Extra- and intrafusal muscle fibre type compositions of the human masseter at young age

In perspective of growth and functional maturation of the jaw-face motor system

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av odontologie doktorsexamen framläggs till offentligt försvar i sal B, 9tr, byggnad 1D, Tandläkarhögskolan, Umeå.

Fredagen den 30 september 2011, kl. 9:00.

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Muscles control body posture and movement by extrafusal and intrafusal (muscle spindle) fibres. The purpose of this thesis was to provide insight into the muscular basis for human jaw function at young age. Extrafusal and intrafusal fibres in the young masseter, and for comparison young biceps, were examined for composition of fibre types and myosin heavy chain (MyHC) isoforms by means of morphological, enzyme-histochemical, biochemical and immuno-histochemical techniques. For evaluation of plasticity during life span the data for young muscles were compared with previous reported data for adult and elderly muscles.

The results showed significant differences in extrafusal fibre types and MyHC expression between young masseter and young biceps and between young masseter and masseter in adults and elderly. Compared with young biceps, young masseter was more intricate in composition of extrafusal MyHC expression. Muscle spindles were larger and more frequent in the masseter than in the biceps. Masseter and biceps muscle spindles showed fundamental similarities but also marked differences in MyHC expression.

The results suggest that the young masseter is specialized in fibre types already at young age and shows a unique fibre type growth pattern. Whereas masseter extrafusal fibres display marked plasticity in fibre types and MyHC isoforms during life span muscle spindles/intrafusal fibres are morphologically mature already at young age and precede extrafusal fibres in growth and maturation. Results showed similarities in intrafusal MyHC expression between young masseter and biceps, but also differences implying muscle specific proprioceptive control. Differences in fibre types and MyHC expression between young masseter and young biceps extrafusal fibres are proposed to reflect diverse evolutionary and developmental origins and accord with the masseter and biceps being separate allotypes of muscle.

Keywords
Jaw, limb, human, muscle, morphology, fibre type, myosin heavy chain, muscle spindle