

»Brilliant Blue G« and »Membrane Blue Dual« assisted Vitrectomy for Macular Hole

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ABSTRACT

The aim of this study is to evaluate vital dyes »Brilliant Blue G« (BBG) and »Membrane Blue Dual« (MBD) for intraoperative staining of the inner limiting membrane (ILM) during vitrectomy for macular hole (MH). Retrospective, comparative case series on 18 eyes with macular holes who underwent »23 and 25 gauge« pars plana vitrectomy. Main outcome measurements were staining intensity and characteristics, visual acuity, visual field, OCT measurements and complications over a period of 6 months. With the help of BBG and MBD successfully was removed complete ILM in 14 eyes. Postoperative visual acuity was improved in 12 patients, unchanged in 2 patients and worse in 4 patients. Central retinal thickness showed significant postoperative reduction with closure of macular hole. OCT values range were from –10 to –250 µm. No visual field defects and no adverse effects were found. BBG and MBD successfully identificate internal limiting membrane during vitrectomy for MH. Good anatomical and functional results are achieved with the use of both vital dyes.

Key words: macular hole, vitrectomy, pars plana, vital dyes

Introduction

First finding of MH as a result of blunt trauma was described by Knapp in 1869 Classification of MH was introduced in 1988 by Johnson and Gass¹. Full thickness MH involve about 0.3% of population over 50 years. This condition can lead to severe visual impairment. Although we describe disease as »hole« in macular area, misplacement of tissue, rather than loss is responsible for visual deterioration². Since 1991 pars plana vitrectomy and traction release is a method of choice, even for longstanding holes^{3,4}.

Peeling of the ILM has become a standard surgical procedure during vitrectomy for MH. Surgical peeling of ILM can be very difficult even for experienced surgeons⁵. Chromovitrectomy is the term of enhancement of ILM contrast through the use of vital dyes. Collagen and glial cells, fibrous astrocytes, Muller cell migration on the ILM are responsible for the traction⁶. Such traction is the initial cause of hole formation. MH can form even in the presence of preexisting complete posterior vitreous detachment. These findings are in favour of the concept of ILM removal in MH surgery⁷. The purpose of this study

is to present our initial experience with intraoperative BBL and MBD assisted peeling of the ILM.

Patients and Methods

In this retrospective, comparative case series we analysed the patient records of 18 interventions for MH with the diagnose of complete MH stage 2 to 4. Median macular hole duration was 6 months. Sutureless small gauge pars plana vitrectomy with peeling of ILM was performed. The mean age of patients was 66 years, ranged from 45 to 82 years. In 9 eyes cataract operation with lens implantation was performed simultaneously, 4 eyes were pseudophakic and 5 eyes phakic. Small gauge systems (Alcon, Accurus, USA) in combination with Photon II light source (Synergetics, USA) were used. BBG and MBD were injected after complete posterior vitreous detachment with washout after 30 seconds. Area of macular hole was protected with the drop of Healon. In 13 cases BBG was used and in 5 cases MBD was used. In that 5 cases overlying epiretinal membranes were identi-

fied. BBG from 0.5 vials at a concentration of 0.25 mg/ml (0.025%) were used (Brilliant Peel, Geuder, Germany) and MBD from 0.5 ml vials at a concentration of 0.25 mg/ml (0.025%) brilliant blue + 0.15% Trypan blue + 4% PEG carrier (Dorc, Netherlands). ILM was grasped with ILM forceps, elevated and torn in a circular motion. The ILM was removed towards MH to avoid enlargement. Retinal periphery was examined for breaks and endolaser was applied when necessary. At the end of surgical procedure 15% C3F8 was used with postoperative face down position for 2 days. All patients underwent ophthalmic examination (best corrected visual acuity, intraocular pressure, slit lamp biomicroscopy and indirect ophthalmoscopy, optical coherence tomography, visual field). ILM staining was ranged from grade 1 to grade 5 (1 – no staining, 5 – good staining). Staining potential was compared with previously used dye Trypan blue. Minimum postoperative follow up was 6 months.

Results

With the help of BBG in 13 cases and MBD in 5 cases successfully was removed complete ILM in 14 eyes (78%). ILM staining grade was grade 3 in 5 eyes, grade 4 in 11 eyes, grade 5 in 2 eyes. Preoperative visual acuity was from counting fingers to 0.3. Postoperative visual acuity was improved in 12 eyes (30% reached best corrected visual acuity of 0.5), unchanged in 2 eyes and worse in 4 eyes. Mean best corrected visual acuity preoperatively was 0.1, and improved significantly to 0.6 postoperatively. Functional success was defined as improvement of two Snellen lines. No visual field defects and adverse effects were found.

Central retinal thickness showed in 15 (83%) eyes significant postoperative reduction with closure of macular hole (8). Values range were from $-10\ \mu\text{m}$ to $-250\ \mu\text{m}$ with complete anatomical closure on ophthalmoscopy exams. Anatomical closure success was defined as disappearance of the subretinal fluid and flattening the hole. Retinal hemorrhages after ILM removal were found in 5 cases but with no complications. Complete removal of epiretinal membranes with the use of MBD was managed in all five cases. Two patients had early postoperative transient hypotony for 2 days. Two patients had new iatrogenic postoperative retinal breaks. One was successfully

treated with laser, other was reoperated for postoperative retinal detachment. Two open macular holes were closed with additional surgery. One phakic patient had major retinal hemorrhage during ILM removal that resulted with macular scar⁹.

Discussion and Conclusion

The purpose of this study was to show our initial experience with intraoperative BBG and MBD assisted peeling of the retinal ILM. Vitrectomy for the MH has become one of the most common indications in vitreoretinal surgery¹⁰. Peeling of the ILM during MH surgery has positive effect on outcomes¹¹. Better preoperative visual acuity, smaller macular hole size and shorter duration are favourable prognostic factors for good postoperative outcome¹².

There is a general trend towards smaller gauge instrumentation and sutureless surgery especially in MH surgery. Complete removal of ILM is important for surgical success.

Because of transparency and fragility of ILM chromovitrectomy as a widely accepted approach facilitates the removal of membrane. Most widely used stain for ILM in the past was indocyanine green (ICG)¹³. There is still debate about intravitreal ICG and retinal toxicity.

There are some new alternative substances such as infracyanine green, trypan blue, brilliant blue, triamcinolone acetate, patent blue, membrane blue, bromophenol blue. Only brilliant blue and trypan blue showed significant level of ILM staining. BBG is used as food colorant and food additive in many countries. First description of BBG use for ILM staining was in 2006¹⁴. Animal studies showed no apparent toxicity and good surgical results with BBG. In our study staining was sufficient for safe ILM removal in 14 eyes. OCT scans of central retinal thickness were improved in all but one patient. Postoperative functional outcome was good with BCVA improved in 12 patients and unchanged in two patients.

BBG has very good staining properties for the ILM with good structural and functional outcomes in our study. No BBG toxicity was found. Further investigation on larger number of patients is necessary to study BBG potential and safety profile.

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VITREKTOMIJA KOD RUPTURA MAKULE UZ POMOĆ »BRILLIANT BLUE G« I »MEMBRANE DUAL BLUE« VITALNIH BOJA

S A Ž E T A K

Cilj ove studije je ocijeniti vitalne boje »Brilliant Blue G« (BBG) i »Membrane Dual Blue« (MDB) za bojenje membrane limitans interne (ILM) u tijeku vitrektomije zbog ruptura makule. Učinjena je retrospektivna studija na seriji od 18 očiju sa rupturama makule koji su podvrgnuti »25 i 23 Gauge« pars plana vitrektomiji. Uspoređivane su karakteristike i intenzitet bojenja, vidna oštrina, vidno polje, OCT mjerenja i komplikacije kroz period od 6 mjeseci. Uz pomoć BBG i MDB uspješno je odstranjena kompletna ILM kod 14 očiju. Postoperativna vidna oštrina je poboljšana kod 12 pacijenata, nepromjenjena kod 2 i pogoršana kod 4 pacijenta. Centralna debljina mrežnice je značajno postoperativno reducirana uz zatvaranje rupture makule kod 15 očiju, uz OCT vrijednosti od –10 do –250 μm . Defekti vidnog polja ni nuspojave nisu pronađeni. BBG i MDB uspješno identificiraju ILM tijekom vitrektomije zbog ruptura makule. Dobri anatomske i funkcionalni rezultati su postignuti sa upotrebom obje vitalne boje.