mild familial exudative vitreoretinopathy in the left eye, but the mild vascular changes are in the far periphery, well separated from the hamartoma, and the area that developed the lesion was fully vascularized and free of macroscopic damage or other inciting primary pathology.

We cannot, of course, completely discount the influence of familial exudative vitreoretinopathy as presumed global wnt signaling aberrations, which, although unlikely, may have altered the timing of the hamartomatous growth. Additionally, we do not infer that all combined hamartomas are acquired; in considering the series by Shields et al., it is more likely that a hamartoma in a 2-week-old patient was indeed present at birth. In summary, we report a presumed combined hamartoma that was acquired after birth in a child whose fellow eye’s presentation allowed incidental observation of its development.

Yoshihiro Yonekawa, MD
Benjamin J. Thomas, MD
Kimberly A. Drenser, MD, PhD
Michael T. Trese, MD
Antonio Capone Jr, MD

Author Affiliations: Associated Retinal Consultants, William Beaumont Hospital, Royal Oak, Michigan.

Corresponding Author: Antonio Capone Jr Jr, MD, Associated Retinal Consultants, William Beaumont Hospital, 3535 W 13th Mile Rd, Ste 344, Royal Oak, MI 48073 (acaponejr@arcpc.net).

Published Online: June 4, 2015. doi:10.1001/jamaophthalmol.2015.1675.

Author Contributions: Dr Capone had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Yonekawa, Trese, Capone.
Acquisition, analysis, or interpretation of data: Yonekawa, Thomas, Drenser, Capone.
Drafting of the manuscript: Yonekawa, Trese.
Critical revision of the manuscript for important intellectual content: Yonekawa, Thomas, Drenser, Capone.
Administrative, technical, or material support: Capone.
Study supervision: Drenser, Trese, Capone.

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Funding/Support: Dr Yonekawa is supported in part by the Heed Ophthalmic Foundation.

Role of the Funder/Sponsor: The Heed Ophthalmic Foundation had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Previous Presentation: This case was presented at the 2015 Atlantic Coast Retina Club Meeting; January 8, 2015; Boston, Massachusetts.


Retrospective Appraisal of Split-Cornea Transplantation: An Audit of 1141 Donor Corneas

For more than 100 years, penetrating keratoplasty (PK) with full-thickness replacement of a diseased cornea with an allograft donor tissue has been successfully performed. Especially within the last 10 years, surgical techniques have been improved to the point that selective replacement of the diseased structure of the cornea is possible. Diseases of the corneal endothelium (eg, Fuchs endothelial dystrophy, pseudophakic bullous keratopathy) are the main reasons for corneal transplantations and can be managed by Descemet stripping automated endothelial keratoplasty or Descemet membrane endothelial keratoplasty (DMEK), and Deep anterior lamellar keratoplasty (DALK) allows selective replacement of the anterior pathologic corneal tissue (eg, advanced keratoconus, herpetic corneal
Approximately 80% of indications for keratoplasty can be covered by selective replacement. The increasing demand and declining amount of available donor tissue led surgeons to the idea of splitting donor tissue for 2 recipients. The most common strategy is combining DALK with DMEK. The first studies on split-cornea transplantation documented promising results with saving rates up to 47% of donor buttons. The purpose of our study is to retrospectively evaluate the practicability of split-cornea transplantation in clinical routine.

**Methods** | Between July 1, 2011, and December 31, 2014, 1141 donor corneas were transplanted at the Department of Ophthalmology, University of Cologne, Cologne, Germany. Lamellar corneal grafts were performed preferentially. Penetrating keratoplasty was applied only if full-thickness replacement of the cornea was required (eg, in scarring, ulcerations, surgical macropereation during DALK).

In split-cornea transplantation, the anterior part of the donor button was used for DALK in one patient and the posterior part was used for DMEK in another patient. Depending on the availability of the patients, either DALK or DMEK was performed first. Remaining donor lenticules weregrafted within 1 week. They were stored in culture medium (Biochrom) containing penicillin/streptomycin, amphotericin B, and fetal calf serum at 31°C ± 1°C. Microbiological tests were performed before and after surgery.

Main outcome measures included the technique of surgical intervention (intended and performed) as well as the split use of donor tissue.

This retrospective, nonrandomized, clinical study conformed with the tenets of the Declaration of Helsinki. Written informed consent was obtained from all patients before surgery. The study was approved prospectively by the University of Cologne Institutional Review Board.

**Results** | A total of 1141 donor corneas were used for 1237 transplantations (714 DMEKs, 316 PKs, 100 DALKs, 74 Descemet stripping automated endothelial keratoplasties, and 33 others [7 Boston keratoprosthesis and 26 tectonic corneoscleral patches]) in 951 patients (475 women, 476 men; mean [SD] age, 64.3 [17.4] years). Both DALK and DMEK were combined in 72 cases (75.0%), DMEK and tectonic corneoscleral patches were combined in 13 cases (13.5%), PK (eccentric PKs, diameter ≤ 5 mm) and small DMEKs were combined in 5 cases (5.2%). Descemet stripping automated endothelial keratoplasty and tectonic corneoscleral patches were combined in 16 cases (16.5%) and Boston keratoprosthesis was combined with DMEK in 1 case (1.1%). Split-cornea transplantation was intended but not possible in 5 cases owing to conversion of DALK to PK (2 cases) or unexpected intraoperative events during DMEK surgery (3 cases), including complicated unfolding of the donor membrane. A total of 15.1% of corneal grafts could be performed as split-cornea transplantation, and a total of 96 donor buttons (7.8% [95% CI, 6.2%–9.4%]) could be saved.

**Discussion** | Our data show that indications and referrals for DMEK exceed those for DALK by far (714 vs 100, respectively). Only 15.1% of corneal grafts could be performed as split-cornea transplantation, resulting in 96 donor corneas being saved (7.8%). This asymmetric distribution suggests the need for scheduling DMEK and DALK recipients. Novel techniques with the potential to increase the availability of donor tissue, eg, using hemi-DMEKs (splitting 1 endothelial graft into 2 half-moon-shaped grafts), should be considered.

Friederike Schaub, MD
Claus Cursiefen, MD
Ludwig M. Heindl, MD

**Author Affiliations:** Department of Ophthalmology, University of Cologne, Cologne, Germany.

**Corresponding Author:** Friederike Schaub, MD, Department of Ophthalmology, University of Cologne, Kerpener Strasse 62, 50924 Cologne, Germany (friederike.schaub@uk-koeln.de).

**Published Online:** June 11, 2015. doi:10.1001/jamaophthalmol.2015.1684.

**Author Contributions:** Dr Schaub had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Cursiefen, Heindl.

**Acquisition, analysis, or interpretation of data:** All authors.

**Drafting of the manuscript:** Schaub, Heindl.

**Critical revision of the manuscript for important intellectual content:** Cursiefen, Heindl.

**Statistical analysis:** Schaub, Heindl.

**Obtained funding:** Cursiefen, Heindl.

**Administrative, technical, or material support:** Cursiefen, Heindl.

**Study supervision:** Cursiefen.

**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

**Funding/Support:** This work was supported by grant Forschergruppe 2240 from the German Research Foundation and by grant Biomedicine 1302 from the European Cooperation in Science and Technology.

**Role of the Funder/Sponsor:** The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.


**Sequential Optical Coherence Tomographic Angiography for Diagnosis and Treatment of Choroidal Neovascularization in Multifocal Choroiditis**

Accurate diagnosis of choroidal neovascularization (CNV) is critical to ensure timely anti–vascular endothelial growth factor therapy and preclude loss of visual acuity. Dye-based angiography is the gold standard for CNV diagnosis; however, it is in-