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Mechanical Diagnosis and Treatment for differential diagnosis of case presenting as Diabetic Adhesive Capsulitis: A Case StudySheena Arora¹, Dr. Kshitija Bansal¹, Dr. Khyatee²¹Manav Rachna International Institute of Research and Studies, Faridabad, Haryana.²Pratyaksh Medical Care LLP, Delhi.**Article Information**

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Keywords*Mechanical diagnosis and treatment, Shoulder Pain, Diabetic Adhesive Capsulitis***ABSTRACT**

Background: Adhesive Capsulitis is a debilitating disease which affects passive and active range of motion at shoulder joint. It is commonly seen in people suffering from diabetes specially females. **Purpose:** The purpose of this case study is to evaluate the potency of Mechanical Diagnosis and Therapy (MDT) in assessment and management of patients clinically diagnosed as diabetic adhesive capsulitis and its long-term/prophylactic effects. **Method:** This is a case study on a 60-year-old female presenting with bilateral shoulder pain with diabetes. She had right shoulder pain for past 3 months that started insidiously whereas pain in left shoulder started post fall 2 months back. At initial examination VAS was 7/10 for right shoulder with limited ROM in all planes of motion whereas for left shoulder it was 4/10 with limitation mostly restricted to end range internal rotation. Decrease in functionality was also reported by using UEFI (Upper Extremity Functional Index) – 14/80 on right and 63/80 on left. She was assessed through MDT and it was confirmed on 2nd visit that right shoulder had derangement syndrome whereas left shoulder had dysfunction syndrome and was managed accordingly. **Results:** After 6 visits at 2nd week, the pain in right shoulder improved markedly with increase in range of motion and functionality (55/80=68.75%) whereas in left shoulder there was not much improvement in ERP or functionality (63/80=78.75%). She was asked to continue her treatment for both the shoulders at home for another 4 weeks. On follow up at 6th week, the right shoulder remained better (VAS – 1/10, UEFI – 74/80=92.5%) and improvement in left shoulder was observed as well (VAS – 2/10(ERP), complete IR and UEFI – 80/80=100%). **Conclusion:** The patient demonstrated significant improvement in pain, range of motion and functionality on being assessed and treated by MDT. **Implications:** This study suggests that MDT may be used in further studies to fully explore its potential as assessment and management tool and also as a prophylactic treatment to prevent relapse of diabetic adhesive capsulitis.

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INTRODUCTION:

First described by Duplay as a clinical entity in 1872, “Adhesive Capsulitis” is now defined as a

progressive pain syndrome with accompanying decreases in both active and passive ranges of motion about the glenohumeral joint¹. Adhesive capsulitis can be primary/idiopathic or secondary (due to trauma or injury) in nature². While the exact etiology of idiopathic adhesive capsulitis remains elusive, various risk factors have been identified, including female gender, age between 40-70 years, prolonged immobility, endocrine disorders such as diabetes mellitus and thyroid dysfunction, and cardiovascular conditions^{1,3-8}. The condition typically evolves through three phases: the freezing stage, marked by escalating pain and reduced mobility; the frozen stage, where discomfort may

lessen but stiffness remains; and the thawing stage, characterized by gradual mobility improvement. Association between diabetes mellitus and AC is well established⁹.

AC is mainly treated conservatively with physiotherapy playing major role in its treatment. This may include passive as well as active treatments. Passive therapy includes electrotherapy and joint mobilization techniques whereas Active therapy includes supervised or self-directed exercises (10). MDT or McKenzie is one of the widely used active treatments in spinal problems. According to MDT, extremity problems can be classified into derangement, dysfunction (Articular and contractile), postural syndromes and 'Other' subgroups (11). Derangement can be recognized by presence of 'directional preference' movement which gives a lasting change in decreasing pain, and increasing over all range of motion and function. Articular Dysfunction can be characterized by 'intermittent pain' invariably occurring at the reduced end range of motion with no sudden changes in pain or range of motion. Contractile Dysfunction, may identified by intermittent pain, constantly provoked by loading the musculo-tendinous unit, for instance, with resisted isometric contraction. Whereas in postural syndrome, the pain is produced only on sustained loading, normal tissue experiences abnormal loading leading to symptoms.

Various other therapies are available for treatment of AC. In a systematic review examining the effect of physiotherapy for AC¹², it was found that stretching along with administration of corticosteroid injection, physical therapy, and other modalities was effective in relieving pain and improving ROM and shoulder function in patients with stage 2–3 AC. Whereas one of the meta-analyses reported moderate efficacy of joint mobilization techniques¹³. Showing ambiguity in terms of superior treatment that whether active is better or passive. Also, chronic inflammation in diabetes leads to tissue fibrosis. Formation of advanced glycation end products (AGEs) due to non-enzymatic oxidative interaction between collagen and glucose¹⁴⁻¹⁷ in DM lead to changes in microstructural changes in capsule of shoulder joint resulting in changes in biomechanical properties of the same¹⁷. This all can contribute to occurrence and recurrence of AC in DM. As Diabetic AC is recurring condition, self-directed or supervised exercises is need of the hour to prevent recurrence. Mechanical Diagnosis and Therapy (MDT) is one of the active treatments widely used for spine but there is a dearth of literature of its effect on shoulder joint. The objective of this case study is to evaluates the efficacy of MDT in assessment and management of patients clinically diagnosed as diabetic adhesive capsulitis and its long-term/prophylactic effects.

Patient Description

This case study was carried out at university physiotherapy OPD. The patient was a 60-year-old female presenting with bilateral shoulder pain. She had a medical history of diabetes mellitus for last 10 years managed with insulin with current HbA1c level at 7.1%. She was a homemaker and her work involved movement of shoulder in all pains, sometimes more in overhead activities and occasional lifting of heavy weights. She was experiencing pain in bilateral shoulder. Pain in right shoulder starting from mid clavicular line to humeral head anteriorly, laterally and posteriorly, was being experienced for past 3 months that started insidiously and was worsening whereas pain in left shoulder was unchanging and started post fall 2 months back. Right shoulder pain was worse with dressing and reaching activities and was better when still. Continued use of the right arm made the pain worse which was increased at night. She experienced disturbed sleep when she was trying to sleep on right side. She reported that symptoms sometimes presented as catch during the movement. Left shoulder pain was being experienced from mid scapular region to humeral head posteriorly and got worse only in one movement i.e. while dressing when reaching behind the back and was better if she avoided or modified that activity. Continued use of the arm had no effect on pain and no disturbed sleep when sleeping on left side. Her overall general health was good.

Physical Examination:

An informed consent was taken from the patient her and Mckenzie Assessment for upper extremity was used to further examine her as her history suggested shoulder impairment. Her sitting and standing posture were fair. Then baselines were established for both the shoulders by single movement testing. She reported moderate (>25% to <75%) movement loss in flexion, extension, abduction and external rotation but major (>75%) loss in internal rotation with pain during movement beyond 100 degrees in flexion and abduction and after 55 degrees in internal and external rotation (Table 1). Passive movement testing revealed similar response for right shoulder. On examining left shoulder, minimal (<25%) movement loss was found on internal rotation with end range pain and similar observation was made on passive movement testing. Repeated movement testing was done in standing position to find out the directional preference and make a provisional diagnosis.



Fig. 1. Repeated movement testing – Abduction at Right Shoulder

Intervention:

For right shoulder, Active internal rotation and abduction were the most symptomatic, we started repeated movement testing for internal rotation that the pain was increasing during movement testing and worse after, also in mechanical response it was found that overall range of motion of right shoulder decreased after testing. We proceeded to test active abduction and found pain to be decreasing during the repeated movement testing got better after 1 set of 10 repetitions. It was interpreted that it was derangement dysfunction with the directional preference of active abduction, and the participant was directed to perform active abduction for 10 reps every two hours for next 48 hours and to stop if the pain got worse and to report back immediately. But to continue the active abduction if the symptoms remain the same or get better. After 48 hours, participant reported with 50% less pain in right shoulder and increased range of motion in all directions. She was complaint with exercises so, the diagnosis of derangement dysfunction was confirmed and she was advised to visit the OPD on alternate days for next two weeks. On 3rd visit her symptoms were constant and not getting better suggesting progression of forces. Force was progressed in active abduction by applying over pressure with help of wand which further improved her pain and range of motion which further confirmed the directional preference to be abduction. She was advised to continue her exercises for next 2 weeks.



Fig. 2. Abduction with Overpressure - Patient was asked to perform internal rotation and reach as far as possible and apply

In case of left shoulder, symptoms were present only in internal rotation with minimal movement loss and

end range pain, repeated movement testing was performed for the same i.e. active internal rotation. Symptoms were produced during the movement testing but they were not worse even after 2 sets of the 10 repetitions and no effect was seen in mechanical response. As the participant had history of trauma associated with the symptoms, so a provisional diagnosis of articular dysfunction was made. Active internal rotation was given as the exercise with dosage of 10 reps every 2 hours. Participant was also educated that she should experience end range stretch while doing the exercise and recovery may take 4-6 weeks. Participant reported back after 48 hours. She was compliant with exercises but reported no change. As there was no other symptom, the diagnosis was confirmed and participant was advised to continue the same exercises for two weeks.



Fig. 3. Internal Rotation – Patient was asked to perform internal rotation and reach as far as possible

Outcome Measures used for this study were: Pain measured on Visual Analog Scale (VAS) - A standardized tool for participants to self-report pain intensity on a 10cm long line draw on a paper. Functionality was assessed by Upper Extremity Functional Index (UEFI) which is a validated self-reported measure for quantifying upper extremity function in individuals with musculoskeletal problems. The scores given to the 20 questions are added to give a highest possible score of 80. The lowest possible score is 0. A lower score indicates that the person is reporting increased difficulty with the activities as a result of their upper limb condition. Also, Active Range of motion was examined with the help of Universal Goniometer which is a reliable tool to assess and quantify the range of motion in various shoulder movements.

RESULT:

Outcome measures were assessed at baseline, at two weeks and at follow up of 6 weeks.

Table 1 - Baseline Data

Outcome Measure	Right	Left
VAS	7/10	4/10

UEFI		14/80	63/80
Active Range of Motion	Flexion	120 deg.	180 deg.
	Extension	35 deg.	50 deg.
	Abduction	100 deg.	180 deg.
	Internal Rotation	55 deg.	70 deg.
	External Rotation	65 deg.	90 deg.

Note: VAS – Visual Analog Scale, UEFI – Upper Extremity Functional Index

Right Shoulder Analysis relieved that there was significant improvement in pain in right shoulder at 2 and 6 weeks with percentage improvement of 57.14% and 85.71% respectively (Table 2). UEFI

showed an improvement of 51.25% at 2 weeks and 75% at 6 weeks respectively (Table 2).

All range of motion such as flexion (22.22%), extension (30%), abduction (33.33%), internal rotation (22.22%), external rotation (22.22%), showed improvement at 2 weeks and further improvement in all the ranges such as flexion (33.33%), abduction (38.88%), internal rotation (38.89%), except for extension and external rotation, was reported on follow up at 6 weeks (Table 2).

Table 2 -Right Shoulder Analysis

Outcome Measure	Pre	Post (at 2 weeks)	% Improvement	Post (at 6 weeks)	% Improvement
VAS	7	3	57.14%	1/10	85.71%
UEFI	14/80	55/80	51.25%	74/80	75%
Flexion	120 deg.	160 deg.	22.22%	180 deg.	33.33%
Extension	35 deg.	50 deg.	30%	50 deg.	30%
Abduction	100 deg.	160 deg.	33.33%	170 deg.	38.88%
Internal Rotation	55 deg.	75 deg.	22.22%	90 deg.	38.89%
External Rotation	65 deg.	85 deg.	22.22%	85 deg.	22.22%

Analysis of Left Shoulder showed no change in pain, functionality and range of motion of internal rotation at 2 weeks (Table 3). Improvement in VAS (50%),

UEFI (21.25%) and internal rotation (6.62%) was reported at 6 weeks (Table 3).

Table 3 - Left Shoulder Analysis

Outcome Measure	Pre	Post (at 2 weeks)	% Improvement	Post (at 6 weeks)	% Improvement
VAS	4/10	4/10	No Change	2/10	50%
UEFI	63/80	63/80	No Change	80/80	21.25%
Flexion	180deg.	180 deg.	Not Applicable	180 deg.	No Change
Extension	50 deg.	50 deg.	Not Applicable	50 deg.	No Change
Abduction	180 deg.	180 deg.	Not Applicable	180 deg.	No Change
Internal Rotation	70 deg.	70 deg.	No Change	85 deg.	6.62%
External Rotation	90 deg.	90 deg.	Not Applicable	90 deg.	No Change

DISCUSSION:

In this case study, the right shoulder was classified as derangement syndrome and left shoulder as dysfunction syndrome. The right shoulder showed significant reduction in pain at 2 weeks as compared to left shoulder with dysfunction syndrome. It also showed greater increase in ROM and function as compared to left shoulder. These findings were consistent with the findings of Yarnzbowicz 2020, and Abady et.al, 2017 (18,19) which state that derangement syndrome gives 'rapid responses' (20).

At 6 weeks, reduction in pain and increase in function and range of motion was observed in both the shoulders. These findings could be explained by the theoretical cause of and subsequent management approaches for the Shoulder Derangement and Shoulder Dysfunction syndrome.

The shoulder derangement is postulated to occur due to obstruction as a result of intra articular inclusions like fat pad or capsule that result in pain and loss of movement. Repeated movements can release this obstruction resulting in decrease in pain and increase in range of motion, resulting in improved

functionality rapidly.

The improvement in Left shoulder at 6 weeks is consistent with the results of Abady et. al (19) and Yarnzbowicz (18) . The Shoulder Dysfunction syndrome is theorized to be resulting from adaptive shortening of scar tissue resulting from trauma/injury to the periarticular tissues (e.g. shoulder ligaments, tendons or joint capsule) (11,20). The treatment for dysfunction syndrome is repeated end range loading. This repeated end range loading leads to neurophysiological desensitization which results in lowering the perception of pain (21,22). The increase in range of motion here can result from the end range stretching of the structures around the shoulder joint(23,24). This repeated end range loading of the adaptively shortened tissues results in tissue lengthening and remodeling (23,25) which further increases range of motion giving the desired response. The delayed healing in case of dysfunction syndrome can be attributed to the fact that tissue remodeling as stated above can take upto two years(26) and loading of structurally impaired tissue will not show rapid changes(18). This can explain the slow and gradual decrease in pain and

increase in range of motion and functionality in case of dysfunction syndrome classification (11).

These findings suggests that MDT can be used for diagnosing and managing patients presenting as Diabetic Adhesive capsulitis. Further this study suggests that if the patient has good understanding of self-management, expected outcome these exercises can be used as prophylaxis or long-term treatment.

CONCLUSION:

The participant demonstrated significant improvement in pain, range of motion and functionality on being assessed and treated by MDT. This study suggests that MDT may be used in further studies to fully explore its potential as assessment and management tool and also as a prophylactic treatment to prevent relapse of diabetic adhesive capsulitis.

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