

## **Lens Extraction for Primary Angle Closure Glaucoma: a rapid systematic review.**

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### ***Background***

The World Health Organization ranks glaucoma as the second most common cause of blindness after cataract. Overall, primary open angle-glaucoma (POAG) is more common than primary angle closure glaucoma (PACG) but PACG is more likely to result in bilateral blindness and leads to half of all glaucoma blindness worldwide.<sup>1</sup>

The lens of the eye plays a major role in the mechanisms leading to PACG via pupil block and angle crowding. It has been proposed that PACG could be treated by removing the lens and that early lens extraction would improve glaucoma control, and reduce the disability associated with PACG. Lens extraction for cataract is a very common surgical procedure performed routinely by ophthalmologists. However, as with all intraocular surgery there are potential complications, such as infection and inflammation. Potential complications associated specifically with lens extraction include intra-operative posterior capsule rupture, vitreous loss, postoperative posterior capsular opacification and retinal detachment with consequent visual acuity loss. Lens extraction in eyes with angle closure may pose additional risks due to a shallow anterior chamber. These include corneal endothelial damage which can lead to corneal decompensation (oedema) and consequent reduction in vision and aqueous misdirection. However, lens extraction in patients without cataract may be safer and technically less challenging because of the little power required for phacoemulsification of the lens.

A systematic review by Friedman and colleagues<sup>2</sup> assessed the effectiveness of lens extraction for PACG compared with other interventions in people without a past history of acute-angle closure attacks. No randomized trials or adequate quality non-randomized studies were identified to determine the effectiveness of lens extraction for chronic primary angle-closure glaucoma. Complications of lens extraction were reported in the two included, but small, non-randomised comparative studies, and these reported early intraocular pressure (IOP) elevation, anterior segment inflammation including posterior synechial, wound dehiscence, posterior capsule rupture, and more serious persistent IOP elevation (1/22eyes) and in one case, central retinal vein occlusion.

The purpose of this rapid review was to extend the review by Friedman and colleagues to include case series data to identify and report on any safety

concerns associated with lens extraction for PACG.

### **Methods**

We systematically searched the following databases: Medline, Medline In-process, Embase, Biosis and Science Citation Index for any studies reporting on outcome of lens extraction for primary angle closure glaucoma. Searches were restricted to reports in the English language and to those published from 2002 onwards. Reports published only as abstracts were excluded. Current research registers were also searched to identify any ongoing relevant studies.

Full details of the search strategies used are given in Table 1.

**Table 1: Search strategies**

<p><b>MEDLINE (2002-June Wk 4 2007)</b> <b>EMBASE (2002-2007 Wk 27)</b> <b>Medline In Process (25th June 2007)</b> <b>Ovid Multifile Search URL: <a href="http://gateway.ovid.com/athens">http://gateway.ovid.com/athens</a></b></p> <ol style="list-style-type: none"><li>1 Glaucoma, Angle-Closure/</li><li>2 (glaucoma adj3 clos\$).tw.</li><li>3 PACG.tw.</li><li>4 or/1-3</li><li>5 Phacoemulsification/</li><li>6 (lens adj3 (extract\$ or remov\$)).tw.</li><li>7 phacoemulsification.tw.</li><li>8 or/5-7</li><li>9 4 and 8</li><li>10 limit 9 to (english language and yr="2002 - 2007")</li><li>11 remove duplicates from 10</li></ol>
<p><b>Science Citation Index (2002- 20th June 2007)</b> <b>Biosis (2002- 22nd June 2007)</b> <b>Web of Knowledge URL: <a href="http://wok.mimas.ac.uk/">http://wok.mimas.ac.uk/</a></b></p> <ol style="list-style-type: none"><li>1 TS=(phacoemulsification OR (lens SAME (extract* OR remov*)))</li><li>2 TS=PACG OR (glaucoma SAME clos*)</li><li>3 #1 AND #2</li><li>4 YR=2002-2007</li><li>5 #3 AND #5</li></ol>
<p><b>National Research Register (Issue 2,2007)</b> <b>URL: <a href="http://www.update-software.com/National/">http://www.update-software.com/National/</a></b></p> <ol style="list-style-type: none"><li>1 MeSH Glaucoma, Angle-Closure</li><li>2 glaucoma AND clos*</li><li>3 PACG</li><li>4 or/1-3</li><li>5 MeSH Phacoemulsification</li><li>6 lens AND (extract* OR remov*)))</li><li>7 phacoemulsification</li><li>8 or/5-7</li><li>9 4 and 8</li></ol>

**Current Controlled Trials (June 2007)**

URL: <http://www.controlled-trials.com/>

(phacoemulsification OR lens) AND glaucoma AND cios%

**Clinical Trials (June 2007)**

URL: <http://clinicaltrials.gov/ct/gui/c/r>

(phacoemulsification OR lens) AND glaucoma

**WHO International Clinical Trial Registry (June 2007)**

URL: <http://www.who.int/ictrp/en/>

Glaucoma AND phacoemulsification

After de-duplication, 107 reports were identified of which 16 were selected for full text evaluation. We included studies of any design, including case reports, case series non randomised comparative studies and randomised comparisons. 13 reports of 12 studies were included and were small case series and one case report. Four of these studies<sup>3-6</sup> included patients with either acute angle closure glaucoma or a history of acute angle closure; for the purpose of informing regarding the safety of lens extraction these were included. Only one study reported on clear lens extraction,<sup>7</sup> otherwise the participants had varying degrees of cataract reported as varying from mild to moderate.

The search of the research registers identified two ongoing randomised controlled trials, both being undertaken in Singapore. One<sup>8</sup> compares phacoemulsification and a glaucoma drainage device (phacotube) with combined phaco-trabeculectomy in patients with cataract and angle-closure glaucoma, while the other<sup>9</sup> is comparing outcomes between laser peripheral iridotomy and phacoemulsification in patients with an acute attack of angle closure.

**Results**

4 studies detailed in 5 papers<sup>10-14</sup> did not report any complications; complications may have occurred but were not reported. Liu<sup>7</sup> reported an uneventful post-operative course.

Intraoperative complications reported by Jacobi et al<sup>4</sup> included post capsule rupture in 5% of eyes (2/43), iris prolapse (2/43). Kubota et al<sup>15</sup> reported posterior capsule rupture in 6% (1/18) eyes undergoing lens extraction (included in the Friedman review). Jacobi et al<sup>4</sup> reported early postoperative complications as anterior segment inflammation in 13.9% of eyes (6/43), and transient IOP spikes in 9.3% of eyes (4/43) but reported no long term complications. Lai et al<sup>5</sup> reported loss of visual acuity in 2 out of 21 eyes after lens extraction, one eye having pre-existing advanced glaucomatous optic neuropathy, and the other due to deteriorating diabetic maculopathy. In this same series the vision was unchanged in nine eyes; of these two had corneal decompensation (oedema) and both of these cases had had previous acute angle closure glaucoma with very high IOPS. 5 eyes had advanced glaucomatous optic neuropathy, and one eye had a epiretinal membrane secondary to a prior branch retinal vein occlusion. Kubota et al<sup>15</sup> reported no reduction in vision in any eye at six month follow up. Ko et al<sup>16</sup> reported a decrease in corneal endothelial density after lens extraction,

however this was a small case series with no comparator and the significance of this finding is unclear. One case report of aqueous misdirection, a potentially serious complication, secondary to lens extraction was identified.<sup>17</sup> This followed lens extraction in an eye with PAC, and previous laser iridotomies, and was successfully controlled by diode cyclophotocoagulation with a good visual outcome and controlled IOP.

### **Discussion**

Overall, the evidence base was weak with predominantly small case series including patients with visually significant cataract.

### **Conclusions**

The limited evidence does not suggest serious safety concerns but further data are required on the safety and efficacy of the procedure and patient reported effects on disability and quality of life. A randomised controlled trial is the optimal design to evaluate the effectiveness of the procedure, safety needs to be monitored, and data on long term safety outcomes are required and could be collected as a planned long term follow up of the trial cohort.

### **References**

- 1 Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. *British Journal of Ophthalmology* 2002; 86(2):238-242.
- 2 Friedman DS, Vedula SS. Lens extraction for chronic angle-closure glaucoma. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD005555. DOI: 10.1002/14651858.CD005555.pub2.
- 3 Imaizumi M, Takaki Y, Yamashita H. Phacoemulsification and intraocular lens implantation for acute angle closure not treated or previously treated by laser iridotomy. *J Cataract Refract Surg* 2006; 32(1):85-90.
- 4 Jacobi PC, Dietlein TS, Luke C, Engels B, Krieglstein GK. Primary phacoemulsification and intraocular lens implantation for acute angle-closure glaucoma. *Ophthalmology* 2002;109(9):1597-603.
- 5 Lai JS, Tham CC, Chan JC. The clinical outcomes of cataract extraction by phacoemulsification in eyes with primary angle-closure glaucoma (PACG) and co-existing cataract: a prospective case series. *J Glaucoma* 2006;15(1):47-52.
- 6 Zhi ZM, Lim ASM, Wong TY. A pilot study of lens extraction in the management of acute primary angle-closure glaucoma. *Am J Ophthalmol* 2003;(4):534-6.
- 7 Liu CJ, Cheng CY, Wu CW, Lau LI, Chou JC, Hsu WM. Factors predicting intraocular pressure control after phacoemulsification in angle-closure glaucoma. *Arch Ophthalmol* 2006;124(10):1390-4.
- 8 Chew PT. Combined phacotube vs phacotrabeulectomy: a randomized controlled trial. ClinicalTrials.gov Identifier: NCT00273221

- 9 Seah H. Laser iridotomy versus phacoemulsification in acute angle closure. ClinicalTrials.gov Identifier: NCT00350428
- 10 Di Staso S, Sabetti L, Taverniti L, Aiello A, Giuffre I, Balestrazzi E. Phacoemulsification and intraocular lens implant in eyes with primary angle-closure glaucoma: our experience. *Acta Ophthalmol Scand Suppl* 2002; 236:17-8.
- 11 Euswas A, Warrasak S. Intraocular pressure control following phacoemulsification in patients with chronic angle closure glaucoma. *J Med Assoc Thai* 2005;88(Suppl 9):S121-5.
- 12 Kashiwagi K, Kashiwagi F, Tsukahara S. Effects of small-incision phacoemulsification and intraocular lens implantation on anterior chamber depth and intraocular pressure. *J Glaucoma* 2006;(2):103-9.
- 13 Nonaka A, Kondo T, Kikuchi M, Yamashiro K, Fujihara M, Iwawaki T et al. Cataract surgery for residual angle closure after peripheral laser iridotomy. *Ophthalmology* 2005;112(6):974-9.
- 14 Nonaka A, Kondo T, Kikuchi M, Yamashiro K, Fujihara M, Iwawaki T et al. Angle widening and alteration of ciliary process configuration after cataract surgery for primary angle closure. *Ophthalmology* 2006;113(3):437-41.
- 15 Kubota T, Toguri I, Onizuka N, Matsuura T. Phacoemulsification and intraocular lens implantation for angle closure glaucoma after the relief of pupillary block. *Ophthalmologica* 2003; 217(5):325-8.
- 16 Ko Y-C, Liu CJL, Chou JC, Hsu W-M. Effects of phacoemulsification and intraocular lens implantation on the corneal endothelium in primary angle-closure glaucoma. *J Med Ultrasound* 2004;(2):33-7.
- 17 Muqit MM, Menage MJ. Malignant glaucoma after phacoemulsification: treatment with diode laser cyclophotocoagulation. *J Cataract Refract Surg* 2007;33(1):130-2.