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Lidocaine-assisted xylocaine jelly anesthesia versus one quadrant sub-Tenon infiltration for self-sealing sclerocorneal incision routine phacoemulsification

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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. (Eur J Ophthalmol 2004; 14: 111-6)*

KEY WORDS. *Sub-Tenon anesthesia, Xylocaine jelly, Topical anesthesia, Cataract surgery, Phacoemulsification*

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INTRODUCTION

Ophthalmology has witnessed a significant evolution in surgical and anesthetic techniques for cataract surgery in the last three decades.

Phacoemulsification through a self-sealing sclerocorneal or clear corneal incision has become a standard approach. Despite a continuous increase of clear corneal surgery over the last 9 years, a sclerocorneal approach is still preferred by 53% of American Society of Cataract & Refractive Surgeons (ASCRS) members in the 2000 Leaming study (1), probably because of several theoretical advantages associated with a wound covered by conjunctiva (2).

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Severe risks of traditional sharp needle methods of ocular anesthesia such as globe perforation (3), optic nerve damage (4), respiratory arrest (5), and even brainstem anesthesia (6) have been well documented. The quest for a safer technique led to the introduction of two novel approaches in 1992: topical (anesthetic drops) by Fichman (7) and a one-quadrant sub-Tenon infiltration by Stevens (8). Both techniques avoid the above mentioned risks. A comparison of the two methods was published by Chittenden et al in 1997 (9). These authors discontinued their study, as they believed that topical anesthesia did not provide sufficient analgesia for sclerocorneal surgery (9). However, their topical protocol was similar to the one used in clear cornea cataract surgery, where topical drop anesthesia provides a reasonable intraoperative comfort (10). Pham et al have increased the penetration of conjunctiva and sclera in sclerocorneal cataract surgery using a sponge soaked in an anesthetic solution (11). Later, they also added intracameral lidocaine (12) as suggested by Gills et al (13).

In 1999, Koch brought attention to jellies as potential anesthetic carriers with higher concentration of an analgesic drug and longer exposure time (14). One year later, Dr. Anders of Berlin, Germany, reported in a personal communication about beneficial effects of 2% xylocaine jelly for cataract surgery through a sclerocorneal tunnel. After mastering a learning curve of over 50 sclerocorneal phacoemulsifications under topical jelly, a prospective study was set up in order to compare the analgesic effect of the maximized topical anesthesia-namely, lidocaine supplemented jelly-with the technique of instant sub-Tenon anesthesia.

PATIENTS AND METHODS

Patients undergoing a standard divide and conquer phacoemulsification via a sclerocorneal self sealing tunnel at 12 o'clock with implantation of a 6 mm polymethylmethacrylate intraocular lens (PMMA IOL) were randomly assigned to two groups. Patients with mature cataracts, deafness, glaucoma, against the rule (ATR) astigmatism > 1 D, mental incapability of understanding the task, or color blindness, and those under 30 years of age, were excluded. All surgeries were performed by one surgeon (W.S.). All patients received half a tablet of anxiolyticum midazolam (3.75 mg) orally one half hour prior to surgery. In our experience, this very small dosage does not significantly affect patient vigilance and therefore does not preclude a proper assessment. All patients were informed about objectives of the study and consented to participate in it.

Anesthetic protocol

Jelly + intracameral lidocaine group (J+g). Patients received one drop of oxybuprocaine 0.4% followed by two applications of xylocaine 2% jelly over 7 to 10 minutes. The eye was draped and the fornices washed with beta iodine and gentamicin solution. After the superior conjunctiva was dissected a drop of sterile unpreserved 1% lidocaine was applied onto bare sclera prior to cauterization of episcleral vessels. Additionally, 0.5 ml of sterile unpreserved 1% lidocaine was injected intracamerally prior to instillation of viscoelastic and capsulorrhexis. Before conjunctival closure by bipolar cautery at the end of the procedure an extra drop of lidocaine was put onto the edge of dissected conjunctiva.

Sub-Tenon group (sTg).

Patients received one drop of oxybuprocaine 0.4% into the lower fornix. Patients were draped and disinfected identically to J+g. Patients were asked to commence the superotemporal gaze. Under the operating microscope, the inferonasal conjunctiva was grasped with Colibri forceps 4 mm from the limbus and a 1 to 2 mm incision was made with blunt forceps. In patients with thick Tenon fascia a thorough dissection was performed down to the episclera. A drop of 2% xylocaine was applied into this pocket. Stevens' sub-Tenon cannula (Osborn & Simmons, London, UK) was slowly introduced behind the globe injecting a total volume of 2 mL of 2% xylocaine. The surgery was started immediately after the withdrawal of the cannula (Fig. 1, a-d).

Assessment

During the operation a nurse sat beside the patient, holding his or her hand. Patients were instructed to squeeze the nurse's hand if they felt discomfort at any time. When a pain sensation was indicated, the nurse noted this stage of surgery on a chart. Eleven

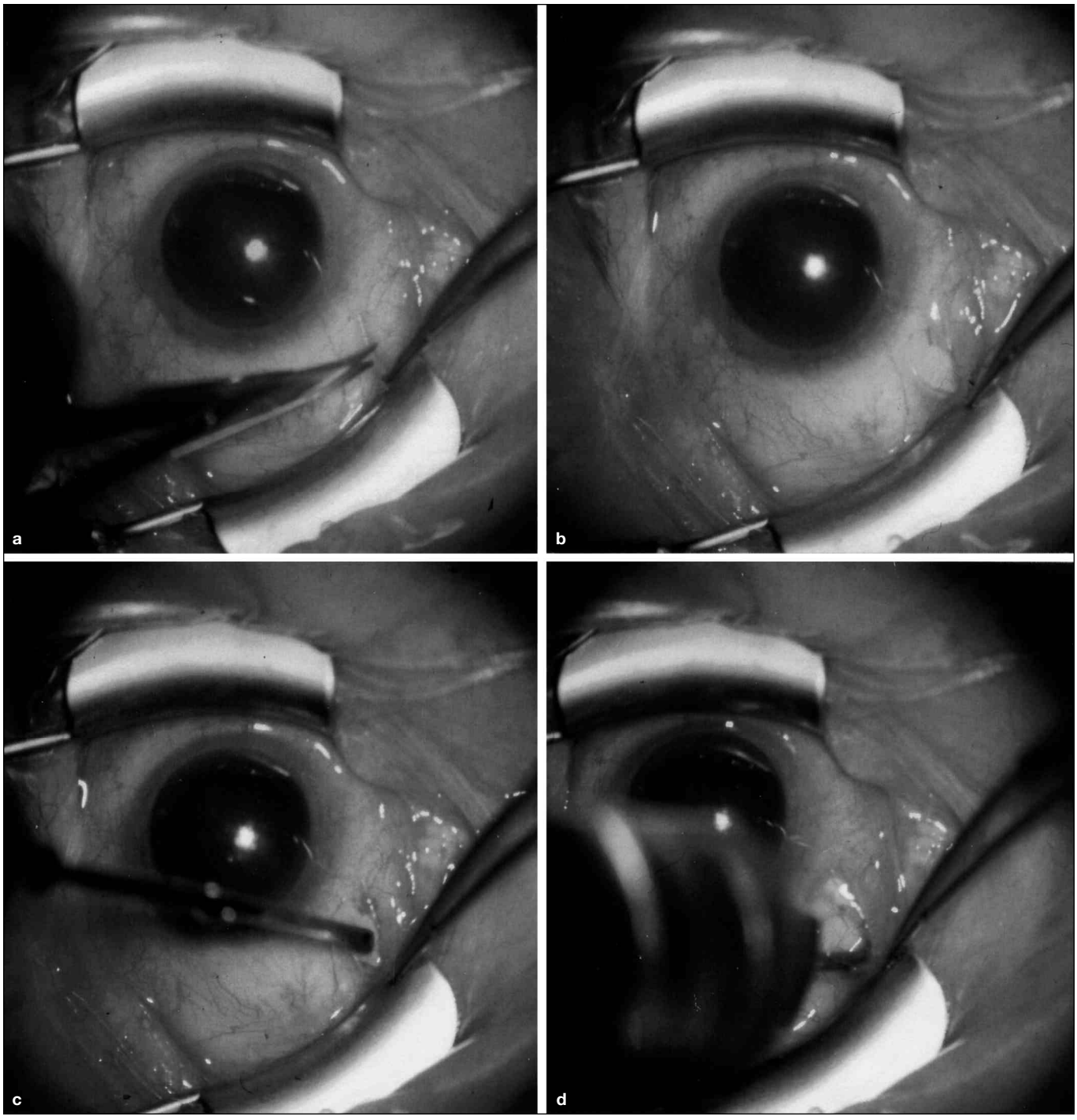

Fig. 1 - *Technique of one quadrant sub-Tenon infiltration.* **a)** *A small incision is created in the inferior nasal conjunctiva.* **b)** *Sclera is visible through a small opened conjunctival pocket.* **c)** *A drop of anesthetic is instilled into the pocket and* **d)** *the cannula is slowly introduced behind the globe.*

surgical steps were included: sub-Tenon injection, dissection of conjunctiva, cauterization of episcleral vessels, preparation of sclerocorneal tunnel, intraocular injection of lidocaine, capsulorrhexis, phacoemulsification, cortex aspiration and capsular bag polishing, enlargement of the tunnel incision to a full width,

IOL implantation, and covering and cauterization of the conjunctiva.

Shortly after surgery, in the resting bay, patients were shown a commercially available visual analogue graphic pain score ruler (Fig. 2) by an independent investigator (J.C.S.). Once the pain intensity was indicated by the patient, an appropriate numerical pain score (range from 0 to 10) on the back side of the ruler was obtained and noted.

Statistical workup was done using Sigma Stat software package (Jandel Inc.) by an independent investigator at a different university (H.B.D.). Statistical significance was checked for by Mann-Whitney rank sum test and Wilcoxon signed rank test.

For safety reasons, intraoperative cardiac monitoring, blood pressure monitoring, oxygen saturation check, and introduction of an IV line with no fluid supplementation were routinely done in every case according to a standardized protocol for intraoperative patient monitoring for intraocular procedures under local anesthesia at the University Eye Hospital Marburg.

RESULTS

Each group was comprised of 50 cataract surgeries in 50 patients. Average patient age was 72.6 years in J+g and 73.5 years in sTg. There was a female preponderance of 40:10 in J+g and 36:14 in sTg. The bedside nurse's hand was squeezed 61 times in J+g. In contrast, in sTg, intraoperative discomfort was indicated 37 times. Although in sTg pain sensation was mainly confined to the initial injection stage, J+g felt pain during the cauterization of the episcleral vessels and to a lesser extent throughout the second part of the operation. Figure 3 graphically shows the distribution of painful surgical steps in every group.

The median pain score for J+g (3) was significantly higher than that of sTg (0) ($p < 0.0001$). In five cases the surgery was converted to sub-Tenon intraoperatively when patients complained of intolerable pain. For the statistical work up these five cases were considered as J+g and were not included into the sTg, because we believed that the subjective pain score was mostly influenced by the strongest pain felt. In these five cases major painful events happened under topical anesthesia. However, these five eyes were excluded from the assessment of particular surgical steps.

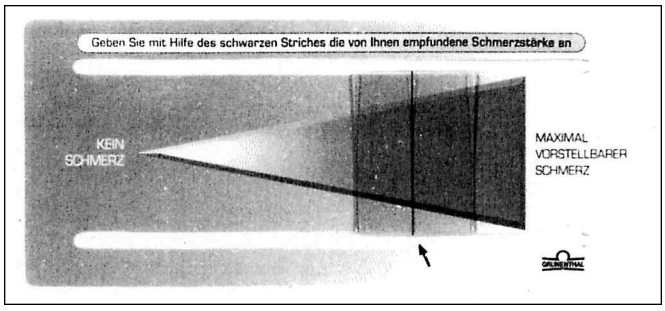

Fig. 2 - *Front side of a commercially available visual analogue graphic pain score ruler used in the study. Patient indicates pain by moving a vertical line (arrow) in the transparent window along the ruler's triangle. Note that the intensity of the pain is also indicated by colors, starting with blue and going to deep red for unbearable pain.*

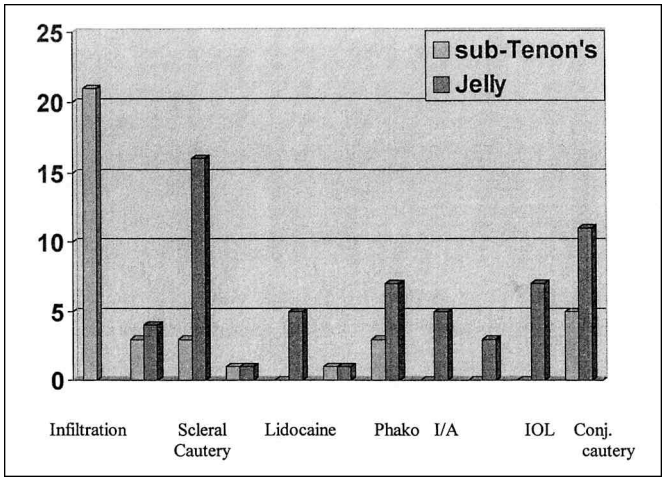

Fig. 3 - *Graphical comparison between the two study groups: painful surgical steps as indicated by the patients by squeezing bedside nurse's hand.*

No intraoperative complications occurred in any of the study groups. One case of postoperative iritis (cells and flare in the anterior chamber) was encountered in each group postoperatively. Both cases resolved on intensified topical steroids without sequelae.

DISCUSSION

The decision to perform this study was based on our personal observation that fully maximized topical anesthesia using jelly supplemented by intracameral and enhanced by topical lidocaine prior to rather painful steps (scleral and conjunctival cautery) works well not only in clear cornea, but also in sclerocorneal inci-

sion phacoemulsification. We also had a good long-term experience using an instant sub-Tenon block. On contrary, Chittenden et al (9), who compared standard topical and sub-Tenon anesthesia, stopped their study after 35 surgeries, as they considered it to be inappropriate to continue with topical anesthesia causing more discomfort than sub-Tenon. They believed that cautery of the episcleral vessels, which is necessary to achieve hemostasis with scleral tunnel incision, causes a high degree of pain (9). This step is obviously not present in clear corneal surgery, which in some instances was even reported to be done without anesthesia (15). However, jelly anesthesia has a potential for better pain relief than eye drops (13). Moreover, Chittenden et al also reported use of a superior bridle suture in sub-Tenon group. This step was omitted from our surgical technique because low-dose instant sub-Tenon anesthesia preserves a full ocular motility in the first 2 to 3 minutes: time enough for the patient to assist during the initial surgical steps up to the phaco phase. Unlike other investigators (8, 9, 16), we believe that the sub-Tenon injection, when performed on the table immediately prior to conjunctival dissection, is an unequivocal part of the surgery. It was therefore assessed along with other stages of operation. Indeed, we showed that this initial step was actually the only significant stage of discomfort in sTg: 21 out of 37 times when pain was indicated, the patient referred to the injection itself. As a result of this observation, we have slightly modified our sub-Tenon approach by not just putting an initial drop into the conjunctival pocket but also releasing some 0.1 to 0.2 ml of anesthetic solution under the Tenon fascia before traversing the equator.

Another important finding of this study was the experience that lidocaine-assisted jelly anesthesia provided reasonable comfort in 90% of patients operated. Despite the fact that the median subjective pain score of 3 was significantly higher than in sTg, where it was 0, this actually represents light pain on a 10-degree scale. This finding of the present study contrasts markedly with the results of Chittenden et al (9), where topical drop anesthesia proved to be of no value in sclerocorneal surgery. Sub-Tenon infiltration is undoubtedly a very safe technique when compared to other injection anesthesias. The main complications such as a minor to moderate subconjunctival bleeding (frequent) and herniation of Tenon fascia through the conjunctival opening (never seen, since the cautery of the conjunctiva at the site of sub-Tenon infiltration was abandoned) are a temporary cosmetic nuisance. However, similarly to other techniques, where a bolus of anesthetic solution is brought to the posterior aspect of the globe, sub-Tenon infiltration temporary reduces the ocular blood flow (17). Therefore, unlike Chittenden et al (9), we did not use any added adrenaline in the injection solution. Moreover, we believe that in patients with compromised blood flow, lidocaine supplemented jelly anesthesia may be a better choice.

This study specifically addressed routine cataract surgery through a sclerocorneal tunnel. Routine surgery requires an anesthetic technique that is ideally painless, providing good analgesia in every patient, reducing stress to the patient and the surgeon alike. It also has to be as safe as possible, avoiding all vision-threatening complications. This study confirms for the first time the superiority of sub-Tenon infiltration to the maximal topical anesthesia: lidocaine supplemented xylocaine jelly anesthesia. Other authors showed a favorable effect of sub-Tenon infiltration in comparison to sharp needle injection (18). We therefore conclude that sub-Tenon infiltration appears to be a first choice anesthesia for routine phacoemulsification via sclerocorneal tunnel in patients with uncompromised ocular blood flow.

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REFERENCES

1. Leaming DV. Practice styles and preferences of ASCRS members-2000 survey. J Cataract Refract Surg 2001; 26: 948-55.
2. Sekundo W, Böker T, Fimmers R. Induced corneal astigmatism using an asymmetric corneoscleral tunnel and a large optic intraocular lens. J Cataract Refract Surg 2000; 26: 79-82.
3. Duker JS, Belmont JB, Benson WE, et al. Inadvertent globe perforation during retrobulbar and peribulbar anesthesia; patient characteristics, surgical management, and visual outcome. Ophthalmology 1991; 98: 519-26.
4. Pautler SE, Grizzard WS, Thompson LN, Wing GL. Blindness from retrobulbar injection into the optic nerve. Ophthalmic Surg 1986; 17: 334-7.
5. Wittpenn JR, Rapoza P, Sternberg P Jr, et al. Respiratory arrest following retrobulbar anesthesia. Ophthalmology 1986; 93: 867-70.
6. Gomez RS, Andrade LOF, Costa JR. Brainstem anaesthesia after peribulbar anaesthesia. Can J Anaesth 1997; 44: 732-4.
7. Fichman RA. Use of topical anesthesia alone in cataract surgery. J Cataract Refract Surg 1992; 22: 612-4.
8. Stevens JD. A new local anaesthesia technique for cataract extraction by one quadrant sub-Tenon's infiltration. Br J Ophthalmol 1992; 76: 670-4.
9. Chittenden HB, Meacock WR, Govan JAA. Topical anaesthesia with oxybuprocaine versus sub-Tenon's infiltration with 2% lignocaine for small incision cataract surgery. Br J Ophthalmol 1997; 81: 288-90.
10. Jacobi PC, Dietlein TS, Jacobi FK. Cataract surgery under topical anesthesia in patients with coexisting glaucoma. J Cataract Refract Surg 2001; 27: 1207-13.
11. Pham DT, Scherrer V, Wollensack. Sponge-Oberflächenanästhesie in der Kataraktchirurgie. Klin Monatsbl Augenheilkd 1996; 209: 347-53.
12. Weller A, Pham DT, Häberle H, Müller A, Cieschinger W, Ledergerber M. Sponge-Oberflächenanästhesie mit intracameraler Lidocain-Applikation. Ophthalmologe 2000; 97: 51-3.
13. Gills JP, Cherchio M, Raanan MG. Unpreserved lidocaine to control discomfort during cataract surgery using topical anesthesia. J Cataract Refract Surg 1997; 23: 545-50.
14. Koch PS. Efficacy of lidocaine 2% jelly as topical agent in cataract surgery. J Cataract Refract Surg 1999; 25: 632-4.
15. Pandey SK, Werner L, Apple DJ, Agarwal A, Agarwal A, Agarwal S. No-anesthesia clear corneal phacoemulsification versus topical and topical plus intracameral anesthesia. J Cataract Refract Surg 2001; 27: 1643-50.
16. Manners TD, Burton RL. Randomised trial of topical versus sub-Tenon's local anaesthetic for small incision cataract surgery. Eye 1996; 10: 367-70.
17. Pianka P, Weintraub-Padova H, Lazar M, Geyer O. Effect of sub-Tenon's and peribulbar anesthesia on intraocular pressure and ocular pulse amplitude. J Cataract Refract Surg 2001; 27: 1221-6.
18. Ripart J, Lefrant JY, Vivien B, et al. Ophthalmic regional anesthesia: medial canthus episclera (sub-Tenon's) anesthesia is more efficient than peribulbar anesthesia: a double-blind randomized study. Anesthesiology 2000; 92: 1278-85.