Reshaping and customization of SMILE-derived biological lenticules for intrastromal implantation

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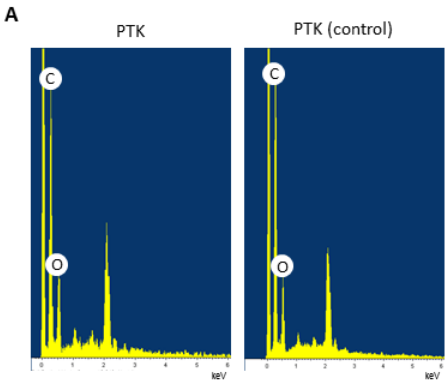
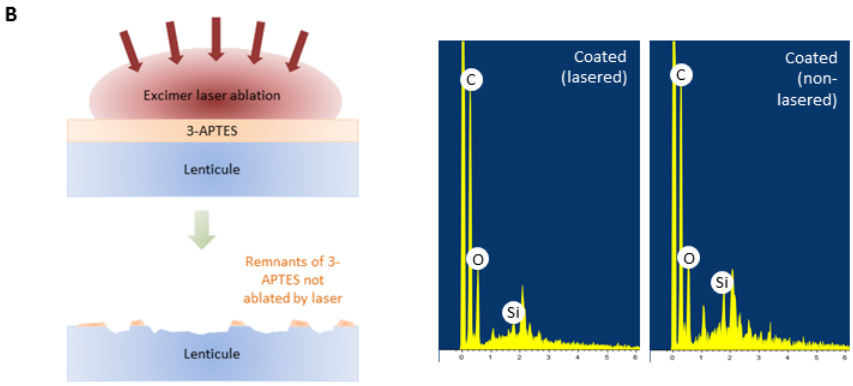
Supplementary information



Treatment	C (%)	*p* value	O (%)	*p* value
PTK	70.6±1.5	0.275	29.4±1.5	0.275
Control	69.4±2.0		30.6±2.0	



Treatment	C (%)	*p* value	O (%)	*p* value	Si (%)	*p* value
Coated (lasered)	70.1±1.3	0.253	29.7±1.3	0.049	0.2±0.1	0.004
Coated (non-lasered)	71.2±2.0		27.3±2.2		1.4±0.6	

Figure S1: Energy Dispersive X-ray spectrographs (EDX) of the surface elemental composition for (A) lasered and non-lasered uncoated lenticules and (B) 3-APTES coated lenticules before and after PTK treatment. No differences in the atomic components (carbon and oxygen) were detected between the PTK-treated and the control group either before or after excimer laser ablation. As biological tissue is largely made of carbon and oxygen atoms, the resulting tissue surface after laser ablation would still inevitably contain the same amount of carbon and oxygen. In order to introduce a new element, which does not exist in the tissue (e.g. silicon atom), the lenticule surface was coated with 3-APTES. As depicted in Figure S3B, this EDX result suggests that the 3-APTES coating, which would be in nano-level thickness, had largely been removed by the laser ablation.

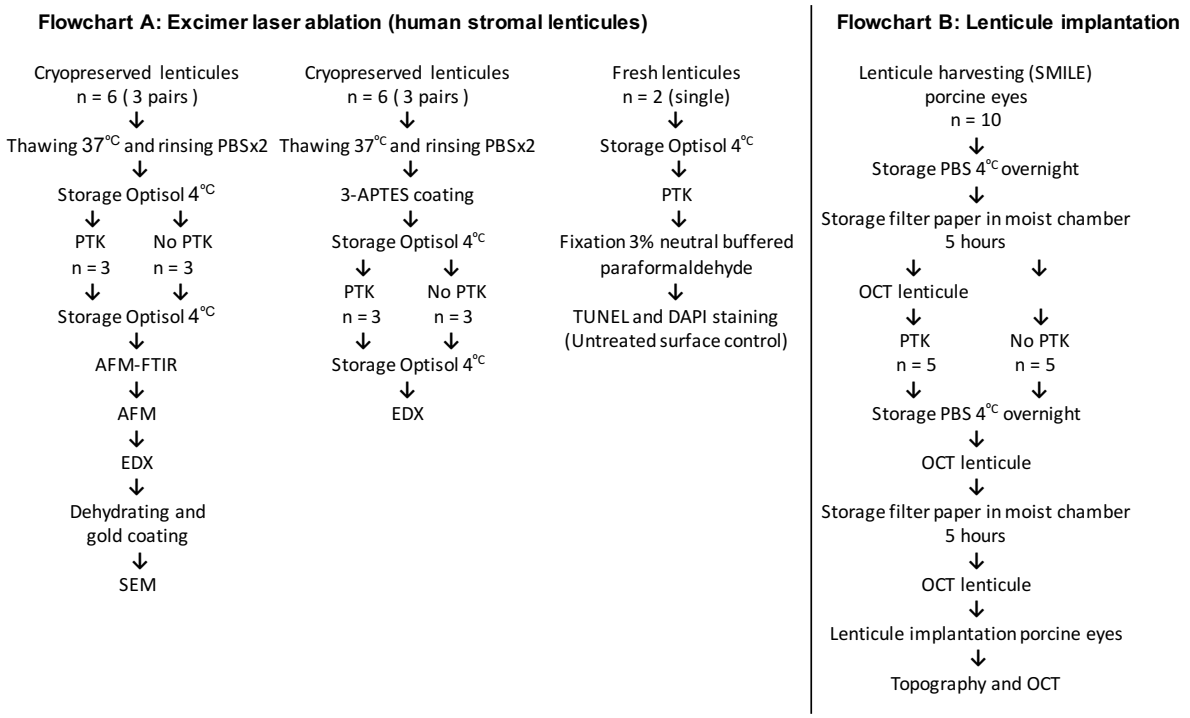


Figure S2: Flowchart for excimer ablated human stromal lenticules (A), and flowchart for lenticule implantation in porcine eyes (B). PBS: phosphate buffered saline. PTK: Phototherapeutic keratectomy. ATM-FTIR: Attenuated Total Reflection Fourier Transform Infrared Spectroscopy. AFM: Atomic Force Microscopy. EDX: Energy Dispersive X-ray Spectroscopy. SEM: Scanning Electron Microscopy. 3-APTES: (3-aminopropyl)triethoxysilane. TUNEL: Terminal deoxynucleotidyl transferase (TdT) dUTP Nick-End Labeling. DAPI: 4',6-diamidino-2-phenylindole. OCT: Optical Coherence Tomography.

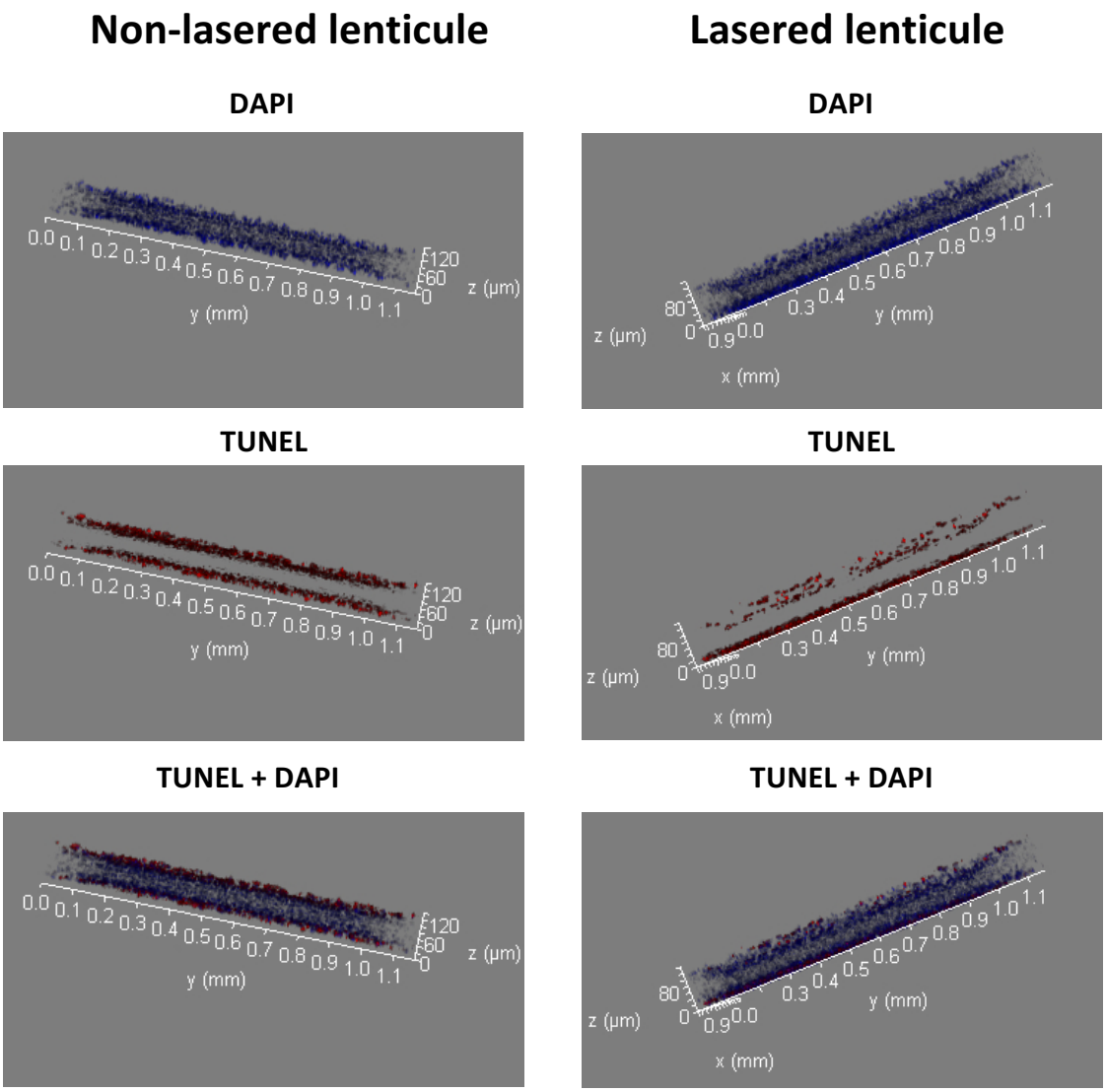


Figure S3: TUNEL and DAPI staining for a non-lasered control lenticule and PTK-treated surface. Total cell density, indicated by DAPI (4',6-diamidino-2-phenylindole) and TUNEL-positive cells, were lower in the lasered section for all lenticules, which could be explained by cell vaporization by excimer laser ablative effect.

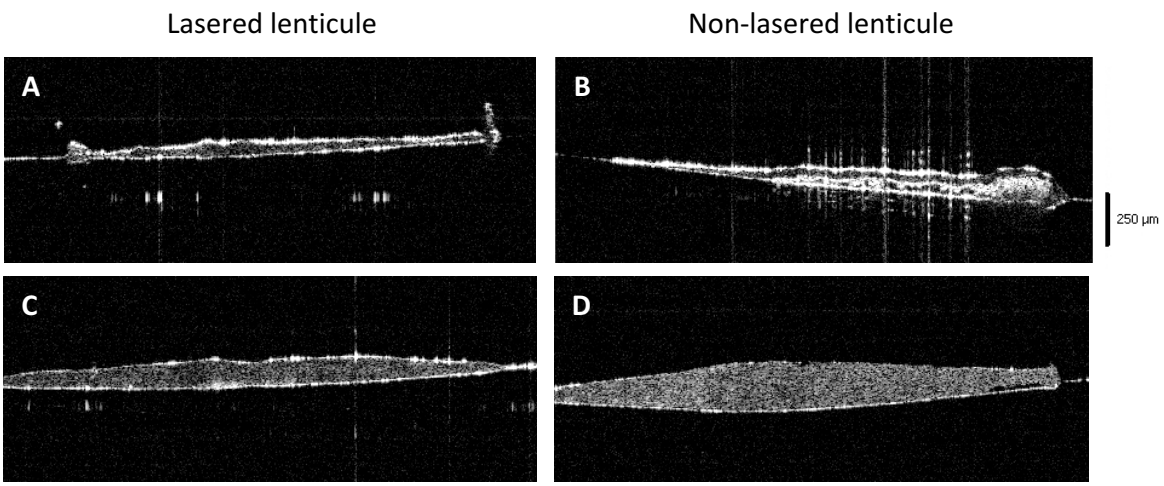


Figure S4: OCT images of PTK treated and control lenticules during during over hydration (C: lasered, D: non-lasered) and after dehydration in a moist chamber (A: lasered, B: non-lasered). The average central thickness of the lasered lenticules was significantly lower than for the non-lasered control lenticules, both during over hydration (storage in PBS overnight, $p<0.001$) and after 5 hours on filter paper in a moist chamber ($p<0.001$).