METABOLISM OF WORKING MUSCLES IN PATIENTS AFTER BURN INJURY (193)

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Central to the process of optimizing burn care and rehabilitation is a comprehensive understanding of the pathophysiological response. People survive severe burn injuries after an often extensive period of hypermetabolism, leading to an increased demand of proteins leading to catabolism, especially of muscle mass. Additionally, their physical activity is decreased e.g. through bed rest and immobilisation. Such enforced periods of unloading and muscle disuse can cause substantial loss of skeletal muscle mass and strength, as well as increased fatigability due to changes in muscle metabolism.

Muscle metabolism seems to play a major role in the pathophysiology following severe burn injury, and is thought to be related to rapid and profound reductions in skeletal muscle mitochondrial content and function [1]. Thus far, mitochondrial function in human burn patients has been measured invasively using muscle biopsies. Oxidative capacity of both pyruvate and fat in the mitochondria was found to be reduced by more than 50% in the first week post-burn in severely burned children [2]. In adults with severe burns it was found that skeletal muscle mitochondria became uncoupled, i.e. more of the energy generated by the mitochondria is lost as heat [3]. Advanced research is required to further elucidate the role of skeletal muscle mitochondrial dysfunction in the pathophysiological response, particularly given the fact that mitochondria are sensitive to environmental and pharmacological interventions.

With Magnetic Resonance Spectroscopy (MRS) it is possible to non-invasively measure in vivo mitochondrial function in human patients. In combination with a MR-compatible bicycle ergometer for in-magnet two-legged human exercise testing, this technique enables to measure bioenergetics (including phosphocreatine (PCr), inorganic phosphorus (Pi), adenosine triphosphate (ATP) and pH) during rest, (maximal) exercise and recovery, i.e. investigate oxidative capacity of working muscles. MRS techniques were previously used in burned mice, where skeletal muscle ATP synthesis rates and PCr concentrations were found to be significantly reduced [4]. The use of MRS provides an unique opportunity to further our understanding of the pathophysiology of burns; a study examining in vivo mitochondrial function in working muscles of severely burned human patients is under development.

References:

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