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Review Article

Client-centered management of adhesive capsulitis of the shoulder: an occupational therapy approach

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ABSTRACT

Adhesive capsulitis, commonly known as frozen shoulder, is a musculoskeletal condition characterized by pain and a significant reduction in shoulder mobility, often leading to substantial impairment in daily activities and occupational performance. Although it is considered self-limiting, the condition can persist for months or even years, necessitating medical and rehabilitative interventions. This comprehensive review focuses on the role of occupational therapy in managing adhesive capsulitis, with an emphasis on client-centered approaches. Utilizing a systematic search of databases such as PubMed, Google Scholar, Scopus, and Cochrane, the review includes high-quality evidence from randomized controlled trials, meta-analyses, and systematic reviews, while excluding case reports and cohort studies. Key interventions highlighted include therapeutic modalities, ergonomic modifications, assistive devices, and comprehensive patient education, all of which contribute to reducing pain, improving functional independence, and enhancing overall quality of life. This evidence provides occupational therapy practitioners with a robust framework for tailoring interventions to meet clients' specific needs, optimizing therapeutic outcomes, and supporting functional recovery.

Keywords: Shoulder adhesive capsulitis, Occupational therapy, Client centred intervention, Evidence-based practice, Holistic approach, Patient education

INTRODUCTION

Adhesive capsulitis, also known as frozen shoulder, is an inflammatory condition that causes a gradual, painful, and progressive loss of both active and passive motion in the glenohumeral joint.[1] The condition, first described by Simon-Emmanuel Duplay in the 19th century as “scapulohumeral periarthritis”, was later elaborated by Ernest Amory Codman in 1934, who coined the term 'frozen shoulder.' In 1945, Julius Neviaser introduced the term 'adhesive capsulitis,' describing the pathological thickening and contraction of the shoulder capsule.[2]

Kelley et al stated that Frozen shoulder affects 2% to 5% of the general population, with higher rates in diabetic and thyroid patients, typically occurring in females aged 40 to 65, and often affecting both shoulders.[3,4] Patients typically report pain during extreme ranges of motion for at least a month, followed by joint limitation. This limitation predominantly affects flexion, abduction (both at average and extreme degrees), and external rotation (especially between 45 and 90 degrees of abduction), interfering with daily activities.[5]

METHODOLOGY USED

This study aims to conduct a comprehensive review of the management of shoulder adhesive capsulitis from an occupational therapy perspective. A systematic search was conducted using keywords such as "shoulder adhesive capsulitis," "pain," "occupational therapy," "client-centered intervention," and "evidence-based

practice" across databases including PubMed, Google Scholar, Scopus, and Cochrane, selected for their coverage of medical and rehabilitation literature. Inclusion criteria focused on randomized controlled trials, meta-analyses, and systematic reviews, while case reports, cohort studies, and editorials were excluded to ensure a focus on high-quality evidence. The review synthesizes occupational therapy interventions for adhesive capsulitis, emphasizing client-centered approaches, therapeutic modalities, assistive devices, and ergonomic modifications. These interventions were analyzed using a top-down reasoning approach, providing a holistic framework aimed at reducing pain, improving occupational performance and functional independence, and enhancing quality of life. The methodological quality of the included studies was assessed based on established criteria to ensure only robust research was incorporated.

ADHESIVE CAPSULITIS

Adhesive capsulitis is classified into two types. Primary frozen shoulder with idiopathic (with no identifiable cause) and secondary frozen shoulder with acquired, and caused by factors such as trauma, immobilization, rotator cuff injuries, diabetes mellitus, myocardial infarction, cardiovascular problems, cerebrovascular diseases, psychological reasons, or as a result of surgery. Secondary frozen shoulder can be further classified into three groups based on its underlying causes. First group is intrinsic, which is caused by shoulder joint disorders such as rotator cuff tendon tears/tendonitis. The second group is extrinsic, resulting from external factors such as trauma, prior shoulder surgery/conditions like cervical disk disease that indirectly affect shoulder mobility. Lastly, systemic group is associated with systemic disorders, most notably diabetes mellitus and thyroid disorders, which increase likelihood of developing adhesive capsulitis due to their impact on connective tissues and inflammation. These factors cause tissue damage that triggers an inflammation process in shoulder.[3-6]

PATHO-MECHANICS OF FROZEN SHOULDER

The patho-mechanics of frozen shoulder, or adhesive capsulitis, remain poorly understood, though it is well-established that the condition is associated with inflammatory reactions and fibrotic processes.[10] This complex pathogenesis involves the contracture of the glenohumeral joint capsule, periscapular stiffness, and an imbalance in muscle strength around the scapula, ultimately leading to restricted movement. Frozen shoulder progresses through a sequence of phases, beginning with pain and advancing to significant stiffness and reduced range of motion (ROM). These changes are driven by capsular thickening and tightening around the joint, which impairs daily activities and reduces quality of life. Initially described in 1872 by Simon-Emmanuel Duplay as “scapulohumeral periarthritis,” the condition was later termed "frozen shoulder" by Ernest Amory Codman in 1934. Codman described its hallmark symptoms as a gradual onset of pain, difficulty sleeping on the affected side, and limited shoulder elevation and external rotation despite normal radiological findings.[8]

The underlying pathophysiological processes involve an initial phase of capsular inflammation followed by fibrosis. This is mediated by various inflammatory cytokines, such as TNF-alpha, IL-1, and IL-6, which induce synovitis and neurogenesis, leading to pain. Cytokines like IL-17A, and TGF-beta, along with matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs), contribute to the development of fibrosis. Most studies suggest that the painful "freezing" phase is driven by inflammation, which is followed by the "frozen" phase marked by fibrotic changes.[9] Frozen shoulder can be triggered by various factors, including repetitive strain, nerve dysfunction, trauma, rotator cuff degeneration, or subacromial impingement, though primary cause remains unknown. Secondary causes may include shoulder fractures, dislocations, surgeries/prolonged immobilization. Frozen shoulder is most common around age 50, and recovery may be spontaneous, possibly linked to molecular changes such as decreased CD90 expression and increased activity of receptors that reduce inflammation.[10]

STAGES OF FROZEN SHOULDER

Neviaser described the arthroscopic stages of adhesive capsulitis, emphasizing the need for a personalized treatment plan. They highlighted the importance of understanding the clinical stages of the disease to tailor the treatment effectively.[2] The histopathological characteristics of adhesive capsulitis can differ depending on the individual and the stage of the condition. These phases include an initial inflammatory stage, followed by a fibrotic phase marked by increasing stiffness and restricted ROM, and finally a thawing or resolution phase where gradual improvements in shoulder mobility are observed. The length of each phase can vary from person to person. Disease progression in adhesive capsulitis is commonly described across 4 clinical phases (Table 1).

Table 1: Clinical and arthroscopic features of adhesive capsulitis across stages.

Pre-adhesive stage	Freezing stage	Frozen stage	Thawing stage
Less than 3 years	3-9 years	9-14 years	15-24 years
Mild loss of forward flexion, abduction, and internal rotation/ external rotation	Loss of all movement	Relatively painless but tightness in the glenohumeral joint	Little pain and as capsular remodelling occur there is a progressive increase in ROM

Continued.

Pre-adhesive stage	Freezing stage	Frozen stage	Thawing stage
Arthroscopy of adhesive capsulitis shows hypertrophic, vascular synovitis, and biopsies confirm the hypervascular synovium with a normal underlying capsule structure.	During arthroscopy, the reduced capsular volume makes it difficult to introduce the arthroscope, revealing diffuse, pedunculated, hypervascular synovitis. Biopsies show dense, proliferative, hypervascular synovitis with perivascular scar formation, capsular fibroplasia, disorganized collagen fibrils, and no inflammatory infiltrates.	Arthroscopic appearance demonstrates patchy synovial thickening without hypervascularity and biopsy shows dense, hypercellular collagenous tissue.	Arthroscopic and histological correlation has not been investigated as surgery is unusual at this phase.

Stage 1 (Pre-adhesive phase): This phase of adhesive capsulitis is characterized by progressive pain and loss of ROM, attributed primarily to hypertrophic vascular synovitis without significant capsular contraction, as observed in clinical and arthroscopic examinations. Patients often complain that their pain is the worst at night.[12]

Stage 2 (Freezing stage): This phase is characterized by symptoms persisting for 3 to 9 months with progressive loss of ROM and ongoing pain. Local anesthetic infiltration or scalene block provides pain relief and partial improvement in ROM. The motion loss in this stage is due to reduced capsular volume and painful synovitis. Arthroscopic examination shows dense, proliferative, hypervascular synovitis, while biopsy specimens reveal hypervascular synovitis with perivascular scar formation, capsular fibroplasia, disorganized collagen fibrils, and a hypercellular appearance, with no inflammatory infiltrates reported.

Stage 3 (Frozen stage): In this phase of adhesive capsulitis, patients typically have a history of shoulder stiffness accompanied by significant loss of ROM. Symptoms have persisted for 9 to 14 months and are observed to evolve. Patients often describe a previous intensely painful phase followed by resolution, leading to a relatively pain-free but stiff shoulder. Examination of ROM remains unchanged after local anaesthetic injection or evaluation under anaesthesia in Stage 3 adhesive capsulitis, indicating persistent capsular volume loss and capsule fibrosis of the glenohumeral joint. Arthroscopic findings in Stage 3 differ from stages 1 and 2, showing a relatively unremarkable appearance with a residual thin synovial layer and areas of thickening but without significant hypervascularity. Capsular biopsy specimens demonstrate dense, hypercellular collagenous tissue.

Stage 4 (Thawing phase): It is known as the "thawing stage," and conservative is marked by gradual and steady improvement in ROM as the capsule remodels in response to increased arm and shoulder use. There is limited data available for

Stage 4 patients due to rarity of undergoing surgery.[11-14]

MANAGEMENT OF ADHESIVE CAPSULITIS

Adhesive capsulitis, or frozen shoulder, is treated through a combination of approaches to reduce pain, improve mobility, and restore function. Depending on the patient's response to initial treatments, the management progresses from medication and drug therapies to surgical options, if necessary, with a strong focus on rehabilitation throughout the process. The following diagram highlights the key treatment layers, beginning with the least invasive methods and advancing as the condition requires (Figure 1).

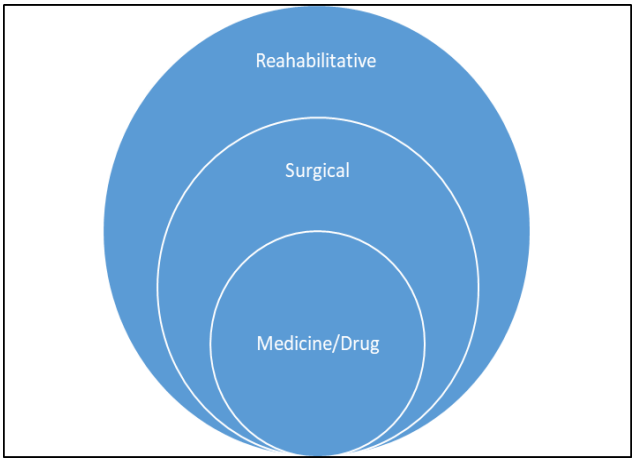

Figure 1: Comprehensive management strategies for adhesive capsulitis.

MEDICAL MANAGEMENT

Medical or drug management options for adhesive capsulitis include oral corticosteroids, glenohumeral joint

corticosteroid injections, manipulation under anaesthesia, arthroscopic capsular release, and various physical therapy interventions. Physical therapy typically involves therapeutic exercises, manual therapy techniques like joint mobilization and manipulation, electrotherapeutic modalities, and thermal treatments.

Treatment strategies that target abnormal shoulder kinematics may help prevent or reduce the duration of stiffness. Shoulder movement occurs in multiple planes, and loss of mobility can lead to significant functional impairment. Traditional treatments often focus on mobilizing the shoulder, but forced elevation in a stiff and painful shoulder can be harmful. McClure et al suggest that improving shoulder mobility should focus on applying tension to the capsule, ligaments, and tendons to elongate restricting tissues, with low-load stretches being an effective method to increase the extensibility of the glenohumeral capsule.

OCCUPATIONAL THERAPY AND ADHESIVE CAPSULITIS

Several shoulder dysfunction therapies use preparatory techniques to increase functional activity. The occupational therapy practice framework (OTPF) (4th ed., AOTA, 2020) outlines a cyclical relationship among preparatory methods and tasks, activities, and occupations, impacting client factors. Preparatory methods and tasks are treatments designed to prepare clients for occupational performance and are seen as a means to an end. These methods, grounded in evidence-based interventions, aim to influence body structures to ultimately enhance clients' participation in daily occupations.[15] According to Persch et al occupational therapy practitioners can use their knowledge of activity analysis to pinpoint the environmental and individual factors that may promote health as well as to identify and recommend the interventions that are most likely to enhance occupational performance.[16] Marik et al found strong evidence that various occupational therapy interventions, such as ROM exercises, joint mobilizations, and strengthening exercises, effectively improve function and reduce pain in individuals with musculoskeletal shoulder conditions. Key interventions vary by specific shoulder disorder, with the strongest evidence supporting exercise-based therapies.[15] Occupational therapists play a crucial role in assisting patients with frozen shoulders, especially in severe cases, using interventions ranging from therapeutic modalities, and ROM exercises to client-centered and occupation-based activities. Early occupation-based interventions have significantly reduced pain and improved ROM.[3,34]

The medical model sees humans as subsystems, while the biopsychosocial model views them holistically as integrated beings. Occupational therapists often balance these models, which use biomechanical approaches Colainni et al. This balance aligns more with the holistic values of occupational therapy's founders.[37] Client-centered occupational therapy involves collaboration between the client and the therapist, empowering the client to engage in functional performance and fulfil their occupational roles in various environments.[18] In a fully client-centered approach, the patient independently makes decisions based on their goals, with power transferred from the therapist to the patient. The therapist supports the patient's decision-making process and accepts their decisions. Together, they work towards achieving expectations and targets. Preparatory methods and tasks are the activities that are used to make clients ready to participate in occupational performance.

The goal of occupational therapy for the rehabilitation of shoulder adhesive capsulitis is to lessen impairment and enhance upper extremity ADL capabilities. It incorporates early intervention, which uses different degrees of interventions to improve and assist in return to work. Adjunctive techniques (methods of preparation), encourage meaningful and purposeful action that yields improvements in ROM, strength, coordination, endurance, accuracy, and intensity, which in turn improves ADL.[19] Active exercises allow greater patient control compared to mechanical exercises such as those performed with shoulder wheels, pulleys, and wands. Muscle re-education may be necessary to restore normal physiological balance to the entire shoulder complex and spine. Strengthening exercises are contraindicated until a normal ROM has been achieved.[17]

According to Gilmore et al occupational therapy treatment for hemiplegic shoulder pain (HSP) that mimics Shoulder Adhesive capsulitis shares major aspects of rehabilitation protocol.[19] These involve proper positioning and handling techniques to prevent injury and pain, as well as facilitating active movement to maintain joint mobility and muscle strength. The use of the gentle passive ROM exercises helps prevent stiffness and improve flexibility. Additionally, implementing external supports such as slings or orthoses that give stabilization to the shoulder joint. The treatment also addresses shoulder-hand syndrome by alleviating symptoms like pain, swelling, and decreased hand function through therapeutic modalities and functional activities. These comprehensive interventions aim to alleviate pain, enhance function, and improve the overall quality of life for individuals with HSP.[20]

The effectiveness of occupation-based treatment is well established, though its application in hand and upper extremity conditions is less challenging.[17] ADL-based therapeutic activities show significant changes and faster improvements in AROM (active range of motion), strength, and functional abilities compared to isolated therapeutic exercises, which suggests incorporating purposeful, occupation-based interventions can enhance outcomes in hand Function. Occupation-based interventions like hitting a drum or playing games have been shown to increase active ROM (AROM) in adults with traumatic brain injury, as noted by cerebral vascular

accidents and in children with cerebral palsy, compared to non-purposeful activities. Additionally, engaging in meaningful activities such as cooking and crafts has been found to increase activity tolerance among nursing home residents and healthy individuals. These findings highlight benefits of purposeful, occupation-based interventions in various populations.

Mild, regular, active exercises, such as Codman's pendular exercises, can potentially alleviate pain and preserve the tissues within and surrounding the joint.[4] A significant improvement was observed in 90% of patients with stage-2 adhesive capsulitis who performed four self-stretches twice a day. These stretches included passive flexion, horizontal adduction, internal rotation behind the back using the unaffected arm, and external rotation at 0° using a cane.

According to Occupational Therapy Practice Framework (OTPF), functional activities are tasks that are vital for daily living and include self-care, work, education, and leisure activities.[36] These activities are essential for maintaining independence and overall well-being. Enabling activities are tasks and exercises designed to improve a person's ability to perform functional activities. These activities often focus on developing specific skills, such as strength, coordination, or cognitive abilities, to support the person in achieving their daily goals and enhancing overall occupational performance. Enabling activities for managing frozen shoulder may include exercises such as horizontal sanding, incline sanding, finger ladder (forward flexion/abduction), peg-board activities (table-top or wall-mounted), moving cones at different levels, and stacking blocks. These activities help improve the ROM and functionality in affected individuals. Purposeful activities are tasks or exercises that are designed to be meaningful and relevant to the individual's daily life. They are aimed at achieving specific goals and enhancing the person's ability to engage in activities that are important to them. Purposeful activities often simulate real-life tasks or situations and are used in therapy to improve functional performance and support the individual's overall well-being. Purposeful activities for managing frozen shoulder may include using a clothing fastener board for practicing buttoning and unbuttoning (placing items in the front or back), a household hardware board positioned at chest level or above for functional tasks, and shifting/placing boxes at different levels while sitting/standing. These activities are designed to improve daily functional skills and enhance ROM (Figure 2).[19]

PATIENT EDUCATION

Patient education is critical in shoulder adhesive capsulitis to enhance understanding of the condition's progression, symptoms, and treatment options. Educating patients promotes adherence to treatment plans, helps manage expectations regarding recovery timelines, and empowers informed decision-making in collaboration with healthcare providers. Furthermore, it encourages the adoption of beneficial lifestyle modifications and self-management strategies, fostering active participation in recovery and long-term shoulder health maintenance.[38]

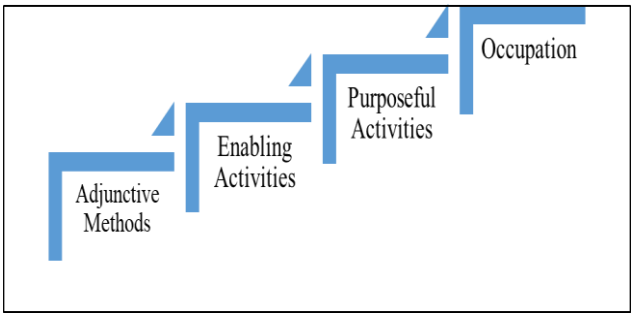

Figure 2: Progression of therapeutic activities in occupational therapy.

THERAPEUTIC MODALITIES

Hot and cold compression are widely used to promote healing and pain relief. Heat therapy, using dry or moist packs, can reduce pain and stiffness in joints and muscles. While the use of cold packs after 10 minutes of heat therapy reduces inflammation and induces muscle relaxation, caution is advised not to exceed 30 minutes to avoid tissue damage. These modalities can enhance the effects of exercises and manual techniques. Hot packs are beneficial before or during the ROM exercises, and moist heat combined with stretching improves muscle extensibility through reduced muscle viscosity and neuromuscular relaxation.[3,4]

ROM EXERCISE AND STRENGTHENING EXERCISE

In the treatment of structural stiffness such as frozen shoulder, ROM exercises, and activity modification play crucial roles. ROM exercises are tailored to the patient's irritability level, with short-duration, pain-free passive or active assisted ROM exercises initially recommended to modify joint receptor input, reduce pain, and improve motion. These exercises are typically performed multiple times daily to gradually increase TERT (Total end range time) without exacerbating symptoms. Activity modification complements ROM exercises by minimizing aggravating movements and promoting functional adaptations that support joint health and mobility. This combined approach aims to achieve pain reduction, enhance functional ROM, and ultimately improve patient satisfaction and outcomes in managing conditions like frozen shoulder.[3] Scapular stabilization exercises are effective for patients with shoulder issues such as impingement syndrome, adhesive capsulitis, and rotator cuff injuries. These exercises help decrease pain, increase ROM and improve functional ability by restoring scapulohumeral rhythm. Voight et al also emphasize the importance of scapular stability in the faster recovery of patients with adhesive capsulitis.[21,22] Muscle energy

techniques (MET) help relax muscles and support the body's natural healing by having the client actively participate while the practitioner guides the process. MET is primarily used to normalize joint ROM rather than to increase flexibility and can be applied to any joint with restricted ROM.[32] Proprioceptive neuromuscular facilitation techniques are effective in improving ROM by elongating Golgi tendon organ, which relaxes antagonist muscles.[6] They are particularly beneficial for increasing shoulder and hip joint mobility, as noted in study by Rave et al. Although PNF techniques show lower efficacy in managing disability compared to steroids, they excel in enhancing ROM, especially in Change to External rotation. However, there is lack of extensive research on their effects on pain, function, and activity limitation.[5,21]

VIRTUAL REALITY

Virtual reality (VR) has shown promising improvement in enhancing rehabilitation outcomes for various conditions through engaging and interactive activities. For individuals with frozen shoulders, VR games, and applications can facilitate shoulder movements and exercises, such as shoulder internal and external rotations, shoulder extensions, and flexion activities.[23] Wearable inertial measurement unit (IMU)-based sensors effectively record shoulder motion and aid in home-based rehabilitation, increasing compliance and facilitating early functional recovery for adhesive capsulitis patients. Combined with telerehabilitation, they provide accessible exercise instructions and enhance exercise accuracy through progress monitoring .[24]

ASSISTIVE DEVICE

According to Sawyer et al the patient was educated about the importance of hydration, proper nutrition, and adequate sleep. Additionally, a smartphone application (Calm; Calm.com, Inc, San Francisco, CA) was utilized to provide stress reduction and relaxation techniques, aiding in stress management and enhancing recovery focus. Evidence suggests that breathing exercises and stress reduction techniques can reduce pain and improve function. According to Cho an arm sling should only be used for comfort for a few days after surgery and must be discontinued by one week in frozen shoulder cases. Patients are also encouraged not to sleep with the arm sling.[25]

WORK PLACE REHABILITATION

Workplace interventions for managing adhesive capsulitis include several key strategies. Change to interventions involve incorporating specific shoulder exercises into the workday to improve ROM and alleviate discomfort. In-house or worksite occupational therapy provides tailored therapeutic services directly at the workplace, addressing both the individual's needs and the specific demands of their job. Work site or Job site analysis involves evaluating the work environment to identify factors that may contribute to shoulder strain, allowing for targeted adjustments.[35]

ERGONOMICS MODIFICATION

Ergonomic modifications include adjustments such as redesigning keyboard setups for better ergonomic alignment and implementing scheduled rest and exercise breaks to reduce strain and promote overall shoulder health. These interventions collectively help manage symptoms and improving comfort by integrating therapeutic practices and optimizing the work environment.[39]

Universal design (UD) aims to create environments and products that are accessible and usable by all individuals, regardless of their physical or cognitive abilities. The principles of UD include: (a) ensuring equitable use for everyone; (b) incorporating flexible designs that meet diverse needs; (c) maintaining simplicity and intuitive usability; (d) providing clear information that is accessible to all sensory abilities; (e) allowing for error tolerance to minimize hazards; (f) requiring minimal physical effort; and (g) offering sufficient space for use. Practical applications of UD in the workplace include features like automatic doors, adjustable furniture, and effective lighting. Implementing UD principles not only helps prevent injuries but also reduces healthcare expenses and the need for individualized accommodations, aligning with the goals of occupational therapy (Table 2).[40]

Table 2: Comparative analysis of therapeutic approaches for adhesive capsulitis.

Therapeutic approaches	Description
Activity modifications: Adapts daily tasks and occupational activities to minimize shoulder strain.	Integrates techniques to improve function while focusing on daily life activities.
Splinting and bracing: Custom splints or braces to support and stabilize the shoulder during tasks	Provides support and pain relief.
Ergonomic modification: Modifies work and home environments to enhance comfort and functionality.	Includes ergonomic adjustments focus on functional improvements.
Education and training: Techniques for safe movement, posture, and joint protection.	Educating client on managing symptoms and preventing further issues.

KINESIO TAPING

Though the application of Kinesio taping (K-taping) in occupational therapy practice is limited and it can only be given as an adjunct modality to reduce pain and assist in improving ROM. It also helps correct the scapular

positioning and manage fascial contraction during soft tissue injuries. It provides gentle sensory stimulation to the skin, activating the spinal inhibitory system and reducing pain through the gate control theory. This makes it a valuable tool in rehabilitation, aiding in pain reduction and tissue healing.[30] Kinesio taping offers a non-invasive approach to musculoskeletal rehabilitation, aiding in pain relief and improved function.[31]

POSTURAL CONTROL

Correcting body posture helps in adhesive capsulitis by reducing shoulder strain, enhancing ROM, improving muscle function, and preventing compensatory movements, all of which contribute to better shoulder mobility and reduce pain. Recent advances in frozen shoulder rehabilitation included iterative design processes, strategic material selection (e.g., Lycra and space cloth), and model adjustments to enhance flexibility and comfort. Evaluating different design types ensured safety and ease of use, ultimately refining the devices for effective and user-friendly rehabilitation support.[28]

CONCLUSION

Adhesive capsulitis is a painful condition that significantly impairs shoulder mobility, occupational performance, and participation in daily activities. Although the condition is often self-limiting, it requires medical and rehabilitative interventions to alleviate symptoms and prevent prolonged functional impairments. Underlying comorbidities, such as diabetes and hypothyroidism, can exacerbate the condition and further reduce quality of life. While corticosteroid injections are a common non-invasive treatment for managing pain, there are currently no proven interventions to consistently halt or reverse the disease's progression. Rehabilitation strategies, including activity modification, patient education, and the use of assistive devices, are essential in improving functional recovery and enhancing participation in daily activities, ultimately leading to a better quality of life for individuals with adhesive capsulitis.

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