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The Use of Lidocaine Gel Versus Subconjunctival Xylocaine Injection in Pterygium Excision

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Article

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Abstract

Objective
To evaluate the effect of a topical anesthetic gel versus subconjunctival anesthesia on peri- and postoperative pain and on postoperative ocular discomfort in patients undergoing pterygium surgery.

Design
Prospective, randomised clinical trial.

Participants
Forty-one patients undergoing pterygium surgery were randomly assigned to two groups matched based on gender, pterygium size and age.

Methods and Intervention

Group A patients received 2% lidocaine gel while group B patients received a subconjunctival injection of xylocaine 2% hydrochloride solution with 0.125 epinephrine.

Main outcome measures

Peri- and postoperative pain was measured using the Visual Analogue Scale (VAS), and ocular discomfort was evaluated on postoperative day 1 and 8 using the Ocular Surface Index (OSDI) and Oxford Dry Eye Scale .

Results
There was no statistically significant difference between groups in terms of peri- and postoperative pain, neither for average nor for decrease in average VAS scores (all p>0.05). Postoperative Oxford Dry Eye Scale scores did not differ significantly between groups postoperatively (all p>0.05). Although overall lower OSDI scores were measured for the Lidocaine group on postoperative day 1 and 8 (39.4±28.6 vs 48.1±25.6 and 23.5±14.0 vs 28.2±17.5, respectively), this result was not statistically significant (p = 0.284 and p = 0.500, respectively).

Conclusion
Topical lidocaine gel is an effective and safe alternative to the traditional subconjunctival xylocaine injection for pterygium excision as it provides comparable pain control during surgery. However, our study shows that topical lidocaine gel does not offer significant postoperative advantages in terms of pain, dryness, or irritation.

INTRODUCTION

Pterygia are wing-shaped conjunctival overgrowths that typically pass from the nasal conjunctiva onto the corneal surface.(1) They cause a variety of symptoms depending on their size and location, ranging from mild foreign body sensation and redness to more severe symptoms in advanced stages like photophobia and decreased visual acuity (VA) due to induced astigmatism.(1)

First line treatment for pterygium consists of symptomatic relief by the use of artificial tears, lubricating ointments, and sunglasses.(2) Persistent ocular irritation, optical disturbances, or cosmetic issues are important indications for surgical removal(1) to relieve these symptoms. The gold standard surgical treatment option is excision with conjunctival autograft placement since it has the lowest risk of recurrence (0–17%).(3, 4) Adjuvant therapies used during pterygium surgery are widely described as well.(5) However, despite surgical improvements, postoperative pain and exacerbation of the above described symptoms still remain important concerns, often decreasing patient satisfaction.(5, 6)

Currently, the classic anesthetic technique involves a subconjunctival injection of xylocaine 2% solution with 0.125 epinephrine. While giving excellent anesthetic results, associated burning sensation during injection highlights the need for novel techniques to improve patient comfort.(5, 7) Several trials have demonstrated sufficient anesthetic effects of lidocaine 2% gel during surgery.(8–11) Beyond its anesthetic effect, there might be additional advantages associated with it. For example, its viscous consistency offers prolonged surface contact time, thereby protecting the ocular surface from desiccating during surgery.

The goal of our study therefore is to evaluate how the choice of anesthetic technique impacts intra- and postoperative pain and ocular irritation in patients undergoing pterygium excision. Specifically, we will compare the postoperative effects on ocular surface dryness and irritation in patients undergoing pterygium excision using either topical 2% lidocaine gel or subconjunctival injection of xylocaine 2% with 0.125 epinephrine.

METHODS

This prospective, randomised, patient and investigator blinded clinical trial included 41 patients undergoing primary pterygium excision (Table 1). Three initially included patients dropped out before surgery due to fear of surgery. Surgeries were performed between December 2024 and December 2025 at the Ophthalmology department of the University Hospital Brussels (UZB) by the same surgeon (KT). The local ethical committee approved the trial (B.U.N. 1432023000159, NCT05978687). Informed consent was obtained from each participant prior to surgery. Exclusion criteria were a positive history of auto-immune diseases (e.g., Sjögren's syndrome, Lupus, Graves' disease, graft-versus-host disease, rheumatoid arthritis, etc.), anxiety

disorders, communicative barriers (deafness, or impossibility to comprehend the Visual Analogue Scale or Ocular Surface Disease Index (OSDI) questionnaire (not due to language restriction)), as well as recurrent pterygium excisions.

Patients were randomly assigned in two groups: Group A (Lidocaine group) and Group B (Xylocaine group) which were matched based on gender, pterygium size and age using the online minimisation QMinim program.(12) Prior to excision, group A patients received topical Povidone-Iodine and 2% lidocaine gel (Ophtesic®, Horus Pharma, France), while group B patients received Povidone-Iodine and a subconjunctival injection (27-gauge needle) of xylocaine 2% hydrochloride solution with 0.125 epinephrine. In both groups, all patients received topical 1% tetracaine eye drops prior to disinfection and additional doses were administered upon each patient's request. Patients remained masked during the trial. Postoperative treatment consisted of TobraDex® drops (Novartis pharma, tobramycine 3mg/1g and dexamethasone 1 mg/1g) four times daily, reduced by one drop every two weeks.

The operative technique was as follows: a traction suture was applied at the superior limbus (Vicryl 6.0) with a Kocher's forceps. The head of the pterygium was separated from its body with scissors and subsequently removed with a hockey knife. The subconjunctival tissue under the body of the lesion was also removed. The conjunctival graft was separated from Tenon's capsule for harvesting by ballooning with a salt based saline solution in group A, versus by injection of 0.5 mL of 2% xylocaine in group B during the initial anaesthetic injection at the start of the surgery. The autograft was excised from the superior temporal side and secured to the recipient bed with Tisseel® fibrin sealant (Baxter International Inc., Deerfield, Illinois, USA). Lastly, the traction suture was removed and an inferior subconjunctival injection of steroids (Celestone® Chronodose, MSD, Rahway, New Jersey, USA) was administered.

We assessed intra- and postoperative pain and irritation using the Visual Analogue Pain Scale (VAS), the Oxford Dry Eye Scale and the OSDI score at different time points.(13, 14)

1. Pain
   The masked investigators monitored pain assessment with VAS. Patients were asked to give a score from 0 (no pain at all) to 10 (worst pain imaginable). The assessment was done intraoperatively by a nurse of the department while the surgeon left the operating room and postoperatively by the investigator. Pain was monitored at the following time points: initial administration of anesthesia, time of incision, within 5 minutes after surgery, and at follow-up visits on postoperative day one and day eight.
2. Dryness
   Post-operative dryness was assessed in two different ways. The Oxford Dry Eye Scale was considered as an objective tool, whereas the OSDI questionnaire was considered as a subjective way of assessing dryness. The questionnaire was available in English, Dutch, and French. Dryness was monitored at follow-up visits on postoperative day one and day eight by two masked examiners (LH and SA).

Complications such as granuloma formation, non-adherence of the graft or infections were monitored throughout the trial.

Statistical analysis was performed using an independent t-test as well as Anova multiple measures with within-subject contrasts. P-values above 0.05 were considered as not significant. Sample size was calculated based on the mean clinically important difference of the OSDI score.(15) The analyses were performed using SPSS statistics version 26.

Table 1: Patient baseline characteristics and surgery-related data for the total study group and separately for the lidocaine group (Group A) and the xylocaine group (Group B)

		Total	Lidocaine Group (Group A)	Xylocaine Group (Group B)
Number		41	20	21
Age (mean±SD) *(years)*		54.5 ± 13.8 (range 22 - 79)	56.2 ± 14.3 (range 33 - 79)	52.9 ± 13.3 (range 22 - 77)
Gender (n)	Male	21	8	13
	Female	20	12	8
Ethnicity (n)	Caucasian	7	3	4
	Sub-Sahara African	9	7	2
	Hispanic & Latino American	4	1	3
	Middle- Eastern	1	0	1
	North- African	20	9	11
Pterygium size over cornea (mean±SD) *(mm)*		1.94 ± 0.76 (range 1.0 – 3.8)	1.97 ± 0.74 (range 1.0 – 3.5)	1.92 ± 0.79 (range 1.0 - 3.8)
Operated eye (n)	Right	27	16	11
	Left	14	4	10
Need for extra anaesthesia (n)		10	6	4
Surgery duration (mean±SD) *(minutes:seconds)*		24:26 ± 6:31 (range 12:57 – 52:05)	23:59 ± 5:52 (range 12:57 – 34:44)	24:51 ± 7:11 (range 15:02 – 52:05)
Secondary events (n)		0	0	0

mm = millimeter; SD = Standard deviation

Table 2: Peri- and postoperative VAS scores, postoperative Oxford Dry Eye Scale and Ocular Surface Disease Index Scores for the lidocaine and xylocaine group during anaesthesia, incision, 5 minutes after operation, and 1 and 8 days after surgery.

	VAS Score (mean ± SD)					**OXFORD DS (mean ± SD)**		**OSDI (mean ± SD)**	
	Anaesthesia	**Incision**	**POMi5**	**POD1**	**POD8**	**POD1**	**POD8**	**POD1**	**POD8**
Lidocaine Group	1.45 ± 2.44	0.70 ± 1.13	1.60 ± 1.67	2.55 ± 2.44	1.15 ± 1.50	0.75 ± 0.64	0.45 ± 0.51	39.40 ± 28.57	23.52 ±14.05
Xylocaine Group	2.29 ± 2.41	0.38 ± 0.97	1.86 ± 2.03	2.76 ± 2.83	1.00 ± 1.55	0.52 ± 0.60	0.48 ± 0.81	48.10 ± 25.59	28.20 ± 17.46
P-value	0.586	0.182	0.712	0.569	0.696	0.791	0.210	0.284	0.500

VAS = Visual Analogue scale, OSDI = Ocular Surface Disease Index, Oxford DS= oxford dry eye scale, POMi5 = 5 minutes after operation, POD1 = one day after operation, POD8 = eight days after operation

RESULTS

Patient Demographics

Forty-one patients with a mean age of 54.5 years (SD 13.8 years, range 22–79 years) were included in the study (Table 1). Group A (Lidocaine group) consisted of 20 patients, while group B (Xylocaine group) contained 21 patients and groups were age- and gender-matched (p = 0.867 and p = 0.721) (Table 1). Mean pterygium size was 1.94 mm (SD 0.76 mm, range: 1.0 mm – 3.8 mm), with no statistical significant difference in both groups (p = 0.984). Five different ethnicity groups underwent surgery: Caucasian (7 patients), Sub-Sahara African (10 patients), Hispanic and Latino American (4 patients), Middle-Eastern (2 patients) and North-African (21 patients). The mean time of surgery duration was 24 minutes and 26 seconds (SD 6:31 minutes, range 12:57–52:05 minutes). No statistical significant difference was noted between both groups (p = 0.710).

Perioperative and Postoperative Visual Analogue Scale (VAS) Scores

There was no statistically significant difference between Group A and B in mean pain score during anesthesia (p = 0.586) and also not at any other timepoint (all p > 0.05) (Table 2). For both groups, between all perioperative and postoperative measuring points, no significant decrease in mean pain scores was experienced (p = 0.530 and p = 0.961, respectively). Ten patients needed additional topical 1% tetracaine eye drops: 6 in group A versus 4 in group B (p = 0.115).

Oxford Dry Eye Scale and Ocular Surface Disease Index (OSDI) Scores

Both groups had similar mean Oxford Dry Eye Scale Scores at both follow-up timepoints (p = 0.791 and p = 0.210, respectively), as well as a comparable decrease in mean Oxford Dry Eye Scale Scores between postoperative day one and eight (p = 0.356).

On both day one and day eight after surgery, the lidocaine group had lower mean OSDI scores (39.4 ± 28.6 vs 48.1 ± 25.6 and 23.5 ± 14.0 vs 28.2 ± 17.5, respectively), this difference, however, did not reach statistical significance (p = 0.284 and p = 0.500, respectively). The mean decrease of subjective irritation score between postoperative one and eight did also not reach significance between group (p = 0.068).

DISCUSSION

In this prospective, double masked, randomized clinical trial involving 41 patients, we compared the effects of two anaesthetic techniques for pterygium surgery: topical lidocaine gel and subconjunctival xylocaine injection.

Previous studies have been carried out to investigate the possible advantages of lidocaine gel during pterygium surgery, proving its equal pain control during surgery.(8–11) Specifically during anesthesia administration, lidocaine gel decreased patients' fear and anxiety, thereby increasing satisfaction. (8–11) In addition, a 2017 prospective non-comparative study by Joshi et al. showed an excellent pain control 20 minutes after surgery with topical Lignocaine 2% jelly.(16) Our data are consistent with these past findings, showing no statistically significant differences in mean pain scores at any of the measured perioperative (anesthesia administration, incision, and five minutes postoperatively) and postoperative timepoints. This is further supported by the comparable need for additional anesthesia during surgery between both groups in our trial.

Along with mean VAS scores, our study also evaluated both subjective (OSDI Score) and objective (Oxford Dry Scale) measures of dryness and irritation on postoperative days one and eight. Our study indicates that lidocaine gel anesthesia provides equivalent pain and postoperative irritation control on both one and eight days after surgery compared to subconjunctival xylocaine injection. A stabilizing effect of the lidocaine gel on the ocular surface during surgery had previously been reported by Oksuz et al., potentially resulting in less postoperative irritation and dryness while having no side effect on corneal healing.(8, 17)

In line with previous trials, no secondary adverse events (such as endophthalmitis, non-adherence of the graft or granuloma formation) were noted during our trial, corroborating the gel's safety profile.(8, 10, 11, 16)

Several limitations were identified during the course of this study. First, VAS score measurements at three different timepoints during surgery occasionally caused confusion among patients often needing additional information during surgery. Second, baseline Oxford Dry Eye Scale and OSDI scores were not recorded preoperatively, thereby limiting the assessment of changes over time. To solve both limitations future studies should consider asking patients' their maximum experienced pain during the whole study period, as well as focus on the course of these scores over time. As the mean decrease in OSDI score between postoperative day 1 and 8 almost reached significance (p = 0.068), this finding may warrant further investigation with a larger sample size.

CONCLUSION

Topical Lidocaine gel is an effective and safe alternative to the traditional subconjunctival xylocaine injection for pterygium excision. It is easy to administer, eliminates the need for frequent surface lubrification, and provides comparable pain control during surgery. However, our study shows that topical Lidocaine gel does not offer significant postoperative advantages in terms of pain, dryness, or irritation.

Declarations

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