

www.h  
www.l  
SEH  
• Badl  
eine L  
Sinnel  
dieses  
schwe

PER  
gotoper.com

# Ophthalmology Times

CUTTING-EDGE ADVANCEMENTS

## EUROPE®

APRIL 2020 VOL. 16, NO. 3

INTRODUCING

# SOLIX

FULLRANGE™ OCT

## DISCOVER WHAT'S NEXT

SOLIX is new technology built upon a proven foundation of ultra-high-speed Spectral Domain OCT. This FullRange platform delivers a field of view that is wide and deep yet does not sacrifice image clarity and resolution. SOLIX delivers multiple tools for a new generation of disease management that empowers practitioners to identify and manage pathologies from the front of the eye to the back.

Learn more at [Optovue.com/SOLIX](http://Optovue.com/SOLIX).



OPTOVUE



# 'Blue period': The new stylistic phase of ophthalmic surgeons?

New development in OVDs aims to make procedures faster, easier and safer

By Dr Andreas F. Borkenstein and Dr Eva-Maria Borkenstein

Ophthalmic viscosurgical devices (OVDs) are routinely used in cataract surgery to fulfil important functions in phacoemulsification and implantation of IOLs. Even experienced surgeons regard manual capsulorhexis as one of the most technically demanding phases of cataract surgery. In specific preoperative situations, such as pseudoexfoliation syndrome (PEX) or mature cataracts, vital dyes are therefore frequently used to improve the visibility of the anterior capsule. Among the various vital dyes, Trypan Blue is considered to be one of the most effective in terms of staining degree and is also classified as safe for the human cornea and the cells of the trabecular meshwork.<sup>1,2</sup>

To limit staining to the region of interest, methods have been described to mix dyes, e.g., Trypan Blue or Indocyanine Green, preoperatively with viscoelastic substances.<sup>3,4</sup> However, this method involves the risk of contamination. A new development in the field of OVDs was recently presented by Alomed (Schwarzenbruck, Germany). The blue viscoelastic Pe-Ha-Blue PLUS (Figure 1) is a combination of bio-fermented sodium hyaluronate (1.7%) and Trypan Blue (0.020 mg/ml), and is supplied sterile and premixed in a ready-to-use syringe. It is CE-approved and allows simultaneous injection of OVD and Trypan Blue in a single step, making ophthalmologic procedures safer, easier and faster.

We conducted a prospective study in our clinic (Privatklinik der Kreuzschwestern, Graz, Austria) to evaluate this new OVD.<sup>5</sup> The objective was to investigate whether the use of Pe-Ha-Blue PLUS (group A; 26 patients) during cataract surgery in patients with PEX and narrow pupils has advantages over the use of a clear standard OVD (POLYHYL 1.6%; Polytech Domilens GmbH) in combination with Trypan Blue (VisionBlue/Blue Color Caps) (group B; 26 patients) (Figure 2). In all cases, a Malyugin ring (6.25 mm) was used intraoperatively to ensure sufficient pupil dilation.

The median age in both groups was 75 years. Post-operative examinations were performed 6 hours, 20 hours and 4 weeks after surgery. With Pe-Ha-Blue

PLUS, it is possible to fill the anterior chamber with OVD and Trypan Blue in a single step, which shortens the entire operating room (OR) duration. The primary study endpoint was therefore the evaluation of the safety aspect and the operation time. Our results were unambiguous and showed a statistically significant lower OR duration in group A. Median surgery time for this first phase of surgery was 112 seconds in group A versus 165 seconds in group B ( $P < 0.001$ ).

This corresponds to a time saving of 53 seconds for the entire OR duration. By using Pe-Ha-Blue PLUS, the total number of necessary surgical steps (1: paracentesis, 2: corneal incision, 3: Suprarenin injection, 4: OVD injection, 5: Malyugin ring insertion, 6: OVD aspiration, 7: Trypan Blue injection, 8: Trypan Blue aspiration, 9: re-injection of the OVD) could be reduced to only five steps (eliminating steps 6–9). The shorter OR time increases the effectiveness of the surgical workflow and is therefore particularly interesting for high-volume clinics. In addition, the safety of the procedure is enhanced as a shortened operating time can reduce the incidence of complications such as endophthalmitis. In addition, less corneal edema and faster recovery are expected post-operatively due to the shorter contact time and less manipulation. In our opinion, this could be one reason why distance visual acuity on the first post-operative day was better in group A (median UDVA: 0.15 logMAR) compared to group B (median UDVA: 0.22 logMAR). For the patient, a shorter OR time subjectively results in an additional "comfort factor", also with regard to local anaesthesia.

To evaluate satisfaction with the surgical procedure and the OVD used in the study, the surgeon and the surgical nurse completed a short questionnaire

## IN SHORT

► Simultaneous injection of an ophthalmic viscosurgical device (OVD) and Trypan Blue in a single step offers numerous advantages in cataract surgery.

immediately after the procedure. A small advantage in favour of group A was shown, which in retrospect also confirms our subjective impression. The overall satisfaction was rated "very good" or "good" in 89% (group A) and 73% (group B) of cases.

After our clinical experience with Pe-Ha-Blue PLUS in more than 100 challenging cases, we see further advantages of this new OVD. The blue viscoelastic is clearly visible to the surgeon, allowing full aspiration of all residues, reducing the risk of post-operative IOP increase. In our study, we demonstrated that the post-operative IOP was on average 1 mmHg lower in the Pe-Ha-Blue PLUS group. Further evaluations with a larger number of cases are planned. In the case of toric IOLs, complete OVD removal between the lens and the posterior capsule also reduces the risk of post-operative IOL rotation. For IOLs with large optic diameters or lenses with plate haptic designs, any residual OVD can be visualised and completely removed. Thus, this OVD would also be an option in refractive procedures like clear lens extraction.

If an "Argentinian flag sign" occurs intraoperatively in cases of cataracta provecta/hypermatura during rhexis, the anterior chamber can be refilled again with Pe-Ha-Blue PLUS. This creates an endothelium-friendly space and at the same time improves visualisation without the risk of Trypan Blue entering the posterior chamber or the vitreous body. The same applies to intraoperative complications such as capsule tearing with vis-à-tergo. Furthermore, it was observed that pronounced synchysis scintillans and vitreous opacities are less disturbing for the surgeon intraoperatively, since the fundus reflex is reduced by the blue dye in the anterior chamber or in the capsular bag during the operation and thus the "moving shadows" are perceived less strongly. Disturbing air bubbles in the anterior chamber can also be identified more quickly during phacoemulsification and aspirated more easily. The resulting visco-free area, which appears as a bright spot surrounded by blue OVD, can then be quickly re-filled with new OVD without affecting the endothelium.

Of particular interest for educational purposes and trainees is the fact that Pe-Ha-Blue PLUS and clear standard OVD can be used simultaneously to highlight structures in the eye and to achieve better stereoscopic vision. The fact that Pe-Ha-Blue PLUS reduces the UV component of the microscope light also contributes to intraoperative protection of the macula, which seems to be particularly useful during long surgeries. If complications such as capsular defects or vitreous body loss occur, the blue OVD may also be useful to stain the posterior capsule without entering the vitreous and causing possible toxic side effects on the retina. In addition, the vitreous body becomes more visible in the anterior chamber and can be aspirated more easily (anterior vitrectomy).

It should be noted that Pe-Ha-Blue PLUS stains the capsule less intensively than conventional Trypan Blue and that it cannot be used unrestrictedly during surgery for external applications, e.g., as protection or moisturisation of the epithelium and conjunctiva, as this would impair the surgeon's view. In exceptional cases of a pronounced subcapsular cataract in high myopic eyes with fundus myopicus the visualisation during the OR may be somewhat limited when using Pe-Ha-Blue PLUS (reduced fundus reflex).

In order to achieve the maximum colouring effect of Pe-Ha-Blue PLUS, it is very important to have a good proportion of blue light in the light source of the operating microscope. In general, Xenon or LED light sources offer a higher wavelength proportion corresponding to the blue colour than tungsten or halogen light sources.

The study results as well as our clinical experience show that the new OVD offers numerous advantages, such as more selective staining, improved visualisation of anatomical structures in the eye and a reduction of the OR time in difficult cases. In addition to cataract surgery, we also see applications for Pe-Ha-Blue PLUS in glaucoma (MIGS) and corneal surgery. In summary, this OVD can be a helpful alternative to clear standard OVD in challenging cases to improve the surgical workflow and make the entire procedure faster and safer.



(FIGURE 1) The new blue OVD, Pe-Ha-Blue PLUS. (FIGURE 2) Incident-light microscopic examination of the Pe-Ha-Blue PLUS and the clear Polyhyl 1.6%; performed by A. F. Borkenstein at the Technical University of Graz (Austria). (Images courtesy of Dr A. F. Borkenstein)

## REFERENCES

1. Dada VK, Sharma N, Sudan R, Sethi H, Dada T, Pangtey MS. Anterior capsule staining for capsulorhexis in cases of white cataract: comparative clinical study. *Journal of cataract and refractive surgery*. 2004;30(2):326-333.
2. Tsaousis KT, Kopsachilis N, Tsinopoulos IT, Dimitrakos SA, Kruse FE, Weige-Luessen U. Time-dependent morphological alterations and viability of cultured human trabecular cells after exposure to Trypan blue. *Clinical & experimental ophthalmology*. 2013;41(5):484-490.
3. Kayikcioglu O, Erakgun T, Guler C. Trypan blue mixed with sodium hyaluronate for capsulorhexis. *Journal of cataract and refractive surgery*. 2001;27(7):970.
4. Kadonosono K, Itoh N, Uchio E, Nakamura S, Ohno S. Staining of internal limiting membrane in macular hole surgery. *Archives of ophthalmology (Chicago, Ill : 1960)*. 2000;118(8):1116-1118.
5. Borkenstein AF, Borkenstein EM. Evaluation of a Novel Blue-Colored Ophthalmic Viscoelastic Device Applied during Phacoemulsification in Eyes with Pseudoexfoliation Syndrome. *Case Reports in Ophthalmology*. 2019;10(1):101-109.

**DR ANDREAS F. BORKENSTEIN, MD**

e: [crystalith@gmx.at](mailto:crystalith@gmx.at)

**DR EVA-MARIA BORKENSTEIN, MD**

e: [crystalith@gmx.at](mailto:crystalith@gmx.at)

*Borkenstein & Borkenstein private practice, Privatklinik der Kreuzschwestern Graz, Graz, Austria. Both authors declare no financial interest.*