General

Current concepts of natural course and in management of medial epicondylitis: a clinical overview

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Medial epicondylitis (ME), called "golfer's elbow", is not frequent or serious disease but can cause symptoms that are bothersome in everyday life. Therefore knowledge about this condition may improve diagnostic-therapeutic process. In this article detailed information concerning pathophysiology and symptomatology of ME was described. Great attention was paid to issues related to the diagnosis of the disease both in terms of differentiation with other elbow disorders as well as examination techniques. Finally, current therapeutic options were presented in detail and their efficacy was discussed based on the available data.

INTRODUCTION

Epicondylitis is one of the most common elbow disorders which concern musculoskeletal system and occurs mainly when wrist flexion/extension followed by pronation/supination with the elbow is repeated for a long time period.[1] Such excessive joint overstrain results in microtrauma at the origin of the tendons and this in turn lead to local tenderness, swelling and ulnar nerve irritation.[2] The first literature report on the epicondylitis comes from 1882 and the condition was then described as "lawn-tennis arm" because the disorder was observed in this sport players.[3] Since that time the knowledge about this entity has spread and currently it is known that epicondylitis may occurred both laterally and medially. In lateral epicondylitis (LE), commonly called "tennis elbow", the pathology arises at the origin of the extensor carpi radialis brevis but may extend to other tendons. In turn medial epicondylitis (ME), called "golfer's elbow", involves the muscles originating on the medial epicondyle of the humerus.[4] Although the colloquial names of diseases suggest their close relationship with the type of sport practiced, these conditions are also observed in many people who perform other activities involving specific type of hand movement. Prevalence of ME is 5-10 times lower than LE and probably this is a reason for minor knowledge and rather poor clinical data about this condition.[5] Therefore this article reviews general information about ME as well as current diagnosis and treatment options.

MEDIAL EPICONDYLITIS

ANATOMY AND PATHOPHYSIOLOGY

The epicondyles are rounded bony protuberances at the distal end of the humerus. The medial epicondyle is located on the inside of the elbow and is attachment sites for five muscles and tendons which form the common flexor tendon (CFT). This musculotendonous structure includes (from proximal to distal): the pronator teres, the flexor carpi radialis, the palmaris longus, the flexor digitorum superficialis, and the flexor carpi ulnaris. Physiological attachment of the CFT to medial epicondyle of the humerus is presented on Fig.1.

Normally, elbow joint performs the movements within the specified range: flexion 130-140º, extension 180º, as well as pronation 60-80º and supination 70-85º.[6] However, chronic repetition of forearm pronation and wrist flexion lead to disorders which may involve almost whole CFT (except for palmaris longus), but the pronator teres and the

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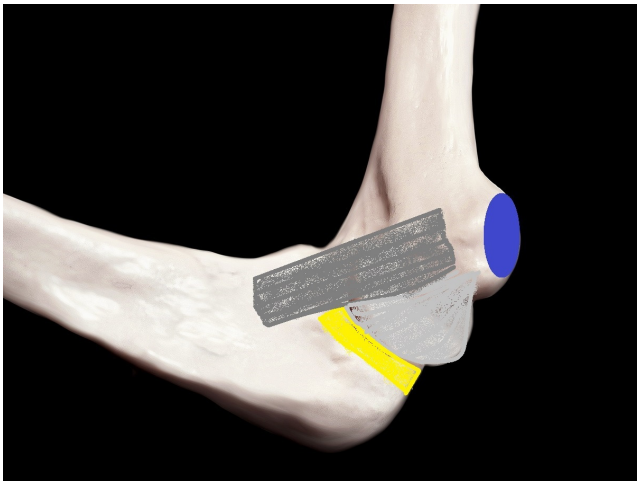

Figure 1. Anatomical diagram showing the site of common attachment of flexors (EFT) - blue area and the medial collateral ligament complex, dark-gray – anterior part, light-gray - posterior part, the transverse part is marked in yellow.

flexor carpi radialis were previously thought to be mostly affected.[7-10]

Initially, inflammatory process was considered to play main role in ME development,[11] and term suggesting an inflammation is still used, however histologically analysis showed that the mechanism of the disease is related to degeneration. Therefore, some specialists prefer the term tendonosis or tendinopathy, when describing elbow epicondylitis.[8] The pathophysiology of ME involves supraphysiologic stress on the tendon that induces recurrent microtears and as a result angiofibroblastic hyperplasia occur.[12,13] Vascular and fibroblastic elements replace the normal tendon, mucoid degenerates and reactive granulation tissue forms. Next, fibrosis or calcification can occur with decreasing collagen strength, scar tissue formation and thickening of the tendons.[10,14-17] At this stage of the disease, patients are usually diagnosed. As the affected muscle attachment with a disturbed structure becomes more susceptible to further microtrauma, greater damage to the structure of the attachment may occur if the affected limb is subjected to further long-lasting unlimited activity.

Depending on whether the ulnar nerve is also affected, ME is classified into two subtypes: without (type 1) and with (type 2) ulnar involvement.[7,18]

EPIDEMIOLOGY

In general population prevalence of ME is up to 1% however the disease may affect even 8% of patients in occupational settings.[19-23] The annual incidence of ME is estimated for 0.8-5.6/1000 person-years.[21-23] Medial-sided pathology is diagnosed in as many as 10% to 20% of patients with epicondylitis.[24-26]

Literature data are not consistent with regard to the gender relationship of ME prevalence. Some studies report that male and female are affected equally,[8,21,23] but the others indicate on ME occurrence twice as frequently in women.[20, 22]

Although the syndrome has been identified in patients ranging from 12 to 80 years old, it predominantly occurs in the fourth and fifth decades of life.[8,21,27]

CAUSES AND RISK FACTORS

As was mentioned above, specific arm movements trigger ME development and are typical for some sports. Although disorder is termed as “golfer’s elbow”, it doesn’t occur only in golf players but also in other athletes who make the movements that stress the wrist and elbow joint e.g. rowers and players of baseball, tennis or bowling. Interestingly, 90% of ME cases are not at all sport-related but are diagnosed in some specific occupations. Work-related exposure criteria described in document which evaluate the work-relatedness of upper-extremity musculoskeletal disorders include: extreme flexion of the elbow, posture with extended elbows, posture with extreme pronation or supination of the elbow, high repetition of movements of the elbow, grasping or lifting of objects with high forces and/or combination of postures, movements and forces.[28] Other articles mention similar factors[19,21,24,29] and systematic review of the literature clarifies that ME is associated with handling objects greater than 5 kg for 2 hours per day, objects greater than 10 kg more than 10 times per day, and repetitive movements and vibrating tools for more than 2 hours per day.[30] Another one study suggest that even just bending/straightening elbow for more than one hour a day may contribute to ME occurrence.[22] Hence, the disorders occur among carpenters, bricklayers, hammerman’s, painters etc. but also among persons who type a lot.[14,31] Despite common belief that mainly repetitive work cause ME, some authors concluded that there is no direct link between this risk factor and the disease[19,21,32] unless repetition are combined with forceful activities or awkward posture.[21] Moreover, forceful work was noted to be even more closely related to the risk of ME than repetitive work.[19] Also a single traumatic event - like a violent contraction of the extensors when attempting extremal exertion, or a twisting injury-may contribute to the disorder.[8]

As might be expected, ME occurs more often in persons with other work-related upper-limb disorders, in particular, shoulder tendinitis, LE and carpal tunnel syndrome.[19] Among non-movement related factors, age 40 or older, smoking, obesity and psychological distress were described to be associated with ME development.[21,22]

SYMPTOMS

Although ME is not life-threatening and does not cause severe disability, it may be very bothersome in everyday life. The main and primary symptoms for ME are pain and tenderness. The pain can come on suddenly or gradually, be intermittent or persistent and localized at the inner side of the elbow, that is at muscle-tendon junction or at insertion points of the wrist flexors in the elbow region. Sometimes pain radiate distally to the forearm. It typically worsens with certain movements like forearm motion, gripping,

or throwing but may also occur at rest, especially in the acute phase.[7,33,34] Other symptoms include joint stiffness, weakness of hand and wrist and also numbness or tingling which may radiate into one or more fingers (usually the ring and little fingers) especially when concomitant ulnar neuropathy exists.[29,34,35] Initially the range of motion can be full, but in more chronic cases limitation of wrist extension and a flexion contracture may occurred.[36,37]

Symptoms are often provoked by the elbow and/or wrist flexion or grasping or lifting of objects (i.e. by supination and pronation movements of the forearm upon elbow extension).[35,38]

About three quarters of the patients are symptomatic in their dominant arms[8,9] but some research outcomes indicate on insignificant association between the side affected by ME and worker's handedness.[19]

DIAGNOSIS

The diagnosis of "golfer's elbow" is clinical and requires a careful medical interviewing of patient and physical examination. Radiographic and imaging studies are necessary rather to distinguish ME from other possible causes of medial elbow discomfort.[8,39]

Interview should apply to patients history and concern either repetitive elbow use, gripping, valgus stress or an acute traumatic blow.[40] It is estimated that about 30% of cases is associated with an acute injury, whereas 70% has a more insidious onset.[9] Information on the occurrence of symptoms and their duration must also be obtained.

According to case definitions criteria for upper-extremity musculoskeletal disorders which are based on symptoms and physical examination signs, ME may be recognizes if pain is at least intermittent, directly located around the medial epicondyle and activity dependent. Symptoms should be present at the time of testing or occur at least for four days during the last seven days. Clinical evaluation should reveal also local pain during ME test which is performed with patients elbow extended and fully supinated. The examiner puts one hand on the patients ventral side of the hand, stabilizes the elbow with other hand and asks patient to move hand to palmar flexion against resistance. Pain on resisted wrist flexion and pronation is the most sensitive physical exam finding.[18,35,41-43] Moreover, on physical examination, there may be swelling, erythema or warmth in acute cases, but chronic ME presents abnormalities rarely. The tenderness is induced by palpation over the five to ten millimeters distal and anterior to the medial epicondyle, especially near the CFT. Forearm pronation or forceful grip may be worse compared with that of the contralateral side and may provoke elbow pain.[31,44-46] When examining overhead athletes, it is important to evaluate for ulnar neuritis and ulnar collateral ligament instability, which may also coexist.[8] A provocative test to aid in the diagnosis is exacerbation of pain with resisted pronation of the forearm with wrist exion. A provocative test to aid in the diagnosis is exacerbation of pain with resisted pronation of the forearm with wrist exion.

In addition to above case definitions criteria and accompanying symptoms, Polk's tests may be employed to assess for ME. Seating patients has elbow flexed about 100° and forearm supinated. Examiner asks patient to grab and lift the object of approx. 2.5 kg. Pain on the medial epicondyle makes test positive.[43,47]

DIFFERENTIAL DIAGNOSIS

Diagnosis of ME may be clear on physical examination and history, however, it is rather uncommon disease with unspecific symptoms, so the entity can be confused with other sources of elbow pain[40,48] that were described below.

CUBITAL TUNNEL SYNDROME/ ULNAR NEURITIS

Cubital tunnel syndrome is the second most common compression neuropathy. The ulnar nerve courses behind the medial epicondyle so the pressure or stretching in this area may affect the shape of the cubital tunnel what cause a pain.[40] However, majority of patients report sensory loss as the first symptom. Numbness and tingling and/or weakness can also occur.[40,49]

Diagnosis of cubital tunnel syndrome may be facilitated with Tinel test which involves direct gentle compression over the nerve course at the elbow. Test is positive when sensation of tingling and paresthesias occurs.[24,40,41,44]

ULNAR COLLATERAL LIGAMENT INJURY

Injury to the medial collateral ligament (MCL) occurs mainly in athletes who throw overhead because the anterior part of the MCL is the primary restraint to valgus stress during overhead throwing. Disorder leads to valgus elbow instability and occurrence of pop sensation over the medial elbow.[41,50,51]

The most important test for MCL injury is valgus stress test called also elbow abduction stress test which involve palpating of the medial joint line of symptomatic elbow and contralateral side to compare them for laxity or instability against valgus forces. Valgus stress should be applied against an elbow flexed 20-30°, and then the amount of opening and the subjective quality of the end point is assessed. Test is positive when a firm end point is absent and joint space opens more than 3 mm or patient feels pain.[14,48] Injury of MCL may be also confirmed with positive result on moving valgus stress test or milking maneuver.[41,43] An ultrasonographic picture of MCL is presented in Figure 3.

CERVICAL RADICULOPATHY

Patients with neurologic disorders should also be examined for cervical radiculopathy, which is a dysfunction of a nerve root of the cervical spine. The C7and C6 cervical nerve roots are the most commonly affected. The typical symptoms of cervical radiculopathy are neck and arm discomfort of insidious onset but also sensory changes along the involved nerve root dermatome, including tingling, numbness or loss of sensation may be present. Confirmation of cervical radiculopathy may be possible with the foraminal compression test (or Spurling test). It is performed by applying downward pressure on the head of patient who has the neck extended and the head rotated. The test is positive if pain radiates into the limb ipsilateral to the side to which

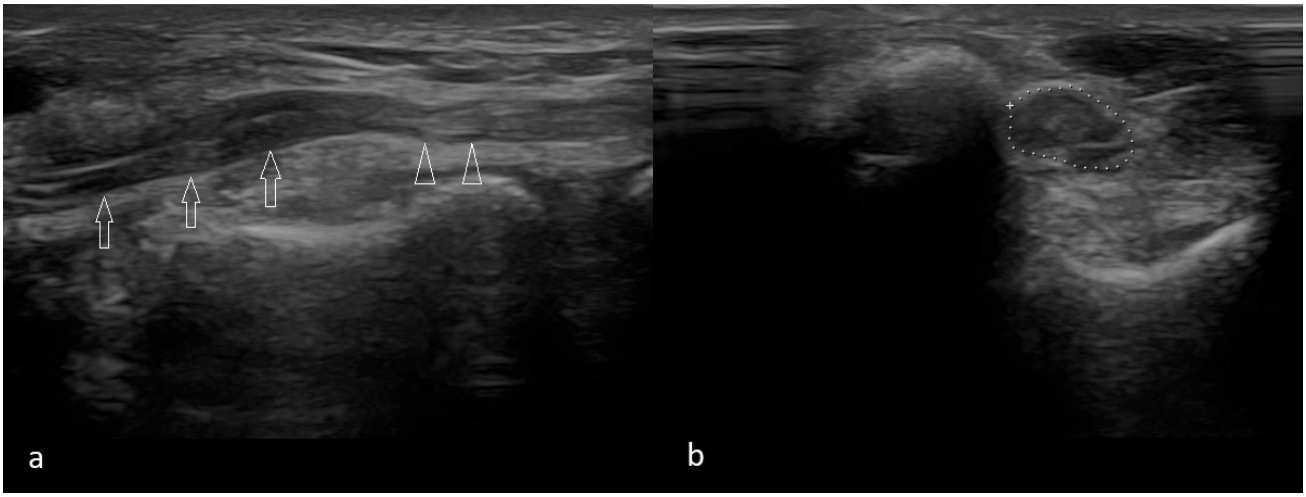

Figure 2. Ulnar nerve neuropathy, a - long axis view, arrows - swollen part of the ulnar nerve, arrow heads - narrowed part of the nerve, b - short axis view, dotted area - swollen part of the nerve.

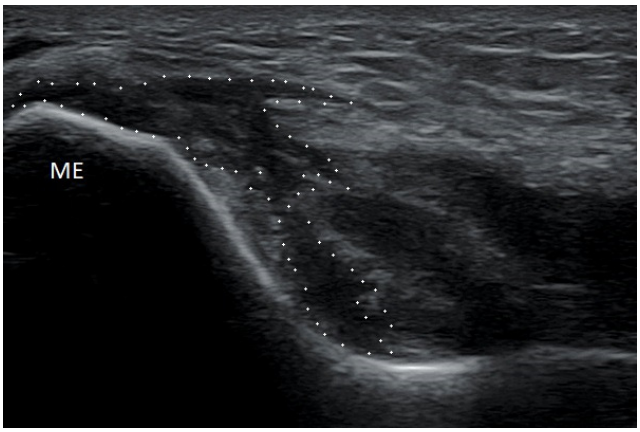

Figure 3. Post-traumatic scarrifications in the CFT attachment and in within the medial collateral humero-ulnar ligament – dotted area, ME – medial epicondyle.

the head is rotated. As C6 and C7 radiculopathy leads to muscle weakness, it may predispose to ME development.[52, 53]

GANGLION CYST

Another cause of elbow pain may be ganglion cyst which is a benign soft tissue swellings. It is rather unusual lesions which typically arise from the ulnohumeral joint capsule. The etiology of ganglia remain unclear, but degenerative changes at the joint and repeated minor trauma seems to be a favorable factor.[54] As the ganglion may mimics epicondylitis or cubital tunnel syndrome, an incorrect diagnosis may be made. Therefore, ultrasonographic evaluation or magnetic resonance imaging (MRI) may be particularly helpful in proper evaluation of pain source.[55-57]

IMAGING DIAGNOSTICS

In some cases radiographic or imaging studies may be necessary to help distinguish causes of medial elbow pain.

RADIOGRAPHY

Plain radiographs of the elbow in ME patients are usually normal, however it may demonstrate sclerotic changes in chronic cases and collateral ligament calcification in throwing athletes. A lateral X-ray is also useful to eliminate alternate diagnoses including medial epicondyle fracture, elbow arthritis, and deformity.[7,29]

ULTRASONOGRAPHY

Ultrasonography (USG) is not essential to diagnose ME because in majority of cases it demonstrate normal findings, however in up to 25% USG may help in diagnosis. It was showed that a sonogram performed by a professionals may have sensitivity, specificity, and positive and negative predictive values over 90% for diagnosis of ME, but it is noteworthy that diagnostic efficacy of ultrasonography is highly dependent on the operator's experience.[7,24,58]

Nevertheless, in each case the technique is crucial. Proper imaging can be obtained if the tested limb is in flexion to 90 degrees and the forearm is in intermediate rotation. The probe should be positioned along the long axis of the forearm in such a way that it lies slightly on the humeral medial epicondyle. By rotating the probe 90 degrees a cross-section can visualized. A normal flexor attachment has a typical fibrous structure, intermediate echogenicity, and uniform thickness.

In patients with ME, USG may show thickening and heterogeneity of the common extensor tendon as well as hypoechoic or anechoic areas of focal tendon degeneration (Fig. 4).

With more advanced tendinopathy, ruptures and evidence of calcification of the CFT (Fig. 5) or MCL, may be observed.

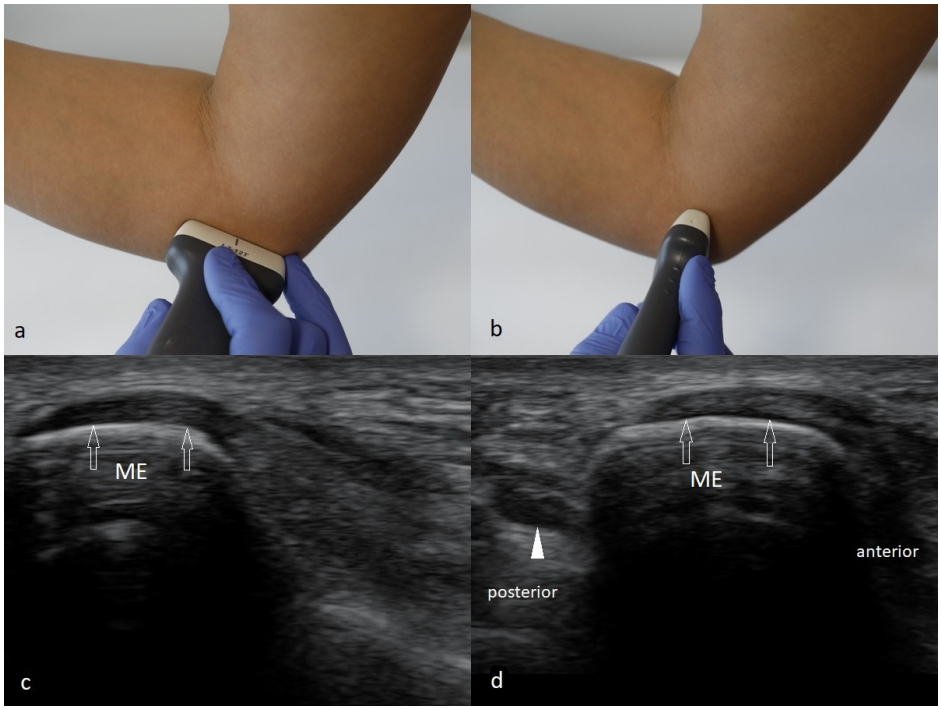

Figure 4. Position of the probe to obtain a CFT image in longitudinal (a) and transverse (b) sections and a correct ultrasound image of CFT in longitudinal (c) and transverse (d) sections; ME - medial epicondyle, open arrows - CFT, white arrow head - median nerve.

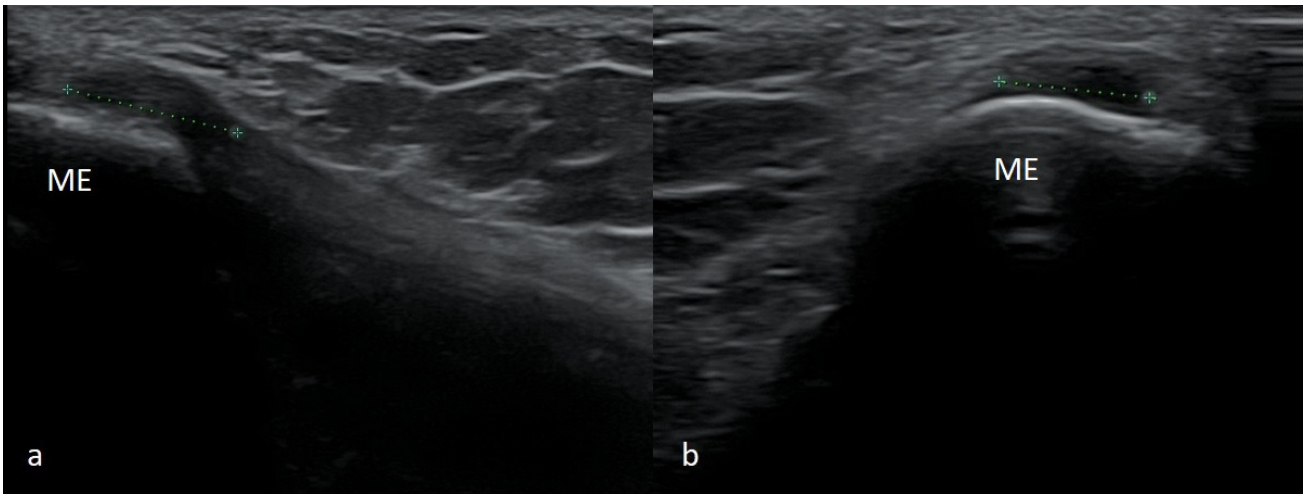

Figure 5. A case of a simple enthesopathy, visible thickening, decreased echogenicity and segmental disappearance of the typical filamentous echostructure.

Ultrasound can also be used during guided injections or tissue modulation and can help assess response to therapy.[14,45,59] Recently, a power Doppler has been applied in epicondylitis management and has high diagnostic accuracy of this examination in tennis elbow was observed.[60] In musculoskeletal studies ultrasound elastography (USE) is increasingly being used.

It is an imaging technology sensitive to tissue stiffness so this technique may be helpful in epicondylitis diagnosis hence increased compressibility is characteristics for this disorder.[59,61] However, usage of USE as a routine test requires further studies and standardization of the technique.

MAGNETIC RESONANCE IMAGING

Noncontrast magnetic resonance imaging (MRI) appears to be the investigation of choice for radiologic detection of ME but usually is performed if the clinical picture of disease is unclear. On T1- and T2-weighted sequences, thickening of the CFT (from intermediate to high) is indication of ME.[62] An increased signal intensity on the T2-weighted images in the CFT area and paratendinous edema are the most characteristic findings.[63] Noncontrast MRI is effective also for detecting pathologic change in the tendon like MCL.[24]

TREATMENT

The aim of ME managing is to relieve acute symptoms, rehabilitate the pathologic tendon and prevent disease recurrence what may be achieved with various non-surgical and surgical treatment options.[24] Due to similar pathophysiology of ME and LE, treatment options for both entities are analogous. However, higher prevalence of LE caused that great majority of studies assessing efficacy of different therapies regarded to this disease.

NON-OPERATIVE TREATMENT

ACTIVITY MODIFICATION

The basic of any therapy is modification of activities and avoiding affected arm movements that cause pain. Ice pack application on affected area may also be helpful.

ORTHOSES/ BRACES

Relief may be obtained with wearing a brace that reduce tendon and muscle strain on affecting arm. The typical brace is inelastic, non-articular proximal forearm strap and should be worn for about 6 weeks.[64] The use of counterforce brace was shown to reduce pain and improve elbow function. However, as an orthosis compresses the extensors slightly distal to the affected area, it may shorten the muscles by excluding the affected segment.[65,66]

PHYSICAL THERAPY

Exercises and massages are focused on stretching and vascularization of the CFT. They should result in strengthening and restoration of the muscle-tendon.[7,34] However, the type of exercises matters - eccentric exercise may be helpful,[67] but isometric exercises seems to be no more effective than ice therapy.[68] It is difficult to definitely evaluate effectiveness of physiotherapy in ME treatment as studies have different design and unconclusive results.[69] To sum them up it is noteworthy to cite outcomes of recent systematic reviews and meta-analysis that showed statistical and clinical outcomes improvement after physical therapy in patients with epicondylitis[70] and superiority of manual therapy and strength training over shock waves, orthoses or high intensity laser.[71]

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS

Although ME is not an inflammatory disorder, the usage of nonsteroidal anti-inflammatory drugs (NSAIDs) may be helpful. It was estimated that such conservative treatment alleviate symptoms in 88-96% of cases of ME and are particularly effective in reducing the synovitis associated with flexor-pronator tendon degeneration.[72] These pharmaceuticals may be applied orally or topically and both approaches showed short-term efficacy.[73] Recently, it has been demonstrated that NSAIDs combined with kinesio taping in patients with LE effectively decrease pain and improve ultrasonographic parameters like thickness of common extensor tendon and radial nerve cross sectional area.[74]

LOCAL INJECTIONS

CORTICOSTEROIDS

Injections of corticosteroids are the most common applied form of therapy for epicondylitis.[75] They possess an anti-inflammatory properties and when injected into the peritendinous and synovial tissues may reduce pain and improve arm function, although their mechanism of action remains uncertain.[44,76,77] A lot of studies demonstrated that corticosteroid injections provide significant pain relief but this effect is restricted only to short period of time (< 8 weeks).[78-81] Long term effects of this therapy were rather unsatisfactory and even worse than in case of saline injections or no treatment.[79,82,83] Besides, repeated corticosteroids injections may lead to the iatrogenic tendon rupture and muscle atrophy.[84]

PLATELET-RICH PLASMA

The second commonly injected substance is platelet-rich plasma (PRP). This is an autologous preparation of whole blood which was filtered to obtain a fraction of plasma containing high level of platelets. They contain different growth and differentiation factors that play a role in tissue healing.[85] Treatment with PRP relief pain, improves recovery of structure and function in epicondylitis patients, but also has a positive effect on quality of life during recovery process.[86,87] It was suggested that higher platelet counts with leukocytes and a slightly acidic pH injection is optimal for triggering healing of tendons.[88] Effects of PRP therapy do not appear immediately but they seem to be long-lasting. Result of studies concerning PRP efficacy are divergent – from suggestion that PRP may be alternative for surgery[70] to conclusion that PRP is not superior than saline injection.[89] Although, it seems that most of studies indicate on long-term improvement with PRP injections in patients with epicondylitis.[90-92]

CORTICOSTEROIDS VS. PRP

Trying to compare efficacy of corticosteroid and PRP injections, it should be emphasized that corticosteroids provide rapid therapeutic effect but it is observed in short follow-up. In turn, improvement after PRP administration occur later but lasts for a longer period of time.[79,82,90-93] Systematic review revealed that corticosteroid injections in comparison with PRP led to more significant decrease in Doppler activity and tendon thickness but they increase the number of patients with cortical erosion.[82]

TECHNIQUE OF INJECTIONS

Regardless of the substance being injected, the technique of injection is crucial for therapy effectiveness. Before corticosteroids injection, the point of maximal tenderness should be palpated over the medial epicondyle and marked. Then, the needle should be inserted directly down to the level of bone and pulled back 1 to 2 mm before solution in-

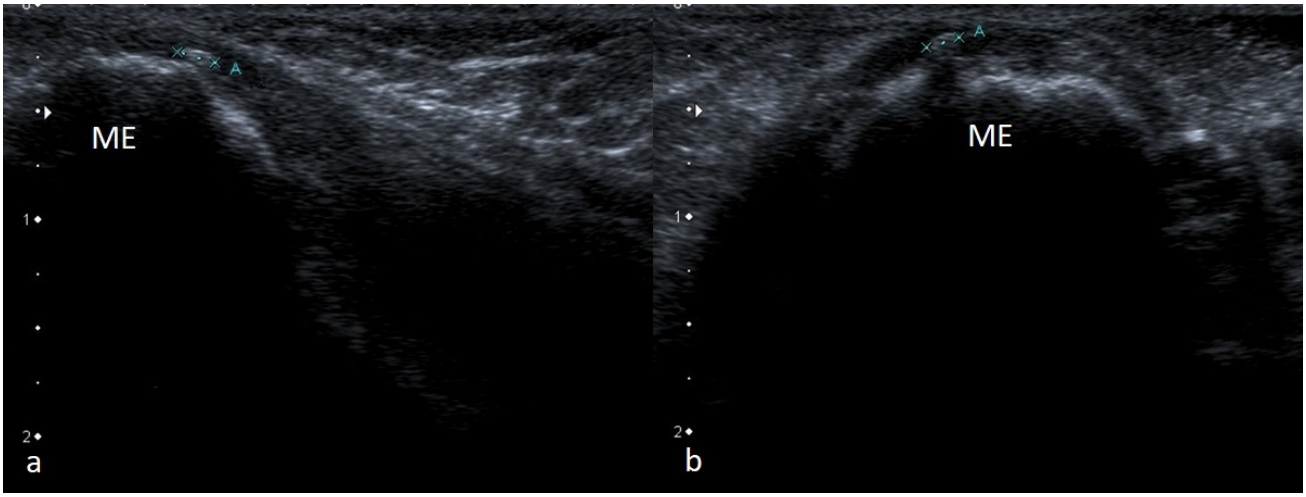

Figure 6. A case of advanced enthesopathy with formation of calcifications due to damage to the CFT structure, a. longitudinal image view, b. transverse image view. ME – medial epicondyle.

jection. Usually a mixture of local anesthetic and steroid is injected. The PRP, collagen or HA also should be injected into the most affected area, however they are administered without anesthetic addition. In all cases an antiseptic technique should be applied and after injection, the wrist extensors or flexors should be stressed to injected solution may circulate properly.[94]

The use of ultrasound to guide the injections is thought to improve the outcome of the autologous blood injections,[95] however some studies indicate that ultrasound-guided injection has no better outcomes than a palpation-guided injection of corticosteroids.[96,97] Image of ultrasound-guided injection is presented on Figure 6.

Different routes of drug delivery using in-plane and out-of-plane techniques are possible, the in-plane procedure seems to be more beneficial. In-plane coronal approach involves placing the probe longitudinally with the proximal end of the transducer over the medial epicondyle. When medial epicondyle and the proximal attachments of the CFT are identified they should be marked as well as obvious vessels. The needle should be inserted parallel to the transducer from distal to proximal or conversely but not too posterior to avoid the ulnar nerve damage. When corticosteroids are injected, attention should be paid to avoid superficial administration as it can cause subcutaneous atrophy or depigmentation.[98]

DRY NEEDLING (DN)

Dry needling (DN) also may be used in treatment of epicondylitis as insertion of a needle alone is supposed to exert therapeutic effects. The explanation of this effect might be increase in the blood supply and thus oxygenation in affected area that lead to a healing response.[75] This procedure showed superiority in pain and function improvement over NSDAis and bracing.[99] It was demonstrated that even one session of DN may improve pain and disability.[100] Dry needling is not associated with major complications and may be even more effective than corticosteroids injections, especially in longer follow-up.[99-101]

EXTRACORPOREAL SHOCK-WAVE THERAPY (ESWT)

The extracorporeal shock wave therapy (ESWT) is one of the most common electrotherapeutic modalities recommended for tendinopathy. This technique is based on acoustic waves that are focused on targeted body site. Shock waves are supposed to cause a controlled microtrauma that triggers the body's natural healing process involving improvement of tissue regeneration, decrease in calcification and inhibition of pain receptors, although exact mechanism of its action is not described in details. This method should not be applied for acute epicondylitis but is recommended for patients when symptoms lasting for more than six months or when other treatment options are ineffective.[15,102,103] Results of recent systematic review and meta-analysis indicate that ESWT can effectively relieve the pain and functional impairment in LE, but authors points that quantity and quality of data were poor.[103] However, the second recent meta-analysis demonstrated that although ESWT does not reduce overall pain, it made more people obtain 50% pain reduction.[104]

OPERATIVE TREATMENT

Operative interventions are typically reserved for patients in whom non-surgical treatment fails, that is if symptoms persist despite at least 3-6 months of conservative treatment.[24,105,106] Higher probability of subsequent surgical treatment seems to concern patients obese (BMI > 30) and over 65 years as they are at risk of therapeutic injection failure.[107]

There are a few options of surgical techniques used in ME treatment, however the most common are open techniques which consists of: skin incision, excision of the pathologic tendon fragment, enhancement of local vascularity to promote a healing, reattachment of elevated tendon origin back to the epicondyle, repair of the resultant defect, and – if needed - management of concurrent ulnar nerve or ULC pathology.[8]

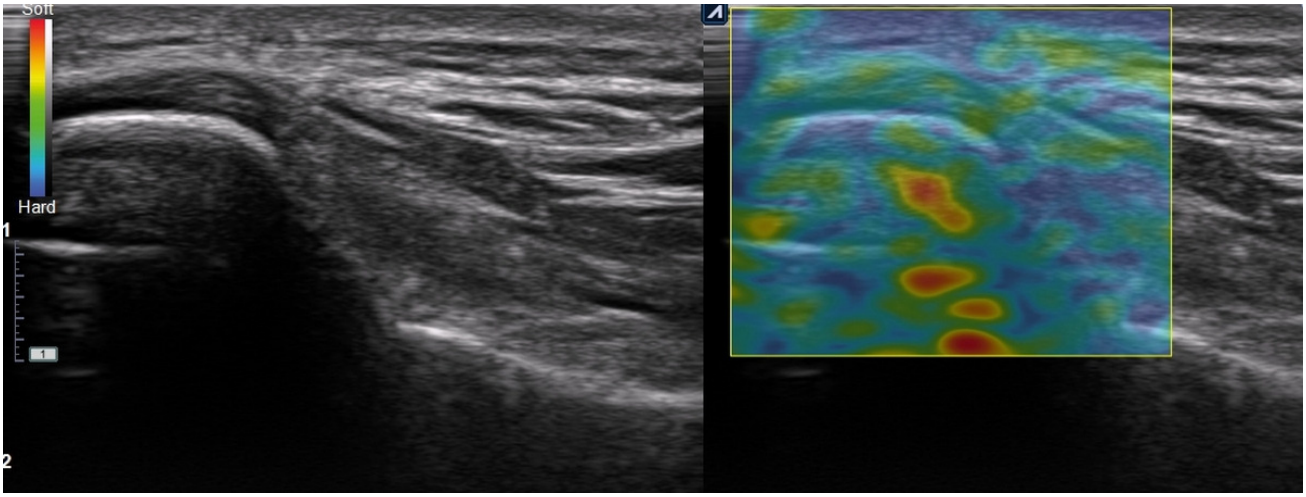

Figure 7. CFT. On the left a 2d, B-mode view, on the right an elastographic image.

One of technique modality involves open debridement of the common tendon, with or without microfracture of the medial epicondyle, and either side-to-side tendon repair or reattachment of the common tendon to the medial epicondyle.[44,108] More recent techniques concern repair of the CFT to the medial epicondyle with use suture or anchors or transosseous sutures.[108,109] Another ones involve making a mini-open muscle resection of the common flexor mass and microfracture of the medial epicondyle without reattachment of the tendon. Then closure of the fascia is performed to create an enclosed hematoma to promote healing.[108,109]

Generally, open techniques allow the surgeon to perform additional procedures when needed but - above all - they also allow to identify and protect the ulnar nerve. In turn, risk of iatrogenic injury of MCL and the ulnar nerve due to close location the medial epicondyle make arthroscopic approach usually not recommended in ME surgical management.[40,43,105,109]

Postoperatively, the arm should be immobilized via a splint or sling for up to two weeks and then return to activities of daily living is advised. Strengthening exercises may begin minimum six months after surgery, and eventual return to full activity or sport may take place after three -six months.[24]

A new treatment approach proposed as an alternative treatment to surgical intervention for epicondylitis is an ultrasound-guided percutaneous needle tenotomy (PCNT) for treating tendinopathy called the TENEX. This procedure involves minimally invasive, ultrasound-guided removal of scar tissue in the region of the tendon pain and showed efficacy in treatment both lateral and medial epicondylitis even with long-term follow-up for 3 years.[110,111]

CONCLUSIONS

Although ME, commonly known as “golfer’s elbow” is not a frequent disease, it is worth to know its specificity, because it is not quite as it may seem. ME is not reserved for golf players only and for other athletes hence it is found much more often in patients working in specific occupational settings. The work-related risk factors include extreme elbow flexion or extension, pronation or supination, and also lifting of objects with high forces and/or combination of mentioned.

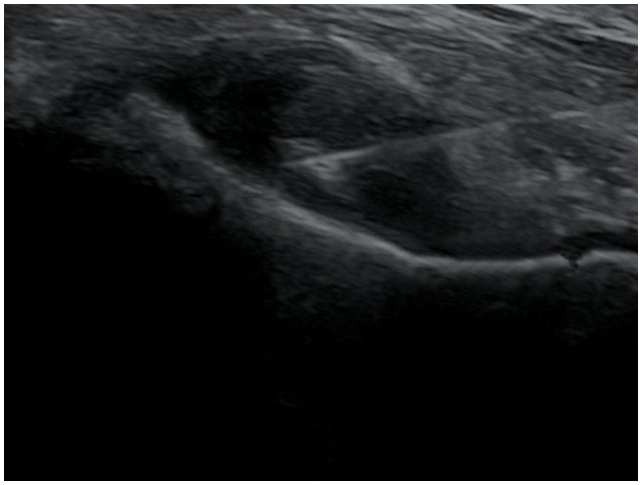

Figure 8. Injection of medial epicondylitis.

Also belief that mainly repetitive work cause ME was negated. It turned out that forceful work may have even greater impact on ME development than repetitive motions which are thought to be associated with the disease only when combined with forceful activities or awkward posture.

Regarding to the nature of the ME, it might be supposed that the underlying cause of the "epicondylitisis the inflammatory process. However, it was proved by the results of histological research that ME involves degenerative changes at the CFT.

In treatment of ME different approaches - especially nonoperative - may be applied, however their effectiveness may be not as high as it is expected hence this issue should be verified in further studies.

Summing up, it can be concluded that although ME seems to be rare and inconspicuous disease, it may cause difficulties in diagnostic-therapeutic process due to its specific nature. For this reason, it would be reasonable to de-

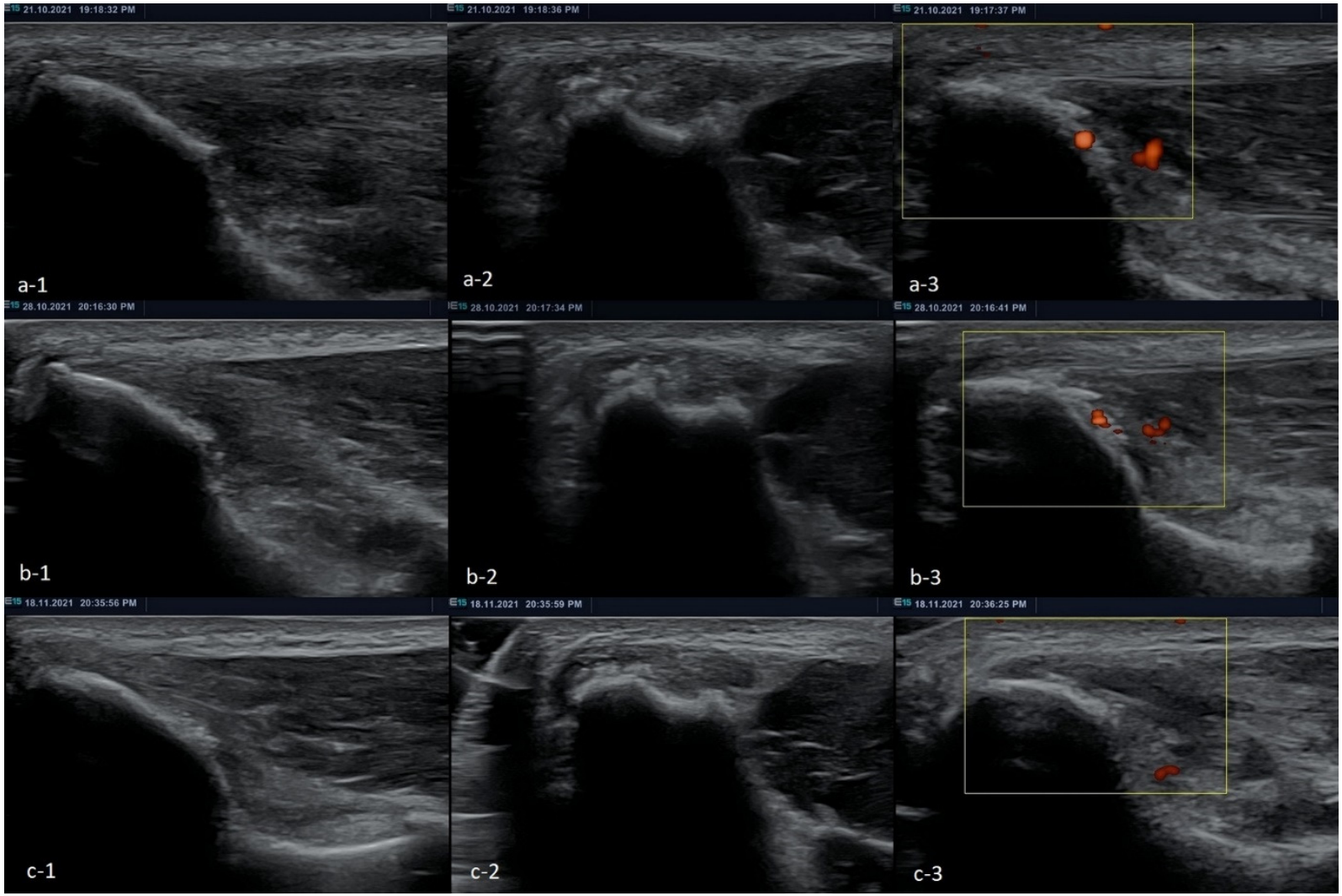

Figure 9. A case of CFT enthesopathy treated with a single PRP injection, in each section 1-3, on image 1 -longitudinal, 2- transvers, 3 – power Doppler scans are posted, series a – just before injection – 1,2 - the CFT attachment has reduced echogenicity, it is slightly thickened (well seen on a-2 scan), a pour fibrous echostructure is visible, in the power Doppler mode, a single vessels are visible, which can be considered normal; b – a week after injection, 1,2 a reduction in the size of the hypoechoic area is seen, and enhanced second-degree vascularization is observed in the power Doppler mode; c - 4 weeks after injection, 1,2 - reduction of hypoechoic area is visible, the fibrillary echostructure of the attachment begins to renew, the features of increased vascularization disappeared in the power Dopler mode.

velop clear guidelines for the diagnosis and treatment of "golfer's elbow" based on current knowledge and newest research results.

ETHICAL STATEMENT

The article does not contain a description of tests and experiments on animals. The patients were informed that data from the research would be submitted for publication, and gave their consent.

CONFLICT OF INTEREST

None

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