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RESEARCH ARTICLE

PREVALENCE AND MANAGEMENT OF THE DIABETIC FROZEN SHOULDER

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Abstract

The term “frozen shoulder” was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease. Long before Codman, in 1872, the same condition had already been labelled “periarthritis” by Duplay. In 1945, Naviesar coined the term “adhesive capsulitis.” [2] The pathophysiology of idiopathic adhesive capsulitis (frozen shoulder) is poorly understood. Most authors have reported various degrees of inflammatory changes in the synovial membrane. Adhesions between the shoulder capsule and the humeral head have been noted by some, but not all, authors. [4] The aetiology of periarthritis of the shoulder, however, is not clearly understood. Amongst the factors suggested are trauma myocardial infarction hemiplegia, pulmonary tuberculosis, thyrotoxicosis, cerebral tumour, and epilepsy. [7] Subjects with Frozen Shoulder Syndrome group A treated with ERM and MWM and group B treated with MRM. The duration of each treatment was 3 weeks. There was an improvement in mobility and functional ability at 12 weeks in subjects treated withthe 3 mobilization techniques. Comparing the effectiveness of the 3 treatment strategies in subjects with unilateral Frozen Shoulder Syndrome, ERM and MWM were more effective than MRM in increasing mobility and functional ability. [22].

Introduction:-

Shoulder pain is a common musculoskeletal symptom, accounting for 16% of all musculoskeletal complaints with an annual prevalence of 20 to 50%, being the main cause of non-traumatic upper limb pain. It presents a high chronicity and recurrence and the symptoms persist for 6 to 12 months in 40 to 50% of patients. Lifetime prevalence of shoulder pain has been reported to range from 7% to 36% of the population. [1]

The term “frozen shoulder” was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease. Long before Codman, in 1872, the same condition had already been labelled “periarthritis” by Duplay. In 1945, Naviesar coined the term “adhesive capsulitis.” [2]

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Frozen shoulder, also known as adhesive capsulitis, is a disabling disease. It is characterized by shoulder pain and limitations of both active and passive range of movement in all directions. It is the result of fibrosis and thickening of the joint capsule and adherence to the humeral head. Fifteen percent of the patients experience long-term disability as a result of chronic loss of shoulder mobility.(Fig 1)[3]

Fig 1:- Frozen Shoulder.

Patho-physiology of Frozen Shoulder:

The pathophysiology of idiopathic adhesive capsulitis (frozen shoulder) is poorly understood. Most authors have reported various degrees of inflammatory changes in the synovial membrane. Adhesions between the shoulder capsule and the humeral head have been noted by some, but notall, authors. The optimum management of adhesive capsulitis has been the subject of great debate, particularly since the condition tends to resolve spontaneously over months to years. Intra-articular corticosteroid injections and/or physiotherapy programs combining exercise, physical agents, mobilization and simple home exercise programs are the most common treatment options used in patients with adhesive capsulitis.[4]

The pathology of frozen shoulder has been examined more recently by Bunker and Anthony who describe a „Dupuytren‟s-like‟ contracture of the coracohumeral ligament and capsule which prevents external rotation. It is characterized by severe pain and insidious shoulder stiffness, which can cause almost complete loss of passive and active forward elevation and external rotation of the glenohumeral joint. The natural history of the condition follows a pattern of recovery which moves through three phases: the „painful phase‟ lasting three to eight months, the „adhesive phase‟ lasting four to six months, and the „resolution phase‟ lasting 5 to 24 months. However, the literature suggests that for many patients the symptoms do not resolve completely, leaving them with prolonged pain or stiffness.The pain interferes with sleep and is increased by movement, the patient becoming more aware of limitation of movement as time passes. Some patients may be left with some restriction of movement, but in most there is no residual impairment. Recurrence in the same shoulder has never been reported, though up to 20% of affected persons develop the condition on the opposite side. [5&6]

Aetiology:

The aetiology of periarthritis of the shoulder, however, is not clearly understood. Amongst the factors suggested are trauma myocardial infarction hemiplegia, pulmonary tuberculosis, thyrotoxicosis, cerebral tumour, and epilepsy. In this paper, an association of periarthritis of the shoulder with diabetes mellitus is described. The incidence of this condition in diabetic patients is compared with that in nondiabetic medical patients seen during the same period of time.[7&8]

Frozen shoulder can be either primary (idiopathic) or secondary. Secondary frozen shoulder is defined as that associated with trauma; rotator cuff disease and impingement; cardiovascular disease; hemiparesis; or diabetes (although some classify this in diabetics as primary frozen shoulder). The incidence of frozen shoulder in

people with diabetes is reported to be 10% to 36%, and these tend not to respond as well to treatment as in nondiabetic.[9][Fig-2]

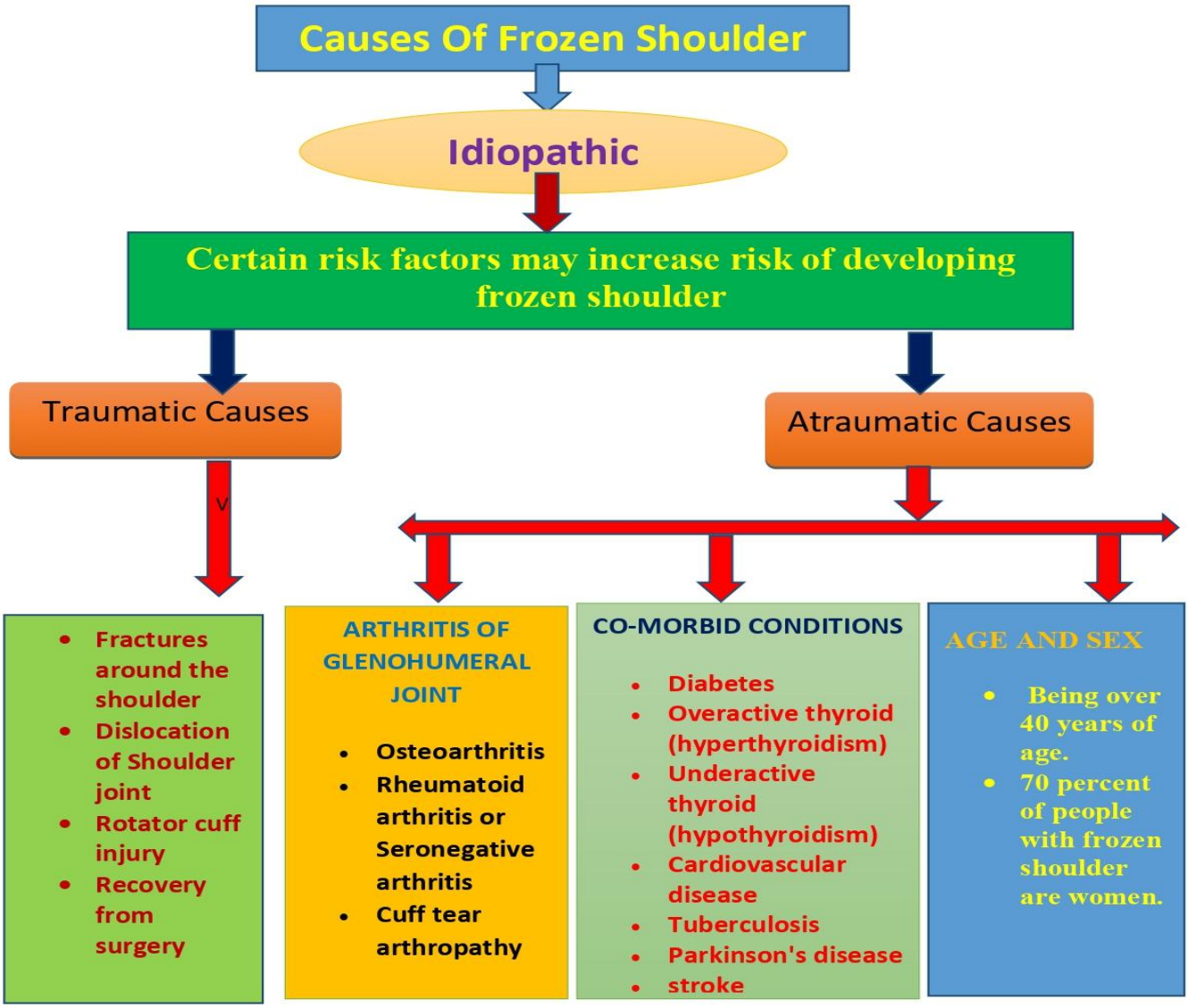

FIG-2 Flow Chart of aetiology of frozen shoulder

The aetiology is unknown. Lunberg and Helbig et al classified frozen shoulder as primary and secondary. The primary form is idiopathic, usually seen in women older than 45 years of age. Many predisposing factors can lead to secondary frozen shoulder, including upper extremity fracture with immobilization, cervical disc disease, diabetes mellitus, head injury, and stroke. Double contrast shoulder arthrography is the definitive diagnostic test for adhesive capsulitis. Joint capacity, normally 14 mL or greater, is usually less than 10mL in adhesive capsulitis. [10]

Clinical Feature:
Frozen shoulder limits the daily activities of the patients by causing pain around their shoulder and reducing the range of motion (ROM) of their joints. Limitation of ROM is due to the adhesion of the joints, hyperplasia of the synovial membranes through reduction of the area of the joint cavity, contraction of the articular capsule, and historical tissue proliferation. Such musculoskeletal system pain results in motor control disorders and degrades the balance control capability. These can cause secondary problems and weakening as well as psychological problems that will further limit the movements and weaken the muscles.[11]

Cyriax claimed that these symptoms occur in a natural cycle which cannot be altered by physical treatment. Phase 1: Pain at the limit of active movement leading to decreased Gleno-humeral range. Phase 2: Constant and severe pain referred down the arm, further decrease in Gleno-humeral joint range, slight jarring causing excruciating pain. Phase 3: Constant pain decreasing to pain on movement only. Range of glenohumeral movement unaltered. Phase 4: Decreasing pain on movement and increasing range of glenohumeral joint leading to full painless function. Each stage varies in duration, but it is rare for the constant pain to disappear in less than eight months, while it is common for all symptoms to remain for twelve to eighteenmonths.[12]

Differential Diagnosis:
In early (freezing) stage might be a diagnostic challenge as it may mimic subacromial pathology and rotator cuff tendinopathy. Regarding shoulder impingement and rotator cuff pathology, patients report predominantly pain with less pronounced passive range of motion. Several facets help to distinguish frozen shoulder from other shoulder disorders. Regarding the causes other than Adhesive capsulitis, patients often state lifting a heavy object or performing repetitive overhead movements. In contrast, frozen shoulder patients usually describe spontaneous onset without an apparent cause or a history of overuse activity. Extra precaution should be paid in case of the history of malignancy.

Common conditions that may mimic early adhesive capsulitis:
1. Subacromial pathology and rotator cufftendinopathy
2. Post-stroke shouldersubluxation
3. Referred pain (cervical spine or malignancy, e.g., Pancoasttumor)

Later in the course of frozen shoulder, as severe restriction of motion comes to predominate, the diagnosis becomes more apparent. However, glenohumeral joint arthritis should also be considered, which can be ruled out by free shoulder movement following lidocaine injection to the glenohumeral joint.[13]

Features of frozen shoulder are commonly present in patients with calcific tendonitis, fractures of the proximal humerus (especially those of the greater tuberosity), tears of the rotator cuff and early osteoarthritis of the glenohumeral joint. These pathologies can usually be detected using conventional radiographs and ultrasound examination. There are several causes of shoulder pain, but few shoulder disorders are associated with a markedly limited rangeof passive motion. Frozen Shoulder (FS) is differentiated from reflex sympathetic dystrophy by the vasomotor and trophic changes in the latter. It may be necessary to perform blood tests and radiography to exclude rheumatoid arthritis and bone diseases. Arthrography should be done in case of doubt. It is uncertain whether electromyography may be of value in a few cases with suspected neurological disease. Arthroscopy seems not to be useful in diagnosis of frozen shoulder. Since diabetes mellitus is over represented inpatientswith frozenshoulder,thisdisease should beconsideredinpatientswithfrozenshoulder.[14&15]

[Table 1]:-: The differential diagnosis of Frozen Shoulder [16].

Traumatic and Infectious Causes	Degenerative & 0ther Causes
Fracture of clavicle	Acute calcific tendonitis/bursitis
Fracture of scapula	Secondary Bursitis of the shoulder
Fracture of shaft of humerus	Arthrosis of the shoulder,
Fracture of upper end of humerus	Osteoarthritis of the acromioclavicular joint
Contusion of shoulder and upper arm	Osteoarthritis of the cervical spine
Impingement syndrome of the shoulder	Osteoarthritis of the glenohumeral joint
Injury of blood vessels at shoulder and upper-arm level, including avascular necrosis	Cervicobrachial syndrome
Osteoporosis with pathological fracture	Rheumatoid arthritis
Injury of nerves at shoulder and upper-arm level, including supra-scapular nerve entrapment	Radiculopathy, Cervicalgia & Cervical disc disorders
Injury of muscle and tendon at shoulder and upper-arm level, including Labral lesions	Juvenile rheumatoid arthritis
Sprain and strain of acromioclavicular joint	Neoplasm
Sprain and strain of sternoclavicular joint.	Fibromyalgia
Diseases of the digestive system	Persistent somatoform pain disorder
Pyogenic arthritis	Psychological and behavioural factors associated with disorders or diseases
Pain in thoracic spine	Somatoform autonomic dysfunction

Diagnosis:

Diagnostic Criteria: The diagnosis of painful stiff shoulder (capsular syndrome) was made using the standard diagnostic guidelines for shoulder complaints, that is, passive glenohumeral mobility must be painful and limited, lateral rotation must be relatively more restricted than abduction and medial rotation, and there must be no clear signs (painful arc, positive resistance tests, loss of power) that the shoulder pain was caused by another condition. After enrolment prognostic indicators and baseline values of outcome measures were assessed.[17]

Adhesive shoulder capsulitis is a clinical diagnosis made on the basis of medical history and physical exam and is often a diagnosis of exclusion. Other causes of a painful stiff shoulder must be excluded before a diagnosis of adhesive capsulitis is rendered, including septic arthritis, mal-position of orthopedic hardware, fracture malunion, rotator cuff pathology, glenohumeral arthrosis or cervical radiculopathy. Clinically, patients with this condition usually first present with shoulder pain followed by gradual loss of both active and passive range of motion (ROM) due to fibrosis of the glenohumeral joint capsule. BoyleWalker et al. observed that the majorityofpatients(90.6%)reporteddevelopingshoulderpainbeforelossofmotion. Externalrotationisoften the first motion affected on clinical examination, with steady global loss of ROM with disease progression. Pain is generally worse at the extremes of motion, when the contracted capsule is stretched. Passive ROM is lost with firm painful endpoints of motion, suggesting a mechanical rather than a pain-related restriction to motion. Imaging studies are not necessary for the diagnosis of adhesive shoulder capsulitis but may be helpful to rule out other causes of a painful and stiff shoulder. Plain films of the shoulder may reveal osteopenia in patients with prolonged adhesive capsulitis secondary to disuse (i.e. disuse osteopenia). Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) may reveal thickening of capsular and pericapsular tissues as well as a contracted glenohumeral joint space. Mengiardi et al. reported that MRA findings of coracohumeral ligament (CHL) ligament thickness 4mm (95% specificity, 59% sensitivity) or capsule thickness 7mm (86% specificity, 64% sensitivity) may aid in the diagnosis of adhesive capsulitis. Dynamic sonography may reveal thickening of the joint capsule and limited sliding movement of the supraspinatus tendon. These findings correlate with intraoperative direct visualization, documenting thickening of primarily the rotator interval and CHL.[18]

The diagnosis of frozen shoulder is probably less frequent, but recognition of this abnormality has an important effect on therapeutic decisions and may prompt invasivetherapy.

Magnetic resonance (MR) imaging is widely used to assess shoulder pain. A large number of publications have described the MR imaging assessment of the rotator cuff, labrum, capsule, and biceps tendon, and abnormalities of these structures are frequently described in radiologyreports.

MR arthrography was performed in all patients to demonstrate additional pathologic condition. The referring clinician initiated MR arthrography to rule out an additional rotator cuff tear in 20 patients with frozen shoulder and to rule out an additional lesion of the long biceps tendon in two patients. At arthroscopy,all patients showed signs of synovitis in the area of the rotator cuff interval. Eight patients had an intact rotator cuff. Three patients had a full-thickness tear of both the supraspinatus and the infraspinatus tendons, seven patients had a full-thickness supraspinatus tendon tear, and four patients had a partial-thickness tear of the supraspinatus tendonMR arthrography reveals characteristic findings in patients with frozen shoulder. Thickening of the CHL and the capsule at the rotator cuff interval and complete obliteration of the fat triangle under the coracoid process (subcoracoid triangle sign) are the most characteristic MR findings in frozen shoulder. [19]

Methodology:-

We conducted a literature search on 12thSeptember 2020 using EmbaseandPubmedNCBI. The search terms used were „frozen shoulder," „adhesive capsulitisandshoulder".Inthesearch,therewereno instructions on date of publication or language. Ethical approval was not required as there was no handling of confidential data. The study was conducted and meets the ethical standards as per the recommendations set out by Padulo et al.(2013).

The search returned 2500 articles. The titles and abstracts of these were reviewed to identify those for fullreview. Studies were included if they identified prevalence of FS in a diabetic population or DM in a population with FS. Studies were excluded if the diagnosis of FS was not idiopathic i.e. it was related to trauma or post-operative. The studies had to define their understandingofFS.

Table 1:- Summary of studies identifying Frozen Shoulder in populationswithDM.

Study	Population	N	Prevalence
Kidwai et al. 2013[20]	India	413 210 T2DM 203 Controls	11% (in DM) p=0.001 (T2DM vs Controls)
Attar 2012[21]	Jeddah, Saudi Arabia	252	6.70%
Mathew et al. 2011[22]	India	310	16.45%
Ray et al. 2011[23]	Calcutta, India	100	18%
Dehghan et al. 2010[24]	Yazd, Iran	510 150 DM	13.30% (in DM)
Gupta et al. 2008[25]	Udupi, India	233	29.61%
Aydeniz et al. 2008[26]	Turkey	203 102 T2DM 101 non-DM	14.7 (in DM) p=0.009 (T2DM vs non-DM)
Thomas et al. 2007[27]	Scotland	1067 865 DM 202 non-DM	4.4% p=0.005
Sarkar et al. 2003[28]	Kolkata, India	1660 860 DM 800 non-DM	17.9 (in DM) p<0.001 (DM vs non-DM)
Cagliero et al. 2002[29]	Massachusetts	300	12% (DM vs non-DM)

Arkkila et al. 1996[30]	Finland	425	14% Overall 10%T1DM 22%T2DM
Pal et al. 1986[31]	Newcastle, UK	184 109 DM 75 non-DM	19% (in DM)
Bridgman 1972[32]	London, UK	1400 800 DM 600 non-DM	10.8% (in DM) p<0.005 (DM vs non-DM)

Table 2:- Summary of studies identifying DM in populationswithFS.

Study	**Population**	**N**	**Prevalence (Event Rate)**
Wang et al. 2013[33]	Australia	263 87 with AC	20% (in AC) p=0.005 (AC vs non-AC)
Tighe and Oakley 2008[34]	USA	88	38.6%
Milgrom et al. 2008[14]	Israel	224	29%
Rauoof et al. 2004[5]	Kashmir, India	100	27%
Withrington et al. 1985[35]	London, UK	60	40%

Management of Diabetic frozen shoulder can be done in the primary care setting. When the pain and restricted range of motion do not resolve, the patient must be referred to Physical therapist and orthopaedic surgeon for additional treatment and follow-up.

Physical therapy and supervised home exercises are considered important in the non-surgical treatment of frozen shoulder. Gentle stretching exercises within the limits of pain can achieve greater mobility then aggressive stretching andstrengthening.[20]

A number of heating modalities have been suggested for the treatment of frozen shoulder to enhance the effect of exercises by relaxing the muscles and a positive influence on pain. A review in 2013 analysed 39 studies of the effectiveness of non-surgical treatment modalities for frozen shoulder. They found that low-level laser therapy can be used for pain relief and improvement of shoulder function, but it will not improve range of motion. Electrotherapy can be used for short-term pain relief.[21]

Continuous passive motion can provide short-term relief of pain but does not increase function or range of motion. Deep heat can provide pain relief and improve range of motion. Ultrasound is not recommended for relief of pain or improvement of function or range of motion. Other therapies are described in low-level trials, such as acupuncture and supracapsular nerve blocks. [22&23]

This study was a randomized clinical trial to compare efficacy of two different physiotherapy intervention strategies for frozen shoulder. There are two groups, the group A treated with end-range mobilization and group B treated with interferential current or stretching exercise and moist heat. Total duration of the study was of nine months and each subject was treated for 6 daily sessions. The total numbers of subject assessed were 59. The baseline data of ROM with goniometer, VAS for pain and SPADI (shoulder pain and disability index) were taken by an observer who was blinded to the study.

The results of present study demonstrated that patients treated with end range mobilization showed greater improvement in range of motion when compared with the group treated with moist heat andstretching exercises. Improvement in pain severity and disability was similar with both the treatments. Therefore, end range mobilization can be used for better improvement in range of motion particularly in acute stage of frozen shoulder. Both the treatment strategies were equally effective for pain management. [24]

Subjects with Frozen Shoulder Syndrome. A multiple-treatment trial on two groups was carried out. The group A treated with ERM and MWM and group B treated with MRM. The duration of each treatment was 3 weeks, for a total of 12 weeks. Outcome measures included the functional score and shoulder kinematics. The study showed positive findings. There was an improvement in mobility and functional ability at 12 weeks in subjects treated with

the 3 mobilization techniques. Comparing the effectiveness of the 3 treatment strategies in subjects with unilateral Frozen Shoulder Syndrome, ERM and MWM were more effective than MRM in increasing mobility and functional ability.[25]

The subjects were divided randomly into two groups to receive Maitland or Kaltenborn mobilization to the affected shoulder. Grade III anteroposterior oscillation and posterior translation were used for the Maitland and Kaltenborn mobilization groups, respectively. He concluded anteroposterior MM and KM reduced pain and improved ROM in frozen shoulders patients. Therefore, these techniques are effective for improving frozen shoulders -associated joint contracture and pain. However, there was no significant difference between the MM and KM techniques with respect to pain reduction or ROM improvement. Therefore, we recommend both anteroposterior MM and KM be considered for ROM improvement and pain reduction among frozen shoulder patients.[26]

The MBSR (BC) program significantly improves psychological distress, fear of recurrence, and quality of life among BC survivors who have recently transitioned off treatment. In cancer patients who are more severely distressed and limited in their ability to attend 2-hour weekly in-class sessions program may still be of clinical value in terms of improving overall psychological well-being.[27]

MBSR improve glucose control, much more work is needed to better understand the myriad possible applications of MBSR to diabetes care. The ability of MBSR techniques to lower stress and improve coping could have very broad applications in the care of diabetes and related conditions. [28]

Non-steroidal anti-inflammatory drugs, both oral and intra-articular, are the main agents used, although they do not have long-term positive effects. Several studies in small numbers of patients have shown positive effects of oral glucocorticoids (eg, prednisolone 30 mg once daily for 3 weeks). This will reduce pain and improve range of motion, although the effect will not last longer than a fewweeks.[29]

Intra-articular corticosteroid injections can induce short-term pain relief and improvement in range of motion. This effect usually only lasts for a maximum of 6 weeks and is most effective when given in an early stage of the disease..[30&31]

Surgical treatment should only be considered in patients who are refractory to adequate conservative therapy. Generally, surgical treatment can be considered in patients without improvement after 12 months of conservative therapy and with severe disabling symptoms. If progress without surgical intervention is made, the next step should be postponed. Patients who do not gain full function of the shoulder after therapy could have an underlying disease, like rotator cuff pathology or osteoarthritis, and this should be diagnosed. Surgical options are joint MUA, arthroscopic capsular release, and capsular distension.[32]

Pain management is important in the early postoperative stage because disuse of the shoulder will bring stiffness. Physical therapy should be started directly after surgery to maintain the gained range of motion. Maintaining the range of motion gained is also important. The exercises are basically the same as in the preoperative phase, as described above. Again, pain and vigorous exercises should be avoided, and stretching has to be done several times a day.[Fig-3]

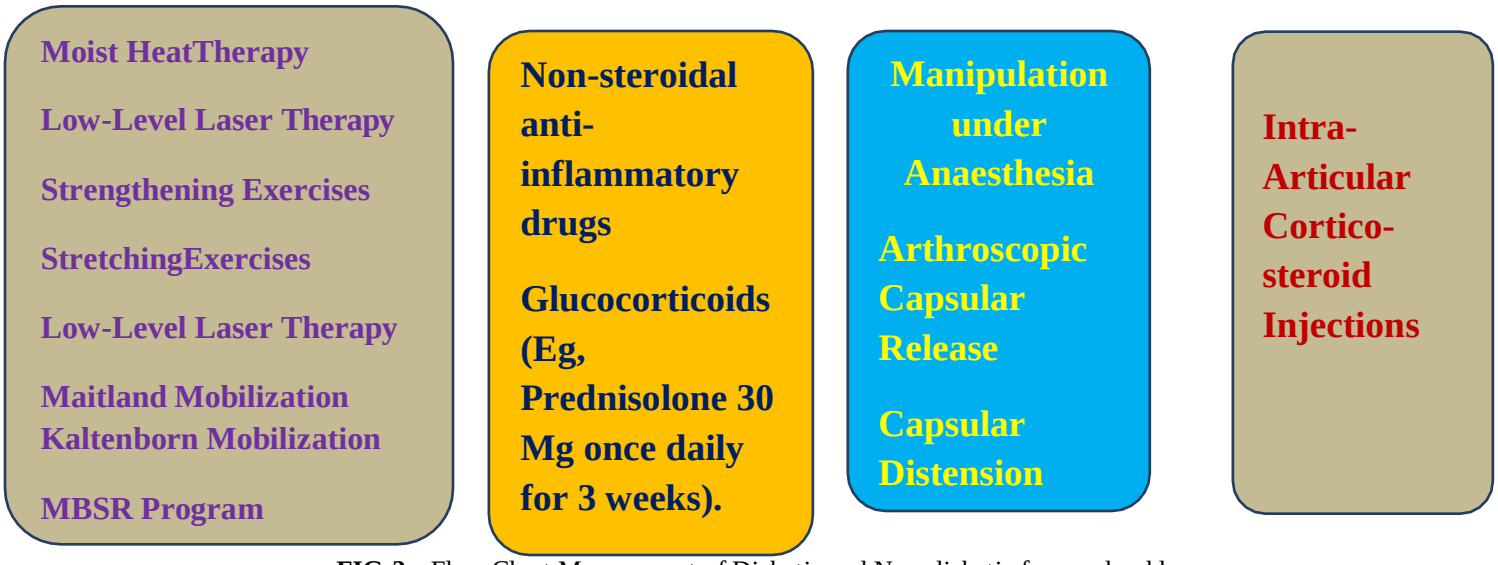

FIG-3:- Flow Chart Management of Diabetic and Non-diabetic frozen shoulder.

Prevention of frozen shoulder would be preferable to treatment of the condition. However, there is no evidence supporting specific exercise programs to prevent frozen shoulder. Early mobilization of the shoulder after injury or dislocation with adequate pain medication could therefore be a preventive measure. Despite the fact that the prevalence of frozen shoulder is higher in diabetic patients, a retrospective analysis of 201,513 diabetic patients showed no correlation between the prevalence of frozen shoulder and elevated glycated hemoglobin levels.

Insulin-dependent patients are more likely to develop a frozen shoulder than non-insulin-dependent diabetic patients (odds ratio 1.93). Moreover, a normal glycated hemoglobin level will not prevent a frozen shoulder. Since there are no specific preventive measures, it is best to identify high-risk patients and minimize immobilization of the shoulder without compromising the outcome of other treatments for the shoulder.[33]

Use of High Grade Mobilization Technique versus Cyriax Manipulation in Improving Abduction & External Rotation in Frozen Shoulder. The High grade mobilization technique and cyriaxmanipulation in decreasing pain and improving ROM. Supporting evidence from the literature though seem to be controversial in certain areas, the outcome of this study with no significant statistical changes will lead us to the conclusion of accepting the null hypothesis which could be stated as high grade mobilization technique (grade III & IV) is not effective in reducing pain & increasing shoulder abduction and external rotation than cyriax manipulation.[34]

Limitations:-

A limitation of our study, weincluded only diabetic frozen shoulder patients. We have excluded non-diabetic frozen shoulder patients. The majority of the studies did not assess the type of DM. It also provides an impetus to undertake more detailed and larger analyses if we are to better manage this debilitating condition.

Conclusion:-

In this study diabetologists, rheumatologists and orthopaedic surgeons should be aware of the high prevalence of DM in patients with FS. Most of the authors stated that there is very slow recovery in diabetic frozen shoulder patients. Future studies assessing outcomes of interventions for FS should consider stratifying subjects into those with normal glucose tolerance, impaired glucose tolerance and T2DM based on HbA1c. This would provide meaningful insights into the effects of dysglycaemia and overall glycaemic control in relation to the development and outcomes ofFS.

Reference:-

1. Ann Linda Baldwin, Kirstin Fullmer(2013). Comparison of Physical Therapy with Energy Healing for Improving Range of Motion in Subjects with Restricted ShoulderMobility.

2. Richard Dias, Steven Cutts and Samir Massoud (2005). Frozen shoulder. British Medical Journal. Volume- 331 (17).PP-1453 to1456.
3. Suzanne Margaretha van de Laar Peer and van der Zwaal (2014) Management of the frozen shoulder. Orthopedic Research and ReviewsOrthopedic Research and Reviews Volume-6. PP- 81 to90.
4. Simon Carette, Helene Moffet and Johanne Tardif (2003). Intra-articular Corticosteroids, Supervised Physiotherapy, or a Combination of the Two in the Treatment of Adhesive Capsulitis of the Shoulder. Arthritis & Rheumatism Volume- 48 (3). PP- 829 to838.
5. M. Rookmoneea, L. Dennis, S. Brealey, A. Rangan, B. White, C. McDaid, M. Harden (2010). The effectiveness of interventions in the management of patients with primary frozen shoulder. J Bone Joint Surg. Volume- 92(9). PP-:1267 to 72.
6. M Lubiecki and A Carr (2007). Frozen shoulder: past, present, and future. Journal of Orthopaedic Surgery. Volume-15(1).
7. G. C. Lloyd-Roberts and P. R. French (1959).Periarthritis Of The Shoulder A Study Of The Disease And Its Treatment. British Medical Journal. PP- 569 to571.
8. J. F. Bridgman (1972). Periarthritis of the shoulder and diabetes mellitus. Ann. rheum. Dis. Volume- 31. PP-69 to71.
9. Amar Rangan, Lorna Goodchild, Jo Gibson and Peter Brownson (2015). Patient Care Pathways Frozen Shoulder Shoulder& Elbow. Volume- 7(4). PP- 299 to307.
10. Chi-Yin Mao, MD, Woan.Chwen Jaw, AID, Hui-Cheng Cheng (1997). Frozen Shoulder: Correlation Between the Response to Physical Therapy and Follow-Up Shoulder Arthrography . Arch Phys Med RehabilVol 78. PP-857to859.
11. Byung-Ki Lee (2015). Effects of the combined PNF and deep breathing exercises on the ROM and the VAS score of a frozen shoulder patient: Single case study. Journal of Exercise Rehabilitation. Volume- 11(5). PP-276 to281.
12. Leonie E. Warmington (1970) Frozen Shoulder--An Effective Method of Treatment. Aust. J. Physiother., Volume- 3.PP-124-130.
13. Kamal Mezian; Ke-Vin Chang. (2020) Frozen Shoulder Stat PearlsPublishing;
14. C. M. Robinson, K. T. M Seah and Y. H. Chee (2012) Frozen shoulder. The Journal of Bone and Joint Surgery. British volume-. 94(1).
15. B. Baslund, B. S. Thomsen & E. M. Jensen (1990).Frozen Shoulder: Current Concepts Scand J Rheumatology. Volume- 19: PP-321 to325.
16. Martin J. Kelley, Michael A. Shaffer, and John E. Kuhn (2013). Shoulder Pain and Mobility Deficits: Adhesive Capsulitis. Journal of Orthopaedic& Sports Physical Therapy Volume- 43.(5).
17. Nahar1,Monirul Islam2, M Aliha Hakim3, Akm Anwar Ullah4 (2008) Role Of Corticosteroid Injections Versus Physiotherapy For The Treatment Of Painful Stiff Shoulder: A Randomised Control Trial Shamsun. Bangladesh Journal Of Neuroscience; Volume- 24 (1). PP- 1 to8.
18. Hai V. Le, Stella J. Lee, AraNazarian and Edward K. Rodriguez (2017).Adhesive capsulitis of the shoulder: review of pathophysiology and current clinical treatments. Shoulder & Elbow Volume-9 (2). PP-75–84.
19. Bernard Mengiardi, Christian W. A. Pfirrmann, Christian Gerber, and Ju¨rgHodler, et al. Frozen Shoulder: MR Arthrographic Findings. Musculoskeletal Imaging. Volume- 233 (2). PP-486 to492.
20. Buchbinder R, Green S and Youd JM, et al (2006). Oral steroids for adhesive capsulitis. Cochrane Database Syst Rev.Volume-4.
21. Jain TK, Sharma NK. (2014). The effectiveness of physiotherapeutic interventions in treatment of frozen shoulder/adhesive capsulitis: a systematic review. J Back MusculoskeletRehabil. Volume-4. (27).PP-247–273.
22. Green S, Buchbinder R, Hetrick S.(2005) Acupuncture for shoulder pain. Cochrane Database Syst Rev. Volume-2.
23. Neviaser RJ. Painful conditions affecting the shoulder (1983). Clincal Orthopedics.PP-63–69.
24. Dhara N. Panchal, CharuEapen (2015). Effectiveness Of End-Range Mobilization And Interferential Current Or Stretching Exercise And Moist Heat In Treatment Of Frozen Shoulder- A Randomized Clinical Trial. Int J Cur Res Rev. Volume- 7(14).
25. Jing-lan Yang, Chein-wei Chang and Shiau-yee Chen (2007). Mobilization Techniques in Subjects With Frozen Shoulder Syndrome: Randomized Multiple-Treatment Trial. Physical Therapy journal. Volume- 87(10).
26. Gui Do Moon, JinYonGLiM and Da YeonKiM (2015) Comparison of Maitland and Kaltenborn mobilization techniques for improving shoulder pain and range of motion in frozen shoulders. J. Phys. Ther. Sci. Volume- 27 (5). PP- 1391 -1395.

27. Cecile A. Lengacher, Versie Johnson-Mallard and Janice Post-White (2009). Randomized controlled trial of mindfulness-based stress reduction (MBSR) for survivors of breast cancer. Psycho-Oncology Psycho-Oncology Volume- 18. PP-1261-1272.
28. Niraj Kumar, Navneet Badoni, KunalKishor (2020) et al. Mindfulness Based Stress Reduction in Diabetic and Non-Diabetic Frozen Shoulder Conditions. Physiotherapy and Occupational Therapy Journal. Volume-13(2). PP- 81 to86.
29. Arroll B and Goodyear-Smith F. (2005) Corticosteroid injections for painful shoulder: a meta-analysis. Br J GenPract. Volume-55.PP-224–228.
30. Lorbach O, Anagnostakos K and Scherf C (2010)etal. Nonoperative management of adhesive capsulitis of the shoulder: oral cortisone application versus intra-articular cortisone injections. J Shoulder Elbow Surg. Volume-19.PP-172–179.
31. Shah N, Lewis M. (2007). Shoulder adhesive capsulitis: systematic review of randomised trials using multiple corticosteroid injections. Br J Gen Pract. Volume-57 PP-662–667.
32. Buchbinder R, Hoving JL, Green S, Hall S, Forbes A, Nash P. (2004) Short course prednisolone for adhesive capsulitis (frozen shoulder or stiff painful shoulder): a randomised, double blind, placebo controlled trial. Ann Rheum Dis. Volume-63.PP-1460–1469.
33. Yian EH, Contreras R, Sodl JF (20120. Effects of glycemic control on prevalence of diabetic frozen shoulder. J Bone Joint Surg Am.Volume-94PP-919–923.
34. Shashank Kumar, Niraj Kumar and Jyoti Sharma (2018). Use of High Grade Mobilization Technique versus Cyriax Manipulation in Improving Abduction & External Rotation in Frozen ShoulderPhysiotherapy and Occupational Therapy Journal. Volume- 11 (2). PP-59 to66.