

Imaging the intraocular lens with anterior segment add-on lens



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PURPOSE

Optical coherence tomography (OCT) of anterior segment provides three-dimensional visualization of the anterior structures including the crystalline lens or, in case of post-cataract surgery, the intraocular lens (IOL). Cross-sectional images of the crystalline lens potentially can be used for cataract monitoring while OCT of the IOL implant can be used as an evaluation tool during or after the surgery.

METHODS

- An anterior segment (AS) add-on lens was designed to be used in combination with the PLEX® Elite 9000 (ZEISS, Dublin, CA) swept-source OCT system with 1060 nm central wavelength.
- The add-on lens has a telecentric geometry with a built-in fixation target with maximum FOV of 20 mm and working distance of 28 mm.
- The add-on lens is appended to the instrument ocular lens magnetically.
- PLEX Elite prototype software was modified and equipped with AS tracking and AS specific scan patterns: AS 6x6 mm Angio at 200kHz with 6 mm depth.
- Two healthy subjects (ages 32 and 67) and an IOL implanted eye (age 60) were scanned with central fixation to visualize the lens.

Anterior segment OCT via add-on lens: 3D visualization of crystalline lenses and implanted IOL

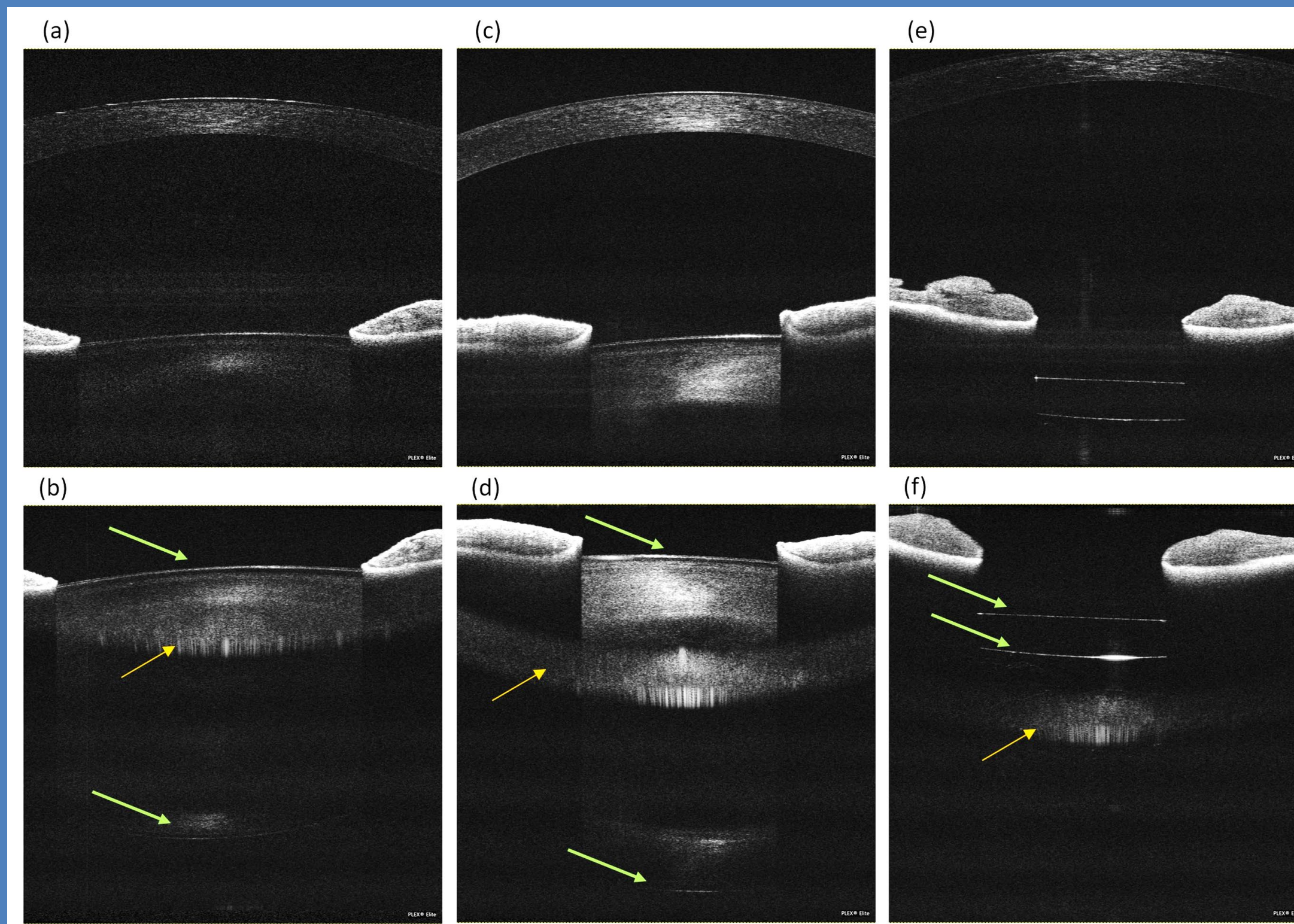


Figure 1: AS 6x6 mm Angio OCT B-scans at different depths of (a & b) a normal crystalline lens of a 32-year-old female, (c & d) a normal crystalline lens of a 67-year-old male, (e & f) an intraocular lens implant in the eye of a 60-year-old subject.

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RESULTS

The results show the capability of visualizing the crystalline lens in healthy subjects of different ages (Figure 1 a-d). With 6 mm depth, anterior chamber from cornea to the middle part of lens can be captured. Alternatively, by moving the delay arm (B-scan position), both surfaces (Figure 1, green arrows) of the lens can be seen in the cross-sectional image. However, the mirror image of the cornea (orange arrows) also appears as an artifact (Figure 1 b, d, f). Opacification of the crystalline lens with age is significantly visible in the cross-sectional images of the healthy subjects. We also imaged an eye with intraocular lens implant at both depths. Both surfaces of the clear IOL are visible in the B-scans (Figure 1 e & f).

CONCLUSIONS

We successfully scanned healthy crystalline lenses and implanted IOL in different age groups with anterior segment optical coherence tomography using PLEX Elite and the AS add-on lens attachment. Results show the potential of the method in monitoring of cataract progression and evaluation of cataract surgery outcome. The current study has a limitation of 6 mm depth; however, the conjugate mirror can be removed in post processing or axial depth can be increased at a lower A-scan rate.

