

View Abstract

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Study Group: (none)

ABSTRACT

TITLE: Large-Area RPE Removal by Microsecond Laser followed by hiPS-RPE transplantation

ABSTRACT BODY:

Purpose: Cell therapeutics for AMD were often implanted regardless of RPE status in the target zone. This may result in RPE multilayering. Here we study a novel laser to remove RPE without collateral damage prior to RPE implantation to encourage better subretinal integration.

Methods: Pigment rabbits (n=24) were immunosuppressed with Sirolimus, Doxycyclin and Minocyclin. Using a SLO/ OCT (Heidelberg Engineering) extended with a prototype laser (Meridian Medical; wavelength: 532 nm; pulse duration, 8 μ s), a large area of RPE was selectively removed in 19 rabbits. Animals without laser lesions served as controls (n=5). A 25 gauge vitrectomy (Geuder) with removal of posterior hyaloid membrane was performed thereafter. Human iPS-RPE (1000 cells/ μ l) were manually injected using a 100 μ l syringe (Hamilton) connected to a 38G cannula (MedOne) into the RPE laser lesion, or over healthy RPE in controls, monitored by intraoperative OCT imaging (RESCAN 700, Zeiss). In vivo follow up/ retinal imaging was up to 12 weeks including fluorescein and indocyanine angiography, as well as SD-OCT (Spectralis [®], Heidelberg Engineering).

Results: Representative RPE laser wounds exhibited mild late phase FA& ICGA leakage, without abnormal outer retinal or choroidal hyperreflectivity on OCT. By contrast, lesions with earlier leakage on FA/ ICGA showed beam-sized outer retinal hyperreflectivity on OCT, suggesting coagulation. The size of the RPE wounds was typically 10-12mm².

iOCT demonstrated in an immediate and directed spread of the bleb retinal detachment (bRD) within the lasered zone. By contrast, bRDs performed over non-lasered RPE raised slower with a circular spread. Subretinal injection ranged from 5-70µl, with lesser volumes/ larger bRDs areas over lasered regions. At 6 and 12 weeks, none of implanted regions showed FA/ICGA leakage, some lesions had blockage due to hyperpigmentation; on OCT, representative areas showed preserved ellipsoid bands, with some RPE undulations. Lasered/implanted areas with a peripheral hyperpigmentation showed central outer retinal atrophy along with irregular RPE. Control implantation sites showed retinal atrophy and a variably thickened RPE band.

Conclusions: Large-area RPE removal with laser disruption is feasible in healthy rabbits and appears to facilitate superior integration of RPE suspension grafts, compared to subretinal injection alone. Future work aims to correlate histology with in vivo imaging.

(No Image Selected)

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.: The results from this study hint that RPE cell suspension transplants implanted onto a laser lesion might integrate as a monolayer. Laser pretreatment with subsequent minimally invasive subretinal RPE injection may enhance technology adoption given a simplified procedure.

DETAILS

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AWARDS:

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