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## The Results of Local Steroid and Physiological Saline Solution Used for Chronic Achilles Tendinitis, A 2-Year Follow Up

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### ABSTRACT

**Background and objectives:** Achilles tendon (AT) is the strongest and the thickest tendon of human body. Sarcostyles of this tendon are not exactly vertical and have a spiral shape to some extent. Due to this fact, tendon gets stronger and the contact (friction) between sarcostyles decreases. Achilles tendinitis is a kind of wounding that can be caused by overuse or misuse of achilles tendon, lack of flexibility, genetical structure, gender, age, height, weight, pes cavus deformity, lateral ankle instability, forefoot varus, lateral heel throb during the act of walking and excessive compensatory pronation, decrease in ankle dorsiflexion, lower extremity alignment disorders, endocrine and some metabolic factors and many others. It mostly happens for athletes. If we look with a histopathological perspective at achilles tendinitis, we will see that tendon has an angiofibroblastic hyperplasia. The reaction created against the degenerative process of tendon is an inflammatory response in peritenon. Throughout the treatment, pains and tenderness are tried to be decreased. In order for this purpose, resting, hypothermia and NSAID can be applied. Raising the heel is recommended in order to decrease the burden on tendon. Within the chronic process, the renewal of tendon is preferred. **Methods:** In our study; a 30 cc local anesthetic and saline physiological injection was applied to 38 of 98 patients while a mixture of 15 cc corticosteroid and local anesthetic injection was applied to 60 patients. **Conclusion:** It is highly significant that we did not record any relapse within our 2-year follow-up after increasing local blood circulation with the injection of physiological saline and local anesthetic mixed solution although we got the response later than steroid method and the rate of success in this method was relatively low. Moreover, this method has no side effects and can be used securely when steroid method cannot be used.

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## INTRODUCTION

Achilles tendinitis is placed in posterior superficial compartment of the leg and formed by the combining of gastrocnemius and soleus muscles in distal (Dönmez, 2011; Karahan and Erol, 2004; Doral *et al.*, 2010). Achilles tendon and the structure around it are clinically significant (Apaydın *et al.*, 2011). Achilles tendon is the biggest tendon of body and links gastrocnemius to calcaneus. It is used for walking, running and jumping. Achilles tendinitis is generally not related with a certain wounding but a result of a relapsing stress problem of tendons (<http://orthoinfo.aaos.org>).

Achilles tendon is the easiest one to suffer from a trauma and can easily be ruptured (Wren *et al.*, 2001). Achilles tendinitis which is a disorder caused by degeneration and inflammation of achilles tendon is the inflammation of the body of tendon. It is rather rare than tendinosis and mostly seen together with rheumatismal disorders (Kılıçoğlu, 2009). Achilles tendinitis is a common situation seen beside the heel that causes pain throughout the leg. The response of the body showed by frequent swellings against tendinitis is caused by pain, scratchiness and dermatitis (<http://orthoinfo.aaos.org>). The pain related to achilles tendinitis is the one felt in posterior heel. It is generally seen in a place of tendon that is 2-4 cm above heel and where the blood stream occurs most. This place is called as Tendon Basin (Cluett, 2014).

Achilles tendon is formed by gastrocnemius and soleus muscles (triceps surae). It cleaves into one third of the posterior part of calcaneus with the center and forms a spiral shape. The duty of tendon is to slow down, stabilize and then accelerate the foot during the act of walking. The bad mechanics and overuse of the foot and

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ankle make the patient prone to wounding. Achilles tendinitis is actually caused by overuse and the term “tendinosis” may define this situation better because histopathologically this situation is the angiofibroblastic hyperplasia of tendon. An inflammatory response is created in peritenon against the degenerative process of tendon ([www.drdenizdogan.com](http://www.drdenizdogan.com)).

Gender and age, shoes selection, medical issues, taken drugs are the risk factors for achilles tendinitis (<http://www.mayoclinic.org>). Achilles tendinopathy is a pathology caused by overuse and mostly in athletes. Overuse, misuse of tendon, lack of flexibility, genetical structure, gender, age, height, weight, pes cavus deformity, lateral ankle instability, forefoot varus, lateral heel throb during the act of walking and excessive compensatory pronation, decrease in ankle dorsiflexion, lower extremity alignment disorders, endocrine and some metabolic factors and many other factors cause achilles tendinitis (Tatari *et al.*, 2005; Kader *et al.*, 2002). Moreover, an abrupt increase in training load, changes in the running surface, insufficient heating up before a sport activity, unsynchronized movements of agonist and antagonist muscles during the act of running and the use of low quality shoes (Tatari *et al.*, 2005; Wren *et al.*, 2001). osteophyte in the heel caused by bone growth, tight gastrocnemius muscles (<http://orthoinfo.aaos.org>) are other factors (Tatari *et al.*, 2005; Kader *et al.*, 2002; Jarvinen *et al.*, 2001).

It is seen within the studies that intravascular volume decreases in the place 3-6 cm proximal to calcaneal adherence part and may result in spontaneous rupture (Stein *et al.*, 2000). Some systemic diseases such as rheumatoid arthritis, hyperuricaemia, psoriasis, hypercholesteremia (Mathiak *et al.*, 1999) and the antibiotics within fluoroquinolone group are some other reasons of achilles tendinitis (Tatari *et al.*, 2005; Van Der Linden *et al.*, 2001). The clinician should control the lower extremity order and search for the existence of a short leg or pelvic rotation that might create an excessive amount of stress on achilles tendon. When one foot in pronation and the other is in supination position, there is generally an increased or unequal stress on achilles tendon (Taunton *et al.*, 1999). Weakness of muscles and decreased flexibility can be other reasons for this problem (Paavola *et al.*, 2002). With the existence of a hypomobile pes cavus that causes shortening of tendon, the front of the foot changes to downwards position in plantar flexion and creates extremely high tensile load within the middle phase of stepping. Subtalar pronation is pathology that creates a pathological stress on achilles tendon and it is frequently overlooked. Functional biomechanical orthosis can help for the normal function of the foot (Duane and Hoke, 2003). The shoes with excessively soft heel fords, which can not keep the lateral stability of the foot or the shoes which have inadequate heels and change the position of foot from neutral to dorsiflexion and create excessive tension on tendon can other reasons of the problem (Tatari *et al.*, 2005).

The continual problems in diagnosis and treatment of pathological situations such as the tendinopathy related to achilles tendon require us to know the functional anatomy of achilles tendon in detail. It also important to know the relation between achilles tendon and environmental neurovascular structures in order to decrease the risk of iatrogenic injuries that may happen during surgical treatments (Apaydın *et al.*, 2011).

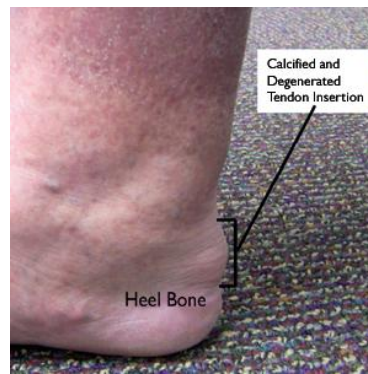
***Symptoms of achilles tendinitis are as follow:***

- Pain and hardness on achilles tendon.
- The pain throughout the tendon and at the back of the heel gets worse during the activity
- Acute pain after training.
- Osteophyte (insertional tendinitis) (<http://orthoinfo.aaos.org>).

Achilles tendinitis has two types depending on the place of dermatitis on tendon (<http://orthoinfo.aaos.org>). Insertional (on adherence area) tendinitis is caused by the ending of micro tearings that occur in bone-tendon junction with a degenerative process in the most distal area of achilles tendon and the adherence area of calcaneus within the time (Chiara *et al.*, 2003; Leitze *et al.*, 2003; Tatari *et al.*, 2005). Insertional tendinitis is the inflammation of achilles tendon that occurs in the joint area of achilles tendon and the heel. A kind of tenderness and pain occur in this kind of patients due to an osteophyte caused by a frequent occurrence of calcium on the joint area of achilles tendon and the calcaneus. As a result of this situation, retrocalcaneal bursitis (look below for information) and an extension of bone called as Haglund Disorder occur in the aforementioned area (Aaron *et al.*, 2011).

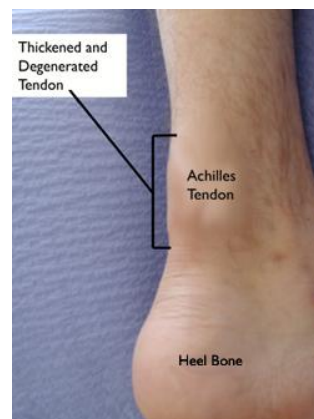
a) Insertional tendinopathy mostly occurs as a chronic ectopic bone formation in the joint area of achilles tendon at middle and later ages and we see this kind of disorder in two ways (Tatari *et al.*, 2005):

1. A tenderness occurs together with a diffuse thickening on adherence place, temperature rise, osseous eminentia and palpation. The patient can not make the movement of raising on tiptoes more than two or three times (<http://orthoinfo.aaos.org>).
2. There occurs a better localized and limited, sensitive area on adherence place. Raising on tiptoes can be made more easily (<http://orthoinfo.aaos.org>).



**Fig. 1:** Insertional Achilles Tendinitis (<http://orthoinfo.aaos.org>).

b) Non-insertional (far from adherence area): This type is the most seen tendinitis. This occurs without showing any histological or clinical symptoms of intratendinous inflammation. Noninsertional achilles tendinitis is the blistering and thickening of tendon as a result of the deformation of middle sarcostyles of the tendon. Generally young and active people suffer from this (<http://orthoinfo.aaos.org>).



**Fig. 2:** Noninsertional Achilles Tendinitis (<http://orthoinfo.aaos.org>).

Within the acute phase of achilles tendinitis, tendon is usually swollen and oedematous and there occurs sensitivity against palpation, erythema and temperature increase in one third of the middle of the tendon. Crepitation also occurs. The pain is more sensible in the beginning of walking activity, while it fades away gradually after some warming up activities. This situation limits sportive activities (Paavola *et al.*, 2002; Cook *et al.*, 2002; Paavola *et al.*, 2002: 178-82). Within more chronic phases, the pain increases with exercises; crepitation and effusion decreases. Some nodules and thickenings may occur around tendon. In more severe situations, the pain can be felt even with the act of walking (Tatari *et al.*, 2005; Kader *et al.*, 2002; Paavola *et al.*, 2002: 178-82). Some biomechanical, metabolic, endocrinologic factors also should be analyzed as underlying factors for the patients who are diagnosed to have achilles tendinopathy (Tatari *et al.*, 2005; Kader *et al.*, 2002).

#### **Conservative Treatment:**

Within the early phases of achilles tendinitis, some different conservative treatment methods might be applied. For the cases that do not respond to conservative treatment, surgical treatment might be recommended (Tatari *et al.*, 2005; Kader *et al.*, 2002; Sorosky *et al.*, 2004). The purpose is to help the patient begin sportive activities again within the shortest time and without pain (Tatari *et al.*, 2005; Kader *et al.*, 2002; Paavola *et al.*, 2002: 178-82). If the reason is overuse of muscles and occurs in early phases, prevention of overuse and resting would be sufficient for recovery. However, if there are mechanic problems, these problems should be identified and restored (Tatari *et al.*, 2005).

Within treatment, firstly it is tried to decrease the pain and tenderness. In order for this reason, resting, hypothermia and NSAID can be applied (<http://www.drdenizdogan.com>).

The most important components of an expedient recovery are resting the achilles and changing exercises for pain and overuse problems (<http://www.drdenizdogan.com>; Aaron *et al.*, 2011). In acute tendinitis, local hypothermia and NSAID applications result in positive responses together with some activity modifications in a

short while. For chronic cases the same treatment becomes successful but generally lasts for a longer period (Kılıçoğlu, 2009).

Raising the heel may decrease the tension of achilles tendon. As the raising will decrease the burden on tendon, this method is recommended. Within the chronic phase, the main purpose of the rehabilitation becomes the restoration of tendon. For this reason, some protocols are conducted together with ultrasound, iontophoresis, deep transverse friction massage, stretching and strengthening. Strength, endurance and flexibility are aimed with therapeutic exercises. Shoes with low heels and having a U-shaped notch on the heel might be helpful for decreasing inflammation. Stretching and strengthening exercises of hind leg and hamstring muscles allow achilles tendon to perform more efficiently. The dorsiflexion stretching activities of ankle that are made for 10 days, two times a day for 30 seconds could help for decreasing the pain. Some other strengthening activities such as theraband exercises or raising on tiptoes could also be efficient. Cortisone could result in weakening and rupture of the achilles tendon (<http://www.drdenizdogan.com>).

Especially for the cases with inflammation and acute damage in achilles tendon, non-steroid anti-inflammatory drugs like ibuprofen could be helpful. Moreover, the treatment process includes stretching and strengthening and correcting the alignment problems under a doctor, physiotherapist or athletic trainer and massages with ice. Injecting cortisone or thrombocyte-rich plasma could be used in order for a relief (Aaron *et al.*, 2011).

In order to prevent the damage of achilles tendon, an intense and difficult exercise program should be conducted and its level should be increased gradually, proper shoes should be used, stretching should be applied for achilles tendon and gastrocnemius, other exercises should be used in order to decrease the risk of injury (Aaron *et al.*, 2011).

The techniques that could be used for the conservative treatment of achilles tendinitis are given below (<http://orthoinfo.aaos.org>; Cluett, 2014; <http://www.drdenizdogan.com>; <http://www.mayoclinic.org>):

***Resting:***

In order to relieve the pain, the first thing to do should be suspending or decreasing the activities. Exercises are done periodically and with lower effects. As a result of this, the stress on achilles tendon could be decreased.

***Ice:***

An ice cube should be placed on the most aching area of achilles tendon and this can be applied many times during the day if needed.

***Non-steroidal anti-inflammatory drug:***

Some drugs like ibuprofen naproxen could be used for decreasing the pain and swelling. However, this would not decrease degenerative tendon thickening.

***Exercises:***

Some exercises and strengthening gastrocnemius could be helpful for relieving the stress on achilles tendon.

***Physiotherapy:***

Physiotherapy is significantly helpful in the treatment of achilles tendinitis.

***Eccentric protocol strengthening:***

***Injection of cortisone:***

Cortisone is a steroid, a kind of strong anti-inflammatory drug. The injection of cortisone inside achilles tendon may result in rupture and this method is rarely recommended.

***Supportive Shoes and Orthosis:***

The pain brought together with insertional achilles tendinitis could be treated with the help of some orthotic devices such like shoes. For instance, shoes with soft heels might decrease the irritation of tendon.

***Pressing:***

This method might be applied with an elastic band, a scarf in order to relieve the swelling and decreasing the movement of tendon in this way.

***Elevation:***

Raising the injured foot over the heart level before sleeping would help for decreasing the swelling.

### **Extracorporeal Shockwave Therapy (ESWT):**

This method is conducted within the tissue healing period by giving high-energy shockwaves to the damaged tendon. However this method did not provide consistent results. Because of this fact, this method is not widely used. There is no need for a surgical cut in this method.

The healing period may be divided in three phases. Phase I is the inflammatory phase, Phase II is the proliferation or fibroblastic phase and Phase III is the remodeling.

Within Phase I the conventional treatment PRICE; Protecting, Rest, Ice, Compression, Elevation could be applied (<http://orthoinfo.aaos.org>; Tatari *et al.*, 2005).

Exercises of Phase I and II are not difficult and can be done depending on the pain tolerance. Doing these exercises in elevation helps for a hemodynamic healing (Taunton *et al.*, 1996). An early-grade stress on damaged tissues stimulates the functional formation of collagen sarcostyle. The exercises could be started with an ice massage, active dorsiflexion (with elastic band resistance), simple calf stretching and eccentric calf exercises (Taunton *et al.*, 1996). The raisin heel should be placed in casual shoes and sport trainers (Cook *et al.*, 2002). The height can be decreased as the motion range of the painless diarthroses increases (Taunton *et al.*, 1996). Non-steroid anti-inflammatory drugs (NSAID) should be used in these phases (Tatari *et al.*, 2005).

Within Phase II, it is aimed to provide normal elasticity, strength and neuromuscular control (Paavola *et al.*, 2002: 178-82). The exercises within Phase II further from simple diarthroses motion range and stretching to muscle strengthening, endurance and cardiovascular and more complicated neuromuscular control programs within the late period (Tatari *et al.*, 2005; Taunton *et al.*, 1996). In order to increase the motion range of the foot and the ankle, a manual mobilization, including subtalar and metatarsal mobilization and medial and lateral stretching of achilles tendon, is used. The dorsiflexion movement is done swiftly in order to allow anterior muscle groups to increase the eccentric activity of dorsiflexes from the pain in the heel until the midtans phase and increase the control of the foot. Diarthroses motion range should be controlled and a free resistant movement should be allowed for some angles that will not disturb damaged tissues. The strengthening of proximal muscles, especially gluteus and multiplanar stretching and eccentric strengthening of gastrocnemius and soleus muscles are highly significant within this phase (Åström and Westlin, 1992).

In order for the optimal healing, both isotonic and isokinetic exercises are recommended. Protective devices can be used within this phase (Tatari *et al.*, 2005; Taunton *et al.*, 1996; Cook *et al.*, 2002).



**Fig. 3:** Osteophyte in Achilles Tendinitis.

Phase III includes the maturation of collagen (scar). A progressive stress could be conducted on tissues in order for the collagen to occur throughout the stress lines in appropriate areas. The aggressive stretching and active resistant movement should be delayed until the relief of pain and swelling. After the inflammation decreases, heating method could be applied before exercises. Within this phase, a proper pair of shoes and orthosis should be used and an analysis should be conducted for trainings. A kind of shoes that have durable and strong heels preventing excessive impacts will increase the shock absorption during the heel kick and the stability of hind foot. Protective bands or elastic bandage can be protective against recurrence of injuries and can relieve the pain that may occur during the start over period (Tatari *et al.*, 2005; Paavola *et al.*, 2002: 178-82; Taunton *et al.*, 1996; Cook *et al.*, 2002).

### **Methods and Results:**

The subject group of the study is composed of 98 patients who applied to our clinic and who were diagnosed with chronic achilles tendinitis. The average age of the patients is 41,8. 62 of our patients are male, while the other 36 patients are female. Nobody among the patients is a professional athlete. The chronic diseases of our patients are as follow: 2 patients are HBV carriers, 8 of them suffer from diabetes mellitus, 4 patients have hypothyroid disease and 6 of our patients have hypertension. The required informing was made for all patients. A 30 cc physiological saline and local anesthetic mixed solution was infiltrated in the area of tendinitis and a fluid volume was formed in tissue under the skin and around the tendon for 38 of the patients. For other 60 of patients, a 15cc steroid and local anesthetic mixed solution was infiltrated into the area of achilles tendinitis. The liquid was dispersed by making massages on the infiltration areas. A bandaging made, high-heeled shoes

were recommended for 2 weeks and challenging movements were prohibited. Follow-ups of all patients were made by the clinic. The patients did not take any analgesic and anti-inflammatory agents. The patients with chronic hypothyroid, diabetes mellitus and the HBV carriers are the ones subjected to the physiological saline injection.

In our study; we injected 30cc local anesthetic and physiological saline mixed solution into the tissue with tendinitis and around the tissue for 38 of our patients while we injected 15 cc corticosteroid and local anesthetic mixed solution for 60 of our patients. We recorded a relief from 82% of the patients we injected local anesthetic and physiological saline mixed solution with 6 weeks and no relapse occurred during our 2-year follow-up. However, for the other group we injected a corticosteroid local anesthetic mixed solution, 92% of this group had a relief within 10 days but the problem relapsed in 7,3 months on an average.

### **Discussion:**

Achilles tendon is the weakest tendon against trauma and rupture (Wren *et al.*, 2001). As a response to the degenerative process of this tendon, peritendon creates an inflammatory reaction (<http://www.drdenizdogan.com>). Sex and age, physical problems, shoes selection, medical cases and used drugs constitutes the risk factors for achilles tendinitis (<http://www.mayoclinic.org>). It is the ending of achilles tendon with a degenerative process in its most distal section and in the adherence area to calcaneus (Tatari *et al.*, 2005; Chiara *et al.*, 2003; Leitze *et al.*, 2003). Protective banding or elastic bandage can relieve the pain and can be protective against recurrence of the injury during the start over (the activity) (Tatari *et al.*, 2005; Paavola *et al.*, 2002: 178-82; Taunton *et al.*, 1996; Cook *et al.*, 2002). It is not recommended to inject cortisone into achilles tendon. Although we got a relief at the rate of 92% with an intense cortisone application within a short period (6 weeks in average), there occurred relapses in 7.3 months. For the patients we injected physiological saline solution, we got the response of relief in a longer period (6 weeks) but no relapse occurred throughout the 2-year follow-up. The patients with chronic diseases are also among this group and this fact makes this result more significant for our study. It is an advantageous fact that some possible problems that could occur especially for the patients with diabetes mellitus and for HBV carriers with the use of steroid did not happen for the patients subjected to the injection of physiological saline mixed solution. Cortisone could result in weakening and rupture of tendon (<http://www.drdenizdogan.com>). We are in the opinion that the result we obtained with the use of physiological saline mixed solution increased the blood circulation and resulted in healing. The number of patients we used in our study is highly significant statistically, but we think that better results can be obtained with bigger series and longer follow-ups.

### **Conclusion:**

Chronic achilles tendinitis is a disease which we mostly encounter clinically both in athletes and middle age group. We mostly use the application of steroid which gives a response within a short period. However this method has some risks like an early relapse and some other possible problems for tendon. It is highly significant that we did not record any relapse within our 2-year follow-up after increasing local blood circulation with the injection of physiological saline and local anesthetic mixed solution although we got the response later than steroid method and the rate of success in this method was relatively low. Moreover, this method has no side effects and can be used securely when steroid method cannot be used.

### **Contribution of Authors:**

The authors Aylin Zekioglu and Ali Serdar Yücel gave support in the translation and summarization of the sources used in the research in addition to literature support.

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