cle and the tissues attached to the CLC, including the 2 lamellae medial canthal tendon situated in front of it. The aim of our study is to characterize the detailed microscopic anatomy of the CLC and the tissues adjacent to it. The term “CLC” is used to represent the part of the canaliculus not covered by Horner’s muscle.

We analyzed 4 postmortem specimens of 3 Japanese cadavers (1 male, 2 females) aged 74, 82, and 87 years at death (3 right orbits, 1 left orbit). The specimens were fixed in 10% buffered formalin and analyzed microscopically. All cadavers were used after obtaining proper consents and approvals. Handling was humane and complied with the tenets of the Declaration of Helsinki.

After performing a full-thickness circumferential incision of the periosteum around the orbit, it was detached near to the orbital apex. Nerves, blood vessels, and the nasolacrimal duct extending out of the orbital wall were cut. The retrobulbar content was incised with a sharp scalpel in a coronal plane. The removed orbital content was incised perpendicular to the upper and lower eyelid margins around their center, and the medial half was used for the analysis. One-millimeter interval axial sections were made parallel to the lower eyelid margin. The sliced specimens were dehydrated and embedded in paraffin, cut into 7-μm thickness sections, and then stained with Masson trichrome.

We found that in all specimens, more than half of the length of the CLC passed through the lacrimal sac wall and into the lacrimal sac (Fig 1A–H [available at http://aaojournal.org]). The extra-sac portion of the CLC was covered by Horner’s muscle.1 The extra-sac portion of the CLC was enclosed by a thick fibrous tissue, which was continuous from the lacrimal sac diaphragm (Fig 1A–H [available at http://aaojournal.org]), although the posterior aspect was obscure in 2 specimens (Fig 1E–H [available at http://aaojournal.org]). Some degree of adipose degeneration was shown in 3 specimens around the CLC and the lower temporal part of the lacrimal sac (Fig 1C–H [available at http://aaojournal.org]). A space between the lacrimal sac and the periosteum was demonstrated in 3 specimens (Fig 1C–H [available at http://aaojournal.org]). In 3 specimens, Horner’s muscle attached to the lacrimal sac diaphragm up to the point that the muscle reached the CLC (Fig 1A,B,E–H [available at http://aaojournal.org]).

No valve structure was seen around the common internal ostium in any of the specimens (Fig 2A–H [available at http://aaojournal.org]). The width of the CLC showed a uniform diameter through its entire length in 3 specimens (Fig 2A–D,G,H [available at http://aaojournal.org]), whereas one specimen showed a larger CLC around the common internal ostium (Fig 2E,F [available at http://aaojournal.org]).

The finding that a significant portion of the CLC passes through the lacrimal sac wall is probably essential for establishing a functional and effective valve mechanism. This might be related to changes in the thickness of the lacrimal sac induced by sympathetic or parasympathetic stimulations.

Continuity between the lacrimal sac diaphragm and the sheath of the CLC, as well as attachment of the lower half of the lacrimal sac diaphragm to Horner’s muscle may play a key role in facilitating normal lacrimal drainage.1 Involutional changes may diminish the efficacy of the pulling or pushing effects of Horner’s muscle and decreases the negative or positive pressure production in the lacrimal lumen.2 This might be an important factor in causing epiphora in elderly patients with patent lacrimal ducts.

A continuously narrow CLC lumen may be an important factor in establishing a functional valve around the common internal ostium. A normal functional valve is possibly maintained by the movement of Horner’s muscle.1 This valve will function more effectively with a narrower canalicular lumen. A canicular tube is sometimes used effectively for treating epiphora in patients with patent canalicu- lar ducts.3 It might act by inducing a significant negative pressure when the canicular lumen is narrowed by the inserted tube.

In conclusion, this study demonstrates the microscopic anatomical relationship between the CLC and its surrounding tissues. These findings may have clinical implications for understanding the pathogenesis of epiphora in patients with patent lacrimal ducts.

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References

Past, Present, and Future of Ophthalmic Surgery

Dear Editor:
The past, present, and future of ophthalmic surgery is found in both the Letter to the Editor by Harry H. Mark, MD, in “History of Ophthalmology” and the article “Robot-assisted vitreoretinal surgery: development of a prototype and feasibility studies in an animal model” by Taskashi Ueta, MD, et al in the August 2009 issue of Ophthalmology. Note there are innovative videos accompanying this article in the electronic edition. Great strides are being made in robot-assisted surgery such as fine computerized motor skills that dampens the surgeon’s microtremors, enhanced 3-dimensional views, tactile
feel, remote access, etc. How long will it be before cataract and retinal surgery may be done remotely? Presently we use computer models for training and assessing surgery in wet labs.

Knowledge of the past helps to define our position in the present and may predict our future. “What’s past is prologue” in Shakespeare’s The Tempest (Act 2, scene 1, 245–254), which is often quoted, is true. Based on past discoveries, the evolution of new and revolutionary technologies sets the next stage for the advancements of medicine. Those readers who are interested in ophthalmic history are encouraged to contact www.cogansociety.org.

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References