Longterm Outcome of Posterior Capsule Opacification

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Posterior capsule opacification

Important longterm complication of modern cataract surgery

- Pediatric cataract surgery
- Developing countries
- Refractive/Presbyopic lens exchange
- Special IOL-Types: Accommodative IOLs

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Nishi, O. et al: JCRS 2000

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Nishi, O. et al: JCRS 2000

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Longterm Results

How long is longterm?

1 year?

3 years?

10 years?
Evaluation of IOLs with low PCO-Scores more than 10 years after Cataract-Surgery

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Database: 1198 patients

Evaluation: 30 patients:
EPCO value < 1.0 (scale 0-4)

Age: 75.1±6.7 years

Follow-Up-Time: 74.3±18 months
Distribution of individual Follow-Up-Time

Follow-Up (Months)

Patients

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Patients

ECCE: n=29, Phaco: n=1

IOL-Modells: IOLAB (4141B, P256E, G156H, G157R, ORC C850Z), Pharmacia (811B)

IOL-Power: 21.3±4.4 Dpt.
Distribution of individual PCO-Scores

**EPCO-Index-Score (Scale 0-4)**

**Median EPCO-Score:** 0.48 ±0.28

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Due to the production all implanted IOLs demonstrated prominent haptic angulation, big optic diameter and sharp optic edges.

These factors led to low PCO scores even more than 10 years postoperatively despite of old surgical techniques.

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Longterm Results

3 years results
hydrophilic
Acrylic IOLs

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FDA Study: Rayner Centerflex

- 84 patients
  (54 female, 30 male)

Follow-up time 3 years:
- 51 patients
  (33 female, 18 male)
- Age: 71.0 +/- 8.6 years
  (range 30 - 85 years)
- 36.16 +/- 0.37 months
  (range 36 - 37 months)
- IOL-power: 20.8 +/- 2.53 D
  (range 16 - 26 D)

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Rayner Centerflex 570H

- Refractive Index: 1.46
- A-Constant: 118.0
- Water content: 26%

Total-Diameter: 12.00 mm
Optic-Diameter: 5.75 mm
no haptic angulation

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Sharp optic edge design!

Haptics not included!
15 of 51 patients (= 29.41%)
20.87 ± 9.85 months (range 2 to 36 months)
Posterior capsule opacification (PCO)

- EPCO 2000 picture analysis program (scale 0-4)
- standardized retroilluminated pictures
- N = 40
- including Nd:YAG capsulotomies

PCO evaluation:
- total IOL-Optic
- central 3 mm zone
- capsulorhexis
PCO development: EPCO2000

- **EPCO-score**

- **IOL**
  - 3-6 months
  - 1 year
  - 3 years

- **3 mm**
  - 3-6 months
  - 1 year
  - 3 years

- **Capsulorhexis**
  - 3-6 months
  - 1 year
  - 3 years

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\[ n = 36 \text{ (6 months)}; \quad n = 31 \text{ (1 year)}; \quad n = 40 \text{ (3 years)} \]
Examples PCO Pictures

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Outlook

C-Flex with enhanced square edge design (360°)

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T. Akahoshi*:

20,000 Acrysof Implantations
7 years Follow up
Nd-YAG- Capsulotomy-Rate: 1,47%

79,8% Excentric Capsulorhexis
8,5% Concentric overlapping Capsulorhexis

* Akahoshi T: Acrysof 19,000+ experience. Vortrag XIX Kongress der ESCR, Amsterdam 1.-5.9.01

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PCO Prevention
PerfectCapsule™ is a foldable silicone device (Milvella Pty. Ltd, Sydney, Australia)

Overall diameter: 7mm. Inner diameter: 5mm. Temporarily seal of a capsulorhexis of less than 5mm.

It enables selective irrigation of the internal capsular and targeting of remaining lens epithelial cells (LECs).

Sealed capsule irrigation (SCI)

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Endothelial cell count (ECC) [cells/mm²]

<table>
<thead>
<tr>
<th>SCI OD</th>
<th>Control OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>preop: 2750</td>
<td>preop: 2600</td>
</tr>
<tr>
<td>postop: 2650</td>
<td>postop: 2450</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difference SCI</th>
<th>Difference Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>194 (7.95 %)</td>
<td>233 (9.11 %)</td>
</tr>
</tbody>
</table>

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**Posterior capsule opacification**

**EPCO analysis software: scale 0–4**

PCO evaluation:
- total IOL optic
- central 3 mm zone
- capsulorhexis

<table>
<thead>
<tr>
<th>Months postop</th>
<th>Total IOL control</th>
<th>Total IOL SCI</th>
<th>3mm control</th>
<th>3mm SCI</th>
<th>CR control</th>
<th>CR SCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.14 ± 0.23</td>
<td>0.19 ± 0.23</td>
<td>0.10 ± 0.15</td>
<td>0.16 ± 0.19</td>
<td>0.15 ± 0.25</td>
<td>0.16 ± 0.21</td>
</tr>
<tr>
<td>6</td>
<td>0.26 ± 0.32</td>
<td>0.27 ± 0.28</td>
<td>0.16 ± 0.21</td>
<td>0.22 ± 0.25</td>
<td>0.24 ± 0.27</td>
<td>0.28 ± 0.30</td>
</tr>
<tr>
<td>12</td>
<td>0.36 ± 0.36</td>
<td>0.28 ± 0.32</td>
<td>0.27 ± 0.35</td>
<td>0.25 ± 0.34</td>
<td>0.37 ± 0.41</td>
<td>0.33 ± 0.38</td>
</tr>
</tbody>
</table>

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PCO development SCI vs. control eye

OD: SCI

1 month 3 months 12 months

OS: control

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Conclusions: clinical study

- PerfectCapsule is a safe device
- Capsulorhexis overlapping more stable after SCI treatment
- No Nd:YAG laser capsulotomy in treated eyes 12 months postop
- Tendency towards less fibrotic reaction in treated eyes

No clinically significant PCO prevention using distilled water!

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Laboratory study:

Evaluation of remaining lens epithelial cells after SCI irrigation using different pharmacological substances

- BSS, Lidocaine 2%, Aqua dest., NaCl 15%, 22.5%, 30%, Isopropanol 50%
Materials & Methods I

32 fresh porcine eyes
Divided along the equator
Fixated in a ring and on a table
Open Sky (removal of cornea and iris)

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Control group (n= 4 eyes): no SCI, only lens removal

Sealed capsule irrigation for 2 minutes; 5 cc

7 groups x 4 eyes: BSS

Aqua dest. Lidocaine 2%
NaCl 15% NaCl 22.5%
NaCl 30% Isopropanol 50%

Fixation of specimens, PAS staining;
Calculation of remaining LECs using
a light microscope (40x)
Histology – Results I

<table>
<thead>
<tr>
<th>Remaining lens epithelial cells:</th>
<th>Control</th>
<th>BSS</th>
<th>Aqua dest.</th>
<th>Lidoc. 2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>245.5</td>
<td>92.5</td>
<td>71.0</td>
<td>26.3</td>
</tr>
<tr>
<td>SD</td>
<td>189.7</td>
<td>100.0</td>
<td>47.0</td>
<td>19.8</td>
</tr>
</tbody>
</table>

BSS

Aqua dest.

Lidocaine 2%

Orig. magnification 10x

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## Histology – Results II

### Remaining lens epithelial cells:

<table>
<thead>
<tr>
<th></th>
<th>NaCl 15%</th>
<th>NaCl 22.5%</th>
<th>NaCl 30%</th>
<th>Isopropanol 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>0</td>
<td>1.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SD</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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Orig. magnification 10x
Conclusions: laboratory study

- BSS Irrigation = mechanical effect
- Aqua dest., Lidocaine less effective than NaCl 15%, 22.5%, 30% (statistically significant difference to BSS)
- NaCl efficacy comparable to alcohol 50%

Clinical evaluation of NaCl irrigation!

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