

## Functional Significance of Fat Surrounding the Orbicularis Oculi Muscle

### To the Editor:

The orbicularis oculi muscle, protractor of eyelid closure, typically is divided into the pretarsal, preseptal, and preorbital portions. Generally, the pretarsal and preseptal contractions account for blinking, whereas the preorbital portion effects tight squeezing. The anatomic descriptions and dissections locate origins and insertions at the medial orbital bony rim with critical attachment along the maxillary process of the frontal bone, the medial canthal tendon, the frontal process of the maxillae, and the inferomedial orbital rim.<sup>1-3</sup> Projection in a lateral raphe over the body of the lateral canthal tendon has also been depicted. The mass movement by uniform contraction of this sphincter muscle forces the lids shut with the inward and inferior brow descent. To the best of my knowledge, the functional significance relative to eyelid movement of fibrofatty planes lying under and over the muscle has not been described. Although the force of eyelid closure is dependent on innervation, muscle fiber condition, and mass, the low-resistance fibrofatty planes both overlying and underlying this muscle contribute substantially by providing a low friction surface, allowing effective free brow and eyelid movement. The majority of the periorbital area underlying the preorbital muscle division contains this fibrofatty layer that is continuous with the suborbicularis orbital fat pad, which provides a low-resistance "slippery" surface, allowing a high amplitude brow and denser soft tissue movement concentrically inward. The fibrofatty plane extends into the eyelid proper underlying the palpebral and sometimes tarsal portion of the muscle. Figure 1 is a surface coil high-resolution MRI, which outlines the relationship of the fatty tissue planes with the muscle in preorbital and palpebral regions. In this sagittal view, note the distinct fat planes underlying the muscle (arrows). Similar fat plane arrangements can be found with other muscles of facial expression. Figure 2 outlines the fat planes surrounding the zygomaticus major muscle.

I have found this anatomic relationship to have surgical significance useful in treating involuntary blepharospasm. Procedures designed to tether the preorbital portion of this muscle to periorbital bone by use of self-drilling titanium screws or other methods can effectively weaken high-amplitude spasms associated with facial dystonias and other forms of facial movement disorders. This method can serve as a nonobliterative adjunct surgical method for treatment of blepharospasm in patients refractory to the conventional use of botulinum toxin.<sup>4</sup> Furthermore, tethered muscle can create altered sensations during natural movements occurring during facial expression. Trigeminal distribution stimulation from these adhesions may serve to stabilize abnormality excitable brainstem interneurons thought to be associated with this disease,<sup>4</sup> simulating the so-called sensory trick.

Titanium self-drilling screws tethering preorbicularis muscle to periorbital bone were used in 20 patients refractory to repeated botulinum toxin injections. After an average follow-up period of 8 months, more than 80% noted a substantial increase in the efficacy of the botulinum toxin, with many noting improvement in functional abilities and

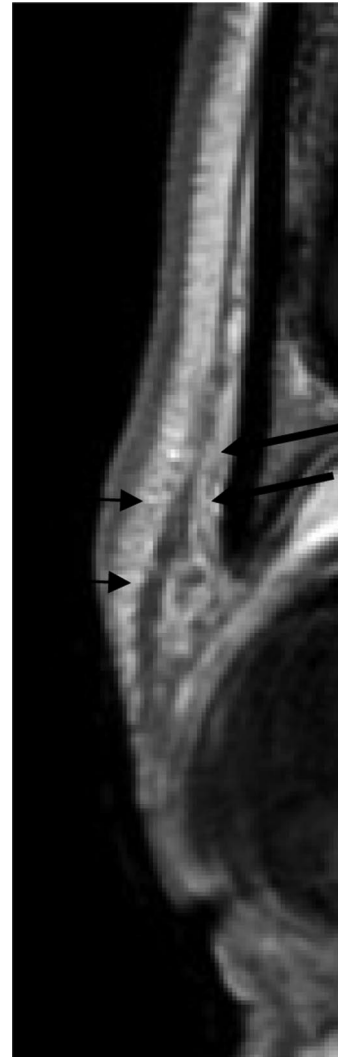


FIG. 1. Sagittal surface coil MRI of orbicularis oculi demonstrating anatomic relationships with surrounding fatty planes.

associated photophobia. Most patients noted fewer tendencies to manipulate their brows to sustain visual capability. No substantial complications were noted with this procedure, and implants were well tolerated.

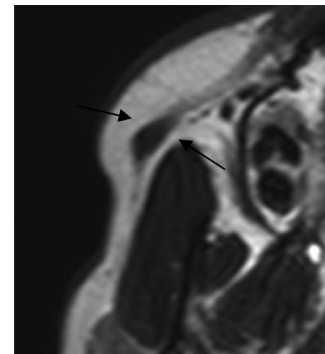


FIG. 2. MRI demonstrating zygomaticus major muscle relationship with overlying and underlying fat planes.

Increasing the resistance surrounding a contracting orbicularis oculi by creating adhesions within “fibrofatty sandwich” can be achieved by surgical tethering of its undersurface to bone. I am continuing to report the technique, experience, follow-up, and development with this approach for the management of involuntary facial movement disease such as essential blepharospasm not responsive to botulinum toxin therapy.

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