Quadriceps Femoral Rehabilitation Associated with Patellar Pain in Sports Activity

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ABSTRACT

Twelve patients (24 knees) with a history of patella dislocation and / or subluxation and continuing patella symptoms were evaluated to determine the effectiveness of their rehabilitation programs. The relative muscular effort of the vastus medialis, the vastus lateralis, the vastus medialis oblique and the rectus femoris were evaluated in a series of exercises. Ten degrees of knee flexion reduced effective muscle strain. The quad set and straight leg lifting exercises in full knee extension offer the best quadriceps rehabilitation program in the sportsman with patellar misalignment syndrome and persistent symptoms.

Keywords: Trauma, Injury, Sport, Rehabilitation, Pain, Patela

Introduction

It has long been recognized that the highest torque of the knee extensor muscles in healthy males occurs with the knee at a 60 ° angle during a maximal isometric contraction. However, the mechanical and compressive forces across the patellar and femoral joint surfaces are maximized by flexed knee programs aggravating the main problem patellar pain both in the carious phase and in the load-extension phase [2].

Material and methods

Twelve athletes with patellofemoral compression patellar syndrome, subluxation or luxation and / or chondromalacia due to the misalignment of the extensor mechanism were grouped for the study of rehabilitation techniques only. Seven females and 5 males aged 11 to 30 years were studied. 6 patients described bilateral problems. [6] Ten of the knees had a previous history of dislocation; nine knees were diagnosed as recurrent subluxations. In no case was the patient recovering from an acute dislocation. Eight of 24 knees had undergone lateral reticular releases prior to being studied. Measurements are made under conditions of maximum isometric effort. The surface electrodes were placed on the central mass of each component by the same technician in all cases. The test was conducted on a routine examination couch much like that used at home or in physical therapy. The subjects were taken through a preset exercise routine of quadriceps sets and straight leg lifting exercises from 20 to 30 centimeters. In the supine position, the exercises were initially performed with the knee between 10 and 20 degrees of flexion. The test was then performed with the knee in full extension with and without 2 kg

weights applied to the ankle. The patient then performed the quadriceps exercises to raise straight legs in a sitting position. Variable hip rotation was selected to assess the difference between internal, neutral, and external rotation of the hip [4]. The selected data were translated and revised according to the load carried out on the quadriceps and the tension produced in the flap. These were then used to correlate individual differences in performance in each exercise (fig.1).

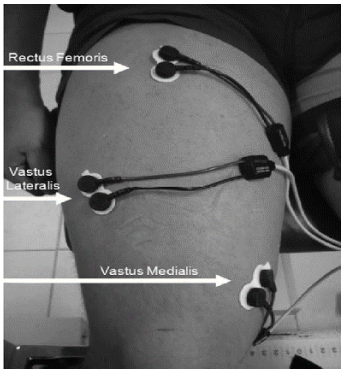

Fig.1 Placement of surfaces electrodes over each component of the quadriceps.

Results

Ten to twenty degrees of knee flexion have reduced the effective muscular effort of the vast group at an average of 1/4 of the muscular effort demonstrated in full extension. Hip rotation or adding 2 kg to the ankle it did not improve the muscular effort of the broad group with the knee in full extension [3]. The session did not affect large group activity or activity of the rectus femoris. No consistent pattern or dominance of activity was observed among the vastus medialis oblique, vastus medialis, or the vastus lateralis in any specific test position. Maintaining full knee extension was the main factor responsible for maximal activity in the large group under all exercise conditions [1].

Discussion

It has long been recognized that the highest torque of the knee extensor muscles in healthy males occurs with the knee at a 60 ° angle during a maximal isometric contraction. However, the mechanical and compressive forces across the patellar and femoral joint surfaces are maximized by flexed knee programs aggravating the main problem patellar pain both in the carious phase and in the load-extension phase [2]. Anatomical factors include non-congruity between the patella and the femoral articular surfaces during knee activity in the quadriceps was almost always fully extended. The present study supports that demonstrated continuous and comparable activity of all parts of the quadriceps in full extension [5]. Patients with postoperative meniscectomy (2 cases) do not demonstrate any dominant component of the quadriceps in terminal extension. Therefore, extensor retardation is a quadriceps' weakness and is not due to selective atrophy of the vastus medialis obliquus as previously believed. This generalized quadriceps weakness is usually secondary to pain that initiates the vicious circle of the patellofemoral joint: pain, quadriceps weakness and increased joint stress which produces more pain. This reflex inhibition of the quadriceps is supported in the work of De- Andrade et al., 23 who noted marked motor inhibition quadriceps activity [5]. Extensor retardation should be expected in knee injuries due to the loss of mechanical advantage of the quadriceps during the last 15 ° of extension. Lieb and Perry, 16 in an anatomical study using amputated limbs, reported a 60% increase in force needed to complete the final 15 ° of extension. Positioning of the body from specific angles of the knee and hip flexion and extension during isometric

contractions to maximize the development of strength [7]. However, we argue that these factors are not applicable when treating the patient with patellofemoral problems. During full extension, hip rotation or hip flexion in sitting position does not affect muscle function during these exercise conditions. Also, adding as little weight as 2kg at the ankle did not increase the force output. It is possible that this small relative burden will not come close a realistic load under optimal quadriceps set conditions and straight leg lift exercises seen in this study [8]. We found difficulty in directing the rehabilitation program to decrease quadriceps reflex inhibition caused by excessive pain while still providing continued improvement in function [9].

Conclusion

The four components of the quadriceps muscle in 12 patients (24 knees) with a history of patellar dislocations (8 knees) and patellar subluxations (4 knees) stresses that full knee extension is essential to get the most benefit from straight leg lifting and quadriceps sets exercises. Ten to twenty degrees of knee flexion, as seen with extensor retardation, reduces effective muscle strain in the vastus group, as noted in muscle strain demonstrated in full extension. The entire quadriceps group of muscles contracts and relaxes in unison, both in terminal extension and between 10 and 20 degrees of flexion. No differential magnitude of contraction could be demonstrated between the vastus medialis and the vastus lateralis. There is no benefit from adding low weight to the ankle. TENS is used, at least occasionally, in most programs. It is non-invasive, relatively inexpensive, harmless, and hardly interferes with other treatments. Although TENS helps some patients with chronic pain, how each individual patient will respond is unpredictable, and its pain relief benefit is likely to wear off over time. Physical pain and recovery programs usually use various methods in conjunction with an exercise program. Clinical experience suggests that exercise is a critical element of treatment and that the combination of exercise and other physical modalities is more effective than any single modality. Furthermore, there is no evidence that a single physical modality is totally effective in treatment. At the end of the training period (8 weeks), pain was significantly reduced by improving muscle activity. In the experimental group, knee extension and muscle strength increased. Quadriceps resistance is increased by maintaining a small weight of 2 kg in favor of rehabilitative exercise.

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