Interstitial changes in trapezius muscle during repetitive low-force work

Studies with microdialysis in healthy subjects and patients with work-related trapezius myalgia

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Official opponents: ass. professor Bente Stallknecht, professor Urban Ungerstedt, Sweden, and professor Nina Vøllestad, Norway.

Tutors: senior researcher Jesper Kristiansen, professor Michael Kjær, and senior researcher Henning Langberg.

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ABSTRACT

Chronic pain in the musculoskeletal system due to working life conditions is an important socio-economic problem in the industrialized world. Muscle pain is frequent in the upper trapezius muscle in occupational groups employed with highly repetitive work tasks. Even though the problem is widely recognized, the underlying mechanisms behind the development of work-related muscle pain are not well understood. Several pathomechanisms have been proposed and although they differ, they have one important feature in common, which is that muscle nociceptors are activated or sensitized by metabolites and algesics released into the interstitial space in response to repetitive low-force work.

The aim of the present thesis was to determine the interstitial trapezius muscle responses to repetitive low-force work in healthy subjects and in patients with work-related trapezius myalgia – with respect to metabolism, inflammatory mediators and potential algesic substances.

The microdialysis technique was used to study the interstitial muscle:

– Cytokine and muscle damage response to the insertion trauma in healthy participants.
– Metabolic and cytokine responses to repetitive low-force work and to intense static shoulder flexion in healthy participants.
– Metabolic, blood flow and algesic response to repetitive low-force work in patients with work-related trapezius myalgia and in healthy controls.

The present thesis demonstrated that the microdialysis technique enabled measurement of low and high molecular weight substances related to metabolism, cytokine response, and algesics in trapezius muscle in response to repetitive low-force work.

It was demonstrated that metabolites accumulate in the trapezius muscle during 20 min of repetitive low-force work. An increase in muscle lactate was found indicating that anaerobic metabolism is accelerated, even though the muscle activity level was below 10% of max.

The cytokine interleukin-6, which has been speculated to have important metabolic and anti-inflammatory properties, increased substantially during repetitive low-force work and the increase could only to a minor degree be explained by the insertion trauma per se.

Finally, and perhaps most important of all, work-related trapezius myalgia was shown to be associated with increased anaerobic metabolism as well as increased levels of potential algesic substances (serotonin, glutamate) that correlated with pain intensity – indicating that peripheral nociceptive processes could be activated. These changes in metabolites and algesics were not associated with a reduced blood flow response in the patients with trapezius myalgia.