

# Muscle spindles in the levator palpebrae superioris muscle of human fetuses

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*Studies were performed on the levator palpebrae superioris muscle, isolated from fetuses aged 17 to 30 weeks. The number of muscle spindles varied from 2 in the 17<sup>th</sup> week to 7 in the 30<sup>th</sup> week. The length of the muscle spindles ranged from 20 to 500  $\mu\text{m}$ , and the diameter varied from 10 to 70  $\mu\text{m}$ . These observations show that the number of muscle spindles in levator palpebrae superioris muscles is significantly lesser than that in the extraocular muscles.*

**key words:** human fetuses, levator palpebrae superioris muscle, muscle spindles

## INTRODUCTION

Muscle spindles represent elongated structures distributed throughout the muscle in parallel to the course of the extrafusal muscle fibres. The number of spindles depends on the precision of the muscle function and is highest in muscles of the eye and hand.

Investigations of muscle spindles in extraocular muscles have been conducted by many authors: Cooper and Daniel [2], Merrillees et al. [5], Voss [7], Korzeniowska-Kromer [3], Korzeniowska-Kromer and Kromer [4] in the oblique eye muscles and Wójtowicz-Kaczmarek [8–10] in the recti muscles.

The spindles in levator palpebrae superioris muscles have been described by few researchers: Voss [7], Merrillees et al. [5], Cooper and Daniel [2], Sunderland [6].

The aim of the present study is to describe the distribution, number, and morphometric features of the muscle spindles in the human foetal levator palpebrae superioris muscle.

## MATERIAL AND METHODS

Studies were performed on the levator palpebrae superioris muscles of human fetuses aged from 17 to 30 weeks. Muscle spindles were studied in serial

sections of the muscle. Sections 5 to 7  $\mu\text{m}$  thick were stained with haematoxylin and eosin and according to the Mallory method. The following measurements were made: number of muscle spindles, diameter of extrafusal and intrafusal fibres, diameter of muscles spindles and length of muscle spindles.

Muscle spindles of the levator palpebrae superioris muscle were studied by light microscopy with the use of a microscopic scaled ocular.

The length of the muscle spindles were calculated on the basis of the thickness of the sections in which each spindle was found.

## RESULTS

Muscle spindles were observed in all the muscles investigated. The levator palpebrae superioris muscle contained few muscle spindles. The number of spindles varied from 2 in the 17<sup>th</sup> week of development to 7 in the 30<sup>th</sup> week. The length of muscle spindles varied from 20–210  $\mu\text{m}$  in the 17<sup>th</sup> week to 40–500  $\mu\text{m}$  in the 30<sup>th</sup> week. The diameter of the muscle spindles ranged from 10–25  $\mu\text{m}$  in the 17<sup>th</sup> week to 20–70  $\mu\text{m}$  in the 30<sup>th</sup> week. The spindles were composed of 1–4 intrafusal muscle fibres. The diameter of the intrafusal fibres varied from 2–5  $\mu\text{m}$  in the 17<sup>th</sup> week to 5–20  $\mu\text{m}$  in the 30<sup>th</sup> week.

**Table 1.** Morphometric features of the levator palpebrae superioris muscle in human fetuses aged 17–30 weeks

No. of fetuses	C-R length [mm]	Age [week]	No. of muscle spindles	Length of muscle spindles [ $\mu$ m]	Diameter of muscle spindles [ $\mu$ m]	Diameter of intrafusal muscle fibres [ $\mu$ m]	Diameter of extrafusal muscle fibres [ $\mu$ m]
1	150	17	2	20–210	10–25	2–5	5–10
2	190	20	5	30–240	10–30	2–3	5–15
3	270	29	4	20–320	10–40	2–15	5–15
4	280	30	7	40–500	20–70	5–20	7–30

The diameter of the extrafusal muscle fibres varied from 5–10  $\mu$ m in the 17<sup>th</sup> week to 7–30  $\mu$ m in the 30<sup>th</sup> week (Table 1).

During the whole period under study all metric features of the levator palpebrae superioris muscle slowly increased.

### DISCUSSION

This study shows that the number of muscle spindles in the levator palpebrae superioris muscle is significantly smaller than that in the extraocular muscles.

The total number of muscle spindles in the extraocular muscles in an adult human is from 22 to 71 spindles according to Merrillees et al. [5], 47 according to Cooper and Daniel [2], and 33 in the findings of Brunech and Ruskell [1]. In human fetuses this number was 17 to 61 in oblique muscles [3, 4] and 10 to 59 in recti muscles [8–10].

Quantitative data on muscle spindles in the levator palpebrae superioris muscle are sparse in the literature. Merrillees et al. [5], Cooper and Daniel [2] and Sunderland [6] reported the presence of these structures in the levator palpebrae. Voss [7] reported counts for one muscle of 2 spindles. In the present study the number of muscle spindles ranged from 2 to 7.

The number of muscle spindles in levator palpebrae superioris muscles is significantly lower than in the extraocular muscles in human fetuses. This may

be linked with the considerably less precise function of the levator palpebrae superioris muscle.

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