

Ultrasound-Guided Epi[®] Technique, New Treatment for Degenerative Tendinopathy

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Abstract

Tendinopathy is a common, painful, overuse disorder, and is associated with a failure of the tendon repair process they have a low potential for healing with the usual techniques. Although many different treatment methods have been described, there is no consensus regarding the optimal treatment for this condition.

Therefore, new treatments for tendinopathies drawn from the existing literature as well as from their own experience dealing with this condition to deal with this delicate pathology have been developed over recent past decades.

This brief review aims to update recent information on the treatment with the EPI[®] technique and tendinopathy resulted in a great improvement in function and a rapid return to the previous level of activity.

Keywords: Tendinopathy; Tendinosis; EPI[®] technique

Introduction

The tendons play an essential role in the musculoskeletal system by transferring the tensile loads from muscle to bone so as to enable joint motion and stabilization [1]. Tendons have the ability to adapt to load changes, increasing collagen synthesis as a result of acute and prolonged physical exercise training [2,3]. Despite this ability to adapt to physiological loads tendinopathies it represents a clinical problem which affects both professional and recreational athletes as well as people involved in repetitive work [4,5]. Tendinopathies overuse represents 30 to 50% of all sports injuries and result in a significant amount of morbidity and spending health care [6]. More than 28 million patients in the United States have tendon damage annually [7].

The etiology includes lifestyle, loading pattern, biological variables (genetics, age, sex) as well as different pharmacological agents [8].

The traditional model of "tendonitis" as an inflammatory process is now obsolete since the appearance of several publications, which have described the pathological process of the tendon as mainly degenerative (tendinosis) [9,10]. This is justified due to the absence of inflammatory cells, the presence of areas of collagen degeneration, myxoid degeneration and an increase in fundamental substance and is associated with a failure of the tendon repair process [9,10].

Tendinopathy is a clinical diagnosis and typically is based on medical history and clinical findings. Imaging techniques: such as color Doppler sonography (CDS) and magnetic resonance imaging (MRI) are valuable tools to confirm the diagnosis and provide guidance for treatment [11].

Tendinopathies are in the main accompanied by an excessive nociceptive signalling from the tendon, causing pain and restricted mobility [12]. Mechanisms driving these structural and neurological

changes are not fully understood. A more recent theory ascribes part of the tendinosis changes to an increased production of biochemical agents, such as substance P (SP) and NMDAR1 glutamate receptor [13-15].

Overall tendinopathies are characterized by prolonged, localized pain, associated with physical activity requiring cyclic mechanical stimuli. Patients respond poorly to most conservative treatments, however, a broad spectrum of disorders of the tendon within the concept of tendinopathy that share some common characteristics (paratendinitis, tendinitis, tendon overuse injuries, spontaneous tendon rupture, calcifying tendinitis) or gaps, often converge in the same tendon (Figure 1). In this sense, there is no single etiology and pathogenesis that can explain all these processes [16].

Treatment options have changed over the last decade in parallel to the pathophysiological and histopathological findings in tendinopathy. Since the underlying pathology of chronic tendinopathy can be defined as a "defective healing response", treatment should aim to encourage regeneration of the tendon, pain modulation and the restoration of the biomechanical properties [17,18].

In recent years, the EPI[®] technique has become more relevant in the scientific literature [19-21] given the good results yielded in the treatment of patellar degenerative tendinopathy in comparison to other previous conservative treatments.

EPI[®] Technique

In recent years, the EPI[®] technique has become more relevant in the scientific literature [20,21] given the good results yielded in the treatment of degenerative tendinopathy in comparison to other previous conservative treatments.

The EPI[®] technique, created by Sánchez-Ibáñez JM [21] and who have over 15 years' experience in its use, uses a flow of cathodic current

directed exclusively to the area of degenerated tendon through an ultrasound-guided needle that brings about an organic reaction that leads to rapid regeneration of the degenerated tendon.

The application of EPI® technique produces a non-thermal electrochemical reaction centered on degenerated tissue (tendinosis). This leads to a controlled local inflammatory reaction that leads to the regeneration of damaged tissue [21].

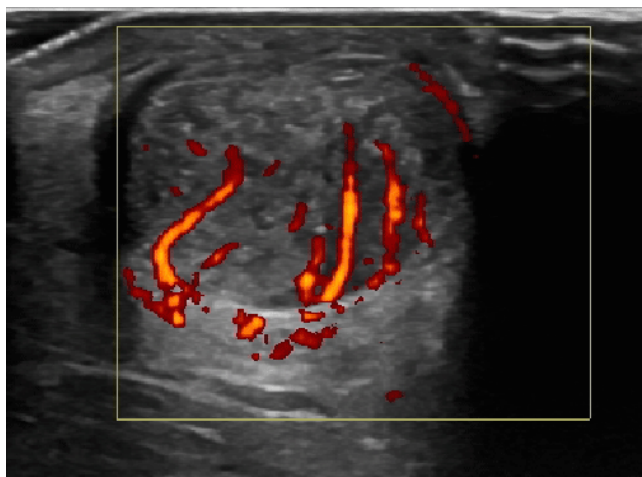


Figure 1: Transverse ultrasound view of Achilles tendonopathy. Gray-scale and power-doppler ultrasound showing the sonographic findings characteristic of Achilles tendonopathy. The sonogram reveals the hypoechoic, darken area of the Achilles tendon, tendon thickening and neovascularization.

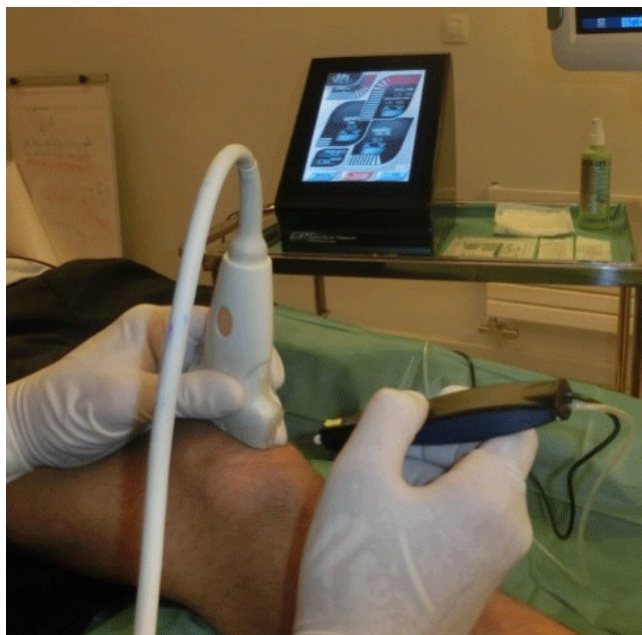


Figure 2: A) Treatment of patellar tendonopathy with ultrasound-guided EPI® technique (EPI Advanced Medicine®, Barcelona, Spain).

The EPI® technique (Figure 2) achieves a much localized organic reaction in the clinical focus by using a specially designed EPI® device for this purpose (EPI Advanced Medicine®, Barcelona, Spain. EPI® technique videos online: www.epiadvanced.com), which leads to the rapid regeneration of degenerated tissue. This leads to the production of new immature collagen fibers that become mature by means of eccentric stimulus [19], thereby obtaining good results in the short and long-term in terms of pain and function.

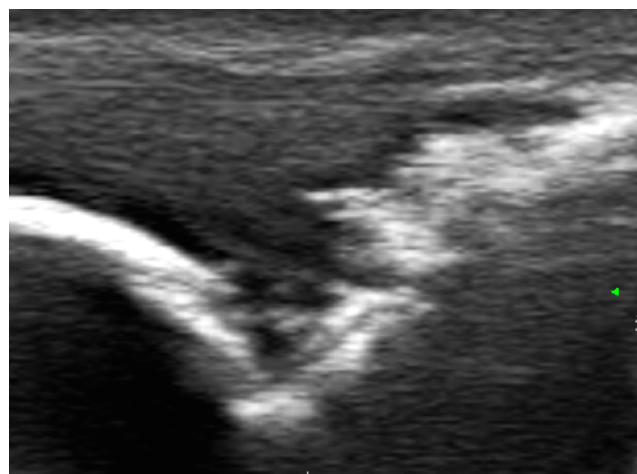


Figure 2: B) Longitudinal ultrasound view of patella tendonopathy. Treatment is directed exclusively to the area of tendon injury. Note the non-thermal electrochemical reaction (white area) produced on the tip of the needle, just in the area of damaged tissue.

A recent experimental study [21] showed that with the use of ultrasound-guided EPI® technique in patellar tendonopathy increase of anti-inflammatory proteins, like peroxisome proliferator-activated receptor gamma (PPAR- γ). These proteins play a key role in the inhibition of expression of proinflammatory molecules secreted by macrophages, such as tumor necrosis factor alpha (TNF- α), IL-6 and IL-1 β , thus producing in the treated tissue a highly beneficial molecular response during degenerative tendonopathy. This, in turn, results in an increase of the expression of vascular endothelial growth factor (VEGF) and vascular endothelial growth factor receptor 2 (VEGFR-2), mediators responsible for angiogenesis anti-inflammatory response. The EPI® technique makes for the activation of molecular and cellular mechanisms of the tendon responsible for phagocytosis and the regeneration of degenerated tissue [19,21].

In recent research [19] to evaluate the therapeutic effects EPI® technique and eccentric exercise on the patellar tendonopathy. The results documented were good and stable with the Victorian Institute of Sport Assessment-Patella (VISA-P) score, Tegner scores and Roles and Maudsley score, and terms of clinical and functional improvement in patellar tendonopathy and providing a follow-up of 10 year.

In another recent study by Sánchez-Ibáñez and co-workers [20] reported that, ultrasound-guided EPI® technique combined with eccentrics exercise has brought about a notable improvement (average 35 point increase in the VISA-P) that allows for the resumption of sports activity to pre-injury levels in few sessions (mean 4.4), a short recovery period (average of 4.5 weeks) and low morbidity.

Discussion

Treatment of tendon injuries is a subject of frequent debate in sports medicine and physiotherapy. Multiple techniques have been described for their treatment and although some of them [22].

To date, there is no consensus on the optimal treatment of tendinopathies. It has been suggested that the incomplete understanding of the underlying mechanisms (etiology of the condition), limits the ability to develop effective treatment strategies [23]. Are emerging as the most accepted treatment option, more RCT's are still needed to clearly establish what the therapeutic protocol therapeutic to follow should be.

Doubts have mainly centered on the fact that there are few controlled prospective studies that analyze all aspects of tendinosis, and few studies that investigate the early stages of these processes and their healing mechanisms. The exact mechanism by which tendinopathy develops in humans remains the target of numerous investigations. A variety of degenerative characteristics associated tendinopathies, including accumulation glycosaminoglycan (GAG), calcification and lipid accumulation nerve damage and hyperinnervation, is one of the theories whose publications are scarce, despite its special interest in explaining the possible pathophysiological mechanisms of pain in tendinopathy [24].

In several studies it has been shown that there is a correlation between tendinopathy and hyper-innervation, citing that the production of nerve growth factor (NGF) and the corresponding hyper-innervation could be induced by repetitive ischemic crisis in osteotendinous union [25,26]. This growth of nerve fibers, which causes chronic pain, could be part of a process of abnormal tissue repair, preceded by repetitive microtrauma [27].

Despite its prevalence, the precise pathogenic mechanisms of tendinopathy are not clear and, as a result, current treatments of tendinopathies are largely empirical and not always efficient [28].

Despite over 15 years of experience in the use of the EPI® technique and its widespread deployment in sporting clubs around the world, this technique has grown in relative to scientific dissemination in recent years [19].

An experimental study showed that after application of the degenerated tendon EPI® technique, an increase in anti-inflammatory proteins, like PPAR- γ has been observed after treatment with the EPI® technique. These proteins play a key role in the inhibition of expression of pro-inflammatory molecules secreted by macrophages, such as TNF- α , IL-6 and IL-1 β [29] thus producing in the treated tissue a highly beneficial molecular response during tendinopathy. This, in turn, results in an increase of the expression of VEGF and VEGFR-2, mediators responsible for angiogenesis anti-inflammatory response [30].

In another recent study by Sánchez-Ibáñez and co-workers [19] it has been illustrated that when treatment with the US-guided EPI® technique and eccentric exercises in patellar tendinopathy it resulted in extensive improvement in the knee function and a rapid return to the previous level of activity after few sessions. The limitation of this study is the absence of a control group of subjects.

References to the use of the EPI® technique in combination with eccentric exercise can be found in the literature. In those cases the EPI Technique® focuses on biological tissue recovery, leaving the functional recovery of tissue biomechanics to eccentric exercise.

The EPI® technique is contraindicated mainly in patients with tumors, articular or systemic infection and bleeding disorders [31].

Conclusion

Tendinopathy is a condition that causes many patients significant pain and disability. Currently, the aetiology of tendinopathy is still unclear, it is multifactorial, and influenced by intrinsic and extrinsic factors. Tendinopathy often becomes chronic because the exact pathogenesis remains largely unknown. Physicians and physiotherapist have a variety of therapeutic options available to treat tendinopathies but, in each case, there is a lack of evidence supporting their use as the gold standard treatment.

Ultrasound-guided EPI® technique offers good results in terms of clinical and functional improvement in Achilles and patellar tendinopathy with low morbidity in a half study period.

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Author Contribution

Wrote the first draft of the manuscript: JMS. Contributed to the writing of the manuscript: JMS. Agree with manuscript results and conclusions: JMS. Jointly developed the structure and arguments for the paper: JMS. Made critical revisions and approved final version: JMS. All authors reviewed and approved the final manuscript.

Disclosures and Ethics

The authors declare that one author has the patent for the EPI devices® and one author are the creators of the EPI® Technique.

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