Intracameral anesthesia: a report by the American Academy of Ophthalmology

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Authors' objectives
To examine the available evidence on intracameral anaesthesia, in order to address questions concerning its effectiveness, the possible toxicity to the corneal endothelium and retina, and the optimal and maximum doses.

Searching

Study selection
Study designs of evaluations included in the review
Studies of any design were eligible for inclusion.

Specific interventions included in the review
The inclusion and exclusion criteria were not defined in terms of the interventions. The following regimens were used in the included studies: combined topical and intracameral anaesthesia versus peribulbar anaesthesia; topical anaesthesia with the adjunct of intracameral anaesthesia versus placebo; and intracameral lidocaine versus bupivacaine. The majority of the studies, where reported, used preservative-free lidocaine hydrochloride (1%) at doses ranging from 0.1 to 0.5 mL.

Participants included in the review
The inclusion and exclusion criteria were not clearly defined in terms of the participants. The studies appeared to include patients undergoing surgery for cataracts.

Outcomes assessed in the review
The inclusion and exclusion criteria were not defined in terms of the outcomes. The outcomes of interest appeared to be efficacy, corneal toxicity and retinal toxicity.

How were decisions on the relevance of primary studies made?
The authors state that panel members reviewed the primary studies, and identified and selected those of clinical relevance. However, the number of reviewers performing the selection was not stated. Relevant studies were reviewed by the panel methodologist.

Assessment of study quality
The authors do not report a formal method for assessing validity, though each study was assigned one of three ratings according to the level of evidence. The quality of the statistical methods used in the studies was also assessed, using a scale from A to F. Papers with scores of D and F were considered to be unacceptable as medical evidence, a score of C was borderline, and scores of A or B were acceptable. The panel methodologist assigned the level of evidence ratings, reported statistical analyses, and assessed the quality of the statistical methods used.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The data were not summarised in tabular format, so it was unclear which data were extracted from the included studies.
Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken.

How were differences between studies investigated?
Differences between the studies were discussed within the text of the review, but no formal assessment of heterogeneity was undertaken.

Results of the review
Ten randomised controlled trials (RCTs) were eligible for inclusion. In addition, there were 4 case-control or cohort studies, 5 case series or case reports, and 13 experimental studies on animals.

Effectiveness. One RCT compared peribulbar anaesthesia and combined topical and intracameral anaesthesia. The trial found that patients who received intracameral lidocaine 1% reported more pain during surgery and post-operatively.

The studies reached different conclusions about the effectiveness of intracameral anaesthesia as an adjunct to topical anaesthesia. Three RCTs reported that the adjunct of intracameral lidocaine 1% decreased pain at various points during and after the surgery, compared with groups receiving topical anaesthesia and placebo intracameraly.

Four RCTs showed a minimal difference in pain control between intracameral lidocaine and placebo when they were used as topical anaesthesia. The evidence from studies using different designs was limited.

One RCT comparing intracameral bupivacaine 0.5% and lidocaine 1% found no significant difference in pain between the two groups.

Corneal toxicity.

Three RCTs examined post-operative endothelial cell counts in the short term. Compared with controls, preservative-free lidocaine 1% caused no change in the endothelial cell counts. There was also no difference between the lidocaine and control groups in terms of the blood-aqueous barrier permeability at 1 month.

The authors also reported the results from animal studies.

Retinal toxicity.

One RCT showed no long-term effect of intracameral anaesthetic on retinal cells. The authors also reported the results from animal studies.

Authors' conclusions
The ideal timing and placement of intracameral anaesthesia have not been determined. Since topical anaesthesia alone is effective, surgeons may elect to use intracameral anaesthesia for incremental pain control in patients who cannot be adequately managed with topical anaesthesia alone. Appropriate patient selection is important when using this method of anaesthesia. While the short-term studies seem to indicate the safety of intracameral anaesthesia, the long-term effects are unknown. The patients' preferences for anaesthesia are not well studied.

CRD commentary
Generally, the methodology of this review was reasonable but insufficient details were reported. For example, although the questions for assessment were well stated, no details of the inclusion or exclusion criteria used for selecting the studies were provided. The search was limited to one database and there is a strong possibility that important studies were missed. Validity was not fully assessed, although the studies were assigned a level of evidence rating. The study details were not summarised in tabular format, although some were reported in the text.

Studies were pooled appropriately in a narrative synthesis.
The authors’ conclusions were suitably cautious given the limitations highlighted, and they follow on from the results.

**Implications of the review for practice and research**

**Practice:** The authors state that straight topical anaesthesia appears to be effective for the patient population selected. However, surgeons may elect to use intracameral anaesthesia for incremental pain control in patients who cannot be adequately managed with topical anaesthesia alone. The authors also state that topical anaesthesia with supplemental intracameral anaesthesia offers rapid visual rehabilitation, and potential reductions in the length of room turnover time, compared with retrobulbar or peribulbar anaesthesia.

**Research:** The authors state that long-term studies in humans are needed to evaluate corneal endothelial toxicity. In addition, further short- and long-term retinal studies in humans are required.

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