Original Investigation
DOI: 10.30827/xx

Management of Tennis elbow in racket sports – a literature review

Tratamiento de codo de tenista en deportes de raqueta – revisión de la literatura

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Received: 04-11-2021

Accepted: 07-05-2022

Abstract

Background: Pain from the lateral aspect of the elbow is a common symptom in racket sports, both in recreational and competitive players. In Tennis elbow (TE), the pain is elicited from the lateral epicondyle and the common extensor origin just distal of the epicondyle. The symptoms are aggravated by gripping activity and might be related to activity level, in work as well as in recreational or elite racket sports. TE is considered to be an overuse injury of degenerative nature and the diagnose is easily made, based on a typical history and clinical findings. **Objective:** To present current knowledge concerning management of TE in racket sports by a review of the literature. **Methods:** Narrative literature review. **Results:** An overview of TE in racket sports with highlight on the clinical features, alternative diagnoses and suggested treatments in the literature. Since TE is considered to be an overuse injury, the paper also provides advice for management and training until resolution of symptoms. Conclusions: This painful condition is self-limiting with a good prognosis. No treatment has been convincingly successful besides methods for reducing pain symptoms. When the pain symptoms are under control, it is important that the return to racket sports is gradual.

Keywords: *Tendinopathy, racket sport, overuse injury, lateral epicondylitis.*

Resumen

Antecedentes: El dolor en la parte lateral del codo es un síntoma común en los deportes de raqueta, tanto en jugadores recreacionales como de competición. En el codo de tenista (CT), el dolor se produce en el epicóndilo lateral y en el origen del extensor común justo distal al epicóndilo. Los síntomas se agravan con actividades de agarre y pueden estar relacionados con el nivel de actividad, ya sea en el trabajo o en los deportes de raqueta recreacionales o de élite. Se considera que el CT es una lesión por sobreuso de naturaleza degenerativa y el diagnóstico se realiza fácilmente basado en la historia y los hallazgos clínicos. **Objetivo:** Presentar el conocimiento actual sobre el tratamiento del CT en los deportes de raqueta a través de una revisión de la literatura. Métodos: Revisión de la literatura narrativa. **Resultados:** Un resumen del CT en los deportes de raqueta con énfasis en las características clínicas, los diagnósticos alternativos y los tratamientos sugeridos en la literatura. Dado que el CT se considera una lesión por sobreuso, el artículo también hace sugerencias para un plan de entrenamiento adicional al tratamiento hasta que se resuelvan los síntomas. **Conclusiones:** Esta condición dolorosa es autolimitada y tiene un buen pronóstico. No hay tratamiento con evidencia determinante, además de los métodos para reducir los síntomas de dolor. Cuando los síntomas de dolor están bajo control, es importante que el regreso a los deportes de raqueta sea gradual

Palabras clave: *Tendinopatía, deporte de raqueta, lesión por sobreuso, epicondilitis lateral.*

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Cite this article as:
Fahlström, M., & Zeisig, E. (2022). Management of Tennis elbow in racket sports – a literature review. *International Journal of Racket Sports Science,* 4(1), x-x.

INTRODUCTION

Pain from the lateral aspect of the elbow is a common symptom in racket sports, both in recreational and competitive players. In badminton 2.4%-13% of all injuries have been reported to be elbow injuries (Caine et al., 2010), and the prevalence of elbow injuries in tennis is 1.3%-14.1% with no difference between men and women (Abrams et al., 2012). Tennis elbow (TE) has been reported to be the most common injury among recreational paddle-tennis players (Castillo-Lozano & Casuso-Holgado 2017). There are few data on elbow injuries in squash, a study on professional squash players showed that only about 1% of all injuries were elbow injuries (Horsley, O'Donnell, & Leeder, 2020). The incidence of TE in a general population is described to be approximately 2%, and the diagnosis is mostly seen between 40 and 53 years of age (Sanders et al., 2015). Tennis players appear to be affected even at younger age; 16-36 years (Maffulli et al., 1990).

There are a variety of proposed diagnoses; lateral elbow pain, lateral epicondylalgia, lateral epicondylitis, lateral epicondylosis, extensor tendinopathy etc. TE is probably the most commonly used diagnosis and includes localized pain from the common origin of the wrist extensor muscles at the lateral epicondyle, with pain during repetitive gripping activities such as in playing tennis or other racket sports. Triggering factors for pain symptoms are change of equipment, technique or higher intensity in activity (Walker-Bone et al., 2012).

The background for the name of the "Tennis elbow" condition was that it was seen in tennis players with single hand backhand stroke already in the 19th century, where the flexors of the dominant hand is used to provide all the power to hold on the grip to the racket and stabilize the wrist during the strike, when the ball is met and redirected back to the opponent (Hume et al., 2006; King et al., 2012). In tennis the wrist is for stabilisation, not for active dorsal flection. However, in other racket sports, such as badminton and paddle-tennis, static and dynamic extension of the wrist might also lead to the same pathophysiology, that is also seen in manual computer working environment. The symptoms can be aggravated when there is a pronation of the hand; the supinator muscles can also be involved (Lawrence et al., 1995).

The pathogenesis is not known, but TE is considered to be an overuse injury of degenerative nature (Krausha-ar & Nirschl, 1999). Biopsies from patients in a chronic stage, i.e. after three months duration of pain symptoms, taken from the origin of extensor carpi radialis brevis, have shown degenerative changes with disorganized collagen, invasion of fibroblasts and vascular hyper-plasia without any signs of inflammation (Nirschl, 1992). The pain mechanism is not fully understood, but biopsies have shown presence of neurotransmitters that imply a kind of "neurogenic inflammation", which should be distinguished from traditional prostaglandin mediated inflammation (Zeisig et al., 2009).

CLINICAL FEATURES

When an athlete has pain from the lateral aspect of the elbow, triggered during racket sport, TE should be considered (Shiri & Viikari-Juntura 2011). The onset is often insidious, but can be more acute after temporary overload (Smidt & van der Windt 2006). The pain is evoked while gripping the racket and there might be a loss of grip strength. Often there is a complaint of stiffness of the elbow, especially in the morning, or after having the elbow fixed in the same position, and the pain is most often related to activity level (Shiri & Viikari-Juntura 2011). The tendinopathy is located in the common extensor origin, located just distally of the top of the lateral epicondyle, where the most tender spot is found during palpation (Villaseñor-Ovies et al, 2012). Pain is provoked from the same area by resisted extension of the wrist and occasionally resisted extension of the third finger. Test for grip strength is painful and strength might be reduced (De Smedt et al., 2007).

The diagnosis is verified by physical examination and further investigation is not necessary with a typical history and clinical findings. If the diagnosis is unclear, the method of choice is examination with ultrasound and Doppler (Zeisig et al., 2006). In cases of TE, there are typical findings with hypoechogenic areas in the common extensor origin with high blood flow seen on Doppler examination (Obradov & Anderson, 2012). Examination with ultrasound or magnetic resonance imaging (MRI) cannot be used to evaluate effect of treatment, since the pathological findings may be seen despite clinical improvement (Chourasia et al., 2013). It is notable that if there has been a local intervention, there is no possibility to distinguish eventual underlying pathology from changes after injections, surgery etc.

Racket sport requires experience from training and puts high demands on correct technique, otherwise pain from hand, wrist, shoulder, abdomen and back, besides from the elbow, might also be experienced.

In cases with TE without any response to treatment after a couple of months, the diagnosis must be re-evaluated, and differential diagnosis considered. Neck and shoulder symptoms must be requested for and the cervical spine must be examined looking for referred pain. (Berglund et al., 2008). If the clinical diagnosis is TE, but the effect of treatment is absent, there might also be a coexistent radial tunnel syndrome. The diagnosis for the latter is tenderness over the radial tunnel and a positive test for the radial nerve (Naam & Nemani, 2012). Elbow pain can also arise from the lateral collateral ligament that is closely related to the common extensor origin and might give the same symptoms as TE after a sprain with or without instability (Clarke et al., 2010). Local synovitis on the undersurface of the common extensor origin can give the same symptoms as TE (Lattermann et al., 2010).

Figure 1. The condition was observed already in the 19th century. The term "Tennis elbow" was introduced in 1882; the condition was seen in tennis players with single hand backhand strokes, where the flexors of the dominant hand is used to provide all the power to hold on the grip to the racket and stabilize the wrist during the strike, when the ball is met and redirected back to the opponent.

More generalized synovitis or arthritis of the radio-humeral joint can be suspected if there is a painful and restricted range of motion (Ravalli et al., 2019). Another intra-articular pathology that can be considered is osteochondritis, especially in younger individuals, where MRI will give the correct diagnosis (Kotnis et al., 2012).

TREATMENT

TE has been shown to be a self-limiting condition with a good prognosis. Most cases are fully recovered in eight to twelve months regardless of treatment, but some cases are recalcitrant (Bisset et al., 2006; Zeisig, 2012; Kim et al., 2021). The golden standard for management is correction of training, related to the specific demands of the racket sport, and different kinds of physiotherapy, as described below. No other regimen has been convincingly successful for a faster recovery, even though there are, of course, different methods for reducing pain symptoms (Struijs et al., 2001; Brosseau et al., 2002; Buchbinder et al., 2005; Taylor & Hannafin, 2012; Coombes et al., 2013; Hoogvliet et al., 2013). First of all, the training schedule, technique and equipment must be looked over. Core and shoulder stability must be included in physical examination. Ergonomics is important, not only during sports, since gripping activities is a part of daily life (Shiri & Viikari-Juntura 2011). See Table 1.

Methods for reducing pain symptoms can be used, even though there is lack of evidence in the literature for methods being superior to other treatments, including alternative activity ("rest"), painkiller, stretching, muscle strengthening (eccentric training), manipulation, electrotherapeutic modalities and acupuncture (Bateman et al., 2021b; Kim et al., 2021).

The forces during ball strike with the racket can be transferred from the common extensor origin and might be reduced using epicondylitic bandage, taping or orthosis stabilizing the wrist (Kroslak et al., 2019).

Table 1.
Brief advice on management of lateral elbow tendinopathy.

• keep in mind; self-limiting condition with good prognosis
• adjust training plan and amount of training/competition
• correction of technique
• look for core and shoulder stability
• correction of equipment
• rehabilitation training
• physical therapy with individualized pain management
• don't forget differential diagnoses

Injection therapies are tried with cortisone, prolotheraphy, platelet rich plasma, autologous blood, sclerosing agent, botulinum toxin and glycosaminoglycan (Placzek et al., 2007; Franchini et al., 2018; Lenoir et al., 2019), but there is no solid evidence for injection therapies to be superior to physical therapy.

Surgery has been proposed to be an alternative treatment in smaller studies. However, it cannot be recommended due to risk of complications. Also, there are other better alternatives for management (Solheim et al., 2013).

In summary, there is no golden standard for treatment for TE. In a search (Medline and Cochrane database) for treatment for TE published 2017-2021, there was 46 meta-analysis and systematic reviews published. Even though these publications are based on randomized controlled trials (RCTs), there were no strong evidence for any treatment. The only significance found was for injections with saline (placebo) (Table 2). This implies that TE is a self-limiting condition in weeks to months, but sometimes up to years, and "wait and see" is an alternative to intervention (Bisset et al., 2006).

PRACTICAL PERSPECTIVES

TE is an overuse injury that is common in racket sports. The background is not fully known, but training load, technique and equipment seem to be important factors for the development of TE. The condition is self-limiting, with a good prognosis (Bisset et al., 2011).

In tennis and badminton, TE is well known by players, trainers and medical staff. Since paddle-tennis is a relatively new racket sport that has gained a lot of interest, it might attract players without previous experience of the loading of racket sports and gripping activity as holding on to a racket. Therefore, a new injury pattern, including a possible high frequency of elbow pain, could be expected in the future (Castillo-Lozano & Casuso-Holgado, 2017). This is an important field for further research.

Table 2.
Forty-six meta-analysis and systematic reviews of treatment for tennis elbow were published 2017-2021. There is only one treatment that showed significance; saline injection (placebo).

Number of studies	Treatment	Conclusion summary
Injection therapy		
14	Platelet-rich plasma (PRP)	No support for PRP, corticosteroids improves outcome short time, PRP effective in long time
3	Autologous blood, bone marrow, dry needling	No significance, week evidence, low effect
2	Botulinum toxin	Temporary effect, heterogenity
2	Saline injection (Placebo)	Significant improvement, improvements
Non operative treatment		
6	Shock wave	No significance, more randomized controlled trials (RCTs) needed, no clinical effect
2	Acupuncture	Low evidence, more RCTs needed
5	Physiotherapy	Can improve, low effect, better than injection
2	Tape	Effective during rehabilitation
3	Orthosis	Low quality evidence
Surgical treatment		
7	Surgery, arthroscopy	No significance, low quality evidence, may be clinical difference

TE is a self-limiting condition with a good prognosis. However, it is important to find ways to help and support the individual athlete in reducing malalignments and provoking factors, as well as pain management in order to maintain physical activity and performance. Many different methods have been suggested. There is, so far, no golden standard for interventions, so every individual case should be carefully assessed by trainers concerning correction of training and equipment. Shoulder stability and core are also not to be overlooked.

Professional correction of this kind might, of course, be a problem for recreational racket players without trainers, especially in relatively new and growing sports with a lot of new players without racket experience, which for example is the case in paddle-tennis in some countries. Also, the correct way to perform strokes differ between racket sports. Stroke technique in one racket sport may not be optimal when a player changes to another racket sport.

Rehabilitation training and physical therapy of different kinds could be tried, with the perspective that "one size doesn´t fit all". This means that methods for pain management, as described above, can differ considerably between different players (Bateman et al., 2021b). A good strategy is: "Hold on to your physical therapy, and hold on to your racket!"

Different invasive interventions, such as injections and surgery have been suggested (Dines et al., 2015), however, there is no strong evidence for any of these methods. Also, invasive interventions might have irreversible side-effects, and might also reduce the possibility to distinguish eventual underlying pathology in clinical follow up of the conditions with ultrasound or MRI (Savnik et al., 2004).

Injection therapies, especially corticosteroid injections, have been used for decades (Claessen et al., 2016). But is it working on tendinopathies without signs of inflammation? It has also shown complications such as atrophy of the overlying tissues (fat) (Coombes et al., 2010). Surgery is often described as effective in recalcitrant cases, where "everything else" has been tried. This gives no alter-native method to use in a RCT, and there is always a risk for complication as infections, aggravated pain symptoms, scar and skin adhesion or lost grip strength (Buchbinder et al., 2011). There is also a lack of evidence for return to racket sport after surgery.

LIMITATIONS OF THE REVIEW

Injury reports from the literature show a large variation in design, methodology and injury definitions, which makes it difficult to estimate exactly how common the condition is in different racket sports. It is also possible that players have symptoms, but are still playing, which has been seen in other overuse pain conditions in racket sports (Caine, 2010). Therefore, it is even more difficult to estimate the prevalence as well as the incidence of TE.

Also, the different studies also have different inclusion criteria and outcome measures, that makes evaluation of different treatment i.e. symptom-reducing intervention methods, difficult to compare. Future studies must be recommended to have a standard for injuries and inclusion criteria, as well as standardized treatment and rehabilitation methods, to make it possible to perform meta-analysis to evaluate effects of interventions (Bateman et al., 2021a).

A recent consensus statement by a working group from the International Olympic Committee has suggested definitions of injuries and illnesses in sports (Bahr et al., 2020). A similar work on badminton inju-ries has been done by a medical expert group in the Badminton World Federation (Gijon-Nogueron et al., 2022). The results from these studies will be a valuable contribution to standardized future studies.

CONCLUSIONS

Pain from the lateral aspect of the elbow are common symptoms in racket sports. The underlying pathology might be tendinopathy in the common extensor origin at the lateral epicondyle – TE – and is considered as an overuse condition. The diagnosis is based on a history of overuse activities and typical findings during physical examination. TE is most often self-limiting with good prognosis, but pain symptoms might need attention. No treatment has showed convincing evidence of being superior to others, all are different methods for reducing pain symptoms. Like in other overuse conditions, individual adjustment of technique and equipment (i.e. grip width, stiffness of racket stringing, shock absorption of the racket), as well as gradual loading of racket sport is recommended.

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