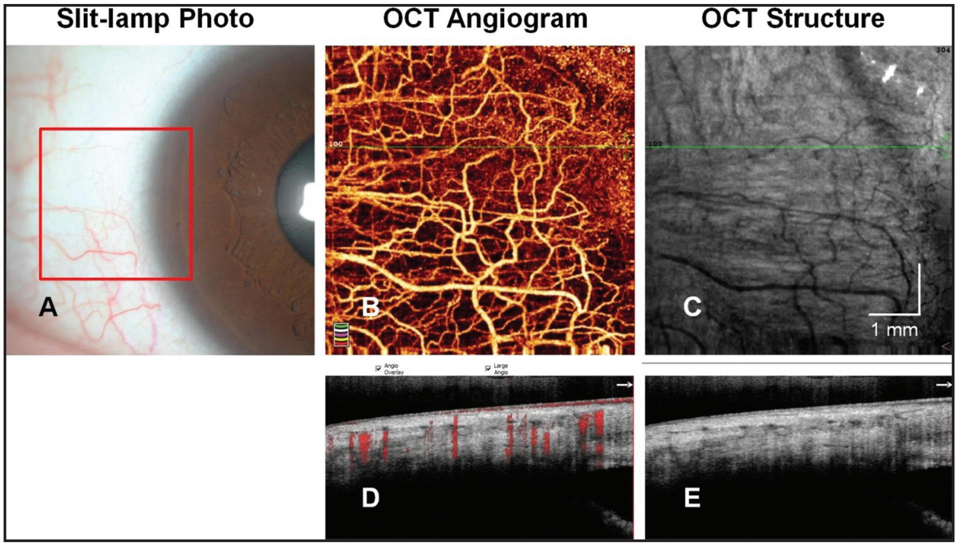

Figure 4-1. Normal bulbar conjunctiva and sclera. (A) Slit-lamp photograph. The red box marks the OCT scan area. (B) *En face* OCT angiogram of combined conjunctival and scleral vasculature. (C) *En face* OCT structure image. (D) A cross-sectional OCT image overlaid with angiographic signal marked in red. (E) A cross-sectional OCT image. The location of the cross-sectional OCT image is marked by a green line in *en face* OCT.

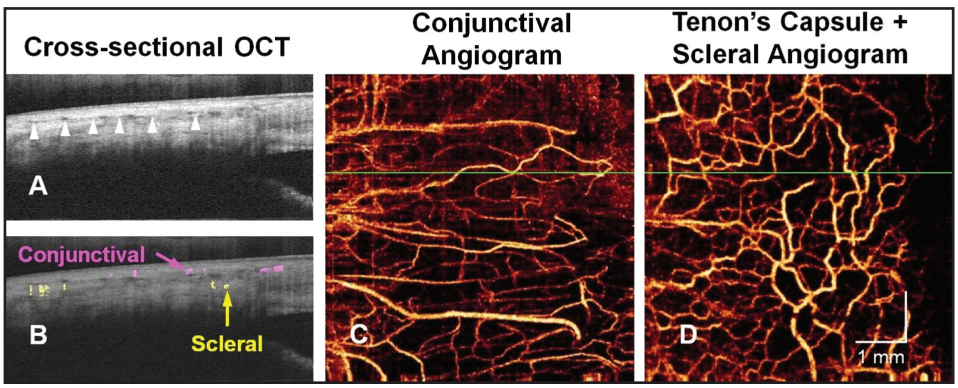

Figure 4-2. Conjunctival and scleral OCTA. (A) A cross-sectional OCT image of the limbus. There is a narrow demarcation line (white arrow heads) separating the conjunctival stroma from the Tenon's capsule and sclera underneath. (B) Depth-resolved conjunctival (pink) and episcleral (yellow) angiography was overlaid on the cross-sectional OCT structure image. (C) *En face* bulbar conjunctival OCTA. (D) Scleral OCTA. The cross-sectional OCT scan location is denoted by green lines in C and D.

Conjunctival and Scleral Optical Coherence Tomography Angiography

Conjunctival and scleral vasculatures are responsible for supplying oxygen and nutrition to the limbus. Blood flow activities within these structures provide clinicians with useful information about conjunctival and scleral conditions, and can serve as sensitive indicators of contact lens performance.

The blood supply of the limbus area originates from the anterior ciliary artery, which divides to form the conjunctival plexus, the episcleral plexus, and the intrascleral plexus.[7] While slit-lamp photos record mostly superficial limbal vessels, OCTA is capable of delineating the deeper episcleral and scleral vessels, as well as the shallower conjunctival vessels.[8,9] A full-thickness *en face* limbal OCTA of a normal volunteer is shown in Figure 4-1B. The OCTA detected a much denser vascular network including vessels not visible on the slit-lamp photo (Figure 4-1A) or the *en face* OCT structure image (Figure 4-1C).

The axial vessel depth information was flattened out on *en face* OCTAs when the angiographic signal was projected to a 2-dimensional plane. However, the depth of the vessels within the tissue can be appreciated on cross-sectional OCTA images (Figure 4-1D) overlaid with OCT structure images (Figure 4-1E). The top of the angiographic signal indicates where the vessel actually inhabits. The elongated red flow signals (tails) shown below blood vessels were due to projection artifacts. The projection artifact is one of the most important artifacts affecting OCTA.[10] It can be resolved by software algorithms such as that described by Zhang et al.[11] The depth-resolved conjunctival and scleral OCTAs are demonstrated in Figure 4-2. To separate the conjunctiva blood vessels from the episcleral and scleral vasculature, the posterior conjunctival boundary needs to be segmented. The bulbar conjunctiva includes an avascular conjunctival epithelium layer and the conjunctival stroma. The conjunctival stroma is composed of a network of irregularly arranged fibers, perfused blood vessels, and cystic spaces that are often in close association with the vessels. The conjunctival stroma highly scatters incident light and appears hyper-reflective in OCT images. There is a narrow demarcation line (marked by white arrowheads in Figure 4-2A) separating the conjunctival stroma from the Tenon's capsule and the sclera underneath.[12] Custom software