

## ACCELERATED THERAPY OF SPORTSMAN ´S PATELLA TENDINOPATHY THROUGH THE TRANSTENDINOUS PERCUTANEOUS ELECTROLYSIS (TPTE). (SÁNCHEZ JM,2001) .

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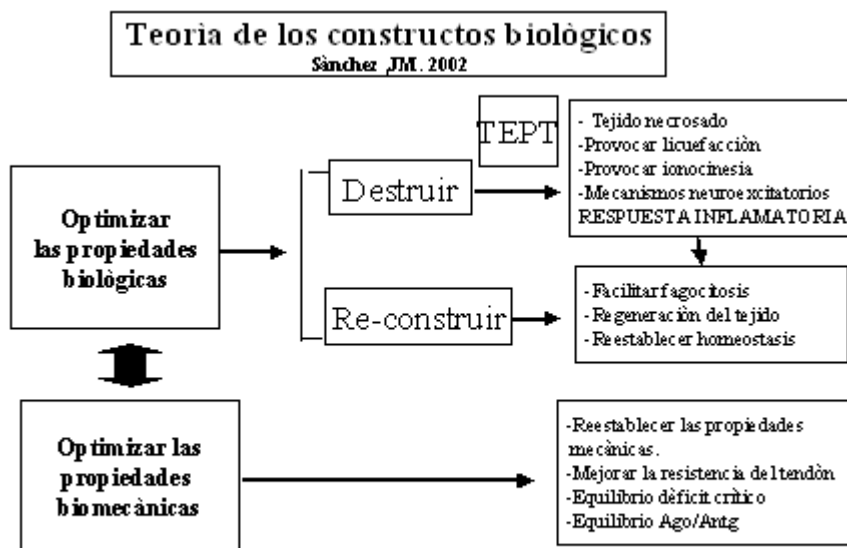
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These type of tendinopathies due to overuse are more common day after day in our ordinary clinical practise. Many researchers all over the world have identified that the specific pathology under these conditions is tendinosis or collagen degeneration (Jozsa L et al,1997;Khan,K et al ,1999,Puudu,G et al 1976). If we admit that patella tendinopathies due to overuse take place because of a tendinosis process (not tendinitis), we should modify the therapeutical approach to our patients. If this is correct, the traditional approach of the patella tendinopathy treatment as "inflammatory tendinitis" is possibly defective. The most vulnerable region to repetitive microtraumas is the osteo-tendinous joint, in short, the most complex histological area and where there is a high number of sense receptors.

In this essay, I introduce an innovative technique (Transtendinous Percutaneous Electrolysis Technique) for the patella tendinopathy treatment. This method is based in the integration of the connective tissue biological principles, of neural tissue, of the regulation of the base system, of the biomechanics of the femoropatellar joint and its involvement in the soft tissue and the basic laws of molecular pathology.

We are in a new millenium and the medical advances flow towards the biological medicine and/or genetics. Therapeuts must follow this stream and suggest new paradigms. This doesn´t mean neither to renounce to the existing paradigms, nor to invent magical treatment ways. The basic aim must be to integrate the specific knowledge of areas such as molecular biology, ionokinesiology, biomechanics, etiopathogenesis, and physiology in any of the pathologies we treat.

Only by the deep knowledge of these areas, we can propose possible ways of therapeutical intervention to treat patella tendinopathies (table 1) with higher accuracy, consistency and always supported by the scientific method.



**Table 1 : Biological Constructors Theory.** The patella tendinopathy ´s basic therapy principles are based in two big connected groups. On one hand, to improve the damaged biological properties by the illness degenerative process itself. To achieve this aim, we should produce the destruction of the fibrotic and necrosed tissue through TPTE. The tissue destruction will produce a repairing inflammatory response. Finally, the reconstruction process will be done parallelly to the self-regeneration of the tissue and the improvement of the mechanical properties (Sánchez, JM 2002).

I am applying the Transtendinous Percutaneous Electrolysis Technique (TPET) since 2001 in soft tissue chronic pathologies (tendinopathies, neuromas, muscle fibrosis and compartment syndromes). Results are really surprising because of its quick action on the affected tissue. In oncology, a similar technique is practised (electrochemotherapy) with certain parameter variations in order to improve the penetration of cytotoxic drugs

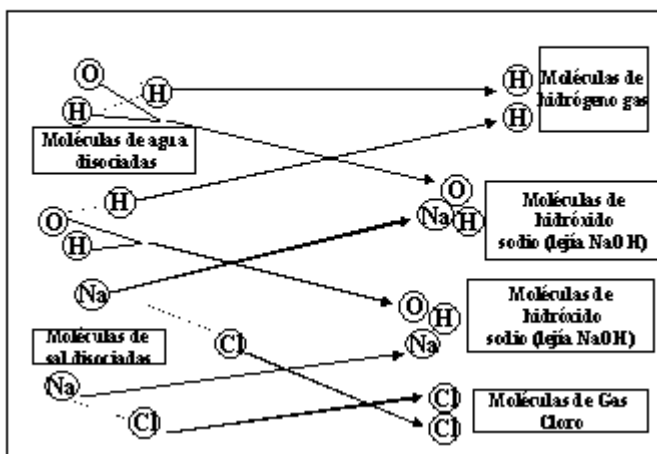
inside the cancerous cells (Okino, M. 1987) .

During a lot of time it has been known that the use of galvanic current in a salty water solution produces a chemical reaction. The electrical current forces the splitting apart of salt (NaCl) and water (H<sub>2</sub>O) into its two basic chemical elements. These elements regroup between each other to form completely new substances. This process is known as electrolysis. The new substances which are produced are sodium hydroxide (NaOH), hydrogen gas (H<sub>2</sub>) and chlorine gas (Cl<sub>2</sub>). In our case, gases produced lack of importance. But sodium hydroxide (or "organic bleach") is an effective destruction instrument when it is used on the symptomatic tendon area through degradation (tendinosis) because it is extremely caustic.

TPET is basically a chemical process where there is neither tissue "cooking" nor "electrocution". When we introduce one or several needles in the tendon, paratendon or infratendon we are going to treat, and we connect the electrical current, the salts in the interstitial tissue transform into "biological bleach" when they combine with the humidity of the ground substance itself. This bleach is the one which will produce the destruction in the tissue, and the inflammatory response for its repair.

All living matter is formed by small constructing units called molecules, which are made up of atoms. In water, every molecule is made up of two hydrogen atoms and one oxygen atom (H<sub>2</sub>O). Under the influence of TPET, these atoms divide (they ionize) into a hydroxile ion (OH) and into a hydrogen ion (H). Ions are inestable and therefore they look forward to recombine themselves with other ions. At the same time the water molecules break down, so do the salt molecules. A salt molecule (NaCl) is made up of a sodium atom (Na) and a chlorine atom (Cl), and during TPET they break down into a sodium and chlorine ion.

All the ions produced during TPET look forward regrouping themselves quickly. We observe that chloride ions couple in stable pairs (Cl<sub>2</sub>) to form chlorine gas molecules. In the same way, hydrogen ions match to form hydrogen gas (H<sub>2</sub>). But the most important fact is that every sodium ion (Na) prones to combine with an hydroxile ion (OH) in order to form sodium hydroxide (NaOH). This will be our therapeutic tool, the "organic bleach" or "galvanic bleach (**Table 2**).



**Table 2 :** During TPET, two salt molecules and two water molecules regroup in one molecule of hydrogen gas (H<sub>2</sub>), one molecule of chlorine gas (Cl<sub>2</sub>) and two molecules of sodium hydroxide (NaOH).

The analogy to produce bleach industrially gives us the opportunity to see within a picture the process that takes place in the tendon during the TPET treatment. Commercial bleach is produced in big metallic containers filled with salty water. The container is connected to an electrical source, transforming itself into a continuous current pole. A big carbon electrode which is suspended in the center of the container acts as the second pole. Electrons flow from the carbon electrode (cathode) where there is the electron excess to the metallic container (anode). The electricity flow through salty water produces the chemical reaction of electrolysis, generating sodium hydroxide (bleach), hydrogen gas and chlorine gas.

According to Faraday's law, we can deduce that the amount of sodium hydroxide produced by TPET is the result of the current applied multiplied by the time along which the current flows (current x time = quantity of NaOH). The longer the time is and the bigger the intensity of the current, the more quantity of NaOH will be produced on the tendon area we are treating.

**Which are the therapeutic principles of TPET?**

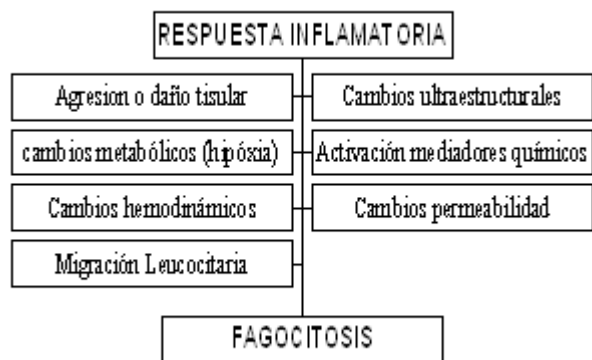
If we accept that patella tendinopathies with more than 3 weeks of evolution correspond to a degenerative process with fibrotic tissue formation, mixoide substance degradation and fundamental system hypoxia, the therapeutic approach must not be the same than within the inflammatory process. Scientific bibliography already highlights that NSAID treatment or corticoids infiltrations inhibitates the inflammatory cells migrating process (neutrophils, macrophages) which are necessary to activate the phagocytosis process. The depressed response of these cells will avoid fibroblast activation in order to generate new collagen and ground substance self-products (PGs,GAGs). These elements are necessary to reestablish the biological properties of the extracellular matrix surroundings.

In this case of patella tendinosis, we must consider as our main objective to encourage the inflammatory response, so that the tendon regenerative mechanisms are activated. TPET produces a chemical reaction in the tendinosis symptomatic focus, and starts a destruction process of the necrosed and fibrotic tissue. In the mean time, the direct contact of the needles to the tendon produces the liquifying of the mixoide substance and the breaking down of the free protein bondings. This fact allows them to flow freely in order to be reabsorbed by the neocapillaries.

When we refer to the localised hyperinnervation in the lower patella pole and patella insercion of the patella aileron, the cathode polarity effect will produce a ionokinesis of the excitatory neurotransmitters freed by the tenocytes during its destruction process. Ionokinesis stimulates the release of the nervous system extended depolarization with no harm for its rest threshold. We will force the destruction of presynaptic buttons produced by hyperinnervation through the caustic effect caused by the direct contact of the neddles to the free sensitive ending and interstitial tissue.

The biological effect produced by TPET is to guarantee the inflammatory response (**tabla 3**), which is the necessary response to reactivate the tendon´s regenerating mechanisms. The TPET dose is selected according to the application time and the intensity. Intensity must always be greater than time in order to guarantee a bigger generation of NaOH and, consequently, more caustic effect. The basic rule for the TPET treatment is to stay on the pain threshold to be sure that we are destroying tissue. If there is no pain, the tissue is not destroyed. And if there is no tissue destruction, there is no way the inflammatory response activates. In short, there will be no regeneration.

By the time the tissue destruction is produced, an inflammatory response takes place. This reaction produces a neoangiogenesis of the near and sane capillaries which have not been affected by the electricity and which will start the invasion of the injury area.



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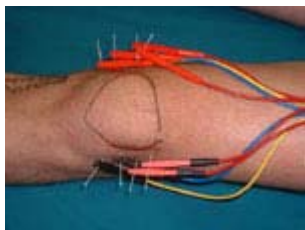
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<b>Polo Positivo (Ánodo)</b>	<b>Polo Negativo (Cátodo)</b>
-Produce Ácido Clorhídrico -Acidifica el Ph	-Produce Hidróxido Sodio (Na OH) o sosa caústica ("lejía") -Alcaliza el Ph
<b>Destruye el Tejido</b>	<b>Destruye el Tejido</b>
<b>Desintegra las agujas de Acero</b>	<b>No tiene efecto sobre las agujas</b>
<b>Forma un tejido cicatrizal duro</b>	<b>Forma tejido cicatrizal sutil</b>
<b>Endurece y solidifica el tejido</b>	<b>Ablanda y relaja el tejido</b>
<b>Alivia el tejido</b>	<b>Irrita el tejido (respuesta inflamatoria)</b>
<b>Reduce el enrojecimiento</b>	<b>Promueve el enrojecimiento como vasodilatador</b>
<b>Germicida (destruye gérmenes)</b>	<b>Germicida (destruye gérmenes)</b>

**Table 4** :Physiological effects produced on the tissue, depending on the cathodic or anodic needle.

The needle number, size and diameter depends on the area we have chosen to treat. When we deal with patella enthesopathy, it is important to identify the entrance points in order to avoid any iatrogenic effect, as the internal saphenous accessory nerve injury could be.



( Click on the image to enlarge )

**Fig. 1** : Patient with one year evolution patella enthesopathy where TPET is applied. A) TPET in superficial muscle fibers in the inferior pole of patella.B) TPET in the interior patella alerón and in the deep proximal insertion face (Sánchez et al 2003).

Before the intervention, we divided the tendon into quadrants, introducing the needle in the deep portion of the tendon insertion contiguous to the area lacking from joint cartilage in the inferior patella pole. Next, in the superficial fibers region in the inferior patella pole (where a hypersensible area is located, due to the existence of hyperinnervation), I apply three impacts of twenty seconds to produce a caustic effect on the presynaptic buttons of the nociceptive terminations. The destruction of microneuroma and mixoide tissue is consequently produced (**fig.1**) .

The TPET treatment of tendinopathies does not exceed sixty seconds, even though this timing may change according to the treating area. After every session where we apply TPET, it is extremely important to train the patient to stay on the homeostasis charge sector. On the other hand, we must remember that the maximum peak of inflammatory response corresponds to the fifth day post-intervention. Within fifteen days, we can assure it will not exist inflammatory cell infiltrate in the injured region.

This is reason why the patient may need a second or third TPET intervention, depending on the healing degree and the treated area. Once we introduce the needle/s in the point/s and select the correct angulation, we will verify the destruction of the tissue when the needle doesn't found elastic resistance on the cauterized tissue. The vasodilatation produced by the cathodic needle favours the diapedesis and, consequently, the neutrophil migration to the microtraumatized region.

In the area touching the needle, a lyophil effect is produced. The mixoide substance matter passes from its gel state to its sol state, much more fluid, to allow the uptake of the catabolits and to facilitate the surrounding pH and PO<sub>2</sub> normalisation. Due to the intensity gradient, a contrairritation in the nociceptive endings is produced, associated to the destruction of the synaptic endings, normalizing the resting potential and inhibitating the accessory mechanism of extended despolarization. The polarity effect of the cathodic needle stimulates the removal and drainage of glutamate excitatory neurotransmitters, reestablishing the resting potential.

In conclusion, we can affirm that the TPET biotherapeutic effects are important, allowing an inflammatory response and the tendon healing in a shorter time that any other type of conservative treatment consulted in the scientific bibliography.

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