anaesth 1995; 75: 169-76.
[27]. Muller LP, Rittmeister M, John J, Happ J, Kerschbaumer F. Frozen shoulder—an algoneurodystrophic process? Acta Orthop Belg 1998; 64: 434-40
[28]. Johanson A, Hao J. Local corticosteroid application blocks transmission in nociceptive c fibers. Acta Anesthesiologica Scand 1990; 34: 335-8.
[29]. Shrestha BR, Maharjan SK, Shrestha S et al. Comparative study between Tramadol and Dexamethasone as an admixture to Bupivacaine in Supraclavicular. Brachial Plexus Block 2007; 46: 158-64.
[30]. Castillo J, Curley J, Hotz J et al. Glucocorticoids prolong rat sciatic nerve blockade in vivo from bupivacaine microspheres. Anesthesiol 1996; 85: 115766.
[31]. Lundberg J. The frozen Shoulder. Clinical and radiographical observations. The effect of Manipulation under general anesthesia. Structure and glycosaminoglycan content of the joint capsule. Local bone metabolism. Acta Orthop Scand (Suppl 119): 1-59.
[32]. Ritzmann P. "Frozen shoulder:" intraarticular corticosteroids lead to faster pain relief than physiotherapy [in German].Schweiz Rundsch Med Prax 1999; 88: 1369-70.
[33]. Steinbrocker O, Argyros TG. Frozen Shoulder: treatment by local injections of depot corticosteroids. Arch Phys Med Rehabil 1974; 55: 209-13.
[34]. Fareed DO, Gallivan WR Jr. Office management of frozen shoulder syndrome. Treatment with hydraulic distension under local anesthesia. Clin Orthop 1989; 242: 177-83.
[35]. Hsu SY, Chan KM. Arthroscopic distension in the management of frozen Shoulder.Int Orthop 1991; 15: 79-83.
[36]. Goupille P, Sibilia J. Local corticosteroid injections in the treatment of rotator cuff tendinitis (except for frozen shoulder and calcific tendinitis). Groupe Rhumatologique Francais del'Epaule (G.R.E.P.). Clin Exp Rheumatol 1996; 14: 561-6.