Efficacy and safety of intraoperative use of tropicamide 0.02%/phenylephrine0.31%/lidocaine1% intracameral combination during pediatric cataract surgery

Paolo Nucci
University of Milan
Andrea Lembo (andrealembo1984@hotmail.com)
San Giuseppe Hospital
Roberto Caputo
Anna Meyer Children's University Hospital
Andrea Dellavalle
University of Milan
Massimiliano Serafino
IRCCS Istituto Giannina Gaslini
Irene Schiavetti
University of Genoa
Francesco Pichi
Cleveland Clinic Abu Dhabi

Research Article

Keywords: pediatric cataract, pediatric ophthalmology, surgery, cataract surgery, mydriatic

Posted Date: March 23rd, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1458073/v1

Abstract

Background: to demonstrate the safety and efficacy of the intracameral use of tropicamide 0.02%/phenylephrine 0.31%/lidocaine 1% in pediatric cataract surgery, a combination widely used in adult patients but still off-label in children

Methods: Design: two-center, prospective, observational study

Setting: San Giuseppe Hospital, Milan and Meyer Children's Hospital, Florence

Study population: children from 0 to 4 years of age undergoing cataract surgery with or without intraocular IOL implantation, in the absence of clinically significant systemic conditions, history of ocular surgery, concurrent ocular medication, hypersensitivity to any of the substances and post-traumatic cataracts. During the surgery, patients received the combination drug after the primary access to the anterior chamber. Efficacy was evaluated by achieving an adequate mydriasis in order to perform capsulorhexis, while safety was assessed by recording vital signs (heart rate, blood pressure, respiratory rate, temperature) pre and post administration of the substance.

Results: this study included 53 surgical procedures of 36 patients: 41 eyes were left aphakic while 12 eyes received primary IOL implantation. The pupil size was adequate to safely perform capsulorhexis in 52 procedures of 53. The difference in pupil enlargement was significant (6.0 ± 1.14mm, P = < 0.001). There were no notable changes in vital parameters.

Conclusions: the administration of intracameral tropicamide 0.02%/phenylephrine 0.31%/lidocaine 1% in pediatric cataract surgery is effective for obtaining an adequate mydriasis without any vital parameters changes throughout the procedure.

Introduction

Pediatric cataract is a leading cause of childhood blindness worldwide. To prevent severe amblyopia, surgery must be performed during early infancy [1, 2]. Proper mydriasis lasting throughout the procedure is mandatory for an uneventful surgery. An adequate pupil dilatation is crucial to provide a good red reflex, a complete visualization of the surgical field and enough space for surgical instruments. Poor mydriasis can result in sight-threatening complications including posterior capsule rupture, vitreous prolapse and loss, iris trauma and the potential risk of developing retinal detachment in the postoperative period [3, 4]. In the infant, pupils dilate poorly, and the dilator muscle could be underdeveloped, therefore explaining the importance of obtaining and maintaining good mydriasis during the surgical procedure.

Phenyleprine and Tropicamide are two of the most common agents used in adults to ensure an adequate pupil mydriasis during cataract surgery.

Phenylephrine is an α-1 adrenergic receptor agonist and its intracameral use may have a potential risk of increasing mean arterial pressure. Phenylephrine eye drops, absorbed through the conjunctiva and nasal

mucosa, have been shown to cause systemic cardiovascular effects, such as blood pressure (BP) elevation and heart rate (HR) disturbances [5–8]. Tropicamide is an anticholinergic agent exerting a dilatory effect on the pupil and theoretically anticholinergic systemic effects include increased heart rate, headache and dry mouth, especially in young children and older patients [9]. Lidocaine is a local anesthetic agent commonly used to provide anesthesia and has an adequate safety margin before it may reach toxic blood levels no matter the administration route, whether by injection, inhalation, or as a topical agent [10–12].

Tropicamide 0.02%/phenylephrine 0.31%/lidocaine 1% (Mydrane®) is a mydriatic/anesthetic combination that has previously been approved in adults for intracameral use during cataract surgery, being able to provide persistent mydriasis all through the surgery [13].

A recent study by Wilson et al. demonstrated that phenylephrine and ketorolac 1.0%/0.3% combination in children aged 0 to 3 years maintained adequate mydriasis throughout cataract surgery with or without IOL implantation, was safe for use and decreased postoperative pain compared with phenylephrine 1% alone [14].

Given the paucity of studies in the pediatric population, we wanted to demonstrate, through a prospective study, safety and efficacy of intracameral fixed-dose of tropicamide/phenylephrine/lidocaine in pediatric cataract surgery, a combination already approved in adult patients but still used off-label in children.

Subject And Methods

The study contains a two-center, prospective, observational study conducted in San Giuseppe Hospital, Milan and in Meyer Children's Hospital Florence. The local Medical Ethics Committees approved the study and written informed consent was obtained from the parent or legal guardian of each child involved in the research after describing the nature and the purpose of the study. The study population consisted of children from 0 to 4 years of age.

Inclusion criteria were the need for cataract surgery with or without intraocular IOL implantation and obtainment of written informed consent. Exclusion criteria were: the presence of clinically significant cardiovascular, respiratory, gastrointestinal, hematological, endocrine, neurological conditions that could increase the surgical risk; presence of microphthalmos; persistent fetal vasculature; previous history of ocular surgery; any concurrent ocular medication that would interfere with the result of the study; reported hypersensitivity to any of the active substances used in the study; post-traumatic cataracts.

Surgery was performed by two surgeons - one for each center (P.N., R.C.) - through two corneal incisions (at hours VII-XI for the right eye, and II-V for the left eye). Every patient received Tropicamide 0,2 mg/ml + Phenylephrine 3,1 mg/ml + Lidocaine 10 mg/ml with a single intracameral injection of 0.1ml, resulting in rapid and persistent mydriasis. In Fig. 1, it is possible to see the effect of the injection in a 4-weeks-old infant. Figure 2 evaluates the effect of the same injection in a 46-month-old baby.

The mydriatic/anesthetic injection was followed by cohesive high viscosity ophthalmic viscosurgical device (OVD) (occasionally Methylene blue) and a continuous curvilinear capsulorhexis. Posterior capsulectomy and anterior vitrectomy were performed using a limbal or a combined limbal/pars plana approach in case of primary IOL implantation. Finally, pupil constriction was achieved with intracameral injection of acetylcholine chloride 20 mg/2 ml. Obtaining a satisfactory miosis quickly and safely was necessary in order to evaluate pupil regularity and stabilize the posterior IOL. We considered IOL implantation in surgeries performed in patients after 2 years old.

Safety of intracameral combination of mydriatic/anesthetic was evaluated by recording vital signs (heart rate, blood pressure, respiratory rate, temperature) pre and post administration of the substance. We recorded the total duration of the surgical procedure and we reported the values of the above parameters one minute before the intracameral injection and one minute after the injection of the combination.

The efficacy endpoint was the achievement of an adequate mydriasis in order to perform capsulorhexis without additional mydriatic. The surgeon evaluated each eye's mydriatic response to combination drug and considered it adequate if pupil size was more than 5mm. Using frames from video recordings, pupil size was measured before and after intracameral injection of the substance and after acetylcholine injection.

Adverse events were recorded.

STATISTICS

Continuous variables were summarized as mean with standard deviation and median with range; categorical data were expressed with frequency and percentage.

Paired sample T-test (or Wilcoxon signed-rank test) and Mc Nemar test were applied for the comparison of pre/post-surgery parameters within patients.

The evaluation of differences over time in each subscore of Alder Hey Triage Pain Score (AHTPS) within patient was performed with one-way ANOVA with repeated measures or by a non-parametric Friedman test, as appropriate. Results refers to two-tailed p-value, alpha = 0.05.

Results

This prospective study included 55 eyes of 38 patients with pediatric cataract scheduled for phacoemulsification with or without IOL implantation. Of 38 patients, 20 were males (52.6%) and the median age was 6 weeks with a range from 4 to 189 weeks (mean age: 20.2 ± 41.9 weeks). Of 38 patients, 17 children (44.7%) underwent a second surgery in the fellow eye because of bilateral cataracts.

One eye was excluded due to technical problems with video recorder, while another eye was excluded because during the surgery the iris showed unusual floppiness and prolapse from the incision.

Overall, we video-recorded 53 surgical procedures of 36 patients. Of 53 eyes, 41 eyes (77,4%) were left aphakic at the time of surgery while 12 eyes received primary IOL implantation (the choice was mainly related to patient's age).

Regarding the safety endpoint, intracameral tropicamide/phenylephrine/lidocaine was generally well tolerated in children undergoing cataract surgery. There were no notable changes in mean blood pressure, heart rate, respiratory rate or temperature pre and post administration of combination of mydriatic/anesthetic (Table 1).

Table 1
pupil dilatation and vital signs recorded pre and post injection of Tropicamide 0,2 mg/ml + Phenylephrine 3,1 mg/ml + Lidocaine 10 mg/ml (N = 53)

	Pre injection	Post injection	$\Delta_{post-pre}$	p
Pupil dilatation (before and after Mydrane)	1.9 ± 0.51 1.8 (1.2–3.3)	7.9 ± 0.95 7.9 (5.7–10.1)	6.0 ± 1.14	< 0.001*
Pupil dilatation (before and after Acetylcholine)	7.9 ± 0.95 7.9 (5.7–10.1)	5.4 ± 0.62 5.4 (4.2–6.8)	-2.5 ± 1.00	< 0.001*
Systolic blood pressure	96.1 ± 5.14 95.0 (88.0–111.0)	95.8 ± 4.71 95.0 (88.0–106.0)	-0.3 ± 1.51	0.20
Diastolic blood pressure	58.8 ± 3.78 58.0 (52.0–67.0)	58.8 ± 3.75 58 (52.0–67.0)	0.0 ± 1.14	0.99
Heart rate	134.0 ± 13.71 134.0 (100.0–158.0)	134.0 ± 13.39 134.0 (100.0–158.0)	0.0 ± 2.72	0.99
Respiratory rate	38.8 ± 7.1 41.0 (25.0–52.0)	39.1 ± 7.3 41.0 (25.0–54.0)	0.3 ± 1.24	0.99
Temperature (°C)	36.8 ± 0.53 36.6 (36.2–37.7)	36.9 ± 0.56 36.6 (36.2–37.7)	0.0 ± 0.30	0.61
Results are expressed as mean ± standard deviation, median (range) and count (percentage)				

As for the efficacy endpoint, our surgeons considered the pupil size more than adequate to safely perform cataract surgery and capsulorhexis without additional mydriatic use in 52 procedures of 53 (98.1%), with a mean pupil size after injection of 7.9 ± 0.95 mm. Additional intraoperative mydriatic procedure was requested in one eye not reaching an adequate mydriasis in order to perform capsulorhexis: ophthalmic

viscosurgical device was injected into the anterior chamber (viscomydriasis) expanding the pupil to the desired size.

The difference in pupil enlargement before and after intracameral combination administration was significant (Table 1) (Δpost-pre 6.0 ± 1.14 mm) (P = < 0.001), showing a great response to combination drug.

The difference in pupil contraction before and after intracameral acetylcholine administration was significant (Table 1) (Δpost-pre − 2.5 ± 1.00 mm) (P = < 0.001), showing effective pupil contraction after dilatation with intracameral mydriatic.

Ocular adverse events considered related to study drug were uncommon and are reported in Table 2.

Table 2
ocular adverse events considered related to study drug (N = 53)

Ocular AEs	N°	%
mild conjunctival hyperaemia	4	7.55%
mild chemosis	3	5.66%
Punctate keratitis	1	1.89%
increased IOP	1	1.89%

The most frequently observed AEs were mild ocular hyperemia, mild chemosis, punctate keratitis, increased IOP none exclusively correlated to the drug administration. None of our patients had intraoperative complications that would interfere with the continuation of the intervention, except the one with iris prolapse, possibly caused by initial presence of viscoelastic behind the iris plan. Overall, the combination of Mydriatic/anesthetic was not associated with significant long-term corneal, IOP or retinal complication resulting in irreversible visual sequelae.

Discussion

In our prospective observational study, we analysed the efficacy and safety of intracameral combination of mydriatic/anesthetic for paediatric use, still considered an off-label use for children.

Our efficacy endpoint - an adequate mydriasis in order to perform capsulorhexis without additional mydriatic - was achieved in 52 out of 53 surgical procedures.

Capsulorhexis is a fundamental step in phacoemulsification surgery and is inevitably associated to the quality and stability of mydriasis. In our study, intracameral combination provided a significant pupil size change before and after intracameral administration, also showing a rapid reversal of mydriasis after the use of acetylcholine. In a similar study by Kaur et al., the combination of mydriatic/anesthetic injected

intracamerally has been shown to be an effective and safe way to obtain stable mydriasis in pediatric cataract surgery [15].

Regarding safety, every pharmacological agent of the combination drug has its potential side effects. Even if absorption of phenylephrine could be unpredictable and occasional pressure spikes are possible collateral effect reported by many pediatric ophthalmologists -included the Authors-, a recent meta-analysis by Stavert et al. showed how systemic adverse events of topical phenylephrine in adults might have been overestimated for many years. This work demonstrated that the use of 2.5% phenylephrine is not correlated with clinically significant BP or HR changes, while changes in BP or HR seen with 10% phenylephrine may be transient and of uncertain clinical relevance[8]. The commonest reported side effects with intravenous use of Tropicamide are confusion, vision changes, vomiting, low blood pressure, sleepiness, numbness, irregular heart rate[10,11]. Indeed, Tropicamide has a very low affinity for muscarinic receptors and therefore infrequently provokes systemic effects [9]. Even lidocaine, when used as a local anesthetic, has rare adverse systemic reactions [12].

In adults the combination of Tropicamide/Phenylephrine/Lidocaine is associated with minor discomfort, sense of pressure and pain than the topical one [13]. In the phase III trial conducted by Labetoulle et al., systemic exposure to the single components of the combination was very low, with almost undetectable plasma concentrations at all timepoints after a 0.2ml intracameral administration, in contrast with higher concentrations in patients receiving the tropicamide plus phenylephrine eye drops. The intracameral combination was also at least as effective as topical administration of tropicamide plus phenylephrine in achieving successful capsulorhexis without additional mydriatic[13].. In a post-hoc analysis by Guell et al., intracameral regimen of combination drug in adults was correlated with less clinically meaningful cardiovascular events (i.e.: a heart rate value > 120 bpm, a systolic BP value > 200 mmHg, a diastolic BP value > 100 mmHg) than topical regimen[16].

In our study, given the differences in vital parameters between a 6 weeks old child (median age of the study population) and older children, the values can differ and have to be interpreted carefully. Overall, the systolic blood pressure, diastolic blood pressure and heart rate were stable before and after the administration of the combination of mydriatic/anesthetic (respectively − 0.3 ± 1.51 mmHg, P = 0.20, 0.0 ± 1.14 mmHg P = 0.99 and 0.0 ± 2.72 bpm P = 0.99). The respiratory rate and temperature again shows no clinical difference between pre and post intracameral administration.

When talking about children, there is always a major concern of different biological reactions compared to adults, but these results are in line with previous clinical studies on intracameral mydriatic in adults, where no systemic adverse effects were reported [17,18].

For what may concern ocular adverse events, our findings are consistent with that reported in previous studies of intracameral mydriatic agents[19,20].

All the AEs are common findings after paediatric cataract surgery, not resulting neither in intraoperative concerns impeding the conclusion of the entire procedure nor in post-operative therapies or permanent

vision loss.

In the previously cited study by Labetoulle et al. in adult cataract surgery, both intracameral combination of mydriatic/anesthetic and topical regimen resulted in a lack of any serious AEs requiring hospitalisation, resulting in permanent visual loss or post-operative issues concerning pachymetry, IOP, funduscopy and retinal thickness compared with baseline[13].

A drawback of our study was the absence of a comparison drug. Indeed, intracameral tropicamide/phenylephrine/lidocaine has been used off-label all these years by pediatric surgeon in phacoemulsification, thus creating a randomized placebo controlled study with another reference molecule is necessarily difficult. Moreover, given the small sample size and the heterogeneity of the study population -mainly in demographic terms-, an international, multi-centric study enrolling more patients could be needed in the future. Even if legislative efforts have increased emphasis of studying therapeutic agents in children, the need for consent from parents and the level of risk to which children may be exposed may limit participation in clinical trials when compared with adult trials.

Since the limited amount of resources available for conducting trials in children, efforts on safety and efficacy should be prioritized for agents that are used in children with high prevalence. In our study the combination of Tropicamide 0.02%/phenylephrine 0.31%/lidocaine 1% administered intracamerally with irrigation solution during cataract surgery in children from 4 weeks to nearly 4 years old has been proven to be effective for rapidly achieving mydriasis and maintaining a stable pupil size during the whole procedure. Our results show minimal (and most of all clinically insignificant) variations of the safety parameters combined with a statistically significant pupil diameter change before and after administration of the combination drug.

Declarations

FUNDING: The authors did not receive any financial support from any public or private sources.

FINANCIAL INTERESTS: The authors have no financial conflict of interest in a product, method or material described herein.

AUTHOR CONTRIBUTIONS: P.N. contributed to the study conception and design. Material preparation, data collection, and analysis were performed by A.L. The first draft of the manuscript was written by A.D., and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

References

1. Wang, J., Chen, J., Chen, W., Wang, Q., Zhao, L., Wang, R., Liu, Z., Chen, H., Cao, Q., Tan, X., Lin, Z., Li, X., Li, J., Lai, W., Zhu, Y., Chen, C., Zheng, D., Wu, M., Han, Y., Chen, W., … Lin, H. (2020). Incidence of and Risk Factors for Suspected Glaucoma and Glaucoma After Congenital and Infantile Cataract

Surgery: A Longitudinal Study in China. Journal of glaucoma, *29*(1), 46–52. https://doi.org/10.1097/IJG.0000000000001398

2. Serafino, M., Trivedi, R. H., Levin, A. V., Wilson, M. E., Nucci, P., Lambert, S. R., Nischal, K. K., Plager, D. A., Bremond-Gignac, D., Kekunnaya, R., Nishina, S., Tehrani, N. N., & Ventura, M. C. (2016). Use of the Delphi process in paediatric cataract management. The British journal of ophthalmology, *100*(5), 611–615. https://doi.org/10.1136/bjophthalmol-2015-307287
3. Plager, D. A., Lynn, M. J., Buckley, E. G., Wilson, M. E., Lambert, S. R., & Infant Aphakia Treatment Study Group (2011). Complications, adverse events, and additional intraocular surgery 1 year after cataract surgery in the infant Aphakia Treatment Study. Ophthalmology, *118*(12), 2330–2334. https://doi.org/10.1016/j.ophtha.2011.06.017
4. Yorston, D., Yang, Y. F., & Sullivan, P. M. (2005). Retinal detachment following surgery for congenital cataract: presentation and outcomes. Eye (London, England), *19*(3), 317–321. https://doi.org/10.1038/sj.eye.6701463
5. Cantrell, M. A., Bream-Rouwenhorst, H. R., Steffensmeier, A., Hemerson, P., Rogers, M., & Stamper, B. (2008). Intraoperative floppy iris syndrome associated with alpha1-adrenergic receptor antagonists. The Annals of pharmacotherapy, *42*(4), 558–563. https://doi.org/10.1345/aph.1K679
6. Fraunfelder, F. W., Fraunfelder, F. T., & Jensvold, B. (2002). Adverse systemic effects from pledgets of topical ocular phenylephrine 10%. American journal of ophthalmology, *134*(4), 624–625. https://doi.org/10.1016/s0002-9394(02)01591-x
7. Li, Q., Pang, J., Deng, Y., Zhang, S., Wang, Y., Gao, Y., Yuan, X., Wei, Y., Zhang, H., Tan, J., Chi, W., & Guo, W. (2021). Adverse Cardiovascular Effects of Phenylephrine Eye Drops Combined With Intravenous Atropine. Frontiers in pharmacology, *11*, 596539. https://doi.org/10.3389/fphar.2020.596539
8. Stavert, B., McGuinness, M. B., Harper, C. A., Guymer, R. H., & Finger, R. P. (2015). Cardiovascular Adverse Effects of Phenylephrine Eyedrops: A Systematic Review and Meta-analysis. JAMA ophthalmology, *133*(6), 647–652. https://doi.org/10.1001/jamaophthalmol.2015.0325
9. Vuori, M. L., Kaila, T., Iisalo, E., & Saari, K. M. (1994). Systemic absorption and anticholinergic activity of topically applied tropicamide. Journal of ocular pharmacology, *10*(2), 431–437. https://doi.org/10.1089/jop.1994.10.431
10. Lidocaine Hydrochloride (Local) The American Society of Health-System Pharmacists. Retrieved Aug 26, 2015. Available at: https://www.drugs.com/monograph/lidocaine-hydrochloride-local.html
11. Lidocaine hydrochloride (4% and 8%) dextrose 5% injection prescribing information). Safety labeling changes approved by FDA center for drug evaluation and research (CDER) U.S. Food & Drug Administration. 2014 Jan; Available at: https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/018461s058lbl.pdf.
12. Nebbioso, M., Livani, M. L., Santamaria, V., Librando, A., & Sepe, M. (2018). Intracameral lidocaine as supplement to classic topical anesthesia for relieving ocular pain in cataract surgery. International journal of ophthalmology, *11*(12), 1932–1935. https://doi.org/10.18240/ijo.2018.12.09

13. Labetoulle, M., Findl, O., Malecaze, F., Alió, J., Cochener, B., Lobo, C., Lazreg, S., Hartani, D., Colin, J., Tassignon, M. J., Behndig, A., & Intracameral Mydrane Study 2 Group (2016). Evaluation of the efficacy and safety of a standardised intracameral combination of mydriatics and anaesthetics for cataract surgery. The British journal of ophthalmology, *100*(7), 976–985. https://doi.org/10.1136/bjophthalmol-2015-307587
14. Wilson, M. E., Trivedi, R. H., & Plager, D. A. (2020). Safety and efficacy data supporting U.S. FDA approval of intracameral phenylephrine and ketorolac 1.0%/0.3% for pediatric cataract surgery: clinical safety and pupil and pain management. Journal of cataract and refractive surgery, *46*(6), 873–878. https://doi.org/10.1097/j.jcrs.0000000000000194
15. Kaur, S., Korla, S., Ram, J., Gupta, P. C., & Sukhija, J. (2021). Intracameral anesthetic mydriatic (ICAM) assisted pediatric cataract surgery. *European journal of ophthalmology*, 11206721211006575. Advance online publication. https://doi.org/10.1177/11206721211006575
16. Guell, J., Behndig, A., Pleyer, U., Jaulerry, S., Rozot, P., Pisella, P. J., Robert, P. Y., Lanzl, I., Pourjavan, S., Aguiar, C., Fernandez, J., Grabner, G., Mencucci, R., Chiambaretta, F., & Labetoulle, M. (2019). Systemic exposure to intracameral vs topical mydriatic agents: in cataract surgery. Clinical ophthalmology (Auckland, N.Z.), *13*, 811–819. https://doi.org/10.2147/OPTH.S189671
17. Lundberg, B., & Behndig, A. (2003). Intracameral mydriatics in phacoemulsification cataract surgery. Journal of cataract and refractive surgery, *29*(12), 2366–2371. https://doi.org/10.1016/s0886-3350(03)00522-4
18. Behndig, A., & Eriksson, A. (2004). Evaluation of surgical performance with intracameral mydriatics in phacoemulsification surgery. Acta ophthalmologica Scandinavica, *82*(2), 144–147. https://doi.org/10.1111/j.1600-0420.2004.00241.x
19. Donnenfeld, E. D., Whitaker, J. S., Jackson, M. A., & Wittpenn, J. (2017). Intracameral ketorolac and phenylephrine effect on intraoperative pupil diameter and postoperative pain in cataract surgery. Journal of cataract and refractive surgery, *43*(5), 597–605. https://doi.org/10.1016/j.jcrs.2017.02.030
20. Hovanesian, J. A., Sheppard, J. D., Trattler, W. B., Gayton, J. L., Malhotra, R. P., Schaaf, D. T., Ng, E., & Dunn, S. H. (2015). Intracameral phenylephrine and ketorolac during cataract surgery to maintain intraoperative mydriasis and reduce postoperative ocular pain: Integrated results from 2 pivotal phase 3 studies. Journal of cataract and refractive surgery, *41*(10), 2060–2068. https://doi.org/10.1016/j.jcrs.2015.10.053

Figures

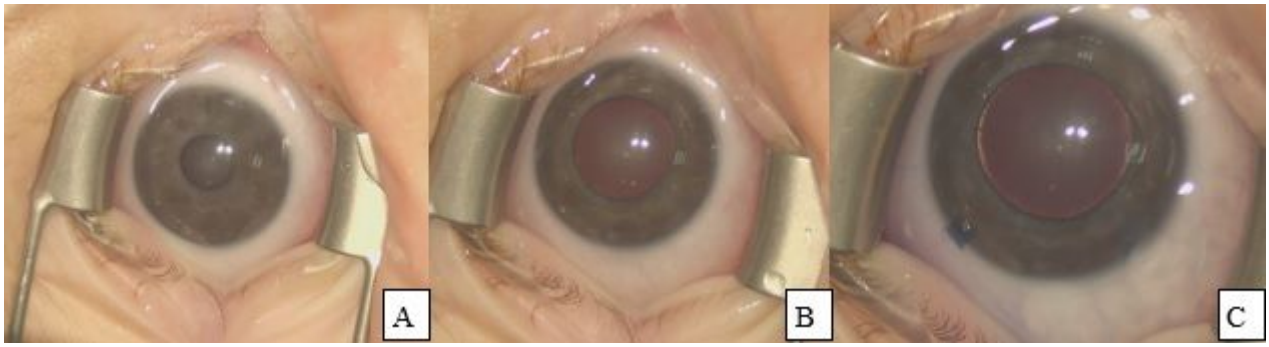

Figure 1

Tropicamide 0,2 mg/ml + Phenylephrine 3,1 mg/ml + Lidocaine 10 mg/ml injection in a 4-weeks-old infant. In Panel A, it is possible to see the patient's pre-operative myosis; after a single intracameral injection a rapid and stable mydriasis is obtained after 10 seconds (Panel B) and 20 seconds (Panel C)

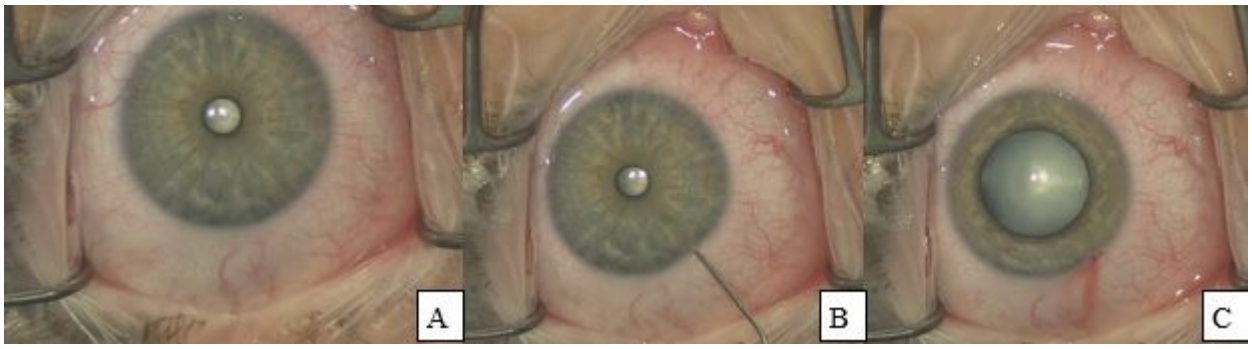

Figure 2

Tropicamide 0,2 mg/ml + Phenylephrine 3,1 mg/ml + Lidocaine 10 mg/ml injection in a 46-month-old baby. In Panel A it is possible to see the patient's pre-operative myosis; and again after a single intracameral injection (Panel B) an adeguate mydriasis is obtained (Panel C)