No Raphe Identified in the Orbicularis Oculi Muscle

By

Hirohiko KAKIZAKI1*, MD, Masahiro ZAKO1, MD, PhD, Takashi NAKANO2, MD, PhD, Ken ASAMOTO2, MD, PhD, Osamu MIYAISHI3, MD, PhD, Toshiaki MIYAGAWA4, PhD and Masayoshi IWAKI1, MD, PhD

1Department of Ophthalmology, 2Department of Anatomy, 3Second Department of Pathology, Aichi Medical University, Nagakute-cho, Aichi-gun, Aichi, 480-1195, Japan
4Department of Sports Medicine, Osaka City University Medical School, 3-3-138 Sugimoto, Sumiyoshi-ku, Osaka, 558-8585, Japan

Materials and Methods

Nine upper eyelids of 6 Oriental cadavers, ages at death ranging from 72 to 91 years, were dissected; 6 for gross dissections and 3 for histological slice sections. After removing the lateral half of the eyelid skin, the lateral part of the orbicularis oculi muscle and its subjacent tissue were observed macroscopically. The full layered tissue of the 8 mm lateral part from the orbital rim was incised perpendicularly and sections sliced, which were then observed microscopically after staining with the hematoxylin and eosin. The raphe was not identified macroscopically or microscopically. The lateral part of the orbicularis oculi muscle was continuous without the tendinous intercalation; under it, fibrous connective tissue corresponding to the lateral orbital thickening was observed, and in which the band configuration, microscopically the tendinous structure, was formed. The raphe was not identified. The physiological role of the lateral part of the orbicularis oculi muscle is maintained by a less tight attachment of the lateral orbital thickening, but not by the raphe.
Fig. 1. Macroscopical examination (*left*: cephalad, *bottom*: lateral).

**A:** The raphe is not identified in the lateral part of the orbicularis oculi muscle. The superior and inferior orbicularis oculi muscles were continuous without any tendinous intercalation between them. **B:** Under the interlacing part of the orbicularis oculi muscle, white connective tissue is observed over the frontal process of the zygomatic bone, in which a band configuration is observed, not a linear one. IRP: interlacing part of the orbicularis oculi muscle, OOM: orbicularis oculi muscle, FCT: fibrous connective tissue, TS: tendinous structure.
binocular loupe (HRP ×3.5, 420 mm/16", Heine, Herrsching, Germany). The connective tissue on the muscle fibers was removed as much as possible. Then we observed macroscopically the lateral part of the orbicularis oculi muscle to ascertain whether a raphe existed or not. In addition, the interlacing part, where the superior and inferior parts of the orbicularis oculi muscle continued, was removed so as not to damage the subjacent connective tissue, and the presence of the linear structure was examined.

Histological preparations were made as follows. The upper and lower eyelids were incised perpendicularly on the center and were also incised parallel to the palpebral fissure on sites 10 mm superior and inferior from the lateral canthal angle. Laterally, an incision was added to the peristomeum on the lateral edge of the frontal process of the zygomatic bone, and the peristomeum detached medially into the orbit 10 mm from the lateral orbital rim with a raspatory. The detached peristomeum and its surrounding tissue were incised on the medial edge and the lateral half of the eyelid removed as a lump. The 8 mm lateral part from the orbital rim of the removed block was incised perpendicularly against the palpebral fissure and sections sliced. After pretreatments, we stained the slice sections with hematoxylin and eosin; and then observed them microscopically.

Results

The linear tendinous structure, namely the raphe, was not identified macroscopically in the lateral part of the orbicularis oculi muscle. The su-

Fig. 2. Microscopic examination (left: cephalad, superior: anterior).

The 8 mm lateral part from the orbital rim in the orbicularis oculi muscle does not show a tendinous structure. Fibrous connective tissue including some tendinous structures can be observed between the posterior aspect of the orbicularis oculi muscle and the zygomatic peristomeum (Hematoxylin and eosin: ×40). PO; peristomeum, FCT; fibrous connective tissue, OOM; orbicularis oculi muscle, TS; tendinous structure.
perior and inferior orbicularis oculi muscles were continuous without a tendinous intercalation between them (Fig. 1-A). Under the interlacing part of the orbicularis oculi muscle, white connective tissue was observed over the frontal process of the zygomatic bone, in which a band configuration was formed, not a linear structure (Fig. 1-B).

Microscopically, the 8 mm lateral part from the orbital rim of the orbicularis oculi muscle did not have any tendinous structure. Between the posterior aspect of the orbicularis oculi muscle and the zygomatic periosteum, there existed fibrous connective tissue, in which a tendinous structure was observed (Fig. 2).

Discussion

The raphe was not identified in the lateral part of the orbicularis oculi muscle. That is, both the septal and orbital parts of the orbicularis oculi muscle contain the origin and insertion in the medial canthus. Each component of the orbicularis oculi muscle moves toward the medial canthus as a whole. However, a tendinous structure, corresponding to the tendon of the pretarsal fibers, exists under the interlacing part of the orbicularis oculi muscle. This tendinous structure exists in the fibrous connective tissue, namely the lateral orbital thickening which is connected not so tightly between the lateral part of the orbicularis oculi muscle and the zygomatic periostium7,8, and enables the movement of that part of the orbicularis oculi muscle. As they have the same white color, macroscopic distinction of the tendinous structure from the lateral orbital thickening is difficult without the careful observation. In addition, the tendinous structure is not a linear, but rather a band configuration. Accordingly, it is hard to call this tendinous structure as the raphe.

In the lacrimal drainage system, it is essential that the lateral part of the orbicularis oculi muscle is moderately fixed and is movable. The lateral orbital thickening contributes to these conditions7,8. The lacrimal fluid secreted by the lacrimal gland is transported inferomedially by the upper eyelid, wetting the ocular surface; the fluid flows medially by the medial movement of the lower eyelid9. This medial movement of the lateral part of the orbicularis oculi muscle is enabled by the not so tight attachment of the lateral orbital thickening, where there is a tendon of pretarsal fibers. As the tendon in the lateral canthus is weaker than the medial10, the eyelid is pulled relatively medially. However, excessive medial movement decreases blinking efficiency because the horizontal component of the eyelid becomes loosened. So, the lateral part of the orbicularis oculi muscle needs to be moderately fixed. The physiological role of the lateral part of the orbicularis oculi muscle is maintained by a not so tight attachment of the lateral orbital thickening, but not by a linear tendinous structure, a raphe.

References

3) Older JJ. Eyelid Tumors – Clinical Diagnosis and Surgical Treatment. London; Manson Publishing; 2003.