

# Muscle pain and the electromyography – experimental studies at the motor endplate region

*Erisela Qerama*

---

The PhD dissertation was accepted by the Faculty of Health Sciences of the University of Aarhus. The defence took place on November 18, 2005.

Official opponents: Siegfried Mense, Universität Heidelberg, Germany; Erik Stålberg, Akademiska Sygehuset, Uppsala, Sweden, Peter Svendsen, School of Dentistry, University of Århus.

Tutor: Troels Staehelin Jensen, Anders Fuglsang-Frederiksen, Aarhus University Hospital

Correspondence : Erisela Qerama, Herluf Trolles Gade 7C, 3. th, 8200 Århus N, Denmark.

E-mail: erisela@akhphd.au.dk

---

Dan Med Bull 2006;53:85

## ABSTRACT

This study was carried out at the Danish Pain Research Center and Department of Neurophysiology, Århus University Hospital. The main objective of the present work was to examine certain aspects of muscle pain with emphasis on localized myofascial pain (MP) and to correlate these aspects with electrophysiological findings in the muscle.

The present PhD study is based on two studies:

1. The experimental study I in which we tested the theory that motor endplate regions of the muscle are important sites for eliciting muscle pain. As an additional hypothesis we tested whether pain in the muscle will change the interference pattern (IP) of the EMG during voluntary contraction and the compound muscle action potential (CMAP).
2. In the clinical study III we tested the hypothesis that Botulinum toxin A will alleviate pain from muscle trigger points by possibly abolishing the abnormal motor endplate activity and by possibly exerting an antinociceptive effect per se on the terminals of sensory fibers as the recent literature has suggested.

In study I we induced pain in the brachial biceps muscles in 21 healthy volunteers by injecting capsaicin and NaCl 5% in the motor endplate region and at electrically silent muscle sites and recorded pain parameters. Moreover we recorded IP at maximal voluntary contraction and the CMAP of the brachial biceps muscle before and after pain.

The clinical trial (study III) was designed as a double-blinded, randomized, placebo-controlled, parallel, trial in which we included 30 patients with trigger points in the infraspinatus muscles. The patients received either 50 units/0.25ml of BoNT A or 0,25ml of isotonic saline. Baseline measures were determined during a run-in period of one week. Outcome measurements were registered three and 28 days after the injection. The IP of the EMG during maximal voluntary effort of infraspinatus muscle and a standardized search for spontaneous electrical motor endplate activity at the trigger points were performed before and 28 days after the injection.

Results study I: The needle pain in the motor endplate region differed both in intensity and quality from that at other sites. The maximal pain after NaCl 5% was higher and the VAS area-under-the-

curve for NaCl 5% and capsaicin were larger in the motor endplate region than in other sites. A higher density of muscle nociceptors in the vicinity of the motor endplate region may account for the observed differences in pain.

Results study II: The interference pattern of the EMG was reduced after pain induced by capsaicin or hypertonic saline. CMAP did not change after injection of either substance. Acute stimulation of muscle nociceptors thus produced a fatigue-like change in the muscle, possibly due to a decrease in motoneuron firing rate.

Results study III: Botulinum toxin A reduced motor endplate activity and the interference pattern of EMG significantly but had no effect on pain (spontaneous or referred) or pain thresholds compared with isotonic saline.

These findings may have clinical implications for the treatment of musculoskeletal pain conditions.