

Evidence for the Longitudinal Division of Skeletal Muscle Fibers

As far as the skeletal muscle fibers are concerned, the increase in the number of fibers during normal development is a matter of dispute. The two existing views regarding the

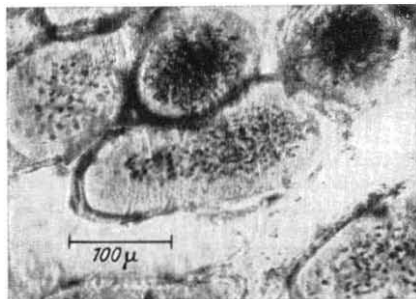


Fig. 1

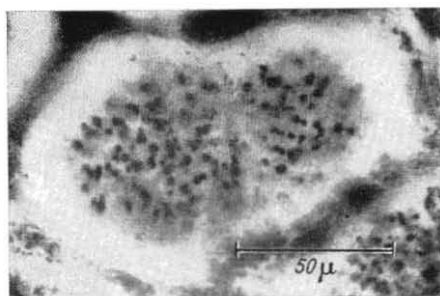


Fig. 2

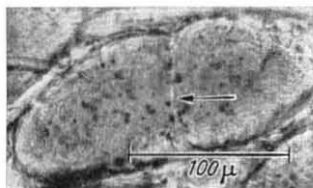


Fig. 3

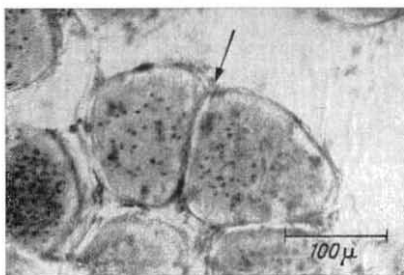


Fig. 4

Fig. 1—4. Microphotographs of the cross section of the human spinal muscle showing the various phases of longitudinal division of the fibers

Fig. 1. Note the fiber prior to division. The sarcoplasm has extended laterally. — 2. A single fiber enlarged. Observe the shape of the fiber and the reorientation of the sarcoplasm into two halves. — 3. Fiber showing the complete division. — 4. After division, the fiber is getting separated

increase in the number of fibers as reviewed by BOYD¹⁾ are: 1. by means of splitting by division or even by budding from the fully grown and mature fibers; 2. by differentiation from

the interstitial fibroblasticlike cells. But many authors have denied the possibility of adult muscle forming new fibers by longitudinal division except in regeneration which follows destructive diseases of muscle^{2), 3)}. However, the controversy regarding the numerical increase of muscle fibers still exists due to lack of evidences.

Investigations on the human spinal muscle of a 47 yrs. old individual, have shown the various phases of longitudinal division of the fibers (Figs. 1, 2, 3, 4). Prior to division the fibers increase in their bulk and size. The sarcoplasm extends laterally and the fibers lose their circular or polygonal outline. Division of the fiber takes place either through the center dividing the fiber into two equal halves or a part of the fiber has been split off giving rise to a new one. But the age of the individual in this case may cast certain doubts regarding the division of the fibers. But the presence of the degenerating fibers in the same muscle⁴⁾ have given an inducement for the normal fibers to divide. According to COWDRY⁵⁾, skeletal muscle fibers may live as long as the whole organism. However, during their life some of them are damaged and perish. Probably their limited multiplication occurs in order to replace the degenerated and perished cells. The division of the fibers is therefore a means for the replacement of the degenerated and perished fibers. The recent views on the longitudinal division of the skeletal muscle fibers as associated with pathological state is therefore questioned. Division of the fibers does occur in the normal muscle as well. The degenerated fibers are replaced by the newly formed ones, thus maintaining the bulk and efficiency of the system to a certain extent.

Thanks are due to Dr. B. SANKARAN, Associate Professor, Department of Orthopaedic Surgery, AIIMS, for the biopsy material and to Mr. P. GANGULY, Senior Photographer, AIIMS, for the microphotographs.

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Eingegangen am 23. März 1964

¹⁾ BOYD, J.D., in: Structure and Function of Muscle, vol. 1, p. 82, ed. by G.H. BOURNE. New York: Acad. Press 1960. — ²⁾ BOSANQUET, F.D., P.M. DANIEL, and H.B. PARRY, in: Structure and Function of Muscle, vol. 3, ed. by G.H. BOURNE. New York: Acad. Press 1960. — ³⁾ ADAMS, R.D., D. DENNY-BROWN, and C.M. PEARSON: Diseases of Muscle. London: Cassel 1962. — ⁴⁾ SUSHEELA, A.K. (Communicated for publication). — ⁵⁾ COWDRY, E.V.: Cowdry's problems of ageing (A. I. Lansing Ed.). Baltimore, Maryland: Williams & Wilkins Co. 1952.