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Diagnosis and Treatment of Golfer's Elbow: A Review of Therapeutic Approaches

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ABSTRACT

Introduction:

Medial epicondylitis, or golfer's elbow, is caused by repetitive stress on the medial epicondyle tendons, leading to pain, reduced grip strength, and limited mobility. Poor biomechanics and overloading worsen the condition, which involves tendon degeneration and inflammation. Treatment begins with rest, physical therapy, and NSAIDs, while advanced cases may require injections, surgery, or innovative therapies targeting oxidative stress.

Aim of study Objective:
The objective of this paper is to analyze the causes, symptoms, and available treatment n methods for golfer's elbow (medial epicondylitis). The paper aims to compare the effectiveness of conservative methods and surgical interventions in treating this condition, as well as discuss the latest advancements in therapy

State of Knowledge:

Medial epicondylitis, or golfer's elbow, is a chronic tendon condition caused by repetitive stress. Diagnosis relies on clinical evaluation and imaging, while treatment begins with conservative methods like rest and physical therapy. For resistant cases, surgical options and innovative therapies. A multimodal, personalized approach ensures optimal recovery and long-term relief.

Summary (Conclusion):

Medial epicondylitis, or golfer's elbow, is caused by repetitive stress and degenerative changes in the flexor-pronator tendons. Effective diagnosis combines clinical evaluation and imaging. Conservative treatment, including rest, physical therapy, and pharmacological support, is the first-line approach. In refractory cases, surgical options like open repair and arthroscopy, along with innovative techniques such as collagen-augmented sutures and stem cell applications, show promising results. Complementary therapies, such as ESWT, PRP, and manual therapy, further enhance outcomes, particularly in chronic cases. A multimodal, personalized approach ensures optimal tendon healing, functional recovery, and long-term symptom relief.

Keywords: Golfer's elbow, medial epicondylitis, conservative treatment, surgical treatment, complementary therapies, PRP, ESWT, diagnosis

Introduction

Medial epicondylitis, or golfer's elbow, is a condition caused by repetitive stress on the tendons attached to the medial epicondyle of the humerus. It primarily affects the flexor-pronator muscle group, including the pronator teres, flexor carpi radialis, and palmaris longus, with chronic tendinosis and degenerative changes replacing earlier notions of acute inflammation. Activities such as repetitive wrist flexion, gripping, or forearm pronation—common in sports like golf and baseball or certain occupations—can lead to microtears and angiofibroblastic hyperplasia. Clinically, patients often present with inner elbow pain radiating to the forearm, reduced grip strength, and discomfort during specific movements [1].Mechanical overuse is further exacerbated by poor biomechanics, inadequate muscle conditioning, and improper technique. Factors such as incorrect golf grip size or overloading during weightlifting amplify stress on the flexor-pronator tendons, contributing to injury and functional impairment [2]. Chronic cases may also manifest as stiffness or reduced elbow mobility.Recent research underscores the role of molecular processes, such as oxidative stress and mitochondrial dysfunction, in tendon degeneration and impaired healing. Oxidative stress, marked by reactive oxygen species (ROS) accumulation, disrupts cellular repair and promotes chronic injury. Additionally, repetitive mechanical loading triggers pro-inflammatory cytokines, including interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), perpetuating inflammation and delaying tendon repair [3]. Addressing these molecular factors is increasingly recognized as critical to effective management.Treatment typically begins with conservative approaches such as rest, activity modification, physical therapy, and NSAIDs to reduce strain and strengthen the forearm muscles. For refractory cases, advanced interventions—including corticosteroid injections, platelet-rich plasma therapy, or surgical procedures like tendon debridement—may be required. Innovative therapies targeting oxidative stress and inflammation hold promise for improving outcomes in tendon healing and recovery [3][4].

Epidemiology

Medial epicondylitis is a prevalent musculoskeletal disorder observed across a wide range of athletic and occupational settings. Studies indicate that its incidence is particularly high among manual laborers, such as those in construction or weightlifting, as well as in athletes who participate in sports like tennis, baseball, and golf. While its name suggests a strong association with golfers, the condition is not limited to this population [1].The condition predominantly affects individuals between the ages of 35 and 50, with a slightly higher prevalence in men. However, younger individuals engaged in repetitive or high-stress activities involving the forearm are also at risk. Medial epicondylitis is estimated to affect 1–3% of the general population and accounts for approximately 10–20% of all elbow-related injuries in sports medicine [1][4]. Occupational risk factors play a significant role, particularly in professions requiring frequent use of the forearm muscles. Workers such as carpenters, plumbers, and assembly line operators are at elevated risk due to the repetitive nature of their tasks. Moreover, improper techniques or equipment during manual labor or sports further increase the likelihood of developing the condition [3].From an etiological perspective, recent studies suggest that medial epicondylitis is not simply the result of mechanical overload but involves a combination of mechanical, vascular, and neural factors.

Characteristics

Microtrauma to the tendon fibers causes structural disorganization and the accumulation of angiofibroblastic hyperplasia, which reduces the tensile strength of the tendon and impairs its capacity to withstand further stress. Additionally, compromised vascular supply within the tendon may play a role in the degenerative changes by limiting the delivery of essential nutrients and impairing repair mechanisms. Neural factors, such as heightened nociceptor activation, may contribute to the chronic pain often associated with medial epicondylitis [6]. Medial epicondylitis is a common cause of elbow pain and disability, impacting individuals' quality of life and work performance. Its prevalence across various age groups and professions underscores the importance of preventive strategies and effective management approaches to reduce its incidence and improve outcomes for affected individuals [3][5].

Medial epicondylitis results from repetitive overuse or mechanical stress on the tendons attached to the medial epicondyle, leading to microtears, tendinosis, and structural degeneration. Clinically, the hallmark symptom is medial elbow pain that may radiate down the forearm and is typically exacerbated by gripping, wrist flexion, or forearm pronation against resistance. Patients often report discomfort during activities involving repetitive forearm movements or sustained gripping, such as lifting, swinging a golf club, or turning a screwdriver. The pain can range from mild to severe, potentially limiting functional capacity and interfering with daily tasks or athletic performance. Additional symptoms may include reduced grip strength, stiffness, or a sensation of weakness in the affected arm [2].

The underlying pathology of medial epicondylitis reflects chronic tendinosis rather than acute inflammation. Histopathological findings reveal angiofibroblastic hyperplasia, characterized by fibroblast proliferation, disrupted collagen organization, and increased vascularity. These changes weaken the structural integrity of the tendon, predisposing it to further injury and delayed healing.

Physical examination typically reveals tenderness upon palpation of the medial epicondyle and pain reproduction with resisted wrist flexion of forearm pronation. In some cases, associated symptoms, such as ulnar nerve irritation, may manifest, leading to tingling or numbness radiating to the ring and little fingers. Chronic cases may also exhibit mild swelling or thickening around the medial epicondyle [1].

In addition to physical examination, advanced imaging modalities, such as magnetic resonance imaging (MRI) and ultrasonography, play a crucial role in confirming the diagnosis and assessing the extent of tendon degeneration. MRI findings often reveal areas of tendon thickening, heterogeneity, and increased signal intensity at the flexor-pronator origin, consistent with chronic tendinosis. Ultrasonography, being cost-effective and dynamic, is particularly useful for identifying tendon abnormalities and associated conditions, such as ulnar nerve subluxation or inflammation [7].

The chronic, degenerative nature of medial epicondylitis underscores the importance of early recognition and appropriate management. Failure to address the condition may result in persistent pain, functional limitations, and difficulty returning to occupational or athletic activities [2].

Clinical Diagnosis

The clinical diagnosis of medial epicondylitis (golfer's elbow) relies on a thorough medical history, physical examination, and exclusion of other potential causes of pain in the region of the medial epicondyle of the humerus. Recognizing the characteristic symptoms and provoking factors is essential to differentiate this condition from other pathologies affecting the elbow and surrounding structures.

During the medical history, particular attention is given to pain localized around the medial epicondyle, which often radiates along the forearm. The pain typically worsens with activities requiring gripping, wrist flexion, or forearm pronation, especially during lifting or repetitive motions. Patients frequently report reduced grip strength and discomfort during daily tasks, such as writing or manual work [8].

The physical examination involves palpation of the medial epicondyle to identify tenderness in the area. A hallmark symptom is pain elicited by resisted wrist flexion or forearm pronation. Common provocative tests include:

- Resisted wrist flexion test: Pain is triggered during an attempt to flex the wrist against resistance with the elbow extended.
- Resisted pronation test: Patients experience pain at the medial epicondyle during resisted forearm pronation.
- Stretching of the wrist flexor muscles: Passive stretching of the flexor muscles by extending the wrist and elbow simultaneously exacerbates pain.

In cases of diagnostic uncertainty, it is crucial to rule out other potential causes of elbow pain, such as ulnar nerve neuropathy, elbow joint inflammation, or ligament injuries. Symptoms like tingling, numbness, or weakness may suggest concurrent irritation or compression of the ulnar nerve.

Accurate clinical diagnosis is a critical step in identifying medial epicondylitis, enabling appropriate treatment and minimizing the risk of complications resulting from misdiagnosis. If necessary, clinical evaluation can be supplemented with imaging studies, such as ultrasonography or magnetic resonance imaging (MRI), which provide additional insights into the condition of the tendons and elbow structures [8].

Radiological Diagnosis

Radiological diagnosis of medial epicondylitis (golfer's elbow) plays a crucial role in confirming the diagnosis, assessing the extent of tendon degeneration, and ruling out other potential pathologies of the elbow joint. Among the available imaging modalities, ultrasonography (US) and magnetic resonance imaging (MRI) are most commonly utilized, as they provide detailed insights into the structure of tendons and adjacent tissues [9].

Ultrasonography (US) is the preferred method for diagnosing medial epicondylitis due to its accessibility, non-invasive nature, and ability to dynamically assess structures. Key ultrasonographic findings include:

- Thickening of the flexor tendons at their attachment to the medial epicondyle.
- Decreased echogenicity of the tendons, indicative of degenerative changes.
- Presence of calcifications or microcalcifications within the tendons, characteristic of chronic cases.
- Hypervascularity detected on Doppler imaging, representing increased fibroblast activity and angiogenesis resulting from angiofibroblastic hyperplasia.

US also enables evaluation of surrounding structures, such as the ulnar nerve. Displacement or compression of the ulnar nerve within the cubital tunnel may lead to coexisting neuropathy. Dynamic imaging allows for the identification of nerve entrapment during elbow flexion and extension [9].

Magnetic Resonance Imaging (MRI) is considered the gold standard in more complex or diagnostically uncertain cases. MRI provides high-resolution images, allowing for a detailed assessment of tendon damage and identification of associated pathologies. Typical MRI findings include:

- Signal heterogeneity within the flexor tendons, indicative of degeneration.
- Tendon thickening and edematous changes at their attachment to the medial epicondyle.
- Changes in surrounding structures, such as ligament injuries or joint inflammation.

Recent studies emphasize the importance of integrating radiological findings with clinical evaluation to enhance diagnostic accuracy and treatment planning. The degree of tendon thickening observed on MRI and US often correlates with pain severity and functional limitations reported by the patient [10]. Doppler-detected hypervascularity is frequently associated with ongoing tendon degeneration and persistent symptoms, providing insights into the chronicity of the condition [11].

Advanced Imaging Techniques

MRI and US are invaluable for identifying subtle changes undetectable through physical examination. For example:

- Low-grade partial tears of the common flexor tendon and peritendinous fluid on MRI often signify acute exacerbations of medial epicondylitis.
- Bone marrow edema in the medial epicondyle, observable on MRI, can indicate recent injury phases, helping guide treatment timing and intensity [13].
- Intratendinous cysts and advanced calcifications are often seen in chronic cases, suggesting the need for interventions such as platelet-rich plasma therapy or tendon debridement [12].

Recent advances in quantitative MRI, such as T2 mapping, allow for the detection of subtle changes in tendon structure. T2 mapping measures water molecule relaxation times within tissue, quantifying the extent of degeneration and disease progression. This technique also aids in evaluating treatment efficacy by tracking changes in tendon composition over time [14].

Superb Microvascular Imaging (SMI) enhances the detection of vascular changes in medial epicondylitis. SMI provides high-resolution visualization of microvascular structures without the motion artifacts typically associated with Doppler imaging. This technique is particularly valuable for detecting early angiogenesis linked to tendon degeneration and monitoring responses to therapies, such as corticosteroid injections or regenerative treatments [15].

Strain Elastography and Shear Wave Elastography (SWE) represent further innovations in ultrasonography. These methods measure tendon stiffness, providing insights into degenerative changes:

- Strain elastography highlights mechanical alterations in soft tissues.
- SWE offers precise, reproducible measurements of stiffness, differentiating acute inflammation from chronic fibrosis and helping guide tailored interventions [16].

By integrating elastography with conventional US and MRI, clinicians can better distinguish between acute and chronic stages of medial epicondylitis. For example, SWE may highlight stiffness variations linked to inflammation or fibrosis, guiding targeted physical therapy or regenerative treatments.

Radiological diagnosis serves as a cornerstone in confirming medial epicondylitis and stratifying its severity. It provides a comprehensive framework for clinicians to design individualized treatment plans, balancing conservative approaches for mild cases with advanced techniques for chronic, refractory presentations. Integration of clinical and imaging data ensures a precise and effective approach to managing golfer's elbow [12,15,16].

Conservative Treatment

Conservative treatment of golfer's elbow (medial epicondylitis) is the first-line therapy, focusing on reducing pain, improving function, and preventing further tendon damage. In many cases, this approach is effective and sufficient, particularly for mild to moderate symptoms [1,2].

1. Rest and Activity Modification
   A key component of conservative treatment is avoiding pain-inducing activities, such as repetitive wrist movements, gripping, or forearm pronation. Introducing short-term rest allows tendons to recover, reducing the risk of symptom exacerbation. Ergonomic adjustments in work and daily activities are also recommended, such as using appropriate tool grips or altering techniques for tasks that strain the tendons [1].
2. Physical Therapy
   Rehabilitation plays a central role in the conservative management of golfer's elbow. A physical therapy program typically includes:

- Eccentric Exercises: Strengthen the flexor and pronator muscles, improving their resistance to stress.
- Stretching: Gentle stretching of the flexor muscles improves flexibility and reduces tension in the medial epicondyle region.
- Manual Therapy: Mobilization techniques around the elbow joint can enhance range of motion and relieve discomfort.
- Proprioceptive Training: Recent evidence emphasizes the importance of integrating proprioceptive exercises to improve neuromuscular control and prevent further injuries. This approach focuses on enhancing coordination and joint stability through dynamic activities that simulate functional movements [18].

Additionally, recent evidence highlights the potential of isometric exercises for pain management in the early stages of medial epicondylitis. Isometric exercises reduce muscle-tendon tension and may provide immediate pain relief, helping patients engage in other rehabilitation activities more effectively [17].

3. Pharmacotherapy
   Non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or naproxen, are commonly used to relieve pain and reduce inflammation. For more severe symptoms, corticosteroid injections may be considered; however, their long-term benefits are limited, and repeated injections can weaken tendon structures [1]. Emerging alternatives, such as topical NSAIDs, provide localized relief with reduced systemic side effects, offering a safer option for patients with contraindications to oral medications [17].
4. Other Conservative Methods

- Immobilization: Temporary use of braces or forearm straps reduces tension at the tendon insertion site, alleviating symptoms.

- Alternative Therapies: Ultrasound therapy, iontophoresis, and shockwave therapy can be used as adjunct treatments, particularly for chronic cases.

In addition, the incorporation of low-energy laser therapy has shown promising results in managing pain and inflammation in medial epicondylitis. Low-energy laser therapy stimulates cellular repair processes by enhancing mitochondrial activity and reducing oxidative stress, offering a non-invasive option to complement traditional rehabilitation programs [18]. Conservative treatment typically leads to improvement within weeks to months, but it requires active patient participation in the rehabilitation process and adherence to activity modification recommendations. In cases resistant to conservative management, further diagnostic evaluation and consideration of more advanced therapeutic methods are warranted [1,2,6,18].

Surgical Treatment

The surgical treatment of golfer's elbow (medial epicondylitis) is considered in cases where conservative therapies fail to provide improvement after at least 6–12 months of treatment or when symptoms significantly limit a patient’s daily functioning. The goal of surgery is to remove degenerative tissue, improve tendon biomechanics, and restore full limb function [19].

1. Indications for Surgery

- Chronic pain that persists despite comprehensive conservative treatment.
- Significant reduction in grip strength or range of motion, impairing daily activities.
- Degenerative changes or tendon injuries visible on imaging studies, such as MRI or ultrasound, including calcifications, microtears, or intratendinous cysts.

2. Surgical Techniques

Modern surgical methods include both open and minimally invasive techniques.

- Open Surgery:
  This is a classic approach involving an incision near the medial epicondyle, removal of degenerative changes, and reattachment of healthy tendons to the bone. This technique provides excellent visualization of structures, which is particularly useful in advanced cases.
- Arthroscopy:
  This less invasive alternative allows treatment of medial epicondylitis through small incisions with the use of a camera. Arthroscopy enables the evaluation and treatment of concurrent elbow pathologies, such as synovitis or ligament injuries.

Recent research highlights the use of collagen-augmented suture repair techniques in golfer's elbow surgery. These sutures not only enhance the stability of the tendon at the repair site but also support tissue regeneration by delivering a collagen matrix that facilitates the healing process. This method has shown particular effectiveness in patients with extensive damage or recurring symptoms after previous procedures [21].

Another promising innovation is the use of stem cells in tendon regeneration. Stem cells, sourced from adipose tissue, for example, can be applied to the injury site during surgery. They support collagen regeneration and reduce inflammation. Preliminary studies suggest that stem cell application may accelerate recovery and improve long-term treatment outcomes [20]..

3. Postoperative Rehabilitation

After surgery, patients undergo an individualized rehabilitation program. Immobilization is applied during the initial weeks to protect the surgical site. This is followed by the gradual introduction of stretching and strengthening exercises to rebuild muscle strength and improve limb functionality.

Return to full activity, including sports, is typically possible within 3–6 months, depending on the extent of the initial injury and rehabilitation progress [19].

Surgical treatment of golfer's elbow is an effective therapeutic method for cases resistant to conservative treatment. The choice of surgical technique depends on the extent of tendon damage, coexisting pathologies, and the surgeon’s preferences. Modern techniques, such as collagen-augmented sutures and stem cell application, open new possibilities for improving treatment outcomes and reducing the risk of recurrence [20,21].

Complementary Treatment

Complementary treatments for golfer's elbow (medial epicondylitis) serve as adjuncts to conservative and surgical interventions, aiming to alleviate symptoms, accelerate healing, and restore functional outcomes. These modalities can be particularly effective in patients with chronic or refractory cases where standard approaches alone may not provide sufficient results [1].

1. Extracorporeal Shockwave Therapy (ESWT)

   ESWT is one of the most studied complementary therapies for medial epicondylitis. By delivering high-energy acoustic waves to the affected tendon, ESWT enhances local blood flow, promotes tissue regeneration, and reduces pain through mechanical stimulation. Clinical studies have demonstrated that ESWT significantly improves pain relief and functional outcomes, particularly when integrated into a structured rehabilitation program for patients with chronic medial epicondylitis [24].

2. Platelet-Rich Plasma (PRP) Therapy

   RP therapy involves injecting autologous platelet-rich plasma into the affected tendon to stimulate the body’s natural healing process. The release of growth factors from concentrated platelets promotes collagen synthesis, reduces inflammation, and accelerates tissue repair. PRP therapy has been shown to be particularly effective in cases resistant to conservative management, offering a minimally invasive alternative for tendon regeneration [24].

3. Low-Level Laser Therapy (LLLT)

LLLT has been explored as a non-invasive approach for treating medial epicondylitis. A multicenter, double-blind, placebo-controlled clinical trial by Simunovic et al. assessed the efficacy of LLLT using a combination of trigger point application and scanner techniques. The study, which included 324 patients (50 with medial epicondylitis), reported complete pain relief and functional improvement in 82% of acute cases and 66% of chronic cases. These findings highlight LLLT's effectiveness, particularly when applied using combined techniques, in managing both medial and lateral epicondylitis [25].

4. Prolotherapy (Regenerative Injection Therapy)

Prolotherapy involves injecting irritant solutions, such as hypertonic dextrose, at tendon attachment sites to stimulate an inflammatory healing response. This localized response promotes collagen deposition, tendon repair, and improved functional integrity. Clinical studies have shown that prolotherapy effectively reduces pain and enhances function when combined with structured rehabilitation programs. However, further research is needed to establish standardized protocols and define optimal patient groups [22].

5. Botulinum Toxin Injections

Botulinum toxin injections represent a novel intervention for chronic medial epicondylitis. By temporarily paralyzing the flexor-pronator muscle group, botulinum toxin reduces mechanical stress on the tendon, leading to pain reduction and improved grip strength. Preliminary studies suggest that combining botulinum toxin injections with physical rehabilitation may yield enhanced functional recovery. Nonetheless, additional research is required to determine the long-term efficacy and optimal dosing strategies [23].

6. Manual Therapy Techniques

Manual therapy techniques, such as deep tissue massage, myofascial release, and mobilization, have shown efficacy in alleviating pain and improving range of motion in patients with medial epicondylitis. These methods aim to break down adhesions, enhance blood flow, and reduce muscle tension. Additionally, bracing with counterforce straps provides immediate symptomatic relief by reducing mechanical strain on the flexor-pronator tendon complex. Combining manual therapy and bracing with a structured exercise regimen has demonstrated superior functional outcomes compared to isolated therapies [22].

7. Combined Therapies

A multimodal approach integrating various complementary treatments has demonstrated superior results in managing golfer's elbow. For example:

- Combining ESWT with PRP therapy has shown synergistic effects, leading to enhanced pain reduction and accelerated tendon healing.
- Integrating manual therapy, bracing, and rehabilitation exercises within a cohesive treatment plan yields better functional outcomes compared to single-modality interventions.
- Tailoring combined therapies to individual patient needs optimizes recovery and reduces recurrence risk [24].

CONCLUSION

Medial epicondylitis, or golfer's elbow, is a multifactorial condition caused by repetitive stress and degenerative changes in the flexor-pronator tendons. Accurate diagnosis, combining clinical evaluation and imaging, is essential to guide effective treatment. Conservative treatment remains the first-line approach, emphasizing rest, physical therapy, and pharmacological support. Surgical options, including open repair and arthroscopy, are reserved for refractory cases, with innovative techniques such as collagen-augmented sutures and stem cell applications showing promising results. Complementary therapies, such as ESWT, PRP, and manual therapy, provide additional benefits, particularly in chronic presentations. A multimodal, patient-specific approach that integrates conservative, surgical, and complementary therapies yields the best outcomes, promoting tendon healing, functional recovery, and long-term symptom relief.

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Author's Contribution:

Conceptualization, KD, and UZ; methodology, KD, UZ, JŚ; software, KD, WF, JD; check, KD, GT, WD and SA ; formal analysis, KD, JD, WF, SA; investigation, KD, KS; resources, KD, UZ, WF, GT, WD; data curation, KD, GT, KS, JW; writing - rough preparation, KD, WD, UZ, JW; writing - review and editing, KD, UZ, WF, MP; visualization, KD, UZ, JD, WD; supervision, KD, JD; project administration, KD, WF, SA, JW, JŚ, MP, KS;

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