Title: General vs. Local Anesthesia for Cataract Surgery

Date: 11 January, 2008

Context and policy issues:

Cataract is defined as the loss of the natural transparency of the natural lens of the eye. Surgery is the only recognized treatment for cataract.\(^1\) Anesthesia is required to perform cataract surgery. There are three categories of anesthesia: general, regional (retrobulbar, peribulbar, and sub-Tenon's), and topical (with or without intraocular anesthetics). Ideally, the use of anesthesia should provide pain-free surgery and facilitate surgical procedure with minimal systematic or local complications, should be cost-effective and time-efficient, and should yield excellent outcomes and patient satisfaction.\(^1\)

Evidence regarding the clinical and cost-effectiveness of the general versus local anesthesia for cataract surgery was requested by the Policy Forum. The mandate of the Forum is to provide federal, provincial, and territorial (F/P/T) jurisdictions with opportunities to share information and collaborate on health technology policy development, where it is beneficial to its members. Through access to evidence-based information about health technologies and options, the Forum will identify opportunities to achieve common purpose and economies in the implementation, management, and decommissioning of health technologies. The Canadian Agency for Drugs and Technologies in Health serves as the Secretariat for the Forum.

Research questions:

1. What is the comparative evidence of efficacy and harm of general anesthesia versus local anesthesia in patients undergoing cataract surgery?

2. What is the comparative cost-effectiveness of general anesthesia versus local anesthesia in patients undergoing cataract surgery?

Disclaimer: The Health Technology Inquiry Service (HTIS) is an information service for those involved in planning and providing health care in Canada. HTIS responses are based on a limited literature search and are not comprehensive, systematic reviews. The intent is to provide a list of sources and a summary of the best evidence on the topic that CADTH could identify using all reasonable efforts within the time allowed. HTIS responses should be considered along with other types of information and health care considerations. The information included in this response is not intended to replace professional medical advice, nor should it be construed as a recommendation for or against the use of a particular health technology. Readers are also cautioned that a lack of good quality evidence does not necessarily mean a lack of effectiveness particularly in the case of new and emerging health technologies, for which little information can be found, but which may in future prove to be effective. While CADTH has taken care in the preparation of the report to ensure that its contents are accurate, complete and up to date, CADTH does not make any guarantee to that effect. CADTH is not liable for any loss or damages resulting from use of the information in the report.

Copyright: This report contains CADTH copyright material. It may be copied and used for non-commercial purposes, provided that attribution is given to CADTH.

Links: This report may contain links to other information on available on the websites of third parties on the Internet. CADTH does not have control over the content of such sites. Use of third party sites is governed by the owners’ own terms and conditions.
Methods:

A limited literature search was conducted on key health technology assessment resources, including PubMed, The Cochrane Library (Issue 4, 2007), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international HTA agencies, and a focused Internet search. Results include articles published between 2002 and the present, and are limited to English language publications only. Filters were applied to limit the retrieval to systematic reviews, meta-analyses, health technology assessments, randomized controlled trials and economic studies.

Summary of findings:

From this limited literature search, there were no health technology assessments, systematic reviews, meta-analyses or randomized controlled trials (RCTs) regarding the comparison between general anesthesia and local anesthesia for cataract surgery identified. Most of the literature focused on the comparison between different types of local anesthesia, with 65 RCTs identified. This comparison is beyond the scope of this report and thus, a list of the citations along with the abstract are provided in Appendix 1. These trials were further classified into two groups (Group A: Supplemental agents for local anesthesia performance and Group B: Surgical and local anesthesia techniques).

One review, two survey studies and two systematic reviews relating to the choice of anesthesia for cataract surgery were identified. These are summarized below.

A review article by Navaleza et al. in 2006 outlined the perceived benefits and risks with different types of anesthesia (Table 1 below). In addition, the author suggests patient populations that may benefit most from a specific type of anesthesia.
Table 1: Benefits and Risks of Anesthesia for Cataract Surgery

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Risks</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. General anesthesia:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Require more medication, equipment, and personnel. Most costly form of anesthesia</td>
<td>Malignant hyperthermia, hemodynamic fluctuation, postoperative nausea and vomiting, allergic reactions</td>
<td>Pediatric patients, patients unable to cooperate (psychiatric disorders, dementia, tremor, and inability to lie flat), lengthy procedures (&gt;3 hours), and patient or surgeon preference (newly practicing surgeon). Patients on anticoagulation treatment, patients with nystagmus and patients with anatomic abnormalities</td>
</tr>
<tr>
<td>Most controlled environment, excellent anesthesia, analgesia and akinesia, fewer ocular complications, high patient satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II. Regional anesthesia:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not as controlled as general anesthesia. More time and cost efficient than general anesthesia</td>
<td>Retrobulbar: allergic reactions, brainstem anesthesia, oculocardiac reflex, retrobulbar hemorrhage, globe perforation, optic nerve damage. Peribulbar: longer duration of onset due to higher volume of injectable required Sub-Tenon’s: cosmetic complications (localized swelling, bruising, subconjunctival hemorrhage)</td>
<td>Patients unable to follow directions (hearing impaired, language barrier), surgeon in training</td>
</tr>
<tr>
<td>Excellent anesthesia, analgesia and akinesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>III. Topical anesthesia:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least controlled environment, shortest duration of action. Most cost and time efficient, most popular form of anesthesia</td>
<td>Rare local allergic reactions, least controlled environment, patient mobility of eyes and body may interfere with surgery, patient perception of visual phenomena during the procedure, possible patient experience of pain and pressure as the lens-iris diaphragm move. These sensations may be reduced by intravenous sedation or analgesia.</td>
<td>Surgeon able to tolerate ocular motility, patient able to follow directions, anesthesia staff willing to modulate intravenous sedation.</td>
</tr>
<tr>
<td>No effect on vision or motility, improve vision almost immediately after surgery, high patient satisfaction if there is no pain or discomfort during surgery, avoid systemic risks of general anesthesia and risk of local trauma of regional anesthesia.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fanzca and Franzco\textsuperscript{3} conducted a survey in 2005 to determine the anesthesia techniques used for cataract surgery. The survey was given to 700 delegates of the Congress of the International Council of Ophthalmology. Results were obtained from 583 respondents (83.3%).

It was found that general anesthesia was seldom used (10%), while local block alone was administered by 55% of respondents and local block combined with sedation was used 35% of respondents. Regional techniques included peribulbar block (38%), retrobulbar block (19%), topical anesthesia or sub-Tenon’s (parabulbar) block (16% each), topical plus intrachamber block (9%) and local infiltration (3%). Of local anesthetic, lignocaine was the most frequent used (44%), followed by bupivicaine (25%) and a combination of agents (20%).

There is a wide variation from country to country in the techniques employed and the frequency of their use. Of ophthalmologists from Canada, 67% used local anesthesia only, 33% used local anesthesia with sedation, and 0% used general anesthesia.

A survey by Leaming\textsuperscript{4} was conducted in July 2003 to the members of the American Society of Cataract and Refractive Surgery (ASCRS) to determine the practice styles and preferences of the ASCRS members. Approximately 15.5% (985) of the 6350 questionnaires were returned for the analysis.

The use of general anesthesia or retrobulbar block has largely been replaced with other safer and equally effective means of local anesthesia, including peribulbar, sub-Tenon’s and topical anesthesia. Retrobulbar block without facial block was used by 11% of surgeons and retrobulbar injection with facial block was used by 9% of surgeons (down from 76% in 1985, 2% in 1995, and 14% in 2000). The peribulbar block was used by 17% of surgeons (down from 38% in 1995). Topical anesthesia was used by 61% of surgeons (up from 8% in 1995 and 51% in 2000). The use of topical anesthesia also varied with surgical volume. Surgeons performing 1 to 5 cataract procedures per month used topical 38% of the time, and those doing more than 75 procedures used it in 76% of the cases.

The systematic review by Padroni et al\textsuperscript{5} in 2007 was from Cochrane collaboration. It compared the efficacy of topical anesthesia (with or without addition of intracameral local anesthetic) and sub-Tenon’s anesthesia in providing pain relief during cataract surgery. The literature search was from 1990 to 2006. Randomized controlled trials were selected. Total of seven trials were included. Overall quality of the studies was not high. Only two studies described allocation concealment and methods of randomization.

The different in pain scores was not large in magnitude, but pain in the topical anesthesia group was significantly greater. Although sub-Tenon’s anesthesia tended to cause more minor aesthetic problems, there were more serious complications such as capsule tear and vitreous loss occurred in patients receiving topical than in sub-Tenon anesthesia (4.3% versus 2.1%). The authors concluded that sub-Tenon’s anesthesia provides better pain relief than topical anesthesia for cataract surgery.

The systematic review by Ezra and Allan et al\textsuperscript{6} in 2007 was from Cochrane collaboration. It assessed pain during surgery and patient satisfaction with topical anesthesia alone compared to topical anesthesia with intracameral lidocaine for phacoemulsification. It also assessed adverse effects and complications attributable to choice of anesthesia.

The literature search was from 1966 to 2006. Randomized controlled trials were selected. Total of eight trials were included. Overall study quality was high.
Patients using supplementary intracameral lidocaine experienced lower intraoperative pain perception, although the difference was small. No significant difference was shown between groups in terms of patient satisfaction, intraoperative adverse events or corneal toxicity.

The authors concluded that the use of intracameral unpreserved 1% lidocaine is an effective and safe adjunct to topical anesthesia for phacoemulsification cataract surgery. There were no economic evaluations on this topic identified.

Conclusions and implications for decision or policy making:

There is no single mode of anesthesia that can serve as universal choice for all patients and surgeons. The selection and execution of anesthesia during cataract surgery will depend on the patient factors, the surgeon’s level of expertise, and the surgery facility. The use of general anesthesia for cataract surgery appears to be limited to special cases. There were no RCTs available that compared general to local anesthesia in cataract surgery published in the last 5 years. Although review articles identify patient populations for which general anesthesia would be suitable, regional (e.g peribulbar, and sub-Tenon’s anesthesia) and topical anesthesia appear to be the preferred anesthesia for cataract surgery.

Prepared by:

Khai Tran, MSc, PhD, Research Officer
Melissa Severn, MIST, Information specialist
Health Technology Inquiry Service (HTIS)
E-mail: HTIS@ccohta.ca
Toll free phone: 1-866-898-8439
References:


Appendix 1

Group A: Supplemental Agents for Local Anesthesia Performance


   **BACKGROUND:** Volumes of local anaesthetics for sub-Tenon’s anaesthesia vary. Lower volumes produce less akinesia, whereas higher volumes increase chemosis and intraocular pressures. Hyaluronidase is often added to local anaesthetics to improve akinesia without increasing the volume of the injection, but this is controversial. This randomized, sequential allocation study examines the addition of hyaluronidase on the minimum local anaesthetic volume (MLAV) required for a sub-Tenon's block. **METHODS:** Sixty-two patients having sub-Tenon's blocks for cataract surgery were randomized into two groups. The control group (n=31) received 2% w/v lidocaine and the study group (n=31) received 2% w/v lidocaine with hyaluronidase 15 IU ml(-1). Using parallel up-down sequential allocation from a 4 ml starting volume, the volumes in both groups were changed using a testing interval of 1 ml according to the quality of globe akinesia. The median effective local anaesthetic volume (MLAV) was calculated for both groups using probit regression. **RESULTS:** The groups were similar for age, sex, and ocular axial length. The MLAV in the hyaluronidase group was 2.6 ml [95% confidence interval (CI), 2.1-3.1] and 6.4 ml (95% CI, 5.1-8.1) in the control group (P<0.002). **CONCLUSIONS:** Hyaluronidase permits a significant 2.4-fold (95% CI, 1.8-3.4) reduction in MLAV for sub-Tenon's anaesthesia.


   **PURPOSE:** To assess the safety and efficacy of topical lidocaine, levobupivacaine, and ropivacaine in cataract surgery with phacoemulsification. **METHODS:** One hundred and five patients scheduled for cataract surgery with topical anaesthesia were randomly allocated into 3 groups of 35 patients each to receive eye drops of lidocaine 2%, levobupivacaine 0.75%, or ropivacaine 1% every 5 min starting 30 min before surgery. Patients graded their pain using a 0-10-point verbal pain score (VPS) at different stages of the procedure. The levels of patient and surgeon satisfaction, the duration of surgery, complications, and the need for supplemental anaesthesia were recorded. **RESULTS:** There was no significant difference in duration of surgery and demographic variables among the groups. At the intraoperative period, end of surgery, and postoperative first hour the mean VPS in the lidocaine group was significantly higher than the others (P<0.01), but no significant difference was found between the levobupivacaine and ropivacaine groups. At incision and 24 h after surgery, it was not significantly different among the groups. Surgeon and patient satisfaction scores were significantly better in the levobupivacaine and ropivacaine groups than in the lidocaine group (P<0.01). **CONCLUSIONS:** Topical anaesthesia with levobupivacaine and ropivacaine were safe, feasible and more effective than lidocaine in cataract surgery. Levobupivacaine and ropivacaine provided sufficient and long-lasting analgesia without the need of supplemental anaesthesia for each patient. Eye advance online publication, 7 September 2007; doi:10.1038/sj.eye.6702973

**PURPOSE:** To quantify the macular edema induced by intracameral mydriatics in phacoemulsification surgery. **SETTING:** University hospital eye clinic, Umea, Sweden. **METHODS:** In a randomized study of 22 patients, 11 patients were given 150 μL of a mixture of phenylephrine 1.5% and lidocaine 1% intracamerally for mydriasis and anesthesia. In a control group (n = 11), conventional topical mydriatics and intracameral lidocaine were given. Multiple preoperative, intraoperative, and postoperative variables were recorded. **RESULTS:** There were no differences in macular edema between the 2 treatments. A correlation was seen between macular edema and impaired visual acuity 1 week postoperatively. On the first postoperative day, a similar correlation was seen between corneal edema and the degree of visual improvement. **CONCLUSIONS:** Intracameral lidocaine and phenylephrine for mydriasis and anesthesia did not induce more significant macular edema than the standard regimen of topical mydriatics plus intracameral lidocaine. Macular edema limited visual improvement 1 week after phacoemulsification, while corneal edema appeared to have a larger effect immediately after surgery.

4. Borazan M, Karalezli A, Oto S, Algan C, Aydin AY. Comparison of a bupivacaine 0.5% and lidocaine 2% mixture with levobupivacaine 0.75% and ropivacaine 1% in peribulbar anaesthesia for cataract surgery with phacoemulsification. *Acta Ophthalmol Scand* 2007;85(8):844-7.

**PURPOSE:** To compare a bupivacaine and lidocaine mixture with levobupivacaine and ropivacaine in terms of safety, efficacy and blocking quality in peribulbar anaesthesia for phacoemulsification. **METHODS:** A total of 105 patients scheduled for cataract surgery with peribulbar anaesthesia were randomly allocated into three groups of 35 patients each, to receive 5 ml of, respectively, a 1 : 1 mixture of bupivacaine 0.5% and lidocaine 2% (group 1), levobupivacaine 0.75% (group 2), or ropivacaine 1% (group 3). Ocular movement scores were evaluated at 2, 4, 6, 8 and 10 mins after injection. Intraoperative and postoperative analgesia were evaluated by verbal pain scores. Duration of surgery, need for supplementary anaesthesia, haemodynamic parameters and the incidence of perioperative complications were recorded. **RESULTS:** The ocular movement score in min 2 was significantly lower in group 1. There was no significant difference between groups 2 and 3. Ocular movement scores at mins 4 and 6 were significantly decreased in group 1 and 2 compared with group 3. There was no significant difference among the groups in ocular movement scores at mins 8 and 10. Verbal pain scores in postoperative hour 4 were highest in group 3, but scores for the intraoperative period and postoperative hours 1 and 2 were similar among the groups. Duration of surgery and haemodynamic parameters did not differ among the groups. **Conclusions:** All agents were considered to be convenient for clinical use in cataract surgery with peribulbar anaesthesia. Although the ocular movement scores in the ropivacaine group were higher than in the other groups at mins 4 and 6, this did not imply any clinical significance.


**PURPOSE:** To evaluate the usefulness of intracameral lidocaine in cataract surgery under topical anesthesia and especially if the patient wanted intravenous sedation.
preoperatively. METHODS: In this prospective study 96 patients were randomly assigned to receive 0.5 cc of balanced salt solution (Group 1) or 1% unpreserved lidocaine (Group 2). Patients who wanted sedation received intravenous midazolam hydrochloride. All surgery was done by one surgeon using a clear corneal technique.

RESULTS: Mean pain scores were 0.73 (of a maximum 3) in Group 1 and 0.54 in Group 2; the difference between groups was not statistically significant. Forty patients in Group 1 (83%) and 44 patients in Group 2 (92%) reported no discomfort or only mild discomfort. The two study groups were comparable in need for intravenous midazolam. Logistic regression analysis showed a significant relationship between pain scores and intravenous sedation (p=0.02) but not with intracameral lidocaine or other tested variables. However, odds ratio for pain increased to 5.1 (95% CI; 1.29-20.41) in participants without intravenous sedation compared to those with sedation.

CONCLUSIONS: The results of the present study suggest that intravenous sedation preoperatively seems to be an important determinant to relieve the sensation of discomfort/pain during small incision cataract surgery, but intracameral lidocaine was shown not to have a clinically useful role.


PURPOSE: To evaluate the safety and efficacy of ropivacaine versus lidocaine for deep-topical, nerve-block anaesthesia in cataract surgery. METHODS: This prospective controlled randomized double-blind study comprised 64 patients undergoing clear corneal phacoemulsification. Patients were equally divided into two group receiving either deep-topical anaesthesia with 1% ropivacaine-soaked sponge (Group R, n = 32) or 2% lidocaine-soaked sponge (Group L, n = 32). The level of intraoperative and postoperative pain was assessed by patients using a verbal analogue scale from 1 to 10. The duration of surgery, the need for supplemental anaesthesia, surgeon satisfaction, and intraoperative and early postoperative complications were recorded. The patients' heart rate, arterial blood pressure and peripheric oxygen saturation (SpO(2)) were obtained just before the anaesthesia and during the surgery. RESULTS: The demographic data of the patients and duration of surgery were similar in both groups. No significant difference in the mean pain scores of patients were found in the ropivacaine and lidocaine groups. Surgical satisfaction was also statistically insignificant. None of the patients had significant difference in heart rate, blood pressure or SpO(2) during the surgical procedure. CONCLUSION: Deep-topical anaesthesia with ropivacaine and lidocaine in cataract surgery is safe and the two anaesthetic agents do not present differences in the degree of analgesia achieved. Deep-topical anaesthesia with ropivacaine or lidocaine was equally effective in providing anaesthesia with sufficient quality for cataract surgery.


PURPOSE: To evaluate the safety and efficacy of phacoemulsification under a topical anesthesia combined with intracameral lidocaine 0.5%. SETTING: Department of Ophthalmology, Chang Gung Memorial Hospital, Taoyuan, Taiwan, China. METHODS: A prospective randomized double-blind study was designed in which patients had phacoemulsification performed under topical anesthesia (4 drops of nonpreserved
lidocaine 2%) with 0.15 mL intracameral placebo (balanced salt solution) in 1 eye (Group 1) and topical anesthesia with intracameral nonpreserved lidocaine 0.5% in the other eye (Group 2). Endothelial changes, including cell density, coefficient variation of cell size, and percentage of hexagonal cells, were measured by noncontact specular microscopy. Preoperative and postoperative best corrected visual acuity was also documented. The degree of pain throughout surgery was ranked on a 10-point visual analog pain scale. RESULTS: Thirty-three patients were recruited. There was no significant difference in preoperative and postoperative mean endothelial parameters between the 2 groups. Furthermore, mean endothelial cell loss was similar. Mild or no pain (score 0 to 1) was reported by 48.5% in Group 1 and 90.9% in Group 2. Patients reported less pain with combined topical and intracameral lidocaine anesthesia (P = .001, Mann-Whitney test). Vision was significantly improved in both groups. However, 1 patient in Group A developed vitreous loss as a result of involuntary eye movement. CONCLUSION: Combining topical anesthesia with intracameral lidocaine 0.5% [corrected] anesthesia was safe and effective in phacoemulsification with intraocular lens implantation.


BACKGROUND: The aim of this study was to compare the efficacy of topical levobupivacaine drops 0.75% vs. lidocaine drops 4% in cataract surgery. METHODS: We examined 203 patients undergoing cataract surgery by phacoemulsification. They were randomized into two groups: one received four drops of lidocaine 4% and the other received four drops of levobupivacaine 0.75%. The onset and offset times of sensory block were evaluated. Application, intraoperative and postoperative subjective pain was quantified by the patients using a verbal pain score. Complications, rates of supplemental anaesthesia, and the satisfaction of surgeon and patients were also recorded. RESULTS: The mean sensory onset and offset times were significantly higher for the levobupivacaine group (P < 0.01). Pain score was lower in the levobupivacaine group than in the lidocaine one and the difference was statistically significant at all stages (P < 0.01). The mean satisfaction scores of patients and surgeon were also statistically higher for levobupivacaine (P < 0.01). No significant differences for complications and rates of supplemental anaesthesia were found. CONCLUSIONS: Topical levobupivacaine 0.75% shows the same efficacy and safety as lidocaine 4% in cataract surgery by phacoemulsification. There was an adequate block with a good level of satisfaction of surgeon and patients. Levobupivacaine 0.75% offers a new and acceptable choice for topical anaesthesia in cataract surgery.


PURPOSE: To assess the anesthetic efficacy of tetracaine hydrochloride 0.5% (TetraVisc) versus lidocaine 2% jelly in routine cataract extraction. SETTING: Private surgicenter, Warwick, Rhode Island, USA. METHODS: A prospective randomized double-blind clinical trial comprised 100 patients having routine cataract extraction by clear corneal phacoemulsification. Patients were randomized to receive TetraVisc or lidocaine 2% jelly, applied once, approximately 5 minutes before surgery. Outcomes included a self-reported postoperative pain score and the need for supplemental
anesthesia. RESULTS: The mean self-reported postoperative pain scores for TetraVisc and lidocaine 2% jelly were similar (0.94 and 1.02, respectively; \( P = .76 \)). A single patient in the lidocaine group required supplemental anesthesia. CONCLUSION: TetraVisc was as effective as lidocaine 2% jelly as a topical anesthetic agent for routine cataract extraction.


BACKGROUND AND OBJECTIVES: For eye surgery, motor block is still often requested by the surgeon. For cataract surgery, rapid block resolution allows eyelids to move and allows eye-patch removal. Therefore, short-duration block is useful in early rehabilitation for ambulatory surgery. Lidocaine is classically assumed to have shorter duration than mepivacaine. Therefore, lidocaine alone might be considered as an alternative to mepivacaine. METHODS: In this randomized, double-blind study, we compared mepivacaine 2% \((n = 22)\) and lidocaine 2% \((n = 25)\) in 47 patients who received episcleral (sub-Tenon's) block for cataract surgery. Akinesia score was measured 1, 5, 10, and 15 minutes and 1, 2, 4, and 6 hours after the end of injection. Primary outcome was block duration (time from injection to full recovery). Secondary outcomes were time to block onset and best akinesia score for each patient. Complications were recorded. RESULTS: The 2 groups were similar for demographic and anesthetic features. We observed no significant difference between mepivacaine and lidocaine in terms of onset, quality of akinesia, and block duration. One case of ocular hypertonia and 1 case of strabismus were observed in the lidocaine group, which could be imputed to hyaluronidase unavailability during the study period or to increased lidocaine myotoxicity. CONCLUSIONS: We found no argument to favor lidocaine over mepivacaine in episcleral (sub-Tenon's) eye block, especially in terms of motor-block duration.


BACKGROUND: Cataract surgery is commonly performed under local anaesthesia with midazolam sedation. Dexmedetomidine, a sedative-analgesic, is devoid of respiratory depressant effects, and its use in cataract surgery has not been reported. This double-blind study compared the use of dexmedetomidine and midazolam in patients undergoing cataract surgery. METHODS: Forty-four patients undergoing cataract surgery under peribulbar anaesthesia randomly received either i.v. dexmedetomidine 1 microg kg\(^{-1}\) over 10 min; followed by 0.1-0.7 microg kg\(^{-1}\) h\(^{-1}\) i.v. infusion (Group D), or midazolam 20 microg kg\(^{-1}\) i.v.; followed by 0.5 mg i.v. boluses as required (Group M). Sedation was titrated to a Ramsay sedation score of 3. Mean arterial pressure (MAP), heart rate (HR), readiness for recovery room discharge (time to Aldrete score of 10), and patients’ and surgeons’ satisfaction (on a scale of 1-7) were determined. RESULTS: MAP and HR were lower in Group D compared with Group M [86 (se 3) vs 102 (3) mm Hg and 65 (2) vs 72 (2) beats min\(^{-1}\), respectively] \((P<0.05)\). Group D patients had slightly higher satisfaction with sedation [median (IQR): 6 (6-7) vs 6 (5-7),
P<0.05], but delayed readiness for discharge [45 (36-54) vs 21 (10-32) min, P<0.01] compared with patients in Group M. Surgeons’ satisfaction was comparable in both groups [5 (4-6) vs 5 (4-6)]. CONCLUSION: Compared with midazolam, dexmedetomidine does not appear to be suitable for sedation in patients undergoing cataract surgery. While there was a slightly better subjective patient satisfaction, it was accompanied by relative cardiovascular depression and delayed recovery room discharge


BACKGROUND AND OBJECTIVE: The low cardiovascular and neurological toxicity of levobupivacaine has led to its application as a local anaesthetic in a wide variety of specialist applications including peribulbar block for cataract surgery. The aim of this study was to evaluate the efficacy of levobupivacaine 0.5% and to compare block quality vs. ropivacaine 0.75% in peribulbar anaesthesia. METHODS: We examined 208 patients subjected to cataract surgery by phacoemulsification who were randomized into two groups according to the anaesthetic used for peribulbar block, namely levobupivacaine 0.5% or ropivacaine 0.75%, both with the addition of hyaluronidase. Nerve block was carried out by injection of 6 mL of the anaesthetic mixture equally distributed between the inferotemporal and superonasal areas. The success of the block was evaluated by determining the time of motor and sensory onset, akinesia score, times of motor and sensory offset and satisfaction of the patient and surgeon after 24 h. Pre-block, post-block and postoperative intraocular pressure as well as the duration of surgical intervention was also determined. RESULTS: With respect to ropivacaine, levobupivacaine showed a significant reduction (P < 0.001) in the average motor and sensory onset. Both the akinesia score (P < 0.01) and mean motor and sensory offset times were also higher (P < 0.001). Neither the average intervention times nor the satisfaction of the patient/surgeon showed any significant differences between the two groups. CONCLUSIONS: Levobupivacaine (0.5%) has better anaesthetic properties with respect to 0.75% ropivacaine and is well-suited for peribulbar block in cataract surgery


PURPOSE: The objective of our study was to assess the efficacy and safety of dexmedetomidine given in a small dose for a 1-h infusion as an adjuvant to local analgesia in ophthalmic operations. The study was double-blind prospective, randomized, and placebo controlled. We studied the effects of a small dose of dexmedetomidine (0.5 micro.kg(-1).h(-1) for 10 min followed by 0.2 micro.kg(-1).h(-1) for 50 min. Patients were divided randomly into two groups with 20 patients in each: group A was the study group and group B was the placebo group. Heart rate, systolic blood pressure, and diastolic blood pressure were significantly lower in the dexmedetomidine group than the placebo group. Bispectral index values were significantly lower in the dexmedetomidine group than the placebo group. Also, intraocular pressure significantly decreased in the dexmedetomidine group compared to the placebo group. The study revealed that dexmedetomidine in the studied dose has a sedative effect, provides safe control of heart rate and blood pressure, and also decreases intraocular pressure during ophthalmic surgery under local anesthesia


**BACKGROUND:** Sub-Tenon’s block for cataract surgery is an increasingly common technique. While this technique has been successfully applied, the optimal local anaesthetic solution is not known. This study was performed to assess any differences in anaesthesia and oculomotor block between 1% ropivacaine and a 2% lignocaine with 0.5% bupivacaine mixture. The results indicate that there was no difference noted in the clinical effect between the solutions.


**BACKGROUND AND OBJECTIVE:** To compare the onset of action, and quality of block, of lidocaine 2% with levobupivacaine 0.75% for sub-Tenon's block in patients undergoing cataract surgery. **METHODS:** We performed a two-centre trial in 91 patients who were randomized to receive 4 mL of lidocaine 2% (n = 44) or levobupivacaine 0.75% (n = 47) for sub-Tenon's block, both with hyaluronidase 15 IU/mL(-1). Onset of akinesia was assessed every 2 min for 10 min. Numbers of patients requiring supplementary injections to achieve clinically satisfactory akinesia or rescue analgesia were recorded. Data were analyzed with Fisher's exact test, U-test and t-test where appropriate. Results were considered significant when P < 0.05. **RESULTS:** The speed of onset was statistically significantly faster for lidocaine compared to levobupivacaine (3.02 vs. 5.06 min, P < 0.001). There was no statistical difference in number of patients requiring a supplementary injection (levobupivacaine 3 vs. lidocaine 0, P = 0.24), rescue analgesia with topical tetracaine (levobupivacaine 0 vs. lidocaine 2, P = 0.5), or ocular akinesia scores at the completion of surgery (lidocaine 1.4 vs. levobupivacaine 1.6, P = 0.12). Pain scores measured by a verbal analogue scale were not significantly different for injection, perioperatively or postoperatively. **CONCLUSIONS:** Both agents produce a rapid onset of anaesthesia when used for sub-Tenon's block. The difference between the two agents, although statistically significant, is not clinically important.


**PURPOSE:** To assess the effect of hyaluronidase on eye and eyelid movements when used as an adjunct in sub-Tenon's anaesthesia. **METHODS:** A total of 60 patients who had sub-Tenon's anaesthesia prior to phacoemulsification surgery were divided into two equal groups in a double-masked randomised controlled fashion. Of these, Group A had 4 ml lignocaine 2%, while Group B had 4 ml lignocaine 2% with the addition of sodium hyaluronidase 75 IU/mL. Ocular motility, levator, and orbicularis oculi function were measured in all patients at 5 and 8 min. Levator function was scored from 0 (no function) to 3 (complete function) while orbicularis function was scored from 0 to 2. The score for ocular motility was the sum in four positions of gaze, each position scoring from 0 to 2.
Results were compared using a nonparametric test. RESULTS: Group B achieved significantly better ocular and lid akinesia than Group A both at 5 and 8 min with P<0.01. The median scores for levator function at 5 and 8 min were 2 for Group A and 0 for Group B. For orbicularis function, the median scores at both time intervals were 2 for Group A and 1 for Group B. For ocular motility, the median score for Group A at 5 min was 3 and at 8 min was 2.5; for Group B at 5 min was 0.5 and at 8 min was 0.

CONCLUSIONS: The addition of hyaluronidase in sub-Tenon's anaesthesia has a significant effect in improving ocular and lid (levator and orbicularis) akinesia.


BACKGROUND AND OBJECTIVES: Patients undergoing eye surgery under regional anaesthesia often require concomitant medication for analgesia and comfort. Remifentanil, with its ultra-short acting-profile, may be useful to reduce pain during retrobulbar nerve block for cataract surgery. METHODS: We performed a prospective, randomized, double-blind study to compare the efficacy of remifentanil for analgesia during retrobulbar nerve block placement. Ninety patients undergoing cataract surgery were randomly divided to receive either remifentanil 0.3 microg kg(-1) (n = 45) or an equivalent volume of saline (n = 45). The injection was administered within 30 s in both groups. Patients rated their amount of pain on a 10 cm visual analogue scale. Respiratory frequency, oxygen saturation, cardiac rhythm and postoperative nausea and vomiting (PONV) were recorded. RESULTS: The mean visual analogue score in the Remifentanil group was 2.56; it was 5.51 in the Saline group (P = 0.001, U-test). Three patients developed bradycardia and three had PONV in the Remifentanil group. Two patients developed tachycardia and one had PONV in the Saline group. No patient developed respiratory depression. CONCLUSION: In patients undergoing retrobulbar block placement for eye surgery, 0.3 microg kg(-1) remifentanil over 30 s significantly reduced their reported pain. In addition, remifentanil did not increase the risk of untoward side-effects.


PURPOSE: To compare the effectiveness of oral acetazolamide, topical brinzolamide 1%, and no ocular hypotensive medication after phacoemulsification. SETTING: Adnan Menderes University Department of Ophthalmology, Aydin, Turkey. METHODS: This prospective randomized double-blind study comprised 60 eyes of 52 patients having phacoemulsification under topical anesthesia. There were no intraoperative complications. Eyes were randomized to receive oral acetazolamide 500 mg 1 hour preoperatively followed by 250 mg acetazolamide every 6 hours, 1 drop of brinzolamide 1% every 12 hours starting immediately after speculum removal, or no ocular hypotensive medication. Intraocular pressure (IOP) was measured using a Perkins tonometer preoperatively and 4 to 6 hours and 18 to 24 hours postoperatively. RESULTS: The preoperative IOP was not significantly different between the 3 groups. Four to 6 hours postoperatively, the acetazolamide group (P=.002) and brinzolamide group (P=.001) had significantly lower IOP than the control group. The same trend was observed at 18 to 24 hours in the brinzolamide group (P=.001) but not the acetazolamide group (P=.018). The IOP levels were not significantly different between the acetazolamide group and brinzolamide group at any postoperative time point. No
eye receiving medication and 2 eyes (10%) in the control group had an IOP of 30 mm Hg or higher 4 to 6 hours postoperatively. Compared with preoperatively, an IOP increase of more than 5 mm Hg was seen at 4 to 6 hours in 3 eyes (15%), 2 eyes (10%), and 14 eyes (70%) in the acetazolamide, brinzolamide, and control group, respectively.

CONCLUSION: Brinzolamide was as effective as acetazolamide in preventing IOP elevation 4 to 6 hours after phacoemulsification and more effective than acetazolamide at 18 to 24 hours.


BACKGROUND: Cataract surgery requires prolonged anaesthesia, concomitant with permanent hydration and lubrication of the cornea, in order to provide a clear view of the operation area. AIMS: The primary objective of the study was to assess several formulae of a soluble ophthalmic insert: TOPICSERT [bupivacaine (Bupi) + hyaluronic acid (HA) or sodium hyaluronate] in terms of complete and long-lasting anaesthesia of the cornea. The hydration properties of HA were not assessed in this study. METHODS: In a prospective double-blind, cross-over, randomized study, with latin-square allocation of treatments, 16 healthy volunteers received a single dose of each formula (A, 1 mg Bupi and 0.1 mg HA; B, 0.5 mg Bupi and 0.1 mg HA; C, 1 mg Bupi and 0 mg HA, and D acting as a placebo) via the ocular route with 1 week of wash-out between each period. Corneal anaesthesia was measured using a Cochet-Bonnet esthesiometer. RESULTS: There was a statistically significant difference between treatments with regard to the main criterion (complete anaesthesia lasting at least 20 min) when general association statistics were used (Mantel-Haenzel test, P < 0.0001): 68.75% (n = 11) of subjects receiving treatment A, 37.5% (n = 6) receiving treatment B, and 87.5% (n = 14) on treatment C reached complete and satisfactory anaesthesia, while this was not achieved in any of the subjects receiving placebo. Ninety-five percent confidence intervals of the difference between treatments were as follows: treatment A vs. B (-0.03, 0.66), treatment A vs. C (-0.47, 0.10), treatment B vs. C (-0.84, -0.16). Only the difference between B and C was statistically significant (adjusted probability by the method of Bonferroni, P < 0.001). When complete anaesthesia was reached, mean (+/-SD) duration of anaesthesia was as follows: 20.7 (+/-6.5), 15.3 (+/-11.4) and 24.7 (+/-7.6) min for treatments A, B, C, respectively. CONCLUSIONS: Bupivacaine 1 mg seems to be the efficient and safe dose. The value of hyaluronic acid as a corneal hydration agent and used in association with bupivacaine will be the subject of further studies.


BACKGROUND: The aim of this study was to compare the effects of ropivacaine with those of lidocaine on the intraocular pressure (IOP) and the quality of the blockade in peribulbar anesthesia for cataract surgery. Fifty patients were allocated randomly into two groups and received 7-10 ml of 0.75% ropivacaine or 2% lidocaine with adrenaline, though the peribulbar two-point injection. The quality of the blockade was assessed by ocular and eyelid akinesia, pain during the peribulbar injection, and surgical satisfaction. The duration of the motor block was also evaluated after surgery. The IOP was measured using a Tonopen before the blockade (control) and at 1, 5, and 10 min after
injection of the anesthetic. Lidocaine induced significantly lower akinesia scores at 6, 8,
and 10 min post-injection than did ropivacaine. The mean IOP (mmHg) was significantly
lower with respect to the baseline level at 10 min after blockade in the ropivacaine group
compared with the lidocaine group. Ropivacaine also caused less pain on injection.
There was no difference in surgical satisfaction between the groups. The duration of the
motor block obtained with ropivacaine was longer than that obtained with lidocaine. Our
data indicate that ropivacaine has efficacy similar to lidocaine, with slightly longer onset
and duration of the motor blockade. In addition, ropivacaine (0.75%) induces lower IOP
and less pain on injection than does lidocaine (2%) when used in peribulbar anesthesia
for cataract surgery

23. Soliman MM, Macky TA, Samir MK. Comparative clinical trial of topical anesthetic
agents in cataract surgery: lidocaine 2% gel, bupivacaine 0.5% drops, and benoxinate

PURPOSE: To assess the efficacy of lidocaine gel, bupivacaine drops, and benoxinate
drops as topical anesthetic agents in cataract surgery. SETTING: Kasr El-Aini Hospital,
Cairo University, Cairo, Egypt. METHODS: This prospective randomized study
comprised 90 patients scheduled for routine cataract extraction. Patients were
randomized into 3 groups of 30 each based on which anesthetic agent they received:
lidocaine 2% gel, bupivacaine 0.5% drops, or benoxinate 0.4% drops. Subjective pain at
application of the agent and intraoperatively was quantified by the patients using a
verbal pain score (VPS) scale from 0 to 10. The duration of discomfort at application,
duration of surgery, rate of supplemental sub-Tenon's anesthesia, and complications
were recorded. RESULTS: The mean VPS at application was 2.97, 1.53, and 1.03 in the
lidocaine, bupivacaine, and benoxinate groups, respectively; the VPS in the lidocaine
group was statistically significantly higher than in the other 2 groups (P<.001). The mean
duration of pain at application was 25 seconds, 14 seconds, and 6 seconds in the
lidocaine, bupivacaine, and benoxinate groups, respectively, and was statistically
significantly higher in the lidocaine group (P<.001). The mean VPS during surgery was
1.6, 4.1, and 7.1 in the lidocaine, bupivacaine, and benoxinate groups; the lidocaine
group had a statistically significantly lower mean VPS than the other 2 groups (P<.001).
The incidence of supplemental sub-Tenon's injection was 3.3%, 10.0%, and 73.3%,
respectively, and was statistically significantly lower in the lidocaine and bupivacaine
groups than in the benoxinate group (P<.001). The patients' overall satisfaction was
statistically significantly higher in the lidocaine and bupivacaine groups than in the
benoxinate group (93.3%, 83.3%, and 33.3%, respectively) (P<.001). Three patients in
the lidocaine group had corneal haze at the time of surgery, which was not statistically
significant (P>.1). CONCLUSIONS: Lidocaine gel was a better topical anesthetic agent
than bupivacaine and benoxinate drops

24. Shah AR, Diwan RP, Vasavada AR, Keng MQ. Corneal endothelial safety of

PURPOSE: To evaluate the effect of intracameral preservative-free 1% xylocaine on the
corneal endothelium as an adjuvant to topical anaesthesia during phacoemulsification
and Acrysof foldable IOL implantation. MATERIAL & METHODS: This is a prospective,
controlled, randomised, double-masked study. 106 patients with soft to moderately
dense (Grade 1-3) senile cataract and corneal endothelial cell density of >1500/mm2
were randomised to the xylocaine group (n=53) and control group(n=53). Central
endothelial specular microscopy and ultrasound corneal pachymetry were performed
preoperatively. On the first postoperative day the eyes were evaluated for corneal oedema and Descemet's folds. Ultrasound corneal pachymetry was performed at 1, 3 and 12 months. Specular microscopy was performed at 3 and 12 months. Cell loss was expressed as a percentage of preoperative cell density. Six patients could not complete one year follow-up. Chi-square and paired t test (2 tail) statistical tests were applied for analysis. RESULTS: Four (7.54%) patients in the xylocaine group and 5 (9.43%) in the control group had a few Descemet's folds associated with mild central stromal oedema. Corneal thickness increased from 549.3 micro +/- 37.2 micro to 555.5 micro +/- 36.5 micro in the xylocaine group and from 553.1 micro +/- 36.2 micro to 559.3 micro +/- 40.5 micro in the control group at the one-month postoperative visit. Thickness returned to the preoperative level in xylocaine group 549.6 micro +/- 34.5 micro and control group 554.7 micro +/- 41.1 micro at three months. (P=0.484) The percentage of cell loss was 4.47 +/- 2.53% in the xylocaine group and 4.49 +/- 3.09% in the control group at one year. (P=0.97) CONCLUSION: Intracameral preservative-free 1% xylocaine does not appear to affect corneal endothelium adversely during phacoemulsification.


STUDY OBJECTIVE: To evaluate the efficacy of three different concentrations of ropivacaine (0.5%, 0.75%, and 1%) together with a single concentration of hyaluronidase administered for peribulbar block. DESIGN: Prospective, randomized, double-blind study. SETTING: Anesthesia department of a university teaching hospital. PATIENTS: 68 ASA physical status I, II, and III patients undergoing elective cataract surgery. INTERVENTIONS: Patients were randomly allocated to receive peribulbar block with 6.5 mL of either 0.5% (Group Ropi-5; n = 22), 0.75% (Group Ropi-7.5; n = 22), or 1% ropivacaine (Group Ropi-10; n = 24). In all patients, 0.5 mL of hyaluronidase was added to the local anesthetic solution. MEASUREMENTS AND MAIN RESULTS: A larger proportion of patients in Groups Ropi-7.5 (82%) and Ropi-10 (83%) showed complete motor block 15 minutes after injection compared with Group Ropi-5 (55%;p = 0.05, and p = 0.03, respectively). Hypotension (reduction of systolic blood pressure by 30% or more from baseline) was observed in two Group Ropi-5 patients (9%), and two Group Ropi-7.5 patients (9%;p = 0.31), whereas bradycardia (reduction in heart rate < or = 50 bpm) was observed in one Group Ropi-5 patient (4%), and three Group Ropi-10 patients (12%;p = 0.18). Seven hours after surgery, a smaller proportion of Group Ropi-10 patients (64%) showed complete recovery of sensory function as compared with both Group Ropi-5 (94%) and Group Ropi-7.5 (90%;p = 0.03 and p = 0.03, respectively). Complete recovery of motor function 1 hour after surgery was more frequent in Group Ropi-5 (37%) than in Group Ropi-7.5 (5%) or Group Ropi-10 (9%;p = 0.05 and p = 0.05, respectively); however, no other differences in recovery of motor function were observed at any other observation times, with complete recovery in all patients 7 hours after surgery. CONCLUSIONS: While confirming that ropivacaine is a good option for peribulbar anesthesia, this study demonstrated that the use of 0.75% or 1% concentrations are preferred in that they produce quick and deep sensory and motor block of the operated eye. If recovery of normal motor function is important after surgery, the 0.75% concentration probably represents the best compromise.

PURPOSE: To compare the effect of xylocaine jelly and intracameral lidocaine with one quadrant instant sub-Tenon infiltration for self-sealing sclerocorneal phacoemulsification.

METHODS: One hundred patients were enrolled into a prospective randomized study, receiving either a combination of topical 2% xylocaine jelly and 0.5 ml of intracameral 1% lidocaine or sub-Tenon infiltration with 2 ml of 2% xylocaine on the operating table. All patients underwent a standard divide and conquer phacoemulsification procedure through a superior sclerocorneal frown incision followed by implantation of a polymethylmethacrylate intraocular lens. Intraoperative pain was indicated by the patient by squeezing the bedside nurse's hand, who allocated it to particular stages of surgery on a chart. After surgery, patients assessed the pain experienced using a 10-unit visual analogue scale. RESULTS: Pain was indicated on 31 occasions during the operation in the sub-Tenon group (mainly the injection itself) and 67 times in the topical group. The median overall subjective pain score was 3 in the jelly group and 0 in the sub-Tenon. Five eyes (10%) had to be converted to sub-Tenon during the surgery because of intolerable pain. CONCLUSIONS: Whereas lidocaine supported xylocaine jelly anesthesia provided acceptable analgesia for 90% of patients operated, sub-Tenon anesthesia proved to deliver better intraoperative comfort in all patients receiving sclerocorneal incision cataract surgery.


STUDY OBJECTIVES: To evaluate the effects of fentanyl on the cardiorespiratory system in elderly patients undergoing cataract surgery with phacoemulsification method.

DESIGN: Randomized, prospective, double-blind study. SETTING: University hospital. PATIENTS: 70 ASA physical status I, II, and III patients (>60 years) who underwent cataract surgery with topical anesthesia. INTERVENTIONS: Patients were randomly divided into two groups. The fentanyl group (35 patients) received fentanyl in 0.7 microg/kg bolus doses in a 2-mL balanced salt solution prior to surgery. The control group (35 patients) received a 2-mL balanced salt solution without any analgesic drug.

MEASUREMENTS AND MAIN RESULTS: Systolic (SBP), diastolic (DBP), mean arterial pressure (MAP), heart rate (HR), peripheral oxygen saturation (SpO(2)), respiratory rate (RR), end-tidal carbon dioxide (ETCO(2)), inspired CO(2) concentration, and sedation scores were measured preoperatively and at 5, 10, 15, 20, and 30 minutes intraoperatively. Postoperatively, patients were questioned about the presence of intraoperative pain. In the fentanyl group, no significant differences were observed in SBP, DBP, MAP, RR, or peripheral SpO(2). In the control group, RR was higher than baseline values at 10, 15, and 20 minutes. Diastolic blood pressure was higher than baseline values at 20 minutes. End-tidal CO(2) and inspired CO(2) levels were higher than baseline levels in both groups at all measurement times. Intraoperative ETCO(2) levels were higher in the fentanyl group than the control group (p < 0.01). Finally, no hypoxemia was observed in either group. CONCLUSION: Fentanyl can be used safely in 0.7-microg/kg dosages in elderly patients to improve patient comfort without any cardiorespiratory side effects, when undergoing cataract surgery with topical anesthesia.


PURPOSE: To study the effect of sedation on patients' anxiety level and perception of pain during cataract surgery under topical anesthesia. SETTING: Royal Eye Infirmary,
Plymouth, England. METHODS: This prospective controlled double-blind clinical trial comprised 100 consecutive patients having routine phacoemulsification with posterior chamber intraocular lens implantation under topical anesthesia by a single experienced surgeon. Patients were randomized to receive intravenous midazolam (0.015 mg/kg body weight) 15 minutes before surgery or no sedation. The main evaluation criteria were the anxiety based on the 6-item, short form of the State-Trait Anxiety Inventory, the pain score using a visual analog scale, and overall patient satisfaction. RESULTS: All operations were uneventful, and no side effects were noted from the use of midazolam. Anxiety scores were significantly higher on arrival at the hospital than just before the commencement and after the conclusion of the surgery in both groups (P<.05). Patients were less anxious after administration of midazolam, but this did not achieve statistical significance. The mean pain score was 0.29 (range 0 to 4) in the sedation group and 0.38 (range 0 to 4) in the control group; the difference between groups was not statistically significant. The patients were equally satisfied in both groups, with mean scores of 3.84 (range 0 to 4) and 3.88 (range 2 to 4), respectively. CONCLUSIONS: Patients who had cataract surgery under topical anesthesia were highly satisfied with their operative experience and reported minimal pain during surgery. Anxiety levels diminished after arrival at the hospital, possibly because of reassurance by experienced staff. Intravenous midazolam did not seem to significantly reduce pain or anxiety.


BACKGROUND: We compared the efficacy and safety of articaine 2% with a mixture of lidocaine 2% and bupivacaine 0.5% without hyaluronidase for peribulbar anaesthesia in cataract surgery. METHOD: In this double-blind randomized clinical study, 58 cataract patients were allocated to receive either articaine 2% with epinephrine 1:200 000 or a mixture of equal parts of lidocaine 2% with epinephrine 1.25:100 000 and bupivacaine 0.5%. Ocular and eyelid movement scores, the number of supplementary injections, total volume of solution used and pain and complications during injection and surgery were used as clinical end-points. RESULTS: Articaine produced greater akinesia after 5 min (P=0.03). Eighteen patients (60%) in the articaine group and 26 (93%) in the lidocaine/bupivacaine group required a second injection (P=0.003). A third injection was needed by two patients (7%) in the articaine group and 12 (43%) in the lidocaine/bupivacaine group (P=0.001). The total mean volume of local anaesthetic required to achieve akinesia was mean 9.4 (SD 1.7) ml in the articaine group and 11.28 (1.86) ml in the lidocaine/bupivacaine group (P<0.001). Median pain score was lower in the articaine group than in lidocaine/bupivacaine group during injection (P=0.004) and surgery (P=0.014). There was no difference between the groups for the incidence of complications. CONCLUSION: Articaine 2% without hyaluronidase is more advantageous than a mixture of lidocaine 2% and bupivacaine 0.5% without hyaluronidase for peribulbar anaesthesia in cataract surgery.


PURPOSE: To evaluate and compare the efficacy of oral clorazepate dipotassium (Tranxilium) and intravenous midazolam (Dormicum) as premedication agents in retrobulbar anesthesia and clear corneal phacoemulsification with intraocular lens (IOL)
implantation. SETTING: Department of Ophthalmology, University of Essen, Essen, Germany. METHODS: In a prospective clinical trial, 97 consecutive patients (97 eyes) having phacoemulsification with implantation of a foldable IOL were randomized to 2 groups. The first group received 10 mg oral clorazepate dipotassium and the second group, 1 mg intravenous midazolam. The surgeon's subjective experience of patients' cooperation during retrobulbar anesthesia and after surgery was measured on a 5-point Likert scale. The duration of surgery and rate of complications were documented. One day after surgery, the patients' subjective comfort during cataract surgery was evaluated using a 5-point Likert scale and the best corrected visual acuity was determined. 

RESULTS: The level of anterograde amnesia tended to be higher in the midazolam group than in the clorazepate dipotassium group (4% versus 0% for anesthesia administration; 14% versus 4% for surgery), but the difference between groups was not significant. There were no significant differences in patient cooperation or complications during surgery. Patient satisfaction scores were not significantly different between the groups (P<.14); however, patients in the midazolam group expected to have significantly less pain during surgery (P<.04). The rate of potential visual acuity recovery was similar between groups. CONCLUSIONS: Anterograde amnesia occurred more frequently and patients expected less pain before surgery with midazolam. Both anesthetic agents provided safe and effective premedication for retrobulbar anesthesia in clear corneal cataract surgery.


PURPOSE: To measure the intraocular levels of bupivacaine 0.75% topically applied before phacoemulsification and to develop standards for topical anesthesia in cataract surgery. SETTING: Department of Ophthalmology, University Hospitals of Leicester, Leicester, United Kingdom. METHODS: Forty eyes having phacoemulsification for senile cataract under topical anesthesia without sedation were randomly assigned to 1 of 2 preoperative topical anesthesia regimens. Bupivacaine 0.75% was applied in 0.1 mL drops 3 times in the 30 minutes before surgery in 18 eyes and 6 times in the 60 minutes before surgery in 22 eyes. Aqueous humor and serum samples were taken at the start of surgery and the bupivacaine levels measured. A visual analog pain score scale was used to indicate intraoperative pain. RESULTS: The mean aqueous humor level of bupivacaine was 5.9 microg/mL +/- 4.3 (SD) after 3 drops and 5.7 +/- 4.0 microg/mL after 6 drops. The blood levels were less than 1.0 microg/mL. There was no statistically significant difference in the aqueous level of bupivacaine between the 2 groups. There was no significant difference in the age or sex distribution between the 2 groups, although there was an increase in the intraocular level of bupivacaine with age (approximately 1.4 microg/mL per decade; P =.048). There was no clear pattern associating the pain score with age, sex, or intraocular level of bupivacaine. CONCLUSIONS: A 3-drop regimen of bupivacaine 0.75% in the half hour before cataract surgery penetrated the eye as effectively as 6 drops in the 1 hour before surgery and provided good analgesia for phacoemulsification. Bupivacaine 0.75% penetrated the eye increasingly effectively with increasing age.

PURPOSE: To determine the effects of systemic fentanyl analgesia in preventing the pain related to the administration of retrobulbar anesthesia and cataract surgery.

SETTING: Departments of Ophthalmology and Anesthesiology, School of Medicine, Kocatepe University, Afyon, Turkey. METHODS: One hundred twenty patients with American Society of Anesthesiologists physical status I to III scheduled for cataract surgery were evaluated in a single-blind randomized study. Patients with a history of hypertension, hyperthyroidism, or neurologic or psychiatric disorders were excluded. In the study (fentanyl) group, an intravenous bolus of fentanyl 2 microg/kg was slowly given 5 minutes before retrobulbar anesthesia was administered. In the control group, fentanyl was not given. There were 60 patients in each group. Demographic data were not statistically different between the 2 groups. The intensity of pain during injection and intraoperatively was measured by verbal pain scores. Hemodynamic stability was assessed by the heart rate (HR) and mean arterial pressure (MAP). End-tidal carbon dioxide concentrations and oxygen saturations were also recorded. RESULTS: The changes in HR and MAP at 0, 10, 20, and 30 minutes were statistically significant between the fentanyl and control groups (P<.05). Fentanyl reduced pain scores significantly at all evaluations (P<.05). CONCLUSION: The results suggest that fentanyl preemptively decreases injection and intraoperative hyperalgesia and provides hemodynamic stability without affecting patient cooperation, resulting in cataract surgery with retrobulbar anesthesia that is comfortable for both surgeon and patient.


BACKGROUND: Retrobulbar injection can be associated with significant pain, due to both needle insertion and deposition of the local anaesthetic solution. The local anaesthetic cream EMLA (eutectic mixture of local anaesthetics) which contains a mixture of lignocaine and prilocaine has been shown to reduce the pain associated with skin puncture. The efficacy of EMLA in alleviating the pain of retrobulbar injection for cataract surgery was assessed in this study. METHODS: In this, randomised double-blind study, EMLA (n = 53) or lignocaine 5% ointment (n = 50) was administered to the inferior orbital margin at least 45 min before retrobulbar block in 103 patients. Pain assessed during retrobulbar block was marked subjectively by the patient on a 10-point numerical rating scale. RESULTS: Median verbal pain scores were 3.0 with an interquartile range of 1.5-6.5 in the control group and 3.50 with an interquartile range of 2.0-6.0 in the EMLA(R) group (P = 0.67). There was no significant difference between the EMLA group and the lignocaine ointment group according to this pain assessment. CONCLUSION: EMLA does not permit pain-free retrobulbar injection.

34. Lai F, Sutton B, Nicholson G. Comparison of L-bupivacaine 0.75% and lidocaine 2% with bupivacaine 0.75% and lidocaine 2% for peribulbar anaesthesia. Br J Anaesth 2003;90(4):512-4.

BACKGROUND: L-Bupivacaine has a safer side-effect profile than bupivacaine. We compared the efficacy of a mixture of L-bupivacaine 0.75% and lidocaine 2% with bupivacaine 0.75% and lidocaine 2% for peribulbar anaesthesia in cataract surgery. METHODS: Ninety patients were allocated randomly to receive 8 ml of a mixture of equal parts of bupivacaine 0.75% and lidocaine 2% or an equal volume of L-bupivacaine and lidocaine 2%. Hyaluronidase 15 IU ml(-1) was added to both solutions. RESULTS: There were significant differences between the groups in clinical end-points. The median time at which the block was adequate to start surgery was 4 min (interquartile range 4-8
min) in the bupivacaine group and 8 min (5-12 min) in the L-bupivacaine group (P=0.002). Median ocular and eyelid movement scores were similarly significantly decreased in the bupivacaine group compared with the L-bupivacaine group at all times (P<=0.03). There was no difference between groups in the incidence of minor complications. CONCLUSIONS: A mixture of bupivacaine 0.75% and lidocaine 2% provides faster onset time than a mixture of L-bupivacaine 0.75% and lidocaine 2%


PURPOSE: To compare the mydriatic effect and safety between different concentrations of tropicamide and phenylephrine in preoperative mydriasis for phacoemulsification. METHODS: Two hundred and seventeen consecutive eyes in the same number of Chinese patients undergoing phaco-emulsification under local or topical anaesthesia in a university-based eye hospital were analyzed. Patients were randomized into two groups by cluster randomization, each group receiving a different preoperative mydriatic regimen. Regimen A consisted of tropicamide 1.0% with phenylephrine 2.5%, and Regimen B consisted of tropicamide 0.5% with phenylephrine 0.5%. The main outcome measures were horizontal pupillary diameter, systolic, diastolic and pulse pressure and pulse rate. RESULTS: The group who received Regimen A attained a mean horizontal pupillary diameter of 7.00 +/- 1.06 mm. Their pupils were significantly larger than those receiving Regimen B (6.61 +/- 1.03 mm, P = 0.007). No untoward cardiovascular effects were noted in either groups. CONCLUSION: Regimen A attained better preoperative mydriasis for phacoemulsification than Regimen B. Both regimens were safe with regard to their cardiovascular effects. The combination of tropicamide 1.0% and phenylephrine 2.5% is recommended as preoperative mydriatic for phacoemulsification in Chinese patients who have darkly pigmented irides


OBJECTIVE: To compare intracameral levels and clinical efficacy of lidocaine 2% gel with lidocaine 4% unpreserved drops. DESIGN: Double-blind, randomized, one-surgeon, controlled trial. PARTICIPANTS: One hundred seven consecutive cataract cases eligible for topical anesthesia. INTERVENTION: Patients were randomly assigned to receive 20 mg of lidocaine either as lidocaine 2% gel (1 ml) or as lidocaine 4% unpreserved eyedrops (0.5 ml) before clear corneal phacoemulsification. MAIN OUTCOME MEASURES: Aqueous samples were taken to measure lidocaine intraocular levels. Intraoperative pain was quantified a few minutes after surgery using a 0 to 10 visual analog scale. SECONDARY OUTCOME MEASURES: Patients were asked to grade the degree to which they were bothered by tissue manipulation. The surgeon graded patients' cooperation. The anesthesiologist recorded any increase in pulse or blood pressure and the need for supplemental topical anesthesia or intravenous sedation. Duration of surgery and intraoperative complications were also recorded. RESULTS: In the gel group intracameral lidocaine levels were significantly higher (P < 0.001) and patient-reported intraoperative pain scores were significantly lower (P = 0.026). Patients in the gel group were bothered by tissue manipulation to a lesser extent (P = 0.028), and their cooperation was better (P = 0.002). Increases in blood pressure were more frequent in the eyedrops group. Supplemental anesthesia was required in two cases
(3.70%) in the gel group versus eight cases in the eyedrops group (15.09%). No correlation between intracameral lidocaine levels and intraoperative pain scores was found (r = -0.026, P = 0.789). CONCLUSIONS: If administered by means of gel, the same amount of lidocaine gives significantly higher intracameral levels of lidocaine, better analgesia, better patient cooperation, and less need for intraoperative supplemental anesthesia. Lower pain scores do not correlate with intracameral lidocaine levels

**Group B: Surgical and Local Anesthesia Techniques**


PURPOSE: To evaluate the natural course of intraocular pressure (IOP) after cataract surgery with combined primary posterior continuous curvilinear capsulorhexis (PPCCC) and posterior optic buttonholing (POBH) of the intraocular lens (IOL) in adult patients. SETTING: Department of Ophthalmology, Medical University of Vienna, Vienna, Austria. METHODS: Fifty consecutive patients with age-related cataract awaiting cataract surgery under topical anesthesia in both eyes were enrolled prospectively. In randomized order, cataract surgery with combined PPCCC and POBH was performed in 1 eye. In the fellow eye, cataract surgery was performed conventionally with in-the-bag IOL implantation and the posterior lens capsule kept intact. Standardized IOP measurements by Goldmann applanation tonometry were performed 1, 2, 4, 6, 8, and 24 hours postoperatively. Follow-up IOP measurements were taken at 1 week and 1 month. Twenty-five patients received 1-time IOP-lowering medication immediately after cataract surgery; the other 25 did not receive IOP-lowering drops. RESULTS: During the first 24 hours postoperatively, no significant differences in IOP were observed between the PPCCC-POBH group and the conventional surgery group (P>.05). No IOP peaks greater than 27 mm Hg were observed in any eye. One week and 1 month postoperatively, no significant differences in IOP were found between groups (P>.05). The use of IOP-lowering drops significantly reduced postoperative IOP. However, no IOP spikes >27 mm Hg were found with and without the use of IOP-lowering drops. CONCLUSION: The course of IOP after cataract surgery with combined PPCCC and POBH showed the technique to be as safe as conventional cataract surgery with in-the-bag IOL implantation.


BACKGROUND: Sub-Tenon's local anaesthesia (STLA) is growing in popularity for ophthalmic surgery, and is widely regarded as safer than the alternative sharp needle techniques. Although safe, STLA is not devoid of risk. Therefore, the effectiveness of a plastic i.v. cannula was compared with the traditional metal Stevens' cannula for delivering STLA. METHODS: In a randomized, controlled trial, the efficacy of STLA administered by either a Stevens' sub-Tenon's metal cannula or a standard 20 G Optiva i.v. plastic cannula was compared; 120 patients, undergoing cataract surgery, were randomly allocated to one of the two groups. After STLA, the primary outcome measure, kinesia of the globe, was recorded at 5 and 10 min. RESULTS: There was no significant difference in the mean total ocular movement scores after STLA performed by either the 20 G i.v. cannula or standard 19 G sub-Tenon's cannula (P = 0.10). There was also no
significant difference in any of the secondary outcome measures. CONCLUSIONS: A 20 G Optiva i.v. cannula and the Stevens' sub-Tenon's cannula were equally effective at providing STLA


AIM: Combining primary posterior capsulorhexis (PPC) and posterior optic buttonholing (POBH) in cataract surgery is an innovative approach to prevent after-cataract formation effectively and to increase postoperative stability of the intraocular lens (IOL). The present study was designed to compare the postoperative intraocular flare after cataract surgery with combined PPC and POBH to conventional in-the-bag implantation of the IOL. METHODS: Fifty consecutive age-related cataract patients with cataract surgery under topical anaesthesia in both eyes were enrolled prospectively into a prospective, randomised clinical trial. In randomised order, cataract surgery with combined PPC and POBH was performed in one eye; in the other eye cataract surgery was performed conventionally with in-the-bag IOL implantation keeping the posterior lens capsule intact. Intraocular flare was measured 1, 2, 4, 6, 12 and 24 h postoperatively, as well as 1 week and 1 month postoperatively, using a KOWA FC-1000 laser flare cell meter. RESULTS: The peak of intraocular flare was observed in POBH eyes and eyes with in-the-bag IOL implantation 1 h postoperatively. In both groups, the response was steadily decreasing thereafter. During measurements at day 1, small though statistically significant higher flare measurements were observed in eyes with in-the-bag IOL implantation (p<0.05). At 1 week and 1 month postoperatively, intraocular flare measurements were comparable again (p>0.05). CONCLUSION: Cataract surgery with combined PPC/POBH showed slightly lower postoperative anterior chamber reaction compared to conventional in-the-bag implantation during 4-week follow-up, indicating that POBH might trigger somewhat less inflammatory response. This could be explained by the posterior capsule sandwiching between the optic and the anterior capsule, preventing direct contact-mediated myofibroblastic trans-differentiation of anterior lens epithelial cells with consecutive cytokine depletion


PURPOSE: To compare the effectiveness for the patient of retrobulbar anaesthesia (RBA) and topical anaesthesia (TA) in cataract surgery by phacoemulsification. METHODS: We performed a prospective, randomized study on 115 patients operated at our clinic using the two anaesthesia techniques. The RBA group comprised 57 patients (20 women, 37 men; age 72 +/- 10 years); the TA group comprised 58 patients (20 women, 38 men; age 74 +/- 10 years). Measured parameters were: blood pressure; heart rate; blood oxygen saturation level; serum adrenaline, noradrenaline and cortisol levels; white blood cell count; indicated pain during the procedure, and pain as reported by the patient afterwards. Two psychological tests were used: the State-Trait Anxiety Inventory (STAI), and the patient-selected face-scale test. Statistical analysis was performed using Student's t-test and the chi-square test. Results were also analysed using a logistic regression model. RESULTS: Both types of anaesthesia were adequate for the surgical procedure. In the RBA group fewer patients experienced pain during surgery (p < 0.01) and fewer recalled any perioperative discomfort. With RBA the
objective parameters were more stable than with TA, and systolic blood pressure was significantly lower (p = 0.01). The logistic model was able to predict perioperative pain with 93% certainty. Pain sensitivity was higher in younger patients and in patients with higher initial cortisol and noradrenaline serum levels. CONCLUSIONS: Both methods of anaesthesia are appropriate, but phacoemulsification with TA is more painful than with RBA. In hypertonic patients and younger patients who are more susceptible to pain, TA should be avoided or used in combination with individualized sedation.


PURPOSE: To compare two methods of postoperative dressing regimen: patching vs "instant vision" without patch. DESIGN: Prospective randomized clinical trial. METHODS: Sixty consecutive hospitalized, nonambulatory patients with cataract surgery under topical anesthesia on both eyes at different days were enrolled prospectively. In randomized order, one eye was patched for the first 24 hours postoperatively; the other eye was left open without patch to obtain "instant vision." Both eyes received the same anti-inflammatory and antibiotic drop therapy. RESULTS: Twenty-four hours postoperatively, no significant differences between patching and "instant vision" could be found for corrected and uncorrected visual acuity, corneal epithelial defects, conjunctival inflammation, anterior chamber flare, and intraocular pressure (P > .05). During the first 24 hours postoperatively, all tear film parameters were significantly worse in the "instant vision" eyes (P < .001), indicating a transient tear film instability. During the first four hours after cataract surgery, pain scores in the "instant vision" eyes were significantly higher than in the patched eyes (P < .001). Eight hours postoperatively and later, there were no significant differences in any pain scores (P > .05). After experiencing both methods, 27% of the patients subjectively rated the two methods as equivalent; 8% of the patients preferred "instant vision." Despite of the benefits of immediately improved orientation, 65% of the tested patients preferred patching to "instant vision" because of lower pain and foreign body sensations and psychologic arguments. CONCLUSIONS: The clinical examinations showed that both methods were equally safe for postoperative therapy. However, further efforts have to be made to increase the patients' comfort with "instant vision" in the first hours after cataract surgery.


PURPOSE: To compare the torque and flattening effect induced by temporal or on-axis clear corneal incisions (CCIs) for phacoemulsification. SETTING: Moorfields Eye Hospital, London, United Kingdom. METHODS: Randomized controlled clinical trial on 62 eyes with cataract and mild to moderate corneal astigmatism (<2.60 diopters [D]) having phacoemulsification with a temporal CCI (temporal group) or on-axis CCI (on-axis group). Corneal astigmatism was assessed by corneal topography preoperatively and 3 weeks after surgery. The meridian of the incisions was marked on the cornea before local anesthesia was given to avoid anesthesia-related cyclotorsion. The surgically induced astigmatism (SIA) vector, torque, flattening effect, and accuracy of incision placement were analyzed in the 2 groups and compared with a paired t test. RESULTS: Three weeks after surgery, the on-axis CCI induced slightly more flattening of the
meridian of the incision (mean -0.63 +/- 0.57 D [SD]) than the temporal CCI (mean -0.50 +/- 0.44 D); however, the differences were not statistically significant (P = .31). Simple algebraic difference showed a mean increase in astigmatism magnitude of 0.12 +/- 0.52 D in the temporal group and a mean reduction of 0.21 +/- 0.53 D in the on-axis group (P = .02). The mean absolute torque was 0.28 +/- 0.27 D and 0.53 +/- 0.37 D, respectively (P<.005). The absolute angle of error of incision placement (alpha) was greater after on-axis CCIs (mean 25.9 +/- 20.1 degrees) than after temporal CCIs (mean 14.5 +/- 14.3 degrees) (P = .01). CONCLUSIONS: In eyes with preoperative astigmatism less than 2.60 D, on-axis CCI phacoemulsification induced slightly more flattening along the incision meridian than temporal CCI phacoemulsification, although the differences were not significant. The on-axis CCI was associated with significantly greater absolute torque and angle of error than the temporal CCI. These factors could limit the benefit of placing the incision on axis when the aim is to reduce preoperative astigmatism in phacoemulsification.


PURPOSE: To test the hypothesis that ocular blood-flow response to peribulbar anesthesia can be reduced by using a smaller volume of anesthetic mixture. SETTING: Departments of Ophthalmology and Clinical Pharmacology, Medical University of Vienna, Vienna, Austria. METHODS: Twenty patients scheduled for bilateral age-related cataract surgery were enrolled in a prospective randomized balanced observer-masked crossover study. Two study days with a 2 mL injection volume or 5 mL injection volume used for peribulbar anesthesia were scheduled. On 1 study day, patients received the 1-dose regimen and on the other study day, when the contralateral eye had surgery, patients received the other injection volume. On both study days, the anesthetic mixture consisted of an equal amount of lidocaine, bupivacaine, and hyaluronidase independently of the injection volume. Intraocular pressure (IOP), blood pressure, and pulse rate were measured noninvasively. Ocular fundus pulsation amplitude (FPA) and peak systolic and end diastolic flow velocities in the central retinal artery were measured with laser interferometry and color Doppler imaging, respectively. The results were recorded as means +/- SD. RESULTS: Peribulbar anesthesia increased IOP and reduced FPA and flow velocities in the central retinal artery. The effects on IOP (5 mL, 35.1% +/- 16.0%; 2 mL, 14.1% +/- 14.1%; P<.001) and ocular hemodynamic parameters (FPA: 5 mL, -17.5% +/- 7.8%/2 mL, -7.3% +/- 7.2%, P<.001; peak systolic velocity: 5 mL, -19.5% +/- 10.7%/2 mL, -10.6% +/- 9.8%, P = .013; end diastolic velocity: 5 mL, -16.7% +/- 6.2%/2 mL, -8.4% +/- 7.3%, P = .005) were more pronounced with the 5 mL injection volume than with the 2 mL injection volume. CONCLUSIONS: An injection volume of 2 mL instead of 5 mL reduced the ocular blood-flow response to peribulbar anesthesia. This procedure may be used in patients with ocular vascular disease to reduce the incidence of anesthesia-induced ischemia and loss of vision.


PURPOSE: To compare the astigmatic correcting effect of paired opposite clear corneal incisions (OCCIs) on the steep axis with that of single clear corneal incisions (CCIs) in cataract patients having phacoemulsification. SETTING: Rajendra Prasad Centre for
METHODS: This randomized prospective clinical study comprised 40 eyes of 40 patients with topographic astigmatism of more than 1.50 diopters (D). Paired 3.2 mm OCCIs were made in the steep axis in Group 1 and single CCIs in Group 2. Preoperative evaluation included uncorrected visual acuity, refraction, applanation tonometry, dilated fundoscopy, biomicroscopic examination, keratometry, and topography. The steep axis was marked before sub-Tenon's anesthesia was given and routine phacoemulsification was performed through a 3.2 mm CCI on the steep axis. An additional opposite 3-step self-sealing CCI was made in Group 1. Patients were examined 1, 4, and 12 weeks postoperatively. Visual acuity, refraction, keratometry, and topography were evaluated. RESULTS: The mean preoperative and postoperative topographic corneal astigmatism was 2.51 D +/- 0.92 (SD) and 0.91 +/- 0.54 D, respectively, in Group 1 and 2.16 +/- 0.80 D and 1.57 +/- 0.70 D, respectively, in Group 2. Mean astigmatic correction was 1.66 +/- 0.5 D and 0.85 +/- 0.75 D in Group 1 and Group 2, respectively. Mean surgically induced astigmatism, measured by a vector-corrected method, was 1.66 +/- 0.50 D and 0.85 +/- 0.75 D in Group 1 and Group 2, respectively (P = .00). The coupling ratio was -0.96 in Group 1 and -0.87 in Group 2. The spherical equivalent was +0.23 +/- 0.41 D in Group 1 and +0.11 +/- 0.17 D in Group 2 at 12 weeks. Uncorrected visual acuity was better in Group 1 than in Group 2 (P = .032). There was no difference in best corrected visual acuity between the groups. There were no incision-related complications. CONCLUSION: Paired OCCIs were predictable and effective in providing an enhanced effect for correcting preexisting corneal astigmatism in cataract surgery.


OBJECTIVE: To compare the pain level and complications during cataract surgery with topical anesthesia in Prechop MPF versus phacoemulsification. STUDY DESIGN: Prospective randomized comparative study. MATERIAL AND METHOD: One hundred patients, undergoing small incision cataract surgery under topical anesthesia, were allocated randomly to perform Prechop MPF (n = 50) or phacoemulsification (n = 50). Patients were asked to rate their pain level on a 10-point visual analog pain scale during the administration of the anesthetic, during the surgery and after surgery. The surgeon recorded his subjective assessment of patient cooperation and surgical complications. RESULTS: The mean pain score during surgery was 1.64 +/- 1.48 (SD) in the prechop MPF group and 0.92 +/- 1.34 (SD) in the phacoemulsification group. The difference between groups was statistically significant (p = .001). There was no significant difference in pain scores for delivery of anesthesia (p = .077), or after surgery (p = .221) and no significant difference in patient cooperation (p = .446) and surgical complications in either group. CONCLUSION: Patients having cataract surgery under topical anesthesia in the prechop MPF group had more intraoperative pain than patients in the phacoemulsification group. However there was no significant difference in patient cooperation and surgical complications between the groups.


PURPOSE: To compare the safety and clinical efficacy provided by limbal anaesthesia with topical anaesthesia in cataract surgery. METHODS: A total of 117 consecutive patients undergoing routine cataract surgery were randomly assigned to receive limbal or topical anaesthesia. Limbal anaesthesia was administered with a cellulose ophthalmic sponge soaked in preservative-free lidocaine hydrochloride 4% applied to the temporal perilimbal area for 45 seconds immediately before surgery. For topical anaesthesia lidocaine 4% was instilled in each patient at 10-min intervals four times before surgery. We studied phaco time, perioperative pain, visual outcome and intraoperative complications. The level of intraoperative pain was scored on a scale of 1-10, where 1 = no pain and 10 = severe pain. RESULTS: 55 patients (91.6%) in the topical group and 54 patients (94.7%) in the limbal group tolerated the procedure well, giving pain scores of 1-3, with no statistical difference. No patients in either group required supplemental anaesthesia and no intraoperative complications were recorded. No eyes had epithelial defects at the end of surgery or at postoperative check-ups. CONCLUSION: Limbal anaesthesia in cataract surgery is safe and the two anaesthesia techniques do not present differences in the degree of analgesia achieved.


BACKGROUND AND OBJECTIVE: Sub-Tenon's block is usually delivered by the infero-nasal (IN) approach, but occasionally this may not be possible. The infero-temporal (IT) approach has been described, but data is not available on its efficacy. METHODS: One hundred patients undergoing cataract extraction were randomized to receive an IN or IT sub-Tenon's injection of lidocaine 2% with hyaluronidase 15 IU mL-1. Akinesia was assessed using the Brahma scale at 0, 2, 4, 6 and 8 min. Injection, intraoperative and postoperative pain scores (verbal analogue score, 0-10) were noted, along with the incidence of sub-conjunctival haemorrhage and chemosis. RESULTS: There were no differences in patient characteristics data, or mean volume of administered local anaesthetic solution (3.3 (SD = 0.4) mL). There were no significant differences between groups in terms of onset of akinesia. Mean akinesia scores at 2, 4, 6 and 8 min were 2.7, 1.1, 0.4 and 0.2 for Group IN, compared to 2.2, 0.9, 0.8 and 0.3 for Group IT. Chemosis occurred in 14 patients in Group IN, compared to 22 in Group IT (P = 0.21). A sub-conjunctival haemorrhage was noted in 14 patients in Group IN and 19 patients in Group IT (P = 0.52). No patients required supplementary injections. Mean pain scores for the injection, intraoperatively and postoperatively were 0.9, 0 and 0 for Group IN, compared to 1.1, 0 and 0 for group IT. The surgeons scored all the blocks as 'good' except for one patient in each group. CONCLUSIONS: The IT approach provides an equally rapid onset of block, without a significant increase in complications.


PURPOSE: To determine whether preoperative counseling about potential intraoperative visual experience during phacoemulsification under topical anesthesia reduces fear in patients having cataract surgery. SETTING: The Eye Institute at Tan Tock Seng Hospital, Singapore, Royal Hull Hospitals NHS Trust, Kingston-upon-Hull, and
Manchester Royal Eye Hospital, Manchester, United Kingdom. METHODS: In this prospective multicenter randomized clinical trial, patients with cataracts having elective phacoemulsification under topical anesthesia were recruited and randomized into 2 groups. Both groups received routine preoperative counseling regarding risks and benefits of cataract surgery. One group received additional counseling on the potential intraoperative visual experience during phacoemulsification; the other group did not. The patients were then interviewed within 24 hours following phacoemulsification regarding their intraoperative experience. RESULTS: Two hundred nineteen patients were recruited over an 11-month period. There were 104 men and 115 women. The mean age was 68 years (range 20 to 89 years). There were 188 Singaporeans, comprising 168 Chinese, 13 Malays, and 7 Indians, and 31 British patients, all of whom were white. The mean fear score was 0.3 in the group that received additional counseling and 0.9 in the group that did not receive additional counseling (P = .036). The effect of counseling on fear was significant (P = .002) even after controlling for sex, age, and whether first or second cataract surgery. CONCLUSIONS: Preoperative counseling about the potential intraoperative visual experience during phacoemulsification under topical anesthesia helped to reduce the fear from the visual sensations in patients having cataract surgery.


PURPOSE: To compare the safety and efficacy of subtenon anaesthesia with peribulbar anaesthesia in manual small incision cataract surgery using a randomised control clinical trial. METHOD: One hundred and sixty-eight patients were randomised to subtenon and peribulbar groups with preset criteria after informed consent. All surgeries were performed by four surgeons. Pain during administration of anaesthesia, during surgery and 4 h after surgery was graded on a visual analogue pain scale and compared for both the techniques. Sub-conjuntival haemorrhage, chemosis, akinesia after administration of anaesthesia and positive pressure during surgery were also compared. Patients were followed up for 6 weeks postoperatively. RESULTS: About 146/168 (86.9%) patients completed the six-week follow-up. Thirty-one out of 88 (35.2%) patients of peribulbar group and 62/80 (77.5%) of subtenon group experienced no pain during administration of anaesthesia. There was no significant difference in pain during and 4 h after surgery. Subtenon group had slightly more sub-conjuntival haemorrhage. About 57 (64.8%) patients of the peribulbar group had absolute akinesia during surgery as compared to none (0%) in sub-tenon group. There was no difference in intraoperative and postoperative complications and final visual acuity. CONCLUSION: Sub-tenon anaesthesia is safe and as effective as peribulbar anaesthesia and is more comfortable to the patient at the time of administration.


BACKGROUND: We performed a prospective, randomized trial assessing the "remaining" volume of anesthetic solution that stays within the sub-Tenon’s space after administration of 2 different volumes: 3 mL and 5 mL. The remaining volume correlated with motor block (r = 0.72; P < 0.001). The volume lost through the incision as a percentage of total volume injected was similar in both groups, suggesting sub-Tenon’s space is not limited to a finite injected volume less than 5 mL and may be capable of receiving larger volumes of anesthetic to improve motor block. IMPLICATIONS: The
volume of anesthetic solution remaining within sub-Tenon's space correlates with motor block. The amount of volume lost as a percentage of total administered is independent of the volume injected, suggesting sub-Tenon's space is not limited to a finite injected volume less than 5 mL and may be capable of receiving larger volumes of anesthetic to improve motor block.


PURPOSE: To compare intraoperative pain scores and objective stress signs during clear corneal phacoemulsification under cryoanalgesia and topical anesthesia. SETTING: Hospital Ramon y Cajal, Madrid, and Hospital Universitario Nuestra Sra. de la Candelaria, Tenerife, Canary Islands, Spain. METHODS: Eighty-two patients were randomized to have phacoemulsification under cryoanalgesia or topical anesthesia. Uncooperative patients and those with shallow anterior chamber and small pupils were excluded. In case of breakthrough pain during the surgery, a supplemental anesthesia protocol was established. Each patient was asked to grade the severity of pain on a 4-point scale (verbal description score; 0=none, 1=little, 2=some, or 3=much). Immediately after surgery, the general discomfort and pain were evaluated. Surgeon stress was evaluated during surgery. A comparison of the 2 groups was performed using a statistical analysis of variance. RESULTS: Supplemental anesthesia was required in 1 patient in each group. A total of 95.23% of patients would repeat the same technique under cryoanalgesia versus 97.5% under topical anesthesia. Similar pain levels and surgical stress scores were noted in both groups. CONCLUSIONS: Cryoanalgesia clear corneal phacoemulsification was safe with an acceptable level of pain. It induced a physiological stress response to that of topical anesthesia (blood pressure and heart rate). Cryoanalgesia was preferred over topical anesthesia by some patients. It is a suitable technique for anesthetic allergy cases.


BACKGROUND AND OBJECTIVES: The authors report the first prospective randomized comparison of the medial canthus single-injection peribulbar anesthesia (also called caruncular anesthesia) with the classic double-injection peribulbar technique. METHODS: One hundred patients scheduled for cataract surgery were randomly assigned to either a single medial canthus injection or a double peribulbar injection of mepivacaine 2%. The amount of anesthetic agent injected was clinically adapted to each patient. Akinesia, volume injected, pain, reinjections, and complications were assessed after the procedure. RESULTS: The medial canthus single-injection peribulbar anesthesia was significantly less painful and required less anesthetic agent than the double-injection peribulbar anesthesia. Akinesia score and the reinjection rate were similar in the 2 groups, whereas chemosis was significantly more frequent in the double-injection group. CONCLUSIONS: Medial canthus single-injection peribulbar anesthesia appears to be an effective alternative to the usual double-injection peribulbar anesthesia.

18. Ruschen H, Celaschi D, Bunce C, Carr C. Randomised controlled trial of sub-Tenon's block versus topical anaesthesia for cataract surgery: a comparison of patient...

BACKGROUND/AIM: Sub-Tenon's block (STB) or topical anaesthesia alone (TOP) are popular techniques employed during cataract surgery. TOP is often preferred by healthcare providers because of financial or staffing reasons, despite existing evidence that pain during surgery is better controlled with STB. Pain is not the only consideration that determines patient preference for the anaesthesia technique. The authors decided to investigate the issue of patient satisfaction using the recently developed Iowa Satisfaction with Anesthesia Scale (ISAS). METHOD: In a randomised controlled pilot trial, 28 patients were enrolled to receive either STB with 3 ml of 2% lidocaine and hyaluronidase, or TOP with proxymetacaine 0.5% and amethocaine 1% (Tetracaine) eye drops. Postoperatively patients rated their satisfaction with anaesthesia care by filling in the self administered written questionnaire, the ISAS. RESULTS: One patient in the TOP group dropped out of the study because of intolerable pain. Analysis of the questionnaire results with a two sample Wilcoxon rank sum test showed a significant difference in patient satisfaction (p<0.0085). The median satisfaction score was higher in the STB group 2.77 (interquartile range IQR 2.45 to 3), than in the TOP group 2.04 (IQR 1.54 to 2.5). CONCLUSION: In the setting of day case cataract surgery, patients report significantly higher satisfaction scores with STB than with TOP alone.


PURPOSE: To compare the effect of volume used in sub-Tenon's anaesthesia on efficacy and intraocular pressure (IOP). METHODS: A prospective, randomised clinical trial was conducted on 52 eyes of 52 consecutive patients undergoing sub-Tenon's anaesthetic for cataract surgery. Eyes were randomly assigned to either 3 mL or 5 mL volume of anaesthetic solution (0.5% bupivacaine/2% lidocaine in a 50:50 mixture). The main outcome measures were akinesia 5 min post-administration of anaesthetic, changes in IOP immediately after and 5 min after anaesthetic administration, and patient pain perception during procedure. RESULTS: The level of kinesia was greater in the 3 mL group (n = 25) compared to the 5 mL group (n = 27) (P = 0.001, Mann-Whitney U-test). There was no significant difference in pain perception between the two groups (P = 0.464, student t-test). Although there was great variation in IOP changes following sub-Tenon's anaesthetic, there was a trend for a larger rise in mean IOP immediately after anaesthetic administration in the 5 mL group (mean +/- SD +5.6 +/- 4.2 mmHg) compared to the 3 mL group (+4.3 +/- 3.8 mmHg), but this did not reach statistical significance (P = 0.25, student t-test). CONCLUSIONS: A 5 mL volume of anaesthetic provides akinesia superior to a 3 mL volume in sub-Tenon's anaesthesia for cataract surgery.


BACKGROUND: Several local anaesthetic techniques are available for cataract surgery. Recently, topical anaesthesia has gained in popularity. A randomized trial was designed to compare patient discomfort and intraoperative complications following routine cataract surgery under topical or sub-Tenon's anaesthesia. METHODS: A randomized double-blinded placebo-controlled clinical trial of 210 patients assigned to either a sub-Tenon's anaesthesia...
group (sub-Tenon’s anaesthesia with placebo topical balanced salt solution, n=140) or a topical anaesthesia group (topical anaesthesia with placebo sub-Tenon’s injection of balanced salt solution, n=70) was carried out. All patients underwent phacoemulsification with intraocular lens implantation. Patients in the sub-Tenon's group received a single injection (3 ml) of a combination of lidocaine 2% (2 ml) and bupivacaine 0.75% (1 ml), and four doses of topical placebo (balanced salt solution). Patients in the topical anaesthesia group received four doses of topical proxymethocaine 0.5% and a placebo sub-Tenon's injection (3 ml) of balanced salt solution. No intracameral injection of local anaesthetic was given. A 10-point visual analogue pain scale was used preoperatively and for postoperative pain assessment immediately after the operation and 30 min postoperatively. The intraoperative complications in the two groups were recorded. RESULTS: The mean pain score immediately after surgery was 2.42 (sd 2.2) in the sub-Tenon's group and 3.44 (2.3) in the topical anaesthesia group (P=0.0043). The mean pain score 30 min after surgery was 1.24 (1.7) in the sub-Tenon's group and 2.25 (2.2) in the topical anaesthesia group (P=0.0009). CONCLUSIONS: Patients undergoing cataract surgery under topical anaesthesia experience more postoperative discomfort than patients receiving sub-Tenon's anaesthesia. Surgery-related complications were similar in both groups.


PURPOSE: To evaluate patients’ visual sensations at different stages of phacoemulsification and posterior chamber intraocular lens (PC IOL) implantation under topical and regional anesthesia. SETTING: Department of Ophthalmology, United Christian Hospital and Tseung Kwan O Hospital, Kowloon, Hong Kong, China. METHODS: Seventy-six consecutive patients having phacoemulsification were randomized to a topical anesthesia group (n = 35) or regional anesthesia group (n = 41). The topical anesthesia group received lidocaine hydrochloride 2% gel (Xylocaine) and the regional anesthesia group, a peribulbar or retrobulbar injection of lignocaine 2%. The patients' visual sensations, including light and color sensations, shape of objects, and visual patterns, were evaluated at different stages of surgery. RESULTS: Two patients (4.9%) in the regional anesthesia group and none in the topical anesthesia group experienced total loss of light sensation throughout surgery (P = .50). There was a significant association between color perception and the type of anesthesia at stages 1 and 2 (P<.05) but not at stages 3, 4, and 5 (P>.05). The perception of objects and visual patterns had no association with the type of anesthesia at any stage (P>.05). Of all patients in the study, 56 (73.7%) reported color changes as surgery proceeded. Both groups saw waves, defined as curves with periodic fluctuations in amplitude, at all stages. The perception of some colors and a rectangular moving object was significantly associated with the type of anesthesia at some or all stages (P<.05). CONCLUSIONS: Patients having phacoemulsification and PC IOL implantation under topical or regional anesthesia had a wide spectrum of visual sensations that were similar at most stages of surgery. Patients in the topical anesthesia group perceived more colors at the early stages and more blue throughout surgery than patients in the regional anesthesia group.

PURPOSE: To ascertain whether the Honan intraocular pressure reducer (HIPR) has an effect on the preoperative intraocular pressure (IOP), surgeon's assessment of anesthesia, and patients’ analgesic experience when sub-Tenon's anesthesia is used for routine cataract surgery. SETTING: Princess Alexandra Eye Pavilion, Edinburgh, Scotland. METHOD: Forty-five eyes of 45 patients having routine phacoemulsification cataract surgery were randomized to receive 10 minutes of ocular compression using the HIPR or no compression after administration of sub-Tenon's anesthesia. The IOP was measured immediately before and immediately and 10 minutes after sub-Tenon's anesthesia administration using a standard technique. One surgeon who was masked to the randomization process performed all injections and completed a questionnaire on aspects of the anesthetic block. Patients scored their level of analgesia during surgery. RESULTS: The mean rise in IOP immediately after administration of sub-Tenon's anesthesia was 1.39 mm Hg +/- 3.91 (SD) (95% confidence interval +0.22 to 2.57; P =.021). In the 22 patients who received compression, there was a mean IOP reduction of 4.20 +/- 2.74 mm Hg at 10 minutes. The mean difference between the compression and no-compression groups at 10 minutes was 4.99 mm Hg (P<.0001). There was no difference in the surgeon's scores for any aspect of the sub-Tenon's anesthesia (P>.05). All patients reported good levels of analgesia. CONCLUSIONS: There was a significant reduction in IOP after compression using the HIPR. However, the rise in IOP after administration of sub-Tenon's anesthesia was small and the use of the HIPR did not make a significant difference in the effectiveness of the anesthesia to the surgeon or patients


PURPOSE: The aim of this study was to examine the distribution of local anesthetic solution by magnetic resonance imaging (MRI) after combined peribulbar and retrobulbar, superomedial retrobulbar, and sub-Tenon's injection in relation to clinical akinesia. DESIGN: Randomized clinical trial. PARTICIPANTS: Fifteen patients scheduled for cataract surgery, 5 patients in each group. METHODS: Five patients received combined peribulbar and retrobulbar anesthesia, 5 patients received superomedial retrobulbar injection, and 5 patients had sub-Tenon's injection, all with a combination of bupivacaine 0.75%, lidocaine 2%, and hyaluronidase. The MRI scans were performed before the injection and up to 35 minutes after the injection. RESULTS AND CONCLUSIONS: Reliable anesthesia is achieved using a combined peribulbar and retrobulbar block and a relatively great volume of local anesthetic solution, which spreads throughout the orbit, as evidenced by MRI. After superomedial retrobulbar and sub-Tenon's injection, the local anesthetic solution accumulates behind the globe. Sub-Tenon's injection gives good analgesia and slight akinesia with a very small volume. Superomedial retrobulbar injection and combined peribulbar and retrobulbar block provide a similar degree of exophthalmos, which seems to be the result of the volume injected behind the globe.


PURPOSE: To evaluate the rise in intraocular pressure (IOP) after phacoemulsification using a straight microtip or a Kelman microtip and its relationship to phaco energy
delivered to the eye. SETTING: Iladevi Cataract & IOL Research Center, Ahmedabad, India. METHODS: This prospective randomized study comprised 48 consecutive age- and sex-matched patients with senile cataract. Inclusion criteria included older than 45 years and presence of any type of cataract from grade I to III. The patients were divided into 2 groups: straight microtip and Kelman microtip. Each group comprised 13 men and 11 women. The mean age was 58.29 years +/- 6.46 (SD) in the straight microtip group and 60.05 +/- 8.45 years in the Kelman microtip group. The IOP was measured preoperatively and postoperatively with a pneumotonometer and applanation tonometer. One surgeon performed all operations using a standardized surgical technique and topical anesthesia. The intraoperative mean phaco power and ultrasound (US) time were noted. The effective phaco time (EPT), percentage of IOP rise, and wound-site thermal injury (mild, moderate, or severe) were calculated. The correlation between the EPT and percentage of rise in IOP was evaluated using correlation coefficients and the paired t test. RESULTS: The mean preoperative IOP was 13.73 +/- 2.89 mm Hg in the straight microtip group and 15.14 +/- 2.60 mm Hg in the Kelman microtip group. The mean US time was 239.4 +/- 1.61 seconds and 238.2 +/- 1.48 seconds, respectively. The mean phaco power was 17.37% +/- 3.28% in the straight microtip group and 17.10% +/- 5.26% in the Kelman microtip group and the mean EPT, 39.06 +/- 2.28 seconds and 40.08 +/- 0.24 seconds, respectively (P = .412). The mean rise in IOP was 111.60% +/- 37.83% in the straight microtip group and 91.29% +/- 31.85% in the Kelman microtip group. The difference between groups was significant (P<.05). The correlation coefficient between the EPT and percentage of IOP rise was significant in both groups: 0.3823, straight microtip group (P<.05); 0.514, Kelman microtip group (P<.01). Wound-site thermal injury was noted in 3 patients in the straight microtip group and 1 patient in the Kelman microtip group. CONCLUSIONS: Although the amount of phaco energy dissipated in the eye was the same between the 2 groups, the percentage of IOP rise was greater with the straight microtip. The rise in IOP was correlated with the dissipated phaco energy.


PURPOSE: To compare the quality of anaesthesia and complication rates between three sub-Tenon cannula of increasing length (anterior Greenbaum, mid Kumar-Dodds, and posterior Steven's sub-Tenon's cannulae). METHODS: A total of 150 patients undergoing cataract extraction were randomised to receive a sub-Tenon injection of 5 ml of 2% lidocaine with hyaluronidase with one of the three cannulae. The development of akinesia was assessed every 2 min over a 6-min period. Complications were also recorded. RESULTS: There was no difference in the onset of akinesia, with 46, 50, and 46 patients achieving adequate akinesia within 6 min for the anterior, mid, and posterior groups respectively (P>0.05). There was an increase in retained lid opening with anterior compared to mid and posterior cannulae (P=0.0001). There was significantly less retained lid closure with the posterior compared to the mid or anterior cannulae (P<00001). The mean (range, SD) scores for pain during injection were 0.4 (0-5, 0.83), 1.2 (0-9, 1.96), and 1.1 (0-6, 1.19) for the anterior, mid, and posterior groups, respectively. These were not significantly different between the anterior and mid groups, or the mid and posterior groups (P>0.05), but there was significantly more pain on injection with the posterior compared to the anterior groups (P<0.01). All patients scored intraoperative pain as zero. There was significantly more chemosis in the anterior group (76%) compared to the mid (20%) and posterior (32%) groups (P<0.0001). There were significantly (P=0.0004) more conjunctival haemorrhages in the anterior group (56%) than the mid (20%) or posterior (20%) groups. CONCLUSIONS: We have shown that all
three cannulae provide high-quality anaesthesia with minor differences in retained muscle activity, chemosis, and haemorrhage rates


**OBJECTIVE:** To compare the retrobulbar anesthesia and intracameral anesthesia using preservative-free bupivacaine hydrochloride 0.5% in terms of effectiveness, complications and comfort to the patient during phacoemulsification with posterior chamber intraocular lens implantation. **METHODS:** This was a hospital based comparative study of two methods of anesthesia, conducted at LRBT Free Eye and Cancer Hospital, Lahore from January to July 2000. Study included 200 patients with uncomplicated age-related cataract, equally divided in two groups on simple random basis. Group A (100 patients) received the retrobulbar anesthesia and Group B (100 patients) received the intracameral anesthesia with bupivacaine hydrochloride 0.5% for phacoemulsification with posterior chamber intraocular lens implantation. Outcome measures like pain, visual acuity, intraocular pressure and anterior chamber reaction were compared. **RESULTS:** On day 1, 79% of the patients in group A and 82% patients in group B had unaided visual acuity ranging between 6/6-6/18. On day 7, this was 88% in group A and 89% group B. On day 1, 99% in group A and 98% in group B had <1+ cells in the anterior chamber while on day 7 this increased up to 100%. On day 1, 97% in group A and 98% group B had intraocular pressure less than 20 mmHg. On day 7, it increased up to 100% in both groups. 97% patients in group A and 96% patients in group B had painless surgery. Results were analysed using computer software SPSS version 10.0. Results showed no significant statistical difference between two groups in terms of pain, visual acuity, intraocular pressure, anterior chamber reaction and patient comfort. **CONCLUSION:** In the hands of expert surgeons and in selected patients, intracameral anesthesia with preservative-free bupivacaine hydrochloride 0.5% is a safe and effective technique of ocular anesthesia for phacoemulsification with posterior chamber intraocular lens implantation.


**BACKGROUND:** To assess and compare the efficacy and safety of topical versus peribulbar anaesthesia in patients undergoing routine cataract surgery. **METHODS:** The unicentre, prospective, randomized, clinical interventional trial included 140 consecutive patients undergoing routine cataract surgery performed by one of two surgeons. The patients were randomly distributed to either peribulbar anaesthesia or topical anaesthesia. To assess intraoperative pain, each patient was asked immediately after surgery to quantitate his/her pain using a 10-point pain rating scale. **RESULTS:** The study groups did not differ significantly in pain score (p=0.54), duration of surgery (p=0.52), anaesthesia-related intraoperative difficulties (p=0.17), postoperative visual acuity (p=0.94), overall intraoperative surgical complication rate, blood pressure rise (p=0.16) or blood oxygen saturation (p=0.74) **CONCLUSIONS:** Patient comfort and surgery-related complications did not differ between topical anaesthesia and peribulbar anaesthesia. As there are no significant differences between the two techniques in terms of subjective pain experienced by patients, intraoperative complications and postoperative visual outcome, and in view of the minimally invasive character of topical...
anaesthesia compared to peribulbar anaesthesia, the present study suggests the use of topical anaesthesia for routine cataract surgery.


**PURPOSE:** To assess patient comfort with and without intravenous (i.v.) cannulation during 1-quadrant sub-Tenon's anesthesia during phacoemulsification. **SETTING:** Royal Alexandra Hospital, Paisley, Scotland, United Kingdom. **METHODS:** This prospective masked controlled clinical trial comprised 119 patients having elective clear corneal phacoemulsification. Fifty had sub-Tenon's anesthesia with an i.v. cannula; 23, sub-Tenon's anesthesia without an i.v. cannula; and 46, topical anesthesia of proparacaine 0.5% without an i.v. cannula. No patient received sedation. All patients had clear corneal phacoemulsification with foldable posterior chamber intraocular lens implantation. The patients' subjective pain experience was measured immediately after surgery by a single independent observer using a 10-point visual analog scale. **RESULTS:** The mean patient-reported pain was low in all 3 groups. The mean i.v. cannula-related pain score in the sub-Tenon's group with an i.v. cannula (1.00; range 0 to 8) was higher than the mean general pain score (0.46; range 0 to 5) and worst pain experienced during surgery score (0.64; range 0 to 3). In the topical anesthesia group, 8 patients (17%) reported greater discomfort directly or indirectly related to the subconjunctival antibiotic injection at the end of surgery. **CONCLUSION:** Patient-reported pain caused by placing an i.v. cannula in the sub-Tenon's group significantly altered overall patient comfort during the surgical experience. Thus, the routine use of i.v. access during clear corneal phacoemulsification under sub-Tenon's anesthesia should be avoided to improve patient satisfaction.


**PURPOSE:** To investigate the effectiveness of aspiration of expired air by a suction system on peripheral oxygen saturation (SpO(2)) and end tidal carbon dioxide (EtCO(2)) during cataract surgery. **MATERIALS AND METHODS:** In total, 160 pre-medicated patients aged between 40 and 70 years (ASA I-III, classification of patients according to the American Society of Anesthesiologists) scheduled for cataract surgery under retrobulbar or peribulbar block were examined in a randomised, single-blind manner. The patients were sedated with 3 mg midazolam i.v. 15 min before operation and were monitored with an anaesthesia monitor. Heart rate (HR), non-invasive mean arterial pressure (MAP), SpO(2) and EtCO(2) were continuously measured using a standardised monitor. The first group (non-suction group, n = 80) received 4 L min(-1) O(2) with nasal cannule while the second group (suction group, n = 80) received 4 L min(-1) O(2) with nasal cannule, and the expired air was aspire d with a Y-piece suction system. EtCO(2) was measured with the line of the sampling tube in the anaesthesia monitor. Respiratory rate (RR) was counted for a period of 1 min at each measurement time with thoracic excursions. The results were evaluated by unpaired t-test and analysis of variance. **RESULTS:** Severe reduction of SpO(2) and raising of EtCO(2) were observed significantly in the first group during the operation. RR, HR and MAP increased due to hypoxaemia. In the second group, SpO(2) was stabilised at high levels and EtCO(2) did not increase. RR, HR and MAP levels remained within the normal limits. Differences
between the two groups were statistically significant (P < 0.05). CONCLUSION: During cataract surgery with local anaesthesia, SpO(2) decreases and RR, HR and MAP increase because of reinspiration of expired air under the drape. Insufflation of O(2) and aspiration of expired air with a suction system have prevented severe reduction of SpO(2) and raising of EtCO(2). It was suggested that O(2) delivery and use of an aspiration system decreased the risk of hypoxaemia significantly in the patients undergoing the cataract surgery.