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Nanofat Tendon Coating (NTC) A Promising Procedure in Treatment of Tendinopathy

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Abstract

Introduction

Tendinopathies are complex, often multifactorial, tendon pathologies that can be treated using the NTC+PPI technique, which involves applying nano fat to the affected tendon with a blunt cannula of different measures and calibre.

Methods

Thirty patients with various tendinopathies (Achilles, patellar, epicondylitis, etc.) were treated with NTC and followed up for six months. Patients were evaluated using specific scales for each type of tendinopathy (VISA-A, VISA-P, PRTEE, VAS).

Results

The results show a significant reduction in pain and improvement in tendon function in all patients. Evaluation scale scores improved significantly between T0 and six months after the procedure (T6).

Conclusions

The NTC technique appears to be a promising therapeutic option for the treatment of tendinopathies, with positive clinical and imaging results and significant pain reduction. The procedure is minimally invasive and does not require rest or immobilization.

Keywords: immune response, healing process, mesenchymal cells, NTC, PPI

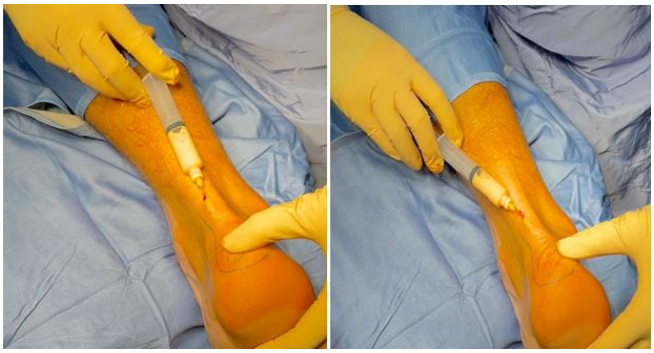
Introduction:

Tendinopathies are complex tendons pathology, generally multifactorial, metabolic or linked to excessive use (sport or work) manifesting as pain, even at rest, and reduced resistance to physical exercise. Rotator cuff tendinopathy is the most frequent, followed by Achilles tendon, external epicondylar tendons (common extensor of the fingers and wrist, radial brachialis), patellar tendon, goose paw tendon tendinopathies. Extensor tendon pathology of the forearm affects about 1-2% of the general population and is particularly frequent among tennis, golf and baseball players[1], even amateur. From a point of view, cellular modifications at this level are well known: disorganization of tendon fibers, increase in both vascularization and the number of sensitive fibers, increase in cell apoptosis, decrease and modifications of the cellular and extra-cellular matrix, reduction and modification of collagen production in particular an increase in type III collagen compared to type I. These histological changes have a MR and US modification on the tendon tissue signal. The possibility to switch on the complex mechanism of the healing process is due to the presence of biomolecular signal, these signals are essential. Without them the process that led to tendinopathy remains chronic and the affected tendon structures inefficient.

Methods:

The rationale for using the Nanofat Tendon Coating (NTC) involve preparing nanofat by lipoaspiration around umbelical area *IntraGraft Fat, Intrauma Spa*. This provides resident cells with signals to trigger the healing process. Mesenchymal cells[2] inserted into the nanofat produce this signals and possess a very useful differentiation capacity for repair processes. They have a complex transport and delivery system mediated by microvesicles that fuse on the phospholipid membrane of resident cells, conveying signal proteins into their cytoplasm[3-4-5-6-7]. Macrophages activation is enhanced by signalling molecules secreted by mesenchymal cells. NTC involves coating affected tendon area and healthy zone with 4/6 ml of nanofat using a blunt cannula (25gx 5 cm or 21gx 7cm) from dermal filler, PPI technique[8] (Pic 1-2-3-4). The blunt tip does not cause any additional tissue damage or hematomas recognizing, thanks to its flexibility, the anatomical plane of cleavage without mechanical stimulation of the sensitive fibers, resulting in no activation of nociceptors and receptors (Golgi, Pacini and Ruffini) in the tendon. The procedure does not require functional rest or immobilization allowing patients to return to daily activities immediately. Molecular signals are distributed to all resident cells, also and especially from healthy ones, which undoubtedly contribute to the enhancement of the process. Thirty patients were treated with NTC, includes Achilles tendons, epicondylar tendons, patellar tendons, plantar fascia with excellent clinical and imaging results[9]. Patients were reassessed at one week, one month (T0), three months (T3) and six months (T6). A total of 30 patients with a medium FU of 6 month (7 ±1). 18 man 12 women, mean age 42.5 ± 14,9 years. The distribution was: 10 Achille's Tendon, 10 Patellar tendon, 5 epicondyle tendons, 2 tibialis anterior tendons, 2 plantar fascia, 1 gluteus medium (bilateral). Achilles tendons was evaluated by VISA-A[10] Patellar tendons by VISA-P, Epicondyle by PRTEE. Other tendons by VAS. Was administrate to all patients, starting from the beginning of the third week after the procedure of specific eccentric exercise.

Pic1-2: Guide needle for skin incision and blunt cannula sliding on tendon structure



Pic: 3-4: FAN TYPE APPLICATION

Results

After the treatment, patients experienced the total pain disappears of end the complete tendon function recovery. Results are unassailable in terms of pain relief end clinical outcome. Imaging demonstrate tissue restructuring previously affected by inflammatory and tendon fibrillar disorganization. Ultrasound checks at different times showed unequivocal sing of tendon structure restoration.

Achille's Tendon	VISA-A T0	VISA-A 3 M	VISA- A 6M
1	55	80	100
2	57	80	98
3	58	85	98
4	60	88	90
5	60	78	100
6	54	100	90
7	51	80	95
8	50	80	100
9	50	80	100
10	50	76	100
	Average 54,5	Average 82,7	Average 97,1

Pict 5 VISA A t0- t3 -t6 evaluation

Patellar Tendon	VISA-P T0	VISA-P 3 M	VISA-P 6M	
1	49	70	100	
2	45	65	100	
3	50	74	90	
4	48	80	90	
5	52	68	100	
6	54	100	98	
7	55	89	95	
8	52	90	100	
9	52	76	100	
10	52	80	100	
	Average 50,9	Average 82,7	Average 97,3	

Pic-6 VISA P to-t3-t6 evaluation

Epicondyle	VISA A T0	VISA A 3 M	VISA A 6M	
1	49	98	100	
2	45	98	100	
3	50	100	98	
4	48	79	98	
5	52	80	100	
	Average 48,8	Average 91	Average 99,2	

Pict. 7 PRTEE to-t3-t6

Other tendons	Vas t0	Vas t3	Vas t6	
Tibialis Anterior 2	7-8	2-2	1-2	
Gluteus medio tendon1 (bilateral)	8	2	1	
Plantar fascia 2	7-8	2-1	0-0	

Pic.8 Vas t0-t3-t6 Other tendons

In patients with Achilles tendinopathy, VISA-A improve from average of 50.6 at T0 to 82.7 at T3 and 97,1at T6.

Patellar tendinopathy patients showed VISA-P scores improving from T0 50.9 to 82,7 at T3 and 99,2 at T6

PRTEE scores for lateral epicondylite improve fro 48.8 T0 to 91 atT3 and 99.2 atT6.

One complication was reported in patellar tendon who experienced swelling and pain after flying for five hours post-prodedure. The swelling resolved with cryotherapy and paracetamol. NSAIDs were avoided for seven days pot- procedure to mantain proinflammatory action of the immune response.

A relevant fact is that already at the check-up after a week, the 99% of the patient sample 30-1(the patient with described complication)reports a reduction in perceived pain of more than 40%. The 70% of patientes evaluated with VISA-A reported the reduction of pain in the Achilles tendon upon awakening by more than 40% around 30 days after NTC+PPI.

80% of all groups after 30 days did not complain of pain in daily activity.

100% of patiens benefited with full satisfaction and has regained the lost quality of life.

Maybe we need more study, a higher patients number, but the evidence is before our eyes. Longer Follow up maybe will confirm present results. During the writing of this paper we are continuing to monitor other patients who have undergone NTC+PPI with results comparable to those presented here.

The immunomodulatory action of mesenchymal cells undoubtedly plays a leading role in our superior experience for tendon pathologies than intraarticular administration. This is probably due to the intrinsic characteristics of the resident cells and their natural response to environmental and biochemical stimuli. The minimally invasive NTC+PPI technique allows you to perform a safe operation, free of risks associated with procurement, without rest and with an immediate reduction in the perceived pain of the treated tendon structure.

Conclusions:

NTC+ PPI procedure is a promising minimally invasive treatment for tendons desease, with less recovery time appear particularly suitable for active patients and athlete, both amateur and

professional. The immediate pain relief and lack of complication makes the procedure, safe and advisable for patients with high functional demand and short recovery time. Eccentric[11-12-13]and proprioceptive exercises administered from the time of second week help reactivate type I collagen production and to orient the tendon fibers in the direction of applied forces.

This strategy, offers a potential solution in restoring tendon and tendon bands with promising therapeutic frameworks as participants of physiological homeostasis and healing response.

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