PAIN FROM PLANTAR FASCIITIS

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INTRODUCTION

The plantar fascia is constituted by connective tissue and has connection with the calcaneal tuberosity (medial tubercle) and with the metatarsal heads and is divided in three sides (central, medial, lateral).

Plantar fasciitis is an inflammatory condition characterized by pain in the medial, central and lateral sectors of the sole accompanied by stiffness.

The aim of this study was to examine and interpret the features of the pain focus in this condition from a clinical and on esthesiological point of view and in relation to the objective findings of a biomechanical evaluation.

MATERIAL and METHOD

Twenty-two subjects (17 men, 5 women), aged 19-51 years were examined who practised sports regularly; all presented pain in the plantar fascia of the foot . Each subject underwent:
1) a clinical examination to identified eventual TrPs in the pain zone; 2) Instrumental examination with mesurement of pain thresholds to electrical stimulation of the skin, subcutaneous tissue and muscle in the affected area and unaffected controlateral area and 3) an evaluation of biomechanical parameters related to function by means of an analysis of the foot-ground reaction and a concentric and eccentric peak force revealed by isokinetic dinamometer during the plantar flex contraction.

The ground reaction has been analized by a Kistler plateform at the normal strike. The values of the peak forces has been obtained with the subject in prone position and with the extended knee. The results have been compared interindividually and intraindividually, a value superior of 15% of the controlateral foot has been accepted like significant.

The patients were then fitted with a corrective insole and re-subjected to the above examinations after 30 and 60 days.

Electrical stimulation technique

A Lace Electronic device was used consisting of a three channel ES-3 square-wave stimulator and a CCI-2 constant current isolator. A digital display incorpored in the latter showed the intensity of the delivered current in milliamperes (range 0-30 mA). A Goldstar double-beam oscilloscope (Model 05-7020) permitted verification of the form of the stimulating waves by measuring the drop in voltage through a 5-k Ω resistor placed in series with the stimulated tissues.
For cutaneous measurement, two surface metal electrodes were used (contact area = 0.6 x 1 mm), placed horizontally 1 cm apart. Electrode paste was used as the conducting medium.
For subcutaneous measurement, two neddle electrodes were employed (monopolar steinless steel needles, 15 mm long, 0.3mm in diameter, insuleted with a teflon envelope except for 2 mm at the

tip). They were inserted vertically into the tissue, 1.5 cm apart. For muscular measurement , these same electrodes were used. We used 18 msec. trains of 0.5 msec square waves (internal frequency, 300/sec), automatically deliverred once every two second, as stimuli.
Pain thresholds in the three tissue were measured by the method of the limits. The stimulus strength was successively increased (in 0.1 mA steps) with notation of the value when pain was first perceived (pricking pain in the skin, tingling pain in the subcutaneous tissue,cramlike pain in the muscle).

RESULTS

The subjects were divided into 3 groups on the basis of the TrP site and area of referred pain:
Group A (12 cases) had fascia1 pain in the calcaneum attachment. The objective examination showed an active TrP determining referred pain to pressure in the median part of the central aponeurosis . Group B (8 cases) had pain localized in the middle third of the medial part of the fascia and in particularly on the flexor longus allucis tendon and reffered pain on third middle of the fascia . The objective examination showed an active TrP in this area which gave pain to pressure radiating disto-proximally. Group C (2 case) had pain localized in the middle third of the lateral part of the fascia. The objective examination showed an active TrP causing pain to pressure radiating disto-proximally to the attachment of the muscle peroneus at the base of the V metatarsus

The esthesiological evaluation of these groups showed lowered pain thresholds in the skin and muscle compared with the controlateral areas (Group A lower rispectively 60% and 80% , Group B and C lower 65% and 80%).

The isokinetic examination revealed, in group A, a significant decrease in the peak force in concentric contraction in 12 feet (100%) at the speed 30osec, 60osec, 90osec, in 9 feet (75%) speed 30osec, 60osec, 90osec, 180osec and peak force in eccentric contraction in 12 feet speed 30osec, 60osec, 90osec, 180osec. Group B and C are like group A.

The foot-ground reaction was in confront with the controlateral health g.r. abnormal for the same spatial and temporal components during the first 27% of the stance phase (s.ph.) contact phase increase of maximal and medium vectorial forces and speed progression, during the second 40% of the s.ph. decrease of the speed progression of the vectors and finally during last 33% of the s.ph. decrease of maximal and medium force in confront of the first 27% forces.
The parameters are similar in all groups exept for the group. B during the last 33% of the s.ph. The values of the forces were increased significantly ($p < 0.001$) in correlation with an increased intra-rotation movement. On the group C an increased external-rotation from 30% of the s.ph. until to 75% of the s.ph. The phisical examiantion with electrogomometerhas demostrated a reduced range of plantarflexion movement (minimum value 113o maximum value 125o) and of dorsiflexion movement (minimum value 90o, maximum value 83o).

A significant reduction of the painful symptoms was observed in these subjects after 30 days with corrective insole, together with a normalization of locomotion. After 60 days, the pain had disappeared and there was an objective reduction of the irritability of the TrPs and absence of the target zone.

Pain thresholds to electrical stimulation of the skin and muscle showed a further increase to values recorded before treatement with respect to the previous control. After 30 days the increased was for the skin 160% and for the muscle 23%. After 60ggthe increased for the skin was 200%, for the muscle 420% (Tab.2).
All components of the ground-foot reaction were improved.

CONCLUSION

These results show that pain from plantar fasciitis of the foot is due to an abnormality of movement which gives rise to an imbalance of the force and flexibility of the flexor muscle in this area. The improvement of the ground-foot reaction brings about a gradual disappearance of the painful symptom.

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