Findings on IOL Calcification: A new Classification

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Hydrogel (Hydrophilic acrylic)
Opacifications:
Partial Listing of Manufacturers:
- Bausch and Lomb (B and L)
- Cibavision
- Medical Developmental Research (MDR)
- Ophthalmic Innovations International (OII)
- International Ophthalmic Devices (IOD)
- Mediphakos
    and multiple sub-distributors
Classification of IOL Calcification

1. Primary
2. Secondary

Primary calcification: The IOL should be withdrawn or modified

IOL Calcification

Primary—Problem with IOL
Material/Fabrication
- MDR
- OII
- Others
Secondary
- Pre-existing Disease or Intraoperative Conditions
Classification of IOL Calcification

2. Secondary

Some Causes of Secondary Calcification

- Any condition associated with breakdown of the blood aqueous barrier
- Diabetes
- Uveitis
- PHPV
- Surgical, e.g., Broken Capsule

Secondary calcification is by definition not IOL related; it may occur with virtually all IOL designs implanted under various adverse circumstances.
Is there a role for hydrophilic acrylic materials for IOLs?

MODERN well-designed, well-manufactured and well-implanted hydrophilic acrylic IOLs can be desirable in certain clinical situations. But, what about calcification?

Microanalysis of Opacified Hydrophillic Acrylic Intra Ocular Lenses (Aqua-Sense)

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Comparison of Calcification of Three Intraocular Lens Materials, Hydrophilic and Hydrophobic Acrylic, and Silicone

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Calcification Study

Purpose: To compare IOLs of different materials in the same model system of IOL calcification
Method: 3 IOLs per group implanted subcutaneously for 10 weeks in New Zealand White rabbits
Lens analysis:
- Scanning electron microscopy (SEM) of central portion of IOL at 500X
- Identifies surface morphology (deposits, pits, nodules)
- Energy-dispersive x-ray spectroscopy (EDX) of central portion of IOL
- Elements release X-rays with unique amounts of energy
- Identifies elemental composition of sample
- EDX sampled at same place on optic as SEM photo
Hydrophilic Acrylic IOLs

Phosphorus (P) peak present for both IOLs
Calcium (Ca) peak present for both IOLs
No nitrogen (N) peak*
Pits, nodules and deposits on the surface of the IOL optic

Acry.Smart IOL

Akreos Fit IOL

*No nitrogen in EDX suggests deposits are not cellular

EDX
SEM

Hydrophobic Acrylic IOLs

No phosphorus (P) or calcium (Ca) peaks for either IOL
No pits, nodules or deposits on the surface of either IOL optic

Clariflex silicone IOL
Silicon (Si) peak due to silicon in IOL

AR40e acrylic IOL
Fluorine (F) peak due to fluorine in IOL

EDX
SEM

Rayner Centreflex and B&O Akreos

No reported primary calcification
Rare but significant secondary calcification

Classification of IOL Calcification

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Thank You!

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for Ophthalmic Devices Research