



A Rare Variation of Superior Rectus Muscle

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Abstract

The extraocular muscles are responsible for all eye movements required to track and fix objects. Superior rectus muscle is located in the superior level of the orbital cavity, below *musculus levator palpebrae superioris*, tilted slightly to the lateral part of the orbit. In a routine dissection, we found a left, unilateral variation of the superior rectus muscle with no variation in other structures, such as nerves and vessels. The abnormal muscle presented in two parts - medial and lateral ones. The medial part bifurcated into two heads with different insertion points. It is a case of a rare variation of the extraocular muscles, which, to our knowledge, has not yet been reported.

Keywords

Extraocular muscle, variation, human anatomy

INTRODUCTION

The extraocular muscles (*musculi externi bulbi oculi*) are the six muscles - four straight (*recti* muscles) and two oblique muscles that control all eye movements necessary to track and fix objects. They act in a coordinated manner to make synchronic movements in both eyes.

The four straight muscles arise from a common tendinous ring, which spans over the opening of the optic canal and the medial part of the superior orbital fissure. From their origin, they extend anteriorly and attach to the sclera in front of the equator of the eyeball. *M. obliquus superior* and *m. levator palpebrae superioris* also start from this common tendinous ring.

Usually, *m. rectus superior* is located in the superior level of the orbital cavity, below *m. levator palpebrae superioris*, tilted slightly to the lateral part of the orbit. It functions as an elevator, adductor, and medial rotator of the eyeball.^[1]

Here we report a case of double *m. rectus superior*, where the medial division is represented by two heads with different insertion points.

CASE REPORT

In a routine dissection of a 78-year-old male cadaver, without facial dimorphism, we found a left, unilateral variation of *m. rectus superior*. No variations in other structures, such as nerves and vessels, were observed.

After removal of the superior orbital wall, we found that *m. rectus superior* is represented by two muscle bodies located on both sides of *m. levator palpebrae superioris*. We named them lateral and medial divisions. The lateral division originated from the common tendinous ring and was located very close to the edge of *m. rectus lateralis*, while the medial division arose adjacent to the origin of *m. superior oblique* (**Fig. 1**) and then further divided into two bellies - medial and lateral (**Fig. 2A**). Furthermore, the lateral division was much better developed than the medial one.

Interestingly, the lateral belly of the medial division bifurcated in its anterior most aspect. Part of the fibers passed over the *m. levator palpebrae superioris* and continued towards the tarsal plate of the upper eyelid (palpebral part). The remaining fibers directed nasally and attached to the eyeball in its medial area (orbital part). The medial belly of the medial division ran anteriorly and attached near the intermediate

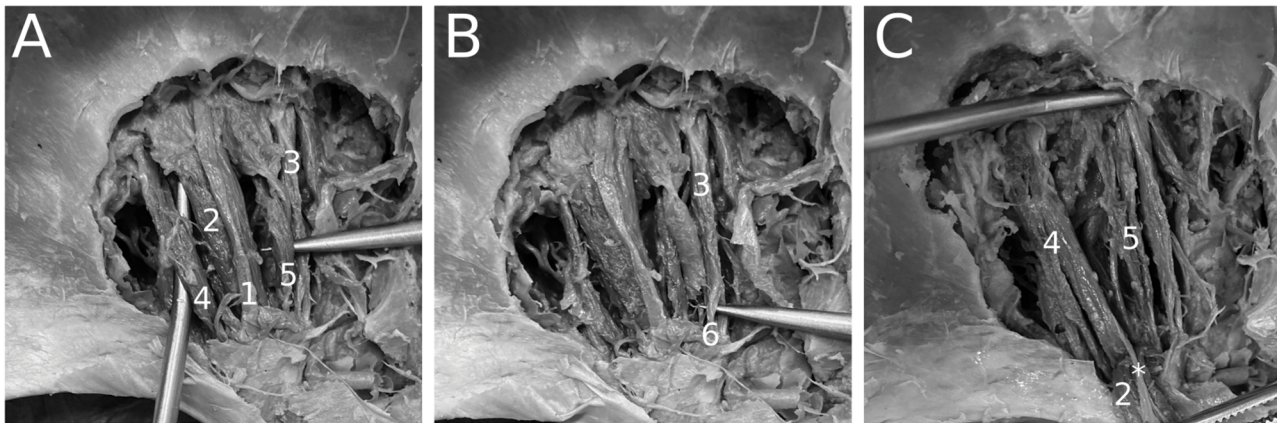


Figure 1. A) An overview of the superior level of the orbital cavity. The instruments are passed under the two divisions of *m. rectus superior* lying symmetrically on both sides of *m. levator palpebrae superioris*; B) *M. obliquus superior* is visualized medially to the medial division of *m. rectus superior* along with the trochlear nerve entering the muscle body in its posterior aspect; C) *M. levator palpebrae* is transected and no muscle fibers were found in its inferior aspect; **Annotations:** 1. *nervus frontalis*; 2. *m. levator palpebrae superioris*; 3. *m. obliquus superior*; 4. lateral division of *m. rectus superior*; 5. medial division of *m. rectus superior*; 6. *n. trochlearis*; * *n. oculomotorius* - superior branch.

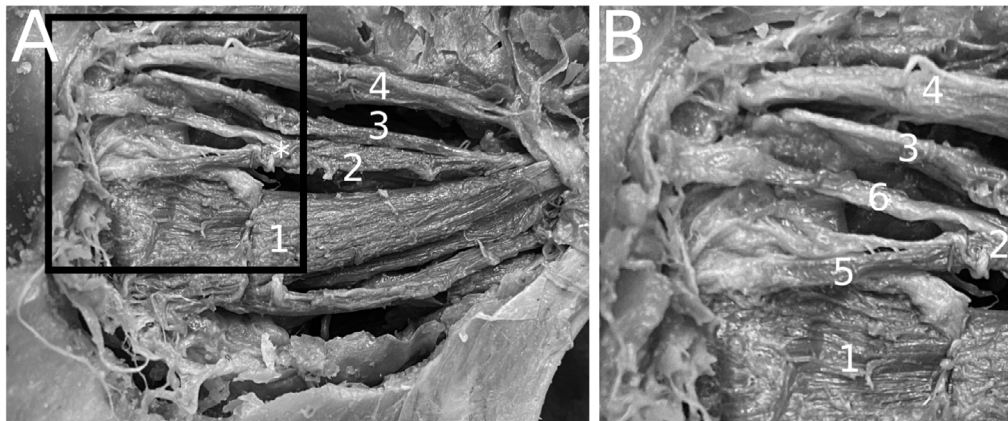


Figure 2. A) An overview of the superior level of the orbital cavity where the dissection is continued in the frontal direction. The medial division of *m. rectus superior* splits into two bellies - medial and lateral; B) The lateral belly has two parts - a palpebral one, passing over *m. levator palpebrae superioris* and an orbital part heading towards the eyeball; **Annotations:** 1. *m. levator palpebrae superioris*; 2. lateral belly of the medial division; 3. medial belly of the medial division; 4. *m. obliquus superior*; 5. palpebral part of the lateral belly; 6. orbital part of the lateral belly; * Lateral belly of the medial division splits in two parts.

tendon of the *m. obliquus superior* (Fig. 2B). All parts of the variant muscle seemed to be innervated from the upper branch of the oculomotor nerve.

DISCUSSION

Anatomical variations of the extraocular muscles are rare. According to literature^[2,3], the frequency of these anomalies is higher in cases with craniofacial abnormalities or strabismus. Kightlinger et al.^[4] proposed a tree group classification of extraocular muscles variations: 1. Muscle bridges between two extraocular muscles; 2. Communicating fibrous bands between two adjacent extraocular muscles; and 3. Additional muscles, which originate from the posterior orbit and are

attached to the eyeball or to another extraocular muscle.

Our case is consistent with the observation that variations in extraocular muscles are not always associated with craniofacial abnormalities and best fit into the 'additional muscle variations' group from the aforementioned classification.^[5,6] In recent years, with the development of imaging methods and especially MRI, the frequency of reported extraocular muscles variations have increased either as an incidental findings during imaging or as a condition related to various types of strabismus.^[3] In our case, the asymmetry in the medial and lateral divisions may suggest some degree of strabismus, but we do not have any premortem clinical data to confirm this.

Most variations occur in *m. rectus inferior* and *m. obliquus inferior*. Most of these variations are either muscle

bridges between *m. rectus superior* and *m. rectus inferior* or bridges between *m. rectus inferior* and *m. obliquus inferior*. Contrarily, variations of *m. rectus superior* are rarely observed, and only a few cases have been described. There is a reported case of double-bellied *m. rectus superior*^[7] with two parts of similar size that start independently from the common tendinous ring and unite before attaching to the sclera. A partial aplasia of *m. rectus superior* was described in the absence of craniofacial abnormalities^[8] and a case of bilateral absence of *m. rectus superior* in a patient with symptoms of upper oculomotor paralysis and no facial dysmorphism was reported^[9].

There have been no previous reports in the literature of a variation similar to the one described in this paper, to our knowledge. This leads us to believe that this is a relatively uncommon abnormality of the *m. rectus superior*, the description of which contributes to a better understanding of the anatomy of orbital muscle variations, which has clear practical applications in the fields of surgical ophthalmology and head imaging.

CONCLUSION

Variations of the extraocular muscles have rarely been reported in the literature. They are usually described as an accidental finding during orbital dissections or operations. The data on muscles variations is of major significance for surgical ophthalmology. They are also important as a differential diagnosis for orbital vascular malformations, lymphomas, pseudotumor and metastases in MRI and CT scans.

Ethical statement

Cadaver material was obtained in accordance with Bulgarian Ministry of Health Regulation No. 2 of 18.05.2012.

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Редкая вариация верхней прямой мышцы

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Резюме

Экстраокулярные мышцы отвечают за все движения глаз, необходимые для отслеживания и фиксации объектов. Верхняя прямая мышца расположена на верхнем уровне глазничной впадины, ниже мышцы, поднимающей верхнее веко, слегка наклонена к латеральной части глазницы. При рутинной диссекции мы обнаружили левосторонний односторонний вариант верхней прямой мышцы без изменений в других структурах, таких как нервы и сосуды. Аномальная мышца представлена двумя отделами – медиальным и латеральным. Медиальная часть раздваивалась на две головки с разными точками прикрепления. Это случай редкого изменения экстраокулярных мышц, о котором, насколько нам известно, ещё не сообщалось.

Ключевые слова

экстраокулярная мышца, вариация, анатомия человека
