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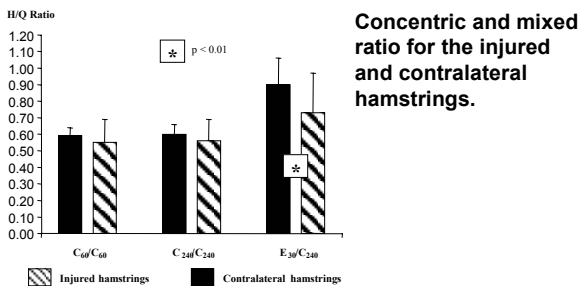
INTRODUCTION

- The relationship between the tone or strength and length of the muscles around a joint is known as muscle balance.
- **Besides these mechanical aspects, neuromuscular activation has to be considered, as current muscle length and strength are widely depending on it.**

METHODS, RESULTS AND DISCUSSION

Voluntary muscle action

- Strength disorders of muscles were measured after hamstrings injuries
- Significant reduction in „mixed“ H/Q – Ratio
- Parameter normalisation, reduction in subjective pain and no hamstrings reinjury after isokinetic eccentric strengthening of hamstrings



- Persistence of muscle weakness and injury may give rise to recurrent hamstrings injury and complaint
- Mixed H/Q – Ratio represents a risk predictor for further injury
- **The concept of muscle balance provides a helpful tool to deal with recurrent isolated muscle injury**

CONCLUSION

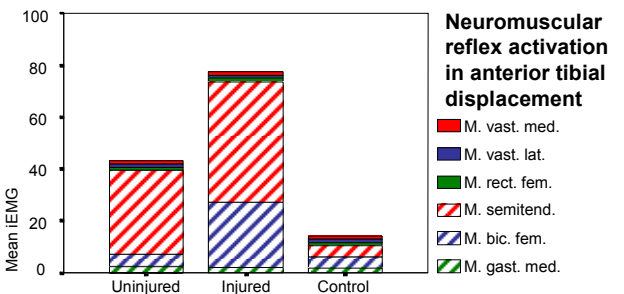
- It is necessary to analyze not only muscle strength, but also neuromuscular activation, as muscle strength and muscle length are depending on it.
- For prevention and rehabilitation of joint injuries, additionally to the voluntary contraction, the reflex mechanisms should be considered.
- The balance situation of a joint complex is not only depending on the muscle balance. The weakness of passive structures may be compensated by synergistic muscles (acl – hamstrings). This leads to an imbalanced state, if only muscle activation and muscle strength is considered, but can be regarded as functional adaptation.
- **Considering the entire joint complex, the concept of “muscle imbalance” may lead to serious shortcomings.**
- **So the rather elusive question is: What is muscle balance and how to quantify it?**

REFERENCES

Croisier et Crielaard: *Isocinetics Exerc Sci*, 8, 175-180, 2000
 Croisier et al.: *Am J Sports Med*. 30. 199-203. 2002

Reflexory muscle action

- Anterior tibial displacement was induced in acl-deficient subjects to investigate the neuromuscular reflex activation of knee stabilizers
- Reflex activity of the acl-synergists (hamstrings) was enhanced in the injured leg in comparison to the uninjured leg and to the control group.



- Enhancement of hamstrings activity indicates clear neuromuscular imbalance in relation to uninjured leg and to control group.
- This imbalance provides a protective reflex mechanism against reinjury, as hamstrings act synergistically to the acl.
- **Should this imbalance be corrected or isn't it a „functional imbalance“?**

Bruhn et al.: *Eur J Sports Traumatol rel res*, 23, 82-89, 2001
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