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The application of mechanical diagnosis and therapy in lateral epicondylalgia

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Background: lateral epicondylalgia (LE) is a musculoskeletal diagnosis that causes pain and dysfunction in the lateral aspect of the elbow. Mechanical diagnosis and therapy (MDT) is an orthopaedic classification and treatment system based on mechanical and symptomatic response to repeated and sustained end-range movement. There has been no investigation of the association between MDT and patients diagnosed with LE.

Case description: this report presents three patients matching the currently accepted diagnostic criteria for LE, two with a diagnosis of lateral epicondylitis (tennis elbow) from a medical doctor. These patients were classified and treated by a diplomat of MDT and two third-year doctoral students of physical therapy using MDT.

Outcomes: short- and long-term (one year) outcomes were excellent, demonstrating rapid abolishment of symptoms and return to prior levels of function in 3–6 visits between 11–59 days. Patients demonstrated the ability to prevent and manage reoccurrence of symptoms independently without seeking further health care.

Discussion: this case series raises questions about whether or not the pathologies traditionally associated with the aetiology of LE are actually at fault. Moreover, it raises questions about the utility of special tests typically utilized to identify those structures. The series provides preliminary evidence that MDT may be capable of providing effective short- and long-term outcomes in the management of LE. Level of Evidence: 4

Keywords: Mechanical diagnosis and therapy, Lateral epicondylalgia, Case series

Background

Lateral epicondylalgia (LE) is a musculoskeletal condition that causes pain and dysfunction in the lateral aspect of the elbow.[1] The aetiology is poorly understood.[2] LE previously thought to be an inflammatory process from tendon overuse.[3] Recent investigation has shown the absence of inflammatory cells in dissected tendons with symptomatic LE.[3–6] Mercer and Bogduk[7] discovered displaced articular structures capable of causing the symptoms of LE, yet there has been no literature reporting the clinical application of these findings. Despite continued research, the true origin of pain from LE remains as an enigma.[2,7–9] Poor understanding of the specific patho-anatomical pain origin may have led to wide variability in specific patho-anatomical treatment of LE; e.g. injection, medication, rest, ice, bracing, therapeutic modalities, therapeutic exercise, massage, mobilization and manipulation.[10–17] This deficit could be a plausible explanation for research indicating that there is no significant long-term benefit of conservative treatment when compared to a wait and see approach.[10,13,17]

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The use of specific patho-anatomic diagnoses in patients with spinal conditions has also shown unacceptable levels of reliability.[18] Non-specific, classification-based assessment and treatment systems, such as mechanical diagnosis and therapy (MDT), have demonstrated acceptable levels of reliability and efficacy in the management of patients with spinal impairments.[19–22] MDT is a relatively new concept used in extremity assessment and treatment.[23] The reliability of classifying MDT extremity syndromes between skilled clinicians has shown 92% agreement with a kappa value of 0.84.[24] The inter-rater reliability between MDT diploma holders has shown 96% agreement in classifying MDT syndromes in patients with shoulder pain.[25] Seven case reports involving MDT management of extremity derangement syndrome of the temporal mandible, shoulder, thumb and knee joints have demonstrated significant symptomatic and functional improvement.[26–32] One randomized control trial, guided by MDT assessment and treatment, found a significant prevalence of patients awaiting total knee replacement to be classified as the MDT syndrome derangement.[33]

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MDT is an evaluation and treatment system that uses symptomatic and mechanical responses through repeated movement testing to classify musculoskeletal disorders into the following syndromes: derangement, dysfunction, postural and other. Derangement is defined as an internal dislocation of articular tissue of unknown origin which causes a disturbance in the normal resting position of the affected joint surface, resulting in pain and restriction to movement.[23] Treatment of derangement involves repeated movement in one direction, known as directional preference. Directional preference is associated with improvement in symptoms, and/or mechanical presentation (i.e. range of motion, strength, etc.).[23] Dysfunction syndrome is defined as mechanical deformation of structurally impaired soft tissue which results in pain and limited range of motion.[23] Dysfunction is subcategorized into articular dysfunction and contractile dysfunction. Treatment of dysfunction involves progressive tissue loading to remodel the articular or contractile tissue. Postural syndrome is defined as mechanical deformation of normal soft tissues or vascular insufficiency arising from prolonged positional stresses resulting in pain. The primary intervention for postural syndrome is patient education and avoidance of the offensive position.[23]

Given that there is poor understanding of the pain mechanisms in LE[1–6] and that there are poor outcomes compared to the wait and see approach,[10,13,17] the efficacy of the MDT approach to manage LE is warranted. There is currently no literature describing the use of MDT in cases of LE. The aim of this case series is to provide a description of three patients with LE, and to report the clinical reasoning, diagnosis, treatment and outcomes associated with MDT management at discharge, three-month and one-year follow-up.

Methods

Three examiners were used for data collection, evaluation and treatment. The lead examiner (JM) holds a doctorate in physical therapy and diploma in MDT. The co-examiners were third-year students of a doctoral physical therapy program. Patients were recruited through the normal business operations of a private outpatient orthopedic physical therapy clinic.

Patients were evaluated using a MDT-based assessment[23] which included a common test cluster for LE accepted by The Journal of the American Medicine Association.[17] MDT assessment involved the use of repetitive and sustained movements while monitoring symptomatic (e.g. pain) and mechanical responses (e.g. strength, range of motion, functional movements and LE special tests). In order to confirm the diagnosis of LE, the authors required that the special tests utilized to confirm the patients' diagnosis produce pain at a level 3/10 on the numeric pain rating scale (NPRS) and lateral elbow pain provoked by at least two of the following orthopaedic special tests: gripping, palpation of the proximal wrist extensor tendon, resisted wrist or middle finger extension or stretching of forearm extensor muscles.[17] Manual muscle testing and grip strength were not included in these guidelines, therefore not used in this report.[17] As advocated by McKenzie and May,[23] nil, minimal, moderate and major loss were used to categorize range of motion measurements. Reproduction of lateral elbow pain was recorded pre- and post-physical examination and is referred to as a baseline or concordant sign.

Motor deficit, sensory deficit and dural tension were assessed to determine if there was neurologic involvement. Spinal involvement was assessed using repeated end-range cervical and thoracic movements. If symptomatic or mechanical elbow baselines altered as the result of spinal movements, or neurologic involvement was present, patients were excluded. If the elbow baselines were unaffected through the spinal assessment, the patient was considered to have no spinal involvement and repeated end-range elbow movements were then tested. In an MDT examination, mechanical or symptomatic responses are tested first in the sagittal plane. If there is no favourable response, then alternative strategies are employed using repeated movement testing in the transverse or frontal planes.[23,34]

The repeated elbow movements are referred to as loading strategies, which are intended to be end-range, self-joint mobilization techniques. They are described by the amount of weight-bearing (e.g. loaded, partially loaded, unloaded), the direction of movement (e.g. extension, flexion, extension with pronation), and the external force (e.g. overpressure, mobilization, manipulation).[23]

Outcome measures were collected at the initial evaluation, discharge from treatment and by phone interview three months and one year after discharge. The outcome measures administered were the patient's average pain via a NPRS, the patient's perceived per cent improvement, and the upper extremity functional scale (UEFS). NPRS and UEFS are reliable and valid measures.[35,36] The NPRS is an 11-point scale where 0 designates "No pain" and 10 designates "The worst pain imaginable".[35] The UEFS is a self-reported questionnaire that consists of 20 items. This measure provides a baseline of the patient's self-reported disability.[36] The psychometric properties of the patient's perceived per cent improvement have not been studied. The patient's perceived per cent improvement is a standardized question stating, "Since your last visit, are you better, worse, or the same?". If the patient reports better or worse, he or she is asked "on a 0–100% scale how much do you perceive your change to be if 100% is completely resolved and 0% is the same as when you started treatment?".

Case Descriptions and Outcomes

Three patients presented with lateral elbow pain. All were classified by MDT methodology and fit the inclusion criteria of LE. No patients were excluded due to neurologic or spinal involvement. Patient characteristics, clinical reasoning, management and outcomes are reported below. No other treatment modalities or therapies were performed other than those reported in the case descriptions.

Patient One

Patient characteristics

Patient one was a 57-year-old female registered nurse, who presented with intermittent left lateral elbow pain that commenced for no apparent reason. Symptoms were present for six months and worsening. She was most limited and painful with gripping, movements involving excessive mid-range pronation and supination, and participation in an exercise class that she attended twice weekly. She was self-referred with no medical diagnosis and no co-morbidities. The UEFS score was 68/80 with an average NPRS of 6/10. She denied having any previous treatment or use of pain medication.

The treating clinician felt that a six-month time frame and predominantly intermittent symptoms ruled out an inflammatory state. A time frame of eight weeks allows for the possibility of abnormal tissue healing, which is referred to as an articular or contractile dysfunction. A characteristic that differentiates the two is pain at end-range (articular) or mid-range (contractile). Pain with mid-range elbow movement (as reported in the patient history) and gripping makes articular dysfunction and postural syndrome unlikely; both should only produce pain with end-range elbow movement. The absence of known trauma reduces the likelihood of fracture or rupture leaving derangement and contractile dysfunction as possible classifications. Mechanical testing was required to further differentially diagnose.[23]

Examination and classification

Upon physical examination, lateral elbow pain was produced by gripping, palpation of the proximal wrist extensor tendon and stretching of the forearm extensor muscles fitting the diagnostic criteria of LE.[17] Range of motion assessment revealed a minimal loss of elbow flexion with end-range pain and a minimal loss of elbow extension without pain. Contractile dysfunction should not have movement loss, which increased the likelihood of derangement.[23] Based on the author's clinical experience, loaded elbow extension has proven to be a common reductive loading strategy, and, therefore, was tested first. Repeated loaded elbow extension with patient overpressure applied to the posterior humerus (Fig. 1) abolished the patient's resting pain and end-range pain with elbow flexion. Both elbow flexion and extension range of motion were restored to normal limits. Pain with gripping decreased but did not abolish. No further movement testing was required given the positive response. The rapid abolishment in painful baselines that occurred on the initial visit suggests that pain is not driven from a pathological or degenerated tendon (the suspected pain generator of LE,[1]) but instead an articular derangement (as described by Mercer and Bogduk[7]) mimicking the presentation of LE.[23] This presentation fits the provisional classification of elbow derangement, with a directional preference of loaded elbow extension with patient overpressure.[23] The dosage of the intervention was prescribed as follows: 10 repetitions every 1–2 hours.

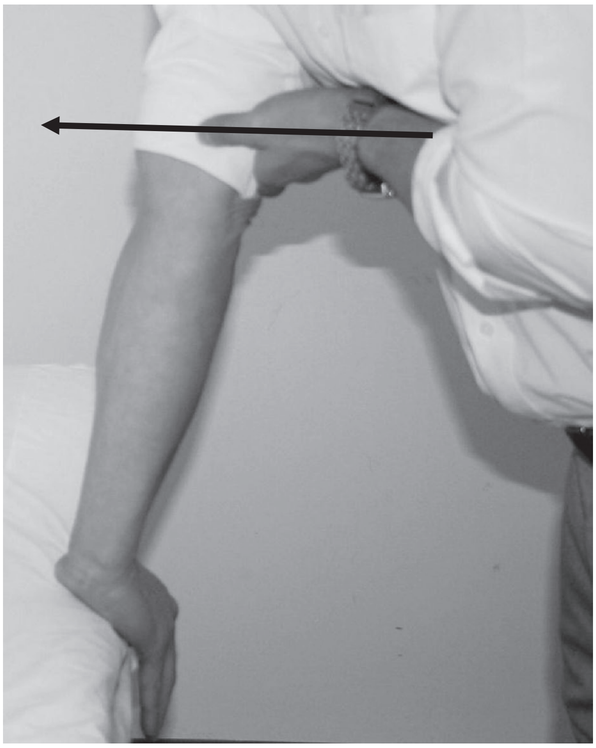

Figure 1 Loaded elbow extension with patient overpressure applied to the posterior distal humerus.

Re-evaluation and outcome

Re-evaluation was in three days. The patient reported 65% perceived improvement relative to her overall condition. She was able to fully participate in her exercise class with only minimal pain. All symptomatic and mechanical baselines were improved. Consequently, her directional preference was confirmed and her treatment strategy was left unchanged.

The second re-evaluation was in one week. The patient reported 100% perceived improvement. Her NPRS improved to 0/10, the UEFS improved to 80/80. The patient's range of motion revealed nil movement loss. Gripping, palpation of the proximal wrist extensor tendon, and stretching of the forearm extensor muscles were all painless. She returned to full participation in her exercise class without pain. She was provided with instruction to prophylactically perform the prescribed loading strategy twice daily for two months and discharged from physical therapy. She was seen for 3 visits in 11 days.

Upon three month phone follow-up, the patient reported a reoccurrence of her symptoms one time. She was able to abolish her symptoms with the prescribed loading strategy without having to seek further health care. She reported no other instances of pain and continued to have no functional deficits.

Upon one-year phone follow-up, the patient reported having a reoccurrence of lateral elbow pain approximately once every two to three months. She stated that pain would appear for no apparent reason and as soon as it did, she would perform 2 or 3 sets of 10 repetitions of her prescribed loading strategy. This would abolish pain immediately and maintain improvement for another two to three months. She reported this reoccurrence caused no functional deficit and she has not sought further health care for lateral elbow pain. She felt confident in her ability to self-manage her condition. She was instructed to continue elbow extension more regularly (e.g. 10 repetitions once or twice daily) to reduce reoccurrence, although she was content with her current state and her ability to independently reduce and abolish pain.

Patient Two

Patient characteristics

Patient two was a 75-year-old retired male who presented with intermittent right lateral elbow pain. He was given the medical diagnosis, lateral epicondylitis, by his primary physician. His symptoms began suddenly four months prior while cutting wood. Symptoms worsened with lifting heavy objects, shoveling and using exercise equipment involving elbow flexion and extension. The patient had no co-morbidities or previous treatment, including pain medication. The UEFS was 73/80, the average NPRS was 5/10.

Given that the patient presented with intermittent pain at four months post onset, an inflammatory state was ruled out. A time frame over eight weeks and the mechanism of injury allows for the possibility of abnormal tissue healing, which is referred to as articular or contractile dysfunction.[23] Pain during functional activities occurred at the patient's mid-range of motion, which precludes both articular dysfunction and postural syndrome. The latter are characterized by end-range pain presentation. A review of the patient's history pointed to a contractile dysfunction, though a derangement could not be excluded.[23]

Examination and classification

The physical examination revealed a minimal loss of elbow extension and end-range pain with both elbow flexion and extension. Lateral elbow pain was provoked by gripping, palpation of the proximal wrist extensor tendon, and resisted wrist and middle finger extension, which fits the diagnostic criteria of LE.[17] Repeated movement testing of loaded elbow extension was tested first. This resulted in less pain with gripping, abolished pain with palpation of the proximal wrist extensor tendon and abolished resisted wrist and middle finger extension. No other test movement was required given the positive symptomatic response. The rapid change in painful baselines ruled out dysfunction, postural and other classifications.[23] A provisional classification of elbow derangement with a directional preference of loaded elbow extension with patient overpressure was established. The dosage of the intervention was prescribed as follows: 10 repetitions every 1–2 hours.

Re-evaluation and outcome

The patient returned in three days for re-evaluation reporting a 50% perceived improvement relative to his overall condition. He no longer had pain with shoveling, but continued to report provocation of symptoms while lifting a coffee mug and heavy bags. The physical examination revealed all previous concordant signs to still be painful. There was no longer movement loss of elbow extension or pain with end-range elbow flexion and extension. Repeated loaded extension with patient overpressure (Fig. 1) no longer had an effect on the patient's pain with gripping, palpation of the proximal wrist extensor tendon and resisted wrist and middle finger extension.

Since loaded elbow extension had previously reduced painful baselines, the treating clinician felt that force progression consisting of therapist overpressure and mobilization would determine if the direction of elbow extension had a continued benefit. Force progression had no effect on the patient's symptoms and elbow extension no longer altered the patient's symptoms or mechanical presentation.

In the MDT management of a spinal derangement, lateral movement testing should be explored if sagittal movements no longer demonstrate improvement of symptoms and/or mechanical presentation or if all sagittal movements worsen symptoms and/or mechanical presentation.[34] Sagittal (elbow flexion, extension) movement no longer had an effect on the patient's symptoms and/or mechanical presentation, so lateral forces were explored. Next, lateral overpressure was applied to the proximal, medial ulna while the patient intermittently gripped an object. Mulligan[37] described this intervention with stabilization to the lateral humerus. This resulted in pain-free gripping while lateral pressure was maintained. The treating clinician believed that, since the patient responded positively to altering the joint position in a lateral direction, it was likely that the latter would need to be incorporated into the loading strategy in order to establish the directional preference. Loaded elbow extension with patient laterally directed overpressure applied from the proximal medial ulna (Fig. 2) was performed for 30 repetitions. This had no effect on symptomatic and mechanical baselines.

Since the patient no longer exhibited movement loss, the treating clinician considered the possibility of an articular displacement outside the elbow joint space, as suggested by Mercer and Bogduk.[7] During elbow dissection, Mercer and Bogduk[7] found joint tissue displaced inside and outside the joint space. When displaced tissue was found outside the joint space, it was located under the proximal wrist extensor tendon, on the lateral aspect of the elbow.[7] Articular tissue displaced under the wrist extensor tendon theoretically could explain why there was no longer

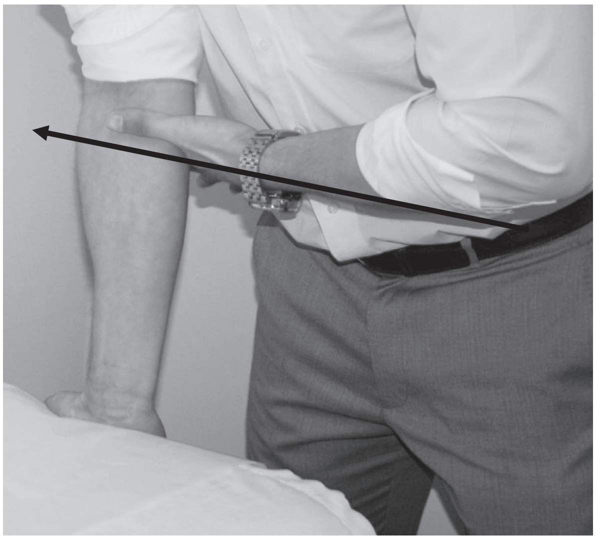

Figure 2 Loaded elbow extension with patient laterally directed overpressure applied from the proximal medial ulna.

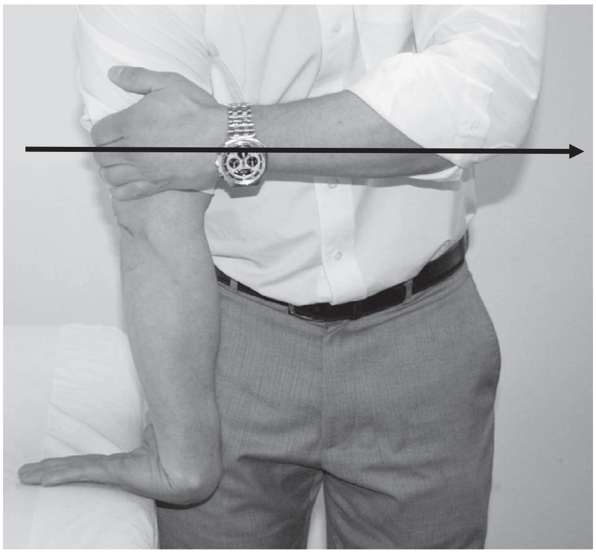

Figure 3 Loaded elbow extension with pronation, wrist flexion and patient overpressure applied to the posterior distal humerus.

observable elbow movement loss. It also theoretically could explain why altering the joint position with lateral overpressure was associated with a pain-free grip. Loaded elbow extension with pronation and wrist flexion was performed with patient overpressure applied to the posterior distal humerus (Fig. 3). This aimed to create an external compressive force to the lateral joint space with the intent to reposition displaced joint material. Coincidentally, this procedure is strikingly similar to a technique historically used for pain reduction of LE known as the Mills manipulation.[9] Repeated movement testing was associated with a significant improvement in symptomatic and mechanical baselines. After 40 repetitions symptomatic and mechanical baselines were painless reconfirming derangement as the classification. Loaded elbow extension with pronation and wrist flexion was confirmed as the new directional preference. The dosage of the intervention was prescribed as follows: 10 repetitions every 1–2 hours.

The second re-evaluation was performed in 48 hours. The patient reported 70% perceived improvement relative to his overall condition. Range of motion remained within normal limits. The physical examination revealed that the previously established baselines of gripping, palpation of the proximal wrist extensor tendon and resisted wrist and middle finger extension were less painful. Loaded elbow extension with pronation and wrist flexion continued to improve the patient's symptomatic and mechanical baselines confirming a directional preference. The patient's technique was reviewed with emphases placed on end-range movement and the importance of the prescribed dosage of the home program.

The third re-evaluation was in five days. The patient reported a 90% perceived improvement relative to his overall condition. The patient's range of motion was within normal limits and his pain was no longer provoked by gripping, palpation of the proximal wrist extensor tendon and resisted wrist and middle finger extension. The patient was encouraged to continue the same loading strategy and to return to all previous functional activities including cardiovascular and strength training.

The fourth re-evaluation was in seven days. The patient reported 100% perceived improvement relative to his overall condition. The UEFS was 79/80 and his NPRS was 0/10. He returned to all previous levels of activity without provocation of symptoms. He was discharged from physical therapy with instruction to continue performing his reductive loading strategy twice daily for one month or if symptoms returned. He was seen for five visits over 18 days.

Three month and one-year phone follow-ups revealed no reoccurrence of his symptoms. The patient reported that he no longer performed his prescribed loading strategy, but was confident that he would be able to independently manage a return of symptoms. He was able to accurately describe the loading strategy technique.

Patient Three

Patient characteristics

Patient three was a 43-year-old male information technology consultant who presented with constant right lateral forearm pain as a result of a tennis serve 3 months prior. He was given the medical diagnosis of lateral epicondylitis by his primary doctor. Previous treatment included massage, ice and anti-inflammatory medication, which had no effect. His symptoms worsened with continuous gripping or lifting. He also reported that his symptoms were worse in the morning. He was unable to participate in tennis secondary to pain and reported limiting all pain provoking activities. The UEFS was 75/80 with averaged NPRS of 6/10.

The constant nature of the patient's symptoms may be characteristic of an inflammatory state; however, the three-month time frame and no effect from anti-inflammatory treatment in conjunction with avoiding pain provoking activities, makes this diagnosis less likely. Since postural and dysfunction syndromes require that the pain be intermittent, these diagnosis were excluded.[23] With inflammation, dysfunction and postural syndrome excluded, the treating clinician felt that derangement syndrome was likely although this needed to be confirmed by movement testing.

Examination and classification

Upon physical examination, passive range of motion displayed a minimal loss of elbow flexion and extension and a moderate loss of supination, all without increased pain. Lateral elbow pain was increased by gripping and resisted wrist and middle finger extension, fitting the diagnostic criteria of LE.[17] Upon repeated movement testing, loaded elbow extension had no mechanical or symptomatic effect on gripping or resisted wrist and middle finger extension. Repeated elbow flexion with clinician overpressure increased resting pain with no effect on range of motion. Sagittal movement testing was exhausted indicating lateral or rotation movement should be explored next.[23] Elbow extension with pronation and wrist flexion with clinician overpressure abolished resting pain. It also abolished pain with gripping, and resisted wrist and middle finger extension confirming derangement syndrome. A provisional classification of elbow derangement was established with a directional preference of loaded elbow extension with pronation and wrist flexion with patient overpressure (Fig. 3). The dosage of the intervention was prescribed as follows: 10 repetitions every 1–2 hours.

Re-evaluation and outcome

Re-evaluation was in three days. The patient reported a 50% perceived improvement relative to his overall condition. He no longer had pain at rest and reported less pain with daily activity. He was encouraged to continue the established loading strategy with an emphasis on end-range loading and the frequency of the prescribed intervention.

The second re-evaluation was in three days. The patient reported being worse due to having increased resting pain, increased pain with grip, and increased pain with resisted wrist and middle finger extension. He also reported poor compliance. Repeated movement of the previously established directional preference (i.e. loaded elbow extension with pronation and wrist flexion with patient overpressure) was re-examined. This abolished resting pain, pain with gripping and pain with resisted wrist and middle finger extension. These results confirmed the patient's directional preference. The patient was cautioned that low compliance with the prescribed loading strategy may be the cause of his worsened presentation. The importance of maintaining the prescribed dosage was re-emphasized and the third re-evaluation was scheduled.

The third re-evaluation was in one week. The patient reported no longer having pain at rest. All daily functional activity was pain-free. Symptoms were still provoked with tennis and forceful gripping movements. Range of motion was within normal limits without end-range pain or pain during movement. Resisted wrist extension was painful although it required significantly more force to provoke. Force progression, including clinician overpressure, mobilization and manipulation of elbow extension with pronation and wrist flexion, were implemented to assess for the presence of a directional preference. This resulted in no further improvement. The clinician felt that there were no longer signs of joint derangement and that a concomitant contractile dysfunction was likely. When change in symptomatic baselines can no longer be rapidly altered through repeated end range or resisted movements in all planes of elbow movement and cervical and thoracic referral have been excluded, a diagnosis of dysfunction can be established. In this case, a contractile (as opposed to articular) dysfunction was suspected because it fit the operational definition of having no movement loss or pain with passive elbow movement and pain only provoked when the contractile tissue was resisted.[23] The treatment of contractile dysfunction included progressive tissue loading aimed at remodelling the collagen fibres of the wrist extensor tendon. This included eccentric wrist extension with elastic tubing 10 repetitions every 3–4 hours as suggested by Cullinane et al.[11] The patient was seen for two more visits for follow up. He reported 100% perceived improvement. The UEFS score improved to 80/80 and the patient's range of motion was within normal limits. Gripping and resisted wrist and middle finger extension were no longer painful. The patient returned to playing tennis, including forceful serves, without limitation or pain. The patient was discharged after 6 visits over 59 days.

Upon three month follow-up, the patient was unavailable via phone. Upon one-year phone follow-up, the patient reported that, after discharge, he continued to have no pain or functional deficit. There was no reoccurrence of symptoms. He continued to increase his tennis play in frequency and intensity without any complications and continued self-treatment for two months after discharge.

Discussion

This report presented three patients with LE managed effectively with MDT. Each patient required a specific and unique management strategy. This highlights the importance of repeated movement testing to find a directional preference and not relying on a pre-determined treatment protocol. In a recent control trial, 165 patients with LE were randomized into the following groups: corticosteroid injection, placebo injection, corticosteroid injection plus physiotherapy and placebo injection plus physiotherapy. Physical therapy included eight treatments of a multi-module exercise protocol including concentric and eccentric wrist extensor strengthening and joint mobilization with movement all tailored to ensure that no pain was provoked. Short-term outcomes demonstrated positive effects in both the injection and physiotherapy groups with a better outcome in the corticosteroid injection group. Long-term outcomes were worse in the corticosteroid group with higher reoccurrence and no significant difference in the physiotherapy group when compared to a wait and see approach.[17] In contrast to this case series, the application of MDT and use of directional preference to treat LE demonstrated preliminary evidence that self-mobilization techniques can be associated with excellent short-term and long-term outcomes. Furthermore, long-term outcomes may be attributable to the ability of the patient to continue independent treatment using self-mobilization.

In the presence of derangement syndrome, commonly used orthopaedic special tests for the assessment of patients with suspected LE (e.g. gripping, palpation of the proximal wrist extensor tendon, resisted wrist or middle finger extension or stretching of forearm extensor muscles)[17] changed from positive to negative at the initial evaluation or at follow-up shortly after. The same phenomenon associated with derangement syndrome has been demonstrated in the knee, wrist and shoulder for the McMurray test, Finkelstein test, Hawkins Kennedy impingement test, Gerber Lift Off test and Open Can test.[28,29,31] This questions the utility of common orthopaedic special tests used to identify pathologies traditionally associated with the etiology of LE.

MDT classification and management of the lumbar spine is driven by the same symptomatic and mechanical response to repeated end-range movement. The intervertebral disc model is used as a tool to guide clinicians in testing and treating patients with lumbar derangement.[34] This concept has yet to be explored in the management of extremity derangement. Although the elbow anatomy is vastly different than the lumbar spine, Mercer and Bogduk[7] have provided a theoretical description which could explain the phenomena occurring in peripheral joint derangement. Their findings indicate that fibro-adipose meniscoids, capsular rims and fat pads could displace in, or outside of, the elbow joint space. These structures are believed to be capable of causing nociception and obstruction to movement; noted characteristics of joint derangement.[7,23] This concept has been further supported by Duparc et al.[8] and Mills,[9] who originally created a manipulation to reduce suspected joint displacement in patients presenting with tennis elbow. As theorized in this case series, a joint derangement can mimic a tendinopathy presentation, which is believed to be a cause of LE. However, the derangement responds at a much faster rate and requires treatment directed at the joint, as opposed to the contractile tissue. This model warrants further investigation to determine if a derangement within the joint is a common source of pain in patients presenting with a diagnosis of LE. The use of repeated movements to establish a directional preference and self-mobilization techniques may improve outcomes in these patients of conservative management.

Conclusion

The application of MDT on three patients with LE has shown excellent outcomes at short- and long-term follow-up. It demonstrates that clinicians with varying levels of MDT education are capable of performing a mechanical evaluation, accurately determining a classification, and administering an appropriate intervention. This methodology should be considered when assessing patients with LE due to its low-tech and low-cost nature. If applicable to larger patient samples, MDT in the management of LE may be a potential strategy to minimize current orthopaedic costs.

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