

4-2020

## Variations in Anterior Segment Vasculature of the Eye and Their Implication in Ophthalmologic Surgical Procedures

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### Recommended Citation

Lewis AL, Johnson KS, Rowe J, Hans K, Gordon V, Marolt C, Olinger A. Variations in Anterior Segment Vasculature of the Eye and Their Implication in Ophthalmologic Surgical Procedures. *The FASEB Journal*. 2020; 34(S1). doi: 10.1096/fasebj.2020.34.s1.04241.

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First published: 17 April 2020

<https://doi.org/10.1096/fasebj.2020.34.s1.04241>

### Abstract

### Objective

Anterior segment ischemia (ASI) is a complication of strabismus surgery and other ocular procedures. The aim of this study is to determine anatomic variability of the vessels involved in the greater arterial circle of iris including short posterior ciliary arteries (SPCA), the long posterior ciliary artery (LPCA) and anterior ciliary arterial (ACA) anastomosis. Understanding these variations may help decrease the incidence of ASI in patients following strabismus surgery and other ophthalmologic procedures.

### Methods

A total of 126 preserved cadaveric eyeballs from Kansas City University, Nebraska Medical Center, and Creighton University were dissected. The dissection was performed through an anterior approach following removal of the orbital contents. All further dissection was performed, and photographs taken, using a Zeiss Meditech AG dissection scope. Choroid was exposed by making an incision in the sclera 1–2 cm from the limbus, followed by removal of overlying sclera to a point 2–3 cm proximal to the insertion point of the four rectus muscles.

Short posterior ciliary arteries were counted as they entered the major arteriolar circle of iris and their locations were mapped in relation to the vertical and horizontal axes. Long posterior ciliary arteries were located, isolated, and cut prior to removal of the choroid. Distances were measured from the penetration point of the LPCA through the sclera in relation to the optic nerve and the vertical and horizontal axes.

The number and location of SPCAs that contribute to the major arteriolar circle of iris and LPCAs as they pierce the sclera was determined. Comparisons were also made to determine if there were significant differences between right and left eyes as well as between males and females.

### Results

Specific locations of SPCAs were determined and mapped to identify their contribution to the anterior segment and generate surgical safe zones during various ophthalmologic procedures. The specific location and number of the LPCAs was also determined and mapped to clarify their contribution to the LPCA – ACA anastomosis, highlighting their importance as the sole source of blood flow following incision of the rectus muscles and corresponding anterior ciliary arteries during strabismus surgery. Surgical safe zones were created using the location where LPCA pierces the sclera which can be used to avoid damage to this artery during invasive ophthalmologic procedures.

## Conclusions

As far as the investigators are able to determine, this is the first cadaveric study that uses an anterior approach to map SPCAs and LPCAs as they enter the greater arteriolar circle of iris. The findings of the study enabled the investigators to identify a surgical safe zone for invasive ophthalmologic procedures involving the extraocular muscles, sclera, choroid, and retina. This information should be beneficial to physicians performing strabismus surgery, choroidal effusion drainage, placement of ocular devices, subretinal fluid drainage and other procedures near these vessels. These findings should help surgeons avoid anterior segment ischemia, hemorrhage, and other important complications during invasive ophthalmologic procedures.