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João Pedro Ferreira Andrade

**Epicondylitis, a literature review of the new
treatment models / Epicondilite - revisão
bibliográfica sobre os novos modelos de
tratamento**

março, 2017

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Ortopedia e Traumatologia

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Epicomyelitis, a literature review of the new treatment models

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DEDICATÓRIA

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Epicondylitis, a literature review of the new treatment models

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Brevis title to page footer: Epicondylitis, new treatment models

ABSTRACT

Aim: Review the state of art on epicondylitis treatment and access the best management approach, focusing in the new promising treatments.

Materials and methods: A research was performed on PubMed / MEDLINE Database including systematic reviews and clinical trials published between 2011 and 2016, using MeSH terms: "Tennis Elbow", "Tennis Elbow/ surgery ", "Tennis Elbow/ therapy ", "Tennis Elbow/ drug therapy ", "Tennis Elbow/ rehabilitation " .

Results: The first approach on epicondylitis treatment is conservative with rest and activity modification, nonsteroidal anti-inflammatory drugs, bracing, physical therapy and kinesio taping therapy. In refractory cases, injection therapy and surgical intervention may be indicated. Despite its controversy, corticoidsteroid injection is still widely used when conservative treatment fails. Recent studies, are focusing on the potential use of growth factors as stimulant for tendon regeneration leading to the new promising injection therapies like autologous blood and platelet-rich plasma injections. Other promising therapies, namely, injection of botulinum toxin A, glycosaminoglycan and polidacanol are also being studied with still few long-term follow up studies proving their efficacy. Some pilot studies are also studying the possible use of stem cells on epicondylitis treatment.

Conclusion: For the past 5 years, several studies have evaluated the effectiveness of different epicondylitis therapies and tried to describe a consensual treatment algorithm. Despite the abundance of studies, it still does not exist a globally accepted treatment algorithm. Whatsoever, a first approach consisting on a conservative treatment with rest and activity modification, physical therapy, nonsteroidal anti-inflammatory drugs and kinesio taping therapy seems to be consensual. The use of biological substances like autologous blood and platelet-rich plasma injection achieves good results and are indicated in refractory cases. Alternatively, corticoidsteroid injections can be used, with a positive short-term response but is associated with a high rate of recurrence and augmented tendon

degeneration. As last resource, surgical intervention is indicated and is associated with a high rate of success with no significant differences between the various surgical techniques. Regardless these promising therapies for epicondylitis, continued research and randomized clinical trials are needed to enable determination of a consensual and globally accepted treatment algorithm.

INTRODUCTION

Epicondylitis, more frequently known as “tennis elbow” is a prevalent disease in general community and is usually self-limited in time. However, it can cause functional impairment, often associated with high morbidity leading to absence of work because of the pain and discomfort on the upper limb. ¹

The pathophysiology of the disease is not well understood. Initially, it was described to be a persistent inflammatory state, however actually it is considered a degenerative disease associated to overuse, resulting from microtraumas at the common extensor tendon originating from the epicondyle, specifically the tendon of origin of the extensor carpi radialis brevis (ECRB), and, in some cases, the extensor carpi radialis longus (ECRL) and extensor digitorum communis (EDC). The microtraumas result from repetitive contractions at the ECRB tendon with wrist extension and forearm supination and pronation, that may lead to micro tears, degeneration and tendinosis associated with an abnormal microvascular response. A very common cause is found in tennis players that undergo eccentric contractions of the ECRB during backhand tennis swing.^{2, 3} Histologic findings support the thesis of a degenerative etiology, with the observation of lesions described as “angiofibroblastic hyperplasia” tendinosis by Nirchl, that implies failure of natural tendon repair mechanism, rather than acute inflammation.⁴

This condition has a world prevalence of 1 to 3%, affecting more frequently patient from 35 to 55 years, with equal gender distribution. Some studies, shown an annual incidence of 4

to 7 per 1000 inhabitants.^{5,6} Among tennis players the prevalence can achieve 14,1 % with an overall incidence of 35%.⁷ Nonetheless, the nomenclature “tennis elbow”, the majority of the patients are not tennis players, but subjects that are manual workers.⁶

The diagnosis is generally clinical, consisting of pain and tenderness in the lateral region of the elbow at the epicondyle site, extending to dorsum of forearm and impaired function with weakness in grip strength. Pain is usually insidious with a sharp character.^{2,6} Symptoms may last from 6 months to 2 years, despite the majority of patients being total recovered within 12 months with “wait and see” approach.^{8,9} Ultrasound (US) has been used on diagnosis and follow-up, permitting the evaluation of the degenerated tissue.¹⁰ Radiologic evaluation may reveal pathologic findings with calcifications on the tendon being present in about 25% of patients, mainly due to previous corticosteroids injections.¹¹

Epicondylitis treatment is still controversial. The first approach is usually conservative, and includes rest and activity modification, nonsteroidal anti-inflammatory drugs (NSAID), bracing and physical therapy. In refractory cases, normally described as recalcitrant epicondylitis, injection therapy and surgical intervention may be indicated.^{2,8}

Despite being a prevalent disease little consensus exists on an exact treatment algorithm, therefore I am in this review to access actual state of art on epicondylitis treatment and to access the best management approach, focusing in the new promising treatments.

MATERIALS and METHODS

This literature review analyzes systematic reviews and clinical trials that contain information related to epicondylitis and its treatment in the last 5 years.

A search for articles published between 2011 and 2016, written in English was performed in the PubMed / MEDLINE database, using a MeSH term: "Tennis Elbow", "Tennis Elbow/ surgery ", "Tennis Elbow/ therapy ", "Tennis Elbow/ drug therapy ", "Tennis Elbow/

rehabilitation “. Comprehensive Keywords *Lateral epicondylitis, autologous blood injection, rich platelet-derived plasma* and *surgical treatment* were also used. Other reference articles in the Epicondylitis literature were also included.

The articles were first selected by the titles and abstracts. In a second phase, the complete article was read and the information to be included in this literature review was extracted.

EPICONDYLIYIS MANAGEMENT

Traditionally, the first approach for epicondylitis management consists of conservative treatment with a “wait and see” strategy, rest and activity modification. About 90% of patients will report improvement in 1 year of symptoms, nonetheless only 34% will account to full recovery at 12 months follow up.¹²

Initially, NSAID can be given for pain relieve. In this phase, other conservative treatments, namely physiotherapy, bracing and extracorporeal shockwave therapy, are possible.

In recalcitrant epicondylitis, minimally invasive techniques are often used, being the most widely used the corticosteroid injection. In the last years, new promising therapies are focusing on the potential use of growth factors as stimulants for tendon repair and new injectable substances, namely botulinum toxin, autologous blood, platelet-rich plasma, polidacanol, glycosaminoglycan and prolotherapy are being described.¹³

Surgery is usually the last resource for treatment. It is estimated that, only 4% to 11% of patients will need surgical treatment. It appears to be a consensus that surgery is indicated and achieves good results on patients with persisting pain, refractory to non-operative treatment for at least 6 months.^{5, 14-16}

1. CONSERVATIVE TREATMENT – NON INVASIVE TECHNIQUES

1.1 WAIT AND SEE APPROACH

Epicondylitis is commonly a self-limited disease with a duration between 6-24 months, so the majority of the cases will reveal improvement on pain and grip strength parameters with an educational approach to avoid potential harmful movements of forearm and rest.⁶

1.2 NSAID

Oral or topical NSAID may improve pain in short term (first 4 weeks), with diclofenac being the most used. However, limited evidence exists on long-term effectiveness, with some long follow-up studies not regarding any improvement on pain and grip strength.^{5, 17}

1.3 PHYSIOTHERAPY (Exercises programs, manual therapy and manipulation)

Exercises programs, with highlight on eccentric isotonic exercises¹⁸ have been used in epicondylitis treatment as adjuvant therapy with significant improvements that may allow faster recovery and return to daily-living activities and sports.^{19, 20}

Manual therapy and manipulation of elbow and wrist are also being linked to a beneficial analgesic effect, that permit more vigorous exercises, resulting in improvement of pain and other functional parameters.

Nonetheless, exercises programs and manual manipulation did not achieve a positive response when they are prescript alone and not as an adjuvant therapy.²¹⁻²³

1.4 BRACING

Counterforce braces are supposed to reduce the level of tension on forearm extensors and, therefore facilitate the healing of degenerated tissue. Several studies have achieved positive results with this therapy with pain and grip strength improvements when associated with other complementary therapy.^{5, 21}

1.5 KINESIO TAPING THERAPY (KTT)

Kinesio taping therapy (KTT) technique is used on musculoskeletal sport-related diseases with satisfying results concerning to pain relief, muscle strength and functional movements restoration.

The beneficial effect of KTT is thought to be related with dispersion and decompression of the stress generated by the muscle contraction and nociceptors inhibition that leads to reduction of painful inhibition and improves strength contraction.²⁴

Some recent studies have showed the potential positive effect of KTT on epicondylitis treatment when tape is applied by muscle technique from origin to insertion, leading to pain and grip strength parameters improvement. Whatsoever, few literature exists and more studies are need to prove exact efficacy of this technique on epicondylitis. ^{24, 25}

1.6 EXTRACORPOREAL SHOCKWAVE THERAPY (ESWT)

ESTW is defined as a transient oscillation pressure locally applied and propagating on the targeted tissue, favoring tissue regeneration by inhibiting inflammatory response and promoting angiogenesis.²⁶ Despite this therapy being widely used on sport related musculoskeletal tendinopathies, controversy exists, regarding its effectiveness with ESWT being associated with opposite results in different studies, since no effect at all to significant pain and grip improvement results, although US findings did not alter. The abysmal differences between studies are probably due to different treatment regime with 4-10 weekly session being linked to better results. However, more studies are needed to determine exact optimal regime.^{10, 27, 28}

2. MINIMAL INVASION THECNQUES – INJECTION THERAPIES

2.1 CORTICOIDSTERIODS INJECTIONS (CSI)

Since the description of epicondylitis, corticosteroids, specially hydrocortisone, have been widely used with controversial results. This treatment was initially introduced, as epicondylitis was thought to be an inflammatory disease. Today, the possible beneficial effects of CSI are attributed to an analgesic effect by inhibiting pain-modulating neurotransmitters. CSI have been consistently linked to a beneficial response in pain and grip strength in a short-term. However, on long term, several studies showed no evidence of effectiveness and in some cases, CSI were associated with harmful effects.^{5,8,29}

CSI have numerous lateral effects, including, skin atrophy and pigmentation, tendon atrophy and rupture, resulting in aggravated tendon degeneration.²⁹ Nevertheless, these complications are rare and CSI can be used with relatively safety rate.

Controversy also exists, on proper location, technique, type and volume of corticosteroid for injection. Some studies show that peppering technique versus single shot injection, achieves better results, by stimulating local blood flow.⁸ Most studies indicate maximum tenderness point, as being the best site to injection.¹³

3. OTHER LOCAL TENDON INJECTIONS

Alternative, less studied local tendon injection therapies have been described, with poorer results compared with corticosteroids and biological injections.

3.1 BOTULINUM TOXIN A

This substance can induce paralysis of extensor muscular group, reducing the resting tone of the muscles and preventing the continuous microtraumas, thereby permitting the degenerated tissues to auto-repair. This procedure has been proven to decrease pain intensity without a negative effect on grip strength, however lateral effects are usually

present with patients often reporting weakness in extension of wrist and fingers, especially the 3th, that may be not tolerated by certain patients.^{13, 30, 31}

3.2 GLYCOSAMINOGLYCAN - HYALURONIC ACID

Glycosaminoglycan have been studied has possible treatment for epicondylitis. Hyaluronic acid, is a heavy weight glycosaminoglycan, that is present in synovial joints fluid and is used on knee osteoarthritis treatment with satisfying results. Some studies have also showed the effect of this substance on epicondylitis, achieving a positive clinical response with a safety profile. However, long follow-up studies determining its long term efficacy still not exist. ^{32,}

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3.3 POLIDOCANOL

Polidocanol is a sclerosing and a local anesthetic agent, used in varicose veins. It is being recently applied in epicondylitis treatment with some studies revealing modest results, with pain recovery being similar to placebo. Although some improvement in tendon thickness, echogenicity and hyperemia has been proved.

At this point it is not possible to recommend polidacanol for epicondylitis management as more studies are needed to access better comprehension on polidacanol effectiveness.^{13, 34}

3.4 PROLOTHERAPY

Prolotherapy induces tissue regeneration by local injection of an irritant solution. This will produce an augment cells growth, promoting the tissue healing. Most used solutions are hypertonic dextrose and morrhuate sodium. Some studies have proved the beneficial effect of this technique, with a clinically significant reduction on pain compared to placebo and US evidence of healing on a short term. ³⁵ Others studies concluded that prolotherapy were only effective as adjuvant therapy,³⁶ so more studies are needed to confirm effectiveness of prolotherapy on long term follow up.

4. PROMISING BIOLOGICAL INJECTIONS

4.1 AUTOLOGOUS BLOOD INJECTION (ABI) and PLATELET RICH PLASMA INJECTION (PRP)

The role of mitomorphogenic factors of blood in the healing of degenerated tendon are the basis for the development of ABI and PRP injections.³⁷ It is hypothesized that these biological substances will induce angiogenesis, increase growth factors expression and recruitment and proliferation of cells implicated in regeneration, mainly because of platelet factors effects.^{1,38} This changes will provide the required cellular and humoral environment to induce a healing cascade and subsequent vascularization and regeneration of the tendon.³⁹ Theoretically, PRP will have a better clinical response, since concentration of platelets are higher in this modality.¹⁶

The solution of ABI is acquired by collecting peripheral venous blood on the ipsilateral arm. For PRP the collected blood must be centrifuged to obtain an augmented platelet concentration solution. A variation of ABI and PRP, called autologous conditioned plasma (ACP) with an intermediary concentration of platelets can also be obtained by centrifugation process.⁴⁰ Finally, the solution is injected at the epicondyle in the maximal tenderness point.¹

The injection procedure should be guided by US placed longitudinally, parallel to the common tendon. The needle then should advance longitudinally until attach bone contact. Then the solution should be injected from 3-4 passages, so solution range superficial, medium and deep fibers using peppering technique. Some authors recommend prior injection of lidocaine for analgesic effect.^{29,38}

After injection, local pain can exist and should be controlled with paracetamol and cryotherapy. NSAID and other anti-inflammatory are not recommended as it may interfere

with platelet function.^{1, 29} Some authors also recommend using a brace for a brief time, usually 1 week, 2 cm below the maximal tenderness point.^{37, 38}

4.2 STEM CELLS THERAPY

In the last years there has been an increase enthusiasm on stem cells application in multiple musculoskeletal diseases. These cells are proved to promote cells differentiation and regeneration and reduce tissue inflammation.

Thereby, utilization of stem cells on epicondylitis is being studied, with some pilot studies showing some promising outcomes, comparable to those on PRP therapy in pain, functional impairment and tissue regeneration patterns. However, larger and longer follow up studies are needed to prove stem cells efficacy and safety profile.⁴¹⁻⁴³

5. SURGICAL INTERVENTION

Surgical management of epicondylitis was first described by Nirschl and Petrone in 1973 with an open procedure that was linked to an 97,7% improvement rate and able patients to return to sports in 85,2% of the cases.⁴⁴ Later studies did not achieve such excellent results but achieved good outcomes.

Open, arthroscopic and percutaneous approaches have been described. The surgical procedures focus on ERCB release and/or debridement, epicondyle denervation, decortication of epicondyle and anconeus flap. These procedures have been tried alone or combined with similar results, existing a consensus on effectiveness of the different surgical approaches in 6-month long recalcitrant epicondylitis.⁴⁵⁻⁴⁸

5.1 OPEN APROACH

Since 1973, Nirshl procedure is being used with little variations from the original technique. It consists of an oblique incision anterior to epicondyle, separation of ERCL and EDC, with posterior visualization of ERCB under EDC tendon. Debridement of the degenerative tissue

and release of ERCB tendon from its insertion in epicondyle. Degenerative tissue in EDC tendon should also be debrided. Finally, ERCL and EDC tendons must be sutured and the wound closed. Two of the most common variations to this technique are the addition of epicondyle decortications and anconeus muscle transfer to cover the tendon when extensive debridement is made.^{44, 46, 49}

The key element for surgery success is the complete withdraw of the degenerated tissue that is easier to attain in the open approach with resource to a scratch maneuver described by Nirschl.^{11, 46}

Denervation of epicondyle as also been described as an alternative to Nirschl technique. In this case, the patients are previously submitted to a diagnostic injection anesthetic agent. If this evolve to a positive response, with pain and grip strength improvement, the denervation itself is performed. The procedure consists of transverse incision proximal to epicondyle, identification of the posterior branches of the posterior cutaneous nerve of the forearm, injection of bupivacaine and transection of the nerves. The nerves are then buried posteriorly in the lateral head of the triceps. This procedure has the advantage of allowing an immediately resume to normal daily activities. ⁹

5.2 ARTHROSCOPIC APPROACH

Arthroscopic approach was described by Baker and consists of a releasement of the joint capsule, permitting extracapsular ERCB visualization. The origin of ERCB and portion of the ERCL and EDC are debrided and the epicondyle can also be decorticated. This approach has the advantage of allowing the assessment and treatment of intra-articular pathology, which is thought to be present in about 25% of the cases.^{11, 49, 50}

5.3 PERCUTANEOUS APPROACH

This approach was first designed by Baumgard and Schwartz [114]. It consists of a skin incision of 5-10mm on the anterior aspect of the epicondyle. After incision the blade in

moved anteriorly and inferiorly to complete release of common extensor tendon origin. Common variations use a radiofrequency probe instead of a blade and perform a US-guided microresection.⁵¹

DISCUSSION

For the past 5 years, several studies have evaluated the effectiveness of the different epicondylitis therapies, trying to access the best management approach to this pathology. Despite the numerous studies found in literature, it still does not exist an international consensus and a globally accepted treatment algorithm.

Recent utilization of biological injections is being linked to good results despite controversy exists. A prospective long term study accessing the effectiveness of ABI in recalcitrant epicondylitis demonstrated a significantly decrease in pain and functional impairment with persisting results in a 3-years follow-up. Patients satisfaction achieved 80% at 6th month and 85% in 3rd year.³⁷

Several randomized controlled trials have demonstrated that ABI is significantly more effective than CSI in a long follow-up, permitting to achieve a 90% success rate with CSI achieving a faster improvement of pain but associated with higher rate of recurrence.³⁹

Studies comparing PRP and CSI also revealed that VAS pain score and functional q-DASH score, achieved better results with CSI in 15-31 days, however at the 3-month final follow-up, VAS score were better on PRP group with a significant difference. Grip strength has been also demonstrated to improve significantly with PRP therapy at a 3-month follow-up.⁵²

Another study comparing PRP with CSI on clinical and US findings improvement, revealed that CSI achieved a peek of clinical improvement only at the 3rd month with subsequent decrease at the 6th month with recurrence of symptoms in 47,6% of patients. Comparing the US findings at the final follow-up, CSI was related to diminished thickness of the tendon and

epicondyle cortical erosion while PRP was related to augmented thickness of tendon. These US finding support the thesis that CSI at long term aggravates the degeneration process, while PRP stimulates a healing response.²⁹

A recent study, comparing ACP and CSI also revealed a faster and significant DASH score improvement in CSI group at 6 weeks and 6 months, but at 1 year PRP was significantly better, being associated with “very good” results compared with only “fair” results in CSI group.⁴⁰

Few studies were made on the past 5 years, comparing ABI and PRP effectiveness on epicondylitis. A randomized clinical trial comparing these treatments, achieved comparable results, with significant VAS pain score and Pressure Pain Threshold score improvement in both groups on a 4-week to 12-month follow-up. Success was achieved in both groups with no statically difference, revealing that there was no advantage on the centrifugation process of autologous blood to produce PRP instead prompt use of ABI. ³⁸

Although several studies support the use of PRP and ABI, some studies exist that raise doubts on their effectiveness. A study comparing PRP to placebo (saline injections) revealed that both groups were associated with a global pain decrease in a 6-12month follow-up. Despite the PRP group showed better results, there were no statistical significant differences between groups, revealing that PRP was no better than saline injections at 12-month follow-up. ¹⁶ Another trial comparing ACP versus dry-needling procedure demonstrated that no statistical differences in VAS pain score were found between groups at a 2-6month follow-up, despite ACP group achieved a slightly higher clinical improvement, especially in a short term.⁵³

A wide range of experimental surgical technique are being described in recent literature.

A variation of Nirschl procedure with the addition of anconeus flap to the debridement of the tendon, achieved significant clinical improvement compared with simply debridement, in pain and functional impairment and no apparent augmented risks of complications.⁴⁵

Among the new promising surgical techniques, percutaneous tenotomy, have been related to significant decrease on pain scores and 100% patient's satisfaction on a 3-year follow-up.⁵⁴ Another promising procedure, the epicondyle denervation, was also related to "excellent" results, with 80% of patients showing improvement on pain and grip strength parameters with few transient adverse effects and allowing immediate return to daily-living activities.⁹

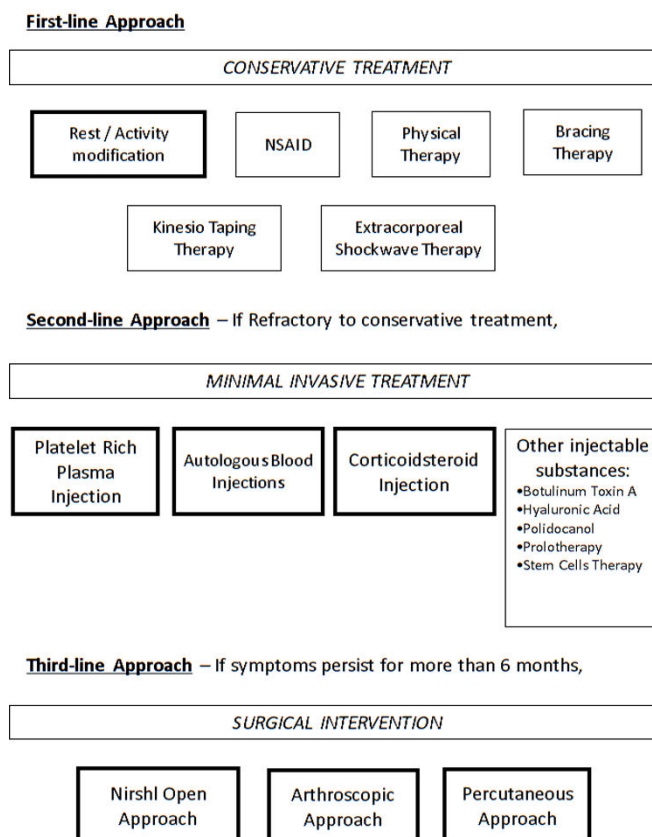
CONCLUSION

Epicondylitis is a prevalent disease with an important pain and functional impairment that can lead to absence of work and serious daily-living activities limitations. Despite being a common condition, there is not a consensus on treatment algorithm. Whatsoever a treatment algorithm **[Figure I]** can be proposed with a first line approach consisting on a conservative treatment with rest, activity modification, physical therapy, NSAID, kinesiologic taping therapy and extracorporeal shockwave therapy that seems to achieve consensus as first line treatment in a wide range of studies.

The majority of patients will need further invasive treatment, so second line approach can be proposed with autologous blood or platelet-rich plasma injections being indicated in patients that fail to respond to conservative treatment as several studies are showing good results with significant pain and strength improvements and patients satisfaction with these injection therapies. Alternatively, CSI can be used in this phase with caution on the long term lateral effects with high rate of recurrence and augmented tendon degeneration. When epicondylitis is refractory to conservative, non-invasive and invasive treatment for more than 6 months, surgical intervention is indicated as third line approach for epicondylitis treatment, being associated with a high rate of success on all three, open, arthroscopic and percutaneous approaches with no significant differences between them.

Continued research and randomized clinical trials are needed to enable determination of a consensual and globally accepted treatment algorithm.

Figure 1: Proposal of an Epicondylitis Treatment Algorithm; Bold boxes indicate the treatments associated with most satisfying results; NSAID – Non-Steroidal Anti Inflammatory Drugs.



REFERENCES

1. Chiavaras, M.M., et al., *Impact of Platelet Rich plasma Over alternative therapies in patients with lateral Epicondylitis (IMPROVE): protocol for a multicenter randomized controlled study: a multicenter, randomized trial comparing autologous platelet-rich plasma, autologous whole blood, dry needle tendon fenestration, and physical therapy exercises alone on pain and quality of life in patients with lateral epicondylitis.* Acad Radiol, 2014. **21**(9): p. 1144-55.
2. Brummel, J., et al., *Epicondylitis: lateral.* Sports Med Arthrosc, 2014. **22**(3): p. e1-6.
3. Tosti, R., J. Jennings, and J.M. Sowards, *Lateral epicondylitis of the elbow.* Am J Med, 2013. **126**(4): p. 357 e1-6.
4. Nirschl, R.P., *Elbow tendinosis/tennis elbow.* Clin Sports Med, 1992. **11**(4): p. 851-70.
5. Ahmad, Z., et al., *Lateral epicondylitis: a review of pathology and management.* Bone Joint J, 2013. **95-B**(9): p. 1158-64.
6. Luk, J.K., R.C. Tsang, and H.B. Leung, *Lateral epicondylalgia: midlife crisis of a tendon.* Hong Kong Med J, 2014. **20**(2): p. 145-51.
7. Abrams, G.D., P.A. Renstrom, and M.R. Safran, *Epidemiology of musculoskeletal injury in the tennis player.* Br J Sports Med, 2012. **46**(7): p. 492-8.
8. Thompson, C. and C. Visco, *Lateral epicondylosis: emerging management options.* Curr Sports Med Rep, 2015. **14**(3): p. 215-20.

9. Rose, N.E., S.K. Forman, and A.L. Dellon, *Denervation of the lateral humeral epicondyle for treatment of chronic lateral epicondylitis*. J Hand Surg Am, 2013. **38**(2): p. 344-9.
10. Gunduz, R., et al., *Physical therapy, corticosteroid injection, and extracorporeal shock wave treatment in lateral epicondylitis. Clinical and ultrasonographical comparison*. Clin Rheumatol, 2012. **31**(5): p. 807-12.
11. Miyazaki, A.N., et al., *EVALUATION OF THE RESULTS FROM ARTHROSCOPIC TREATMENT OF THE LATERAL EPICONDYLITIS*. Rev Bras Ortop, 2010. **45**(2): p. 136-40.
12. Bot, S.D., et al., *Course and prognosis of elbow complaints: a cohort study in general practice*. Ann Rheum Dis, 2005. **64**(9): p. 1331-6.
13. Judson, C.H. and J.M. Wolf, *Lateral epicondylitis: review of injection therapies*. Orthop Clin North Am, 2013. **44**(4): p. 615-23.
14. Solheim, E., J. Hegna, and J. Oyen, *Arthroscopic versus open tennis elbow release: 3- to 6-year results of a case-control series of 305 elbows*. Arthroscopy, 2013. **29**(5): p. 854-9.
15. Sanders, T.L., Jr., et al., *The epidemiology and health care burden of tennis elbow: a population-based study*. Am J Sports Med, 2015. **43**(5): p. 1066-71.
16. Montalvan, B., et al., *Inefficacy of ultrasound-guided local injections of autologous conditioned plasma for recent epicondylitis: results of a double-blind placebo-controlled randomized clinical trial with one-year follow-up*. Rheumatology (Oxford), 2016. **55**(2): p. 279-85.
17. Pattanittum, P., et al., *Non-steroidal anti-inflammatory drugs (NSAIDs) for treating lateral elbow pain in adults*. Cochrane Database Syst Rev, 2013(5): p. CD003686.
18. Raman, J., J.C. MacDermid, and R. Grewal, *Effectiveness of different methods of resistance exercises in lateral epicondylitis--a systematic review*. J Hand Ther, 2012. **25**(1): p. 5-25; quiz 26.
19. Hoogvliet, P., et al., *Does effectiveness of exercise therapy and mobilisation techniques offer guidance for the treatment of lateral and medial epicondylitis? A systematic review*. Br J Sports Med, 2013. **47**(17): p. 1112-9.
20. Weber, C., et al., *Efficacy of physical therapy for the treatment of lateral epicondylitis: a meta-analysis*. BMC Musculoskelet Disord, 2015. **16**: p. 223.
21. Bisset, L.M. and B. Vicenzino, *Physiotherapy management of lateral epicondylalgia*. J Physiother, 2015. **61**(4): p. 174-81.
22. Cullinane, F.L., M.G. Boocock, and F.C. Trevelyan, *Is eccentric exercise an effective treatment for lateral epicondylitis? A systematic review*. Clin Rehabil, 2014. **28**(1): p. 3-19.
23. Menta, R., et al., *The effectiveness of exercise for the management of musculoskeletal disorders and injuries of the elbow, forearm, wrist, and hand: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration*. J Manipulative Physiol Ther, 2015. **38**(7): p. 507-20.
24. Shamsoddini, A. and M.T. Hollisaz, *Effects of taping on pain, grip strength and wrist extension force in patients with tennis elbow*. Trauma Mon, 2013. **18**(2): p. 71-4.
25. Dilek, B., et al., *Kinesio taping in patients with lateral epicondylitis*. J Back Musculoskelet Rehabil, 2016. **29**(4): p. 853-858.
26. Trentini, R., et al., *Short- to mid-term follow-up effectiveness of US-guided focal extracorporeal shock wave therapy in the treatment of elbow lateral epicondylitis*. Musculoskelet Surg, 2015. **99 Suppl 1**: p. S91-7.
27. Dingemans, R., et al., *Evidence for the effectiveness of electrophysical modalities for treatment of medial and lateral epicondylitis: a systematic review*. Br J Sports Med, 2014. **48**(12): p. 957-65.
28. Thiele, S., R. Thiele, and L. Gerdesmeyer, *Lateral epicondylitis: This is still a main indication for extracorporeal shockwave therapy*. Int J Surg, 2015. **24**(Pt B): p. 165-70.

29. Gautam, V.K., et al., *Platelet-rich plasma versus corticosteroid injection for recalcitrant lateral epicondylitis: clinical and ultrasonographic evaluation*. J Orthop Surg (Hong Kong), 2015. **23**(1): p. 1-5.
30. Lin, Y.C., et al., *Injection of botulinum toxin for treatment of chronic lateral epicondylitis*. Semin Arthritis Rheum, 2012. **41**(6): p. e1-2.
31. Sims, S.E., et al., *Non-surgical treatment of lateral epicondylitis: a systematic review of randomized controlled trials*. Hand (N Y), 2014. **9**(4): p. 419-46.
32. Cato, R.K., *Indications and Usefulness of Common Injections for Nontraumatic Orthopedic Complaints*. Med Clin North Am, 2016. **100**(5): p. 1077-88.
33. Kumai, T., et al., *The short-term effect after a single injection of high-molecular-weight hyaluronic acid in patients with enthesopathies (lateral epicondylitis, patellar tendinopathy, insertional Achilles tendinopathy, and plantar fasciitis): a preliminary study*. J Orthop Sci, 2014. **19**(4): p. 603-11.
34. Branson, R., et al., *Comparison of corticosteroid, autologous blood or sclerosant injections for chronic tennis elbow*. J Sci Med Sport, 2016.
35. Hauser, R.A., et al., *A Systematic Review of Dextrose Prolotherapy for Chronic Musculoskeletal Pain*. Clin Med Insights Arthritis Musculoskelet Disord, 2016. **9**: p. 139-59.
36. Rabago, D., et al., *Hypertonic dextrose and morrhuate sodium injections (prolotherapy) for lateral epicondylitis (tennis elbow): results of a single-blind, pilot-level, randomized controlled trial*. Am J Phys Med Rehabil, 2013. **92**(7): p. 587-96.
37. Gani, N.U., et al., *Long term results in refractory tennis elbow using autologous blood*. Orthop Rev (Pavia), 2014. **6**(4): p. 5473.
38. Raeissadat, S.A., et al., *Is Platelet-rich plasma superior to whole blood in the management of chronic tennis elbow: one year randomized clinical trial*. BMC Sports Sci Med Rehabil, 2014. **6**: p. 12.
39. Dojode, C.M., *A randomised control trial to evaluate the efficacy of autologous blood injection versus local corticosteroid injection for treatment of lateral epicondylitis*. Bone Joint Res, 2012. **1**(8): p. 192-7.
40. Lebiezdinski, R., et al., *A randomized study of autologous conditioned plasma and steroid injections in the treatment of lateral epicondylitis*. Int Orthop, 2015. **39**(11): p. 2199-203.
41. Kahlenberg, C.A., M. Knesek, and M.A. Terry, *New Developments in the Use of Biologics and Other Modalities in the Management of Lateral Epicondylitis*. Biomed Res Int, 2015. **2015**: p. 439309.
42. Lee, S.Y., et al., *Treatment of Lateral Epicondylitis by Using Allogeneic Adipose-Derived Mesenchymal Stem Cells: A Pilot Study*. Stem Cells, 2015. **33**(10): p. 2995-3005.
43. Wang, A., et al., *Autologous tenocyte injection for the treatment of severe, chronic resistant lateral epicondylitis: a pilot study*. Am J Sports Med, 2013. **41**(12): p. 2925-32.
44. Nirschl RP, P.F., *Tennis elbow. The surgical treatment of lateral epicondylitis*. J Bone Joint Surg Am, 1979. **61**(6A):832-9.
45. Ruch, D.S., et al., *A comparison of debridement with and without anconeus muscle flap for treatment of refractory lateral epicondylitis*. J Shoulder Elbow Surg, 2015. **24**(2): p. 236-41.
46. Kwon, B.C., J.Y. Kim, and K.T. Park, *The Nirschl procedure versus arthroscopic extensor carpi radialis brevis debridement for lateral epicondylitis*. J Shoulder Elbow Surg, 2017. **26**(1): p. 118-124.
47. Byram, I.R., et al., *Elbow arthroscopic surgery update for sports medicine conditions*. Am J Sports Med, 2013. **41**(9): p. 2191-202.
48. Jeavons, R., et al., *The Boyd-McLeod procedure for tennis elbow: mid- to long-term results*. Shoulder Elbow, 2014. **6**(4): p. 276-82.

49. Pomerantz, M.L., *Complications of Lateral Epicondylar Release*. Orthop Clin North Am, 2016. **47**(2): p. 445-69.
50. Baker, C.L., Jr., et al., *Arthroscopic classification and treatment of lateral epicondylitis: two-year clinical results*. J Shoulder Elbow Surg, 2000. **9**(6): p. 475-82.
51. Baumgard, S.H. and D.R. Schwartz, *Percutaneous release of the epicondylar muscles for humeral epicondylitis*. Am J Sports Med, 1982. **10**(4): p. 233-6.
52. Yadav, R., S.Y. Kothari, and D. Borah, *Comparison of Local Injection of Platelet Rich Plasma and Corticosteroids in the Treatment of Lateral Epicondylitis of Humerus*. J Clin Diagn Res, 2015. **9**(7): p. Rc05-7.
53. Stenhouse, G., P. Sookur, and M. Watson, *Do blood growth factors offer additional benefit in refractory lateral epicondylitis? A prospective, randomized pilot trial of dry needling as a stand-alone procedure versus dry needling and autologous conditioned plasma*. Skeletal Radiol, 2013. **42**(11): p. 1515-20.
54. Seng, C., et al., *Ultrasonic Percutaneous Tenotomy for Recalcitrant Lateral Elbow Tendinopathy: Sustainability and Sonographic Progression at 3 Years*. Am J Sports Med, 2016. **44**(2): p. 504-10.

ANEXOS

Normas de publicação

Objectivos e âmbito

A Acta Reumatológica Portuguesa (ARP) é uma publicação científica internacional, revista por pares, abrangendo aspectos clínicos e experimentais das doenças reumáticas. São publicados artigos originais, artigos de revisão, casos clínicos, imagens em Reumatologia, cartas ao editor e artigos que visam melhorar a Prática Clínica (recomendações e protocolos clínicos, por exemplo).

A ARP foi fundada em 1973 como órgão científico oficial da Sociedade Portuguesa de Reumatologia e subscrive os requisitos para apresentação de artigos a revistas biomédicas elaboradas pela Comissão Internacional de Editores de Revistas Médicas (*International Committee of Medical Journal Editors*), publicada na íntegra inicialmente em N Engl J Med 1991; 324: 42428 e actualizada em Outubro de 2008 e disponível em www.ICMJE.org. A política editorial da ARP segue as Recomendações de Política Editorial (*Editorial Policy Statements*) emitidas pelo Conselho de Editores Científicos, disponíveis em http://www.councilscienceeditors.org/files/public/entire_whitepaper.pdf.

A ARP publica preferencialmente artigos escritos na língua Inglesa. Caso os autores optem por submeter em Português, poderá ser solicitada a sua tradução para a língua Inglesa. O rigor e a exactidão dos conteúdos, assim como as opiniões expressas, são da exclusiva responsabilidade do(s) autor(es).

Os artigos submetidos devem ser originais e não podem ter sido publicados previamente.

Os artigos publicados constituirão propriedade da revista, não podendo ser reproduzidos, no seu todo ou em parte, sem a prévia autorização dos editores.

A Revista está indexada no PubMed/Medline e os seus artigos estão disponíveis online na íntegra, com acesso aberto e gratuito.

Instruções para submissão de artigos

A Acta Reumatológica Portuguesa oferece aos autores um sistema de submissão e revisão de artigos a funcionar exclusivamente *online*. Acedendo ao *website* da ARP (www.actareumatologica.pt) os autores poderão submeter os seus artigos e acompanhar o seu estado no processo de revisão. Os autores serão notificados por email no próprio dia em que o(s) seu(s) artigo(s) sofra(m) alterações relevantes durante o processo editorial.

De modo a submeter um manuscrito, os autores deverão **criar uma conta de utilizador**:

- Aceder ao *website* da ARP (www.actareumatologica.pt), clicar no *link* “Entrar”, seguido de “Registo” e seguir cuidadosamente todas as instruções fornecidas. Um email de activação será enviado para a sua conta de email. Para activar a conta ARP é necessário seguir o *link* fornecido no corpo desse email, que automaticamente o redirecionará para uma mensagem de registo no *website* da ARP.

Após a criação de uma conta ARP, os autores poderão **submeter e acompanhar o progresso do(s) seu(s) artigo(s)**:

- Aceder ao *website* da ARP (www.actareumatologica.pt), entrar na area privada e clicar no link "Submeter artigo". Preencher o formulário seguindo as instruções cuidadosamente.

Instruções aos autores

Para evitar atrasos no processo de revisão, leia cuidadosamente as instruções e assegure-se de que o seu manuscrito está de acordo com os requisitos da ARP antes de submeter (número de palavras e formato).

- Título do artigo: o título deve descrever brevemente o conteúdo do artigo. Não devem ser usadas abreviaturas. Deve ser indicado um curto título para rodapé. Nos artigos escritos em português é necessário incluir o título em inglês.

-Nome dos autores e afiliações

- Informações do autor responsável pela correspondência: nome, morada, telefone e endereço electrónico

- Resumo: com um máximo de 350 palavras ,deve incluir objectivos, material e métodos, resultados e conclusões. Para os casos clínicos o limite de palavras é 180.

Tipos de artigo:

- **Editoriais**: Os Editoriais serão solicitados por convite do Editor e constituirão comentários sobre tópicos actuais ou sobre artigos publicados na revista. O texto dos Editoriais não deverá exceder as 1200 palavras, um máximo de 15 referências e pode conter uma figura ou tabela.
- **Artigos de Revisão**: Preferencialmente, os Artigos de Revisão serão também solicitados pelo Editor. No entanto, os autores interessados em apresentar um Artigo de Revisão podem contactar o Editor para discussão dos temas a apresentar no artigo, o qual não deverá exceder as 4000 palavras, 6 Tabelas ou Figuras e 100 referências;
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- **Imagens em Reumatologia:** Imagens representando manifestações clínicas raras ou de particular interesse podem ser submetidas (no máximo 4). O texto acompanhante não deverá exceder as 500 palavras e 5 referências
- **Cartas ao Editor:** As Cartas ao Editor deverão constituir um comentário crítico a um artigo da Revista ou uma pequena nota sobre um tema ou caso clínico. O texto não deverá exceder as 600 palavras, uma Figura/Tabela e um máximo de 10 referências.

Tabelas: As Tabelas a inserir devem ser assinaladas no texto em numeração romana. Cada Tabela deverá possuir um título e não deverá apresentar linhas verticais. As linhas horizontais só deverão ser usadas como separadores de título e subtítulos. Todas as abreviaturas usadas devem ser explicadas na parte inferior da Tabela.

Figuras: As Figuras a inserir devem ser assinaladas no texto em numeração árabe e apresentar legendas. Cada Figura deve ser importada individualmente em format JPEG ou TIFF de alta qualidade. O Editor reserva o direito de agrupar Figuras ou alterar o seu tamanho de modo a rentabilizar o uso da páginas.

Referências: As Referências bibliográficas devem ser classificadas e numeradas por ordem de entrada no texto e em *superscript*. As abreviaturas usadas na nomeação das revistas devem ser as utilizadas pelo *Index Medicus*. Nas Referências com 6 ou menos autores, todos devem ser nomeados. Nas Referências com 7 ou mais autores, devem ser nomeados os 3 primeiros seguidos de et al. Os números de página inicial e final devem ser totalmente apresentados (ex. 565-569 e não 565-9). Não indicar o número da Revista nem o mês da publicação. As Referências correspondentes a trabalhos não publicados, apresentações ou observações pessoais, devem ser inseridas no próprio texto (em parenthesis) e não como Referências convencionais. Os autores são responsáveis pela exactidão das Referências apresentadas.

Seguem-se alguns exemplos de como devem constar os vários tipos de Referências:

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Nome(s) e iniciais do(s) autor(es). Título do artigo. Nome da Revista Ano; Volume: Página (s).

Ex: Hill J, Bird HA, Hopkins R, Lawton C, Wright C. Survey of satisfaction with care in a rheumatology outpatient clinic. *Ann Rheum Dis* 1992; 51: 195-197.

Artigo publicado *online* (inserir DOI)

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Ex: Merkel PA, Curthbertson D, Hellmich B et al. Comparison of disease activity measures for ANCA-associated vasculitis. *Ann Rheum Dis* Published Online First: 29 July 2008. doi:10.1136/ard.2008.097758.

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Ex: Lorig K. Patient Education. A practical approach. St Louis: Mosby-Year Book, 1992: 51.

Documento electrónico

Título do documento. <http://address>. Data de acesso.

Ex: Programa Nacional de Luta Contra a Tuberculose. Sistema de Vigilância (SVIG-TB). Direcção-Geral da Saúde – Divisão de Doenças Transmissíveis, Março de 2005. <http://www.dgsaude.pt/upload/membro.id/ficheiros/i006875.pdf>. Accessed in January 25th 2008.

Agradecimentos

Incluir nesta secção agradecimentos a pessoas que tenham contribuído para o trabalho mas sem autoria. Instituições ou fontes de apoio financeiro também poderão aqui ser indicadas.

Processo de Revisão

Os artigos submetidos são enviados a revisores especializados no tema do artigo. Concluída a revisão do artigo, os autores são notificados, recebendo os pareceres e comentários dos revisores acerca do estado do mesmo. Com base nesses pareceres, os autores deverão editar o artigo, corrigi-lo e resubmetê-lo para nova revisão. Na resubmissão de um artigo terão de ser incluídas em anexo uma carta-resposta aos Revisores e um .doc com uma versão do artigo em *track changes*. Este documento não deverá ter qualquer identificação dos autores nem as respectivas afiliações. Caso o artigo se mantenha sem uma resposta dos autores durante mais de 6 meses, a Equipa editorial reserva-se no direito de o retirar do processo de revisão.

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Os critérios de aceitação de um artigo para publicação têm em consideração a qualidade e originalidade do artigo apresentado, a excelência na redacção e organização do mesmo e o potencial impacto na literatura médica.

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Os autores dos artigos aceites para publicação receberão uma versão digital da prova do artigo para valiação. Assim, as provas devem ser revistas durante as 72h que sucedem a sua recepção. Os autores devem verificar o texto, Figuras, Tabelas, Legendas e Referências, e contactar os Editores no caso em que sejam necessárias alterações. Apenas pequenas alterações e correcções tipográficas são permitidas nesta fase.

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