# INSERTIONAL TENDON PATHOLOGIES IN ATHLETES: CLINICAL, BIO-MECHANICAL AND MORPHOLOGICAL RELATIONSHIPS

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## INTRODUCTION

The goal of our study was to investigate the biomechanical aspects of some techniques of muscular elongation used to reequilibrate the Kinetic chains of the human body.

In particular the biophysical and biomechanical aspects of muscle tissue subjected to elongation tension were studied.

It is known, in fact, that muscular viscoelasticity is related to the different three dimensional architecture that the single fibrecells assume in the various muscles (Roeleveld K. 1993) and to the molecular organisation of the cytoskeletal matrix in which the sarcomere units are orientated (Wang 1993).

The clinical validity of these techniques was studied in the context of one of the most frequent insertional tendon pathologies which affects athletes; the recto-adductural syndrome.

With regard to this pathology the clinical effectiveness of a pliarmacological analgesic support (somatostatin) was also evaluated in comparison with the medical and/or physiotlierapeutic treatment generally administered.

## EXPERIMENTAL DESIGN

Using an experimental model the biomolecular aspects induced by elongation techniques which differed in their biomechanical imposition and traction times (stretching and active muscle straining) were observed.

For the experimental design 5 rabbits (New Zealand) were used to whose right hind leg was attached a weight of 1 kilogram for 3 minutes consecutively, for a period of 3 weeks.

At the end of the experimental period the rabbits were suppressed and the anterior tibial muscles extracted.

These were then fixed in alcoliol-fornialin (9:1) for 24 hours at +4° and in closed in paraffin.

The hystological sections were then subjected to routine coloration.

For the endomysium study. in order to analyse the macromolecular components of the collagen, a "panel" of specific hystocliemical reactions was set up.

The fragments for the electronic microscope were fixed in glutaraldehyde at 2,5 % in a cacodylate tampon 0,1 M per 45' at +4°.

There followed a post-fixing in Osmium 1% in water, conventional dehydration, infiltration in Toluol and inclusion in Epon 812.

The analysis of the result suggests how, during active eccentric straining. a series of changes take place in the molecular components of the endomysium.

## THE PROTEOGLYCANIC MATRIX

The "panel" of sequential hystochemical reactions which had been set up showed a remarkable positivity with regard to hyaluronic acid suggests an increment in the final plasticity of the endomysium and an

increased dcformability and viscoelasticity which can be associated with a particularly positive effect on the "vasomotion" of the microcircle.

THE COLLAGENIC COMPONENT even if the immuncytochemical sampling of the various types of collagen (I. II, III) did not show significant differences betwen the controls and treated limbs the microscopic analysis in polarized light, integrated with a polyzoic probe, showed together with a thickaess stability a diminished packing. This data, confirmed by the eletronic microscope investigation, integrated with the data relative to the proteogalynic matrix indicated as the endomysiumal matrix, following an active excentric characteristics in the sense of an increased structural deformability.

THE CLINICAL STUDY: MATERIALS AND METHODS

The clinical efficacy of the biomechanical re-equilibrium of the kinetic muscular chains by the techniques of elongation, were studied in a group of 14 athletes (professional footballers) (tab.1) affected by the recto-adductural syndrome.

The sample was subjected. at the beginning, to mobility tests of the kinetic chains of the spinal columm and lower limbs and to a isokinetic valutation of the muscle power used in the abd/adduction of the hip, in the flexing extension of the hip, of the kaee and of the trunk using the Lido Back and Lido Active apparatus (loredan CA-USA).

The parameters considered were the average of peak force and the fatigue index.

Tha valuation of spontaneous pain was carried out using the Scott-Huskinsson horizontal analogical visible scale graduated from 0 to 100; pain during movement was evaluated using Maigne's method (scale 0-3).

Successively tha sample was divided in two groups which were homogeneous with regard to number, age, anthropomorphic characteristics and positivity to mobility testing.

The first group was subjected to muscular re-equilibrium with techniques of active muscular strain following a protocol which foresaw 5 weekly sittings of 1 hour duration.

For the removal of spontaneous and movement pain this group was treated for28 days with an infiltration, at the level of the tendon of the adducturies or of the insertion of the abdominal recti with 750 ug of somatostatin 14 (Stilamin-Serono) every 7 days.

The control group underwent muscular re-equilibrium with the common techniques of stretching for 5 weekly sitting for the duration of 1 hour.

The removal of spontaneous and movement related pain was treated with cycles of physiokinetic thrapy and/or FANS.

The validity of the treatments used was also evaluated on, apart from the parameters considered above, the recommencement of sporting activity of the athlete and a follow-up of three months.

RESULT

The results show a significant reducation ($p<0.001$) of spontaneous pain (Graph 1) and movement related pain (Graph 2) in the treated group versus the control group already in the second week of treatment. The reduction of algic symptomology permitted an intensification of the muscular elongation which, in the group treated with techniques of active muscular straining allowed the annulment, after 4 weeks of treatment, of the positivity index in the mobility tests (Graph 3).

The increment of the mean values of the peak force moment in the treted group compared to that of the controls was significant ($p<0.005$) already from the third week of treatment both for the extensory and flexory muscles (Graph 4) and for the flexory muscles of the knee (Graph 5).

The percentage of athletes in the treated group that recommenced official sporting activity after 4 weeks of treatment (Graph 6) was significant in comparison with the same percentage for the athletes of the control group.

Also in the 3 month follow-up .(Graph 7) the differences between the treated and the controls are evident with regard to the re-occurence of the symptomology of the recto-adductural syndrome.

## CONSDERATIONS

The biomechanics of the techniques of elongation can receive useful inputs from integrated clinical/biological studies.

In other studies (Parente 1992) we investigated the close linkage between biomechanical imbalances and morphological changes during insertional tendon pathologies as well as the analgesic effects of somatostatin to be considered not only in relationship to an inhibition of substance P but also to an antagonistic action some cytokine such as IL-1 and IL-8 which are involved in insertional fibro-angiogenesis (Parente 1994).

Our group's experience, in the biomechanical field of the techniques of muscular elongation permits us to affirm that yhe active tension method of straining in a static excentric position, restoring a correct morphology to the antigravity muscles favours an increase and a longer duration of the amount of "residual elongation".

It is possible to presume that the variations encountered in the endomysium area can influence the resistant capacity of the connective interstice aiding, in this manner the working capacity of the active muscle component.

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