Falls before and after cataract surgery: a prospective cohort study evaluating determinants of risk

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6. Duke-NUS, Singapore
7. Flinders University, Adelaide, SA
8. School of Optometry and Vision Science, The University of New South Wales, Sydney NSW

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People with cataract are 3 times more likely to experience a fall. (Blue Mountains Eye Study, Ivers 2002)
Cataract Surgery & Falls: Evidence to-date

Expedited cataract surgery (UK, Harwood 2005): First eye cataract surgery in women reduced rate of falls

*Rate Ratio 0.66, 95% CI 0.45 to 0.95; n=306*
• First eye cataract surgery increases falls rates >28,000 bilateral cataract surgeries on WA administrative datasets:
  - patients >2 times more likely to fall in the period between 1st and 2nd eye surgery, than prior to surgery. (Meuleners 2013)

• Analysis of >1 million cataract surgeries (Medicare, US) found cataract surgery reduced the rate of falls:
  RR 0.84 (95% CI, 0.81-0.87). (Tseng et al JAMA 2012)
Spectacle correction can impact fall rate

- RCT ‘treating vision problems’ (n=616) increased the rate of falls (RR 1.57, 95% CI 1.19 to 2.06) Cumming et al JAGS 2007
  - 30% new glasses (92), 5% cataract surgery, 8% OT referral, 6% glaucoma referral, 3% other, 4% refused treatment
- RCT regular wearers of multifocal glasses were given single lens glasses (n=597) Harran et al BMJ 2010
  - Outside (and all) falls were significantly reduced in the subgroup that regularly took part in outside activities (RR 0.60, 0.42 to 0.87)
  - But, there was a significant increase in outside falls in intervention group participants who took part in little outside activity (RR 1.56, 1.11 to 2.19).
The FOCUS Study: Fall Risk & Cataract

- Aim: to evaluate the risk and determinants of falls, and secondary health outcomes, in older people with cataract during their surgical waiting period and in the months following first and second eye cataract surgery.
  - 717 participants aged 65 years or older
  - Bilateral cataract; recommended for 1st eye surgery
  - 8 national study sites (Sydney, Melbourne, Perth), all public hospital eye clinics
### Study participants

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
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<tbody>
<tr>
<td>Aged 65 years and over</td>
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<tr>
<td>Referred by optometrist, general practitioner or ophthalmologist for first eye cataract surgery</td>
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<table>
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<tr>
<th>Exclusion criteria</th>
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<tbody>
<tr>
<td>Cognitive impairment (Short Portable Mental Status Questionnaire &gt; 2 errors)</td>
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<td>Diagnosis of dementia, Parkinson’s disease or stroke</td>
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<tr>
<td>Unable to complete study assessments in English language</td>
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<tr>
<td>Significant ocular co-morbidities, e.g. glaucoma, diabetic retinopathy, age-related macular degeneration</td>
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<td>Planned combined ocular surgery, e.g. glaucoma and cataract</td>
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<tr>
<td>Residing outside metropolitan area (preventing completion of study visits)</td>
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<tr>
<td>Living in a residential/long-term care facility</td>
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<tr>
<td>Unable to walk (either aided or unaided)</td>
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The FOCUS Study: Fall Risk & Cataract

Baseline assessment

Follow-up 1: 3 months after 1st eye surgery

Follow-up 2: 3 months after 2nd eye surgery

PRE-SURGERY

First eye cataract surgery

BW-SURGERY

Second eye cataract surgery

POST-SURGERY

- Measures of vision
- Spectacle correction
- Vision function (Catquest 9-SF)
- Quality of life (EQ-5D-5L)
- Physical function
- Incidental & Planned Exercise

R₀: Falls rate before 1st eye surgery

R₁: Falls rate before 2nd eye surgery

R₂: Post surgical falls rate

6 months after 2nd eye surgery or 24 months
<p>| | |</p>
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<tbody>
<tr>
<td>Female, n (%)</td>
<td>182 (55.3)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>76 ± 5</td>
</tr>
<tr>
<td>Live alone, n (%)</td>
<td>98 (29.8)</td>
</tr>
<tr>
<td>Total medications, median (range)</td>
<td>4 (1–20)</td>
</tr>
<tr>
<td>≥10 medications, n (%)</td>
<td>33 (10.0)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>4.3 ± 2.2</td>
</tr>
<tr>
<td>Body mass index</td>
<td>27.8 ± 5.8</td>
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</tbody>
</table>

All values expressed as mean ± standard deviation unless otherwise stated.
Falls During the Surgical Wait

While We Waited: Incidence and Predictors of Falls in Older Adults With Cataract

Anna Palagi,1 Peter McCluskey,2 Andrew White,2−4 Kris Rogers,1 Lynn Meuleners,5,6 Jonathon Q. Ng,6 Nigel Morlet,6 and Lisa Keay1

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5Curtin-Monash Accident Research Centre (C-MARC), Faculty of Health Sciences, Curtin University, Perth, Western Australia, Australia
6Eye & Vision Epidemiology Research Group, School of Population Health, University of Western Australia, Perth, Western Australia, Australia
329 participants enrolled*

No surgery within study period
n=101†

First eye cataract surgery
n=228

Second eye cataract surgery
n=32

196 participants complete post-surgery follow-up

Second eye cataract surgery or end of observation#

Pre-surgery exposure period

Median 173 days
IQR 80–380 days

Post-surgery exposure period

Median 281 days
IQR 168–479 days
# Change in vision with first eye surgery

<table>
<thead>
<tr>
<th></th>
<th>Pre-surgery</th>
<th>Post-surgery</th>
<th>P-value</th>
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<tbody>
<tr>
<td><strong>Bilateral habitual visual acuity (logMAR)</strong></td>
<td>0.28 (0.20)</td>
<td>0.13 (0.20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Visual acuity operated eye</td>
<td>0.48 (0.29)</td>
<td>0.16 (0.20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Bilateral contrast sensitivity (log units)</strong></td>
<td>1.48 (0.19)</td>
<td>1.57 (0.17)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Contrast sensitivity operated eye</td>
<td>1.23 (0.32)</td>
<td>1.45 (0.19)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Anisometropia ≥1 dioptres, n (%)</td>
<td>115 (58.7)</td>
<td>123 (62.8)</td>
<td>0.41</td>
</tr>
<tr>
<td>Degree of anisometropia, dioptres</td>
<td>1.62 (1.77)</td>
<td>2.24 (1.90)</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Habitual distance spectacle correction, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No spectacles</td>
<td>89 (47.8)</td>
<td>124 (63.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Single vision</td>
<td>20 (10.2)</td>
<td>14 (7.1)</td>
<td>0.28</td>
</tr>
<tr>
<td>Multifocals</td>
<td>85 (43.4)</td>
<td>56 (28.6)</td>
<td>0.002</td>
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# Linear regression mixed models

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<thead>
<tr>
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<th>All participants (n=329)</th>
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<tr>
<td></td>
<td>IRR</td>
</tr>
<tr>
<td><strong>Surgery</strong>#</td>
<td></td>
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<tr>
<td>First eye cataract surgery</td>
<td>0.67</td>
</tr>
<tr>
<td><strong>Vision</strong></td>
<td></td>
</tr>
<tr>
<td>Visual acuity, binocular, logMAR</td>
<td>2.12</td>
</tr>
<tr>
<td>Visual acuity, dominant eye</td>
<td>2.20</td>
</tr>
<tr>
<td>Contrast sensitivity, log units</td>
<td>0.45</td>
</tr>
<tr>
<td>Contrast sensitivity, dominant eye</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Refractive Error</strong></td>
<td></td>
</tr>
<tr>
<td>Degree of anisometropia, dioptres</td>
<td>0.96</td>
</tr>
<tr>
<td><strong>Spectacle Modification</strong>#</td>
<td></td>
</tr>
<tr>
<td>Δ spherical spectacle power &gt; ±0.75 dioptres, operated eye</td>
<td>2.17</td>
</tr>
<tr>
<td>Shift into multifocal spectacles (from no/single vision spectacles)‡</td>
<td>1.12</td>
</tr>
</tbody>
</table>

#n=196, all models adjusted for age, sex, Functional Comorbidity Index, physical function (Short Physical Performance Battery total score), and total medications
Falls before and after first eye surgery

Crude falls incidence per person-year:
- Preop
- Postop (first eye)
Evidence for change in spectacle correction impacting falls risk

A) IRR 2.17; 95% CI, 1.23-3.85; $P = .008$

Falls incidence per person-year

- <0.75 D: n=123
- ≥0.75 D: n=63

Spherical equivalent change in spectacle correction after first-eye cataract surgery
Strengths and Limitations

• Prospective falls reporting
• Comprehensive data including BMI and physical activity, though no objective measure of walking/steps
• Not representative of all patients with cataract
Summary

• First eye cataract surgery was associated with a 33% reduction in incident falls and significant improvement to vision in the operated eye
  – One in three patients waiting for cataract surgery will experience a fall
  – More than one half of all falls were injurious

• Those with a history of falls in the prior year and who walk more during their surgical wait are at greatest risk (Palagyi 2016 IOVS)

• Major change (>0.75D) in the spherical equivalent dioptric power of the spectacle lens of their operated eye following surgery had a 2x increase in fall risk during the post-surgery time period
Harwood et al (UK, 2005) demonstrated a 34% reduction in the rate of falls over a 12 month period for patients expedited to receive first eye cataract surgery within 1 month of referral, compared to patients assigned to routine 12 month wait.
Integrated surgical and refractive management

- Avoid large changes in spherical equivalent refractive correction (≥0.75)
- Cylindrical change (p=0.14)
  
  *Cumming 2007, Black 2014, Elliott 2013*

- Multifocals (only 10 new wearers)
  
  *Lord 2002, Supuk 2016*
1/3 of cataract surgeries performed in public hospitals
Best practice management of cataract

✓ Efficient processing of referrals
✓ Expedited cataract surgery
✓ Cautious refractive management
Visual and refractive associations with falls after first-eye cataract surgery

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**Purpose:** To clarify the effect of first-eye cataract surgery on the incidence of falls and identify components of visual function associated with fall risk.

**Setting:** Eight public hospital eye clinics in Sydney, Melbourne, and Perth, Australia.

**Design:** Prospective cohort study.

**Methods:** The study recruited patients who had bilateral cataract, were aged 65 years or older, and were on public hospital cataract surgery waiting lists. Comprehensive assessments of vision, physical function, and exercise activity were performed before and after first-eye cataract surgery. Falls were reported prospectively for up to 2 years and associations with falls were assessed using generalized linear mixed models.

**Conclusions:** First-eye cataract surgery significantly reduced incident falls. Major changes in the dioptric power of spectacle correction of the operated eye after surgery increased the fall risk. Cautious postoperative refractive management is important to minimize this risk.

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