Ophthalmic Technology Assessment

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The Effect of Phacoemulsification on Intraocular Pressure in Glaucoma Patients

A Report by the American Academy of Ophthalmology

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Objective: To examine effects of phacoemulsification on longer-term intraocular pressure (IOP) in patients with medically treated primary open-angle glaucoma (POAG; including normal-tension glaucoma), pseudoexfoliation glaucoma (PXG), or primary angle-closure glaucoma (PACG), without prior or concurrent incisional glaucoma surgery.

Methods: PubMed and Cochrane database searches, last conducted in December 2014, yielded 541 unique citations. Panel members reviewed titles and abstracts and selected 86 for further review. The panel reviewed these articles and identified 32 studies meeting the inclusion criteria, for which the panel methodologist assigned a level of evidence based on standardized grading adopted by the American Academy of Ophthalmology. One, 15, and 16 studies were rated as providing level I, II, and III evidence, respectively.

Results: All follow-up, IOP, and medication data listed are weighted means. In general, the studies reported on patients using few glaucoma medications (1.5−1.9 before surgery among the different diagnoses). For POAG, 9 studies (total, 461 patients; follow-up, 17 months) showed that phacoemulsification reduced IOP by 13% and glaucoma medications by 12%. For PXG, 5 studies (total, 132 patients; follow-up, 34 months) showed phacoemulsification reduced IOP by 20% and glaucoma medications by 35%. For chronic PACG, 12 studies (total, 495 patients; follow-up, 16 months) showed phacoemulsification reduced IOP by 30% and glaucoma medications by 58%. Patients with acute PACG (4 studies; total, 119 patients; follow-up, 24 months) had a 71% reduction from presenting IOP and rarely required long-term glaucoma medications when phacoemulsification was performed soon after medical reduction of IOP. Trabeculectomy after phacoemulsification was uncommon; the median rate reported within 6 to 24 months of follow-up in patients with controlled POAG, PXG, or PACG was 0% and was 7% in patients with uncontrolled chronic PACG.

Conclusions: Phacoemulsification typically results in small, moderate, and marked reductions of IOP and medications for patients with POAG, PXG, and PACG, respectively, and using 1 to 2 medications before surgery. Trabeculectomy within 6 to 24 months after phacoemulsification is rare in such patients. However, reports on its effects in eyes with advanced disease or poor IOP control before surgery are few, particularly for POAG and PXG. *Ophthalmology 2015;■:1−14 © 2015 by the American Academy of Ophthalmology.*

The American Academy of Ophthalmology prepares Ophthalmic Technology Assessments to evaluate new and existing procedures, drugs, and diagnostic and screening tests. The goal of an Ophthalmic Technology Assessment is to review systematically the available research for clinical efficacy, effectiveness, and safety. After review by members of the Ophthalmic Technology Assessment Committee, other Academy committees, relevant subspecialty societies, and legal counsel, assessments are submitted to the Academy's Board of Trustees for consideration as official Academy statements. The purpose of this assessment by the Ophthalmic Technology Assessment Committee Glaucoma Panel is to investigate the longer-term (≥6 months) effect of phacoemulsification on intraocular pressure (IOP) in patients with medically treated primary open-angle glaucoma (POAG), pseudoexfoliation glaucoma (PXG), or primary angle-closure glaucoma (PACG) who have not undergone prior or concomitant incisional glaucoma surgery.

Background

Because IOP is the primary treatable risk factor for glaucoma progression, and because cataracts usually occur in the same patient demographic as the most common forms of chronic glaucoma, treatment of coexisting cataract and glaucoma is an important clinical problem. Although others

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have reviewed the effect on IOP of cataract extraction combined with trabeculectomy and have shown it to be superior to cataract extraction alone,[1] more recent reports using modern cataract surgery performed with phacoemulsification have shown significant short-term and midterm reduction in IOP in patients with ocular hypertension and glaucoma in some,[2,3] but not all,[4] studies. Cataract extraction as a stand-alone procedure typically results in improvement in visual functioning in patients with glaucoma,[5] and the addition of a glaucoma procedure to phacoemulsification can result in more complications during and after surgery and prolonged visual recovery.

Resource Requirements

Because cataract surgery using phacoemulsification is ubiquitous in developed countries at this time, little incremental cost is accrued to use this technology.

Questions for Assessment

This assessment addressed the following questions:

1. What is the effect of phacoemulsification on IOP and glaucoma medication use in patients with medically treated POAG, PXG, or PACG, who have not undergone prior or concomitant incisional glaucoma surgery?
2. What are the primary glaucoma-related complications of phacoemulsification in such patients?

Description of Evidence

Literature searches conducted on June 13, 2013, January 6, 2014, and December 23, 2014, in PubMed and the Cochrane Library resulted in 541 potentially relevant citations; 60 of these were in non-English languages and were excluded. The search terms used are described below:

("Glaucoma, Open-Angle"[Mesh] OR "Glaucoma, Angle-Closure"[Mesh] OR glaucoma[tiab]) AND ("Phacoemulsification"[Mesh] OR "phacoemulsification") AND ("Intraocular Pressure"[Mesh] OR "intraocular pressure") AND ("Randomized Controlled Trial"[Publication Type] OR randomised[tiab] OR randomized[tiab] or randomization[tiab] or randomisation[tiab] or randomly[tiab] OR "Cohort Studies"[Mesh] OR "cohort studies" OR "cohort study" OR "Outcome Assessment (Health Care)"[Mesh] OR "outcome assessment" OR "outcome research" OR "outcomes research" OR "outcomes assessment" OR "Case-Control Studies"[Mesh] OR "case control study" OR "case control studies" OR "case series" or "clinical trial") AND ("Adult"[Mesh] OR "Middle Aged"[Mesh] OR "Aged"[Mesh] OR "Aged, 80 and over"[Mesh] OR "adult" OR "adults"), limited to studies conducted in humans and published in English.

Inclusion criteria were as follows: the study reported on original research, the population consisted of at least 25 adults (ages 18 and older) treated for open-angle or angle-closure glaucoma, phacoemulsification was used for cataract extraction without adjunctive glaucoma surgery, IOP was reported before and after phacoemulsification, and the minimum follow-up was 6 months. The titles and abstracts were reviewed by the authors and 86 were selected for full-text review. Of these, 32 met the inclusion criteria. The methodologist (K.S.) assessed these 32 studies according to the strength of evidence. A level I rating was assigned to well-designed and well-conducted randomized clinical trials, a level II rating was assigned to well-designed case-control and cohort studies and lower-quality randomized studies, and a level III rating was assigned to case series, case reports, and lower-quality cohort and case-control studies. One, 15, and 16 studies were rated as providing level I, II, and III evidence, respectively.

Studies of patients with prior or concomitant incisional glaucoma surgery, including minimally invasive glaucoma procedures and goniosynechialysis by any method, were excluded from this review. Also excluded were studies of patients who had undergone large-incision extracapsular cataract extraction, who had untreated glaucoma, or who had untreated ocular hypertension, because the results of phacoemulsification for such patients are less pertinent to the clinician faced with a management decision for the patient with medically treated glaucoma. In addition, 9 studies were excluded because the data were not presented in a manner that allowed accurate determination of the outcome measures; the population studied was not clearly defined; the population was not predominantly medically treated POAG, PXG, or PACG; or a combination thereof. In articles where the population studied included multiple glaucoma diagnoses, the data on POAG, PXG, and PACG were considered separately to the extent possible. For articles in which results at multiple time points were presented, the longest follow-up time point with the population that fit the inclusion criteria was used. The minimum number of patients for inclusion was 25, although this was waived for prospective studies in some cases.

Published Results

For grouped data synthesizing the results from more than 1 study, the patient number used for analysis from each study was that with the longest follow-up time, and mean and standard deviation measurements were weighted for total number of patients in each respective study. All references to medications are to glaucoma medications. For individual studies, unless otherwise noted, controlled glaucoma refers to IOP control, a single baseline IOP measurement before surgery was used, phacoemulsification was performed with a clear corneal incision and foldable intraocular lens (IOL), and eyes with complications during surgery were included.

The mean ages of the patients in most of the 32 studies were similar; the overall mean age was 73.1±4.3 years (range, 55.0–81.6 years). The mean age of patients in studies of PACG was younger than in studies of POAG and PXG (mean, 69.9±3.8 years vs. 75.1±3.4 years, respectively; $P < 0.001$, independent samples 2-tailed t test).