

Methylene Blue Related Sterile Endophthalmitis

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SUMMARY

To report a case of methylene blue related endophthalmitis. **Observational case report. Review of clinical record, photographs.** A 60 year old man developed endophthalmitis after methylene blue was accidentally used to stain the anterior capsule during phacoemulsification of cataract. His left visual acuity deteriorated from 6/12 to 6/36 two weeks after the operation. Despite intensive treatment with topical and intravitreal antibiotics, his condition deteriorated. A vitrectomy and silicone oil injection eventually managed to control the progression of the disease and salvage the eye. However the visual outcome remained poor due to corneal decompensation and retinal ischemia. Both vitreous tap and vitreous biopsy were negative for any organism. Methylene blue is extremely toxic to ocular structures and should not be used intraocularly.

KEY WORDS:

Methylene blue, Anterior capsule staining, Endophthalmitis

CASE REPORT

Various dyes have been used to stain the anterior capsule in cataract surgery. Use of incorrect dyes or dyes in inappropriate concentrations may result in severe ocular toxicity. We report a case of sterile endophthalmitis as a complication to the use of methylene blue intracamerally during cataract surgery.

During phacoemulsification of a left matured cataract in a 60 year-old gentleman, 0.1 ml of sterile Methylene Blue (MB) 1%, instead of trypan blue, was accidentally injected into the anterior chamber to stain the anterior capsule. MB is kept in the operating theatre for several usages such as to mark the skin during lid surgery as in blepharoplasty and to mark the sclera during sclera buckling. MB and trypan blue used in the operating theatre are generic brands and are kept in multiple-use vials. MB was mistakenly withdrawn into a syringe by the scrub nurse instead of trypan blue and handed over to the operating surgeon. He injected the dye into the anterior chamber and proceeded with the capsulorrhexis. After the capsulorrhexis, he noticed that the blue stain was darker than usual and the cornea was slightly hazy. After checking with the scrub nurse and realizing that the incorrect dye was used to stain the anterior capsule, a thorough anterior chamber wash-out was performed immediately. The cataract surgery was continued as the media was sufficiently clear and the capsule well stained. Otherwise, the surgery went uneventful and a silicone IOL was implanted in the capsular bag. The posterior capsule was noted to be lightly stained blue as well.

The following day there was diffuse corneal oedema with poor view of the anterior chamber and the fundus. He was started with guttae gentamycin and betamethasone hourly.

A week later the cornea was clear with 1+ anterior chamber activity. The posterior segment was normal. However, the capsular bag remained blue. His left visual acuity improved to 6/12 with a pin-hole.

Two weeks post-operatively, he presented with the complaints of progressive deterioration of left vision associated with pain. His left visual acuity deteriorated to 6/36 with the presence of RAPD. There was a severe fibrinous anterior chamber reaction with hypopyon (Figure 1). The intra ocular pressure (IOP) was 30mmHg and a white coagulum appeared on the posterior capsule. The ultrasonography showed multiple vitreous opacities. A diagnosis of endophthalmitis was made. Vitreous tap was performed and intravitreal amikacin and vancomycin were given. Systemic and intensive topical antibiotics were also commenced. The vitreous tap culture and gram stain results were negative for both bacteria and fungus. Despite treatment, his left eye deteriorated three days later with presence of endothelial plaques and rubeosis irides. His vision further deteriorated to HM. Topical antifungal was also commenced. The ultrasonography showed further increase in the number vitreous opacities. Subsequently he was referred to a vitreoretinal surgeon, and a diagnosis of methylene blue related sterile endophthalmitis was made.

He underwent vitrectomy and silicone oil injection on the 17th day after phacoemulsification. Vitreous biopsy was taken. There were dense vitritis with exudates. The retina was swollen and friable with tortuous dilated vessels. There was a superior rhegmatogenous retinal detachment from 10 to 2 o'clock hours with a giant retinal tear. The macula was attached. Posterior vitreous detachment was partially induced. Photocoagulation and cryotherapy were given to the retinal break.

The vitreous biopsy was negative. During the subsequent days he progressed well with reduction of anterior chamber reaction. His vision remained at PL on discharge and the cornea slowly decompensated.

DISCUSSION

Methylene Blue (Tetra-methylthionine chloride) was first synthesised in 1876¹. It has since been widely used for several diagnostic and therapeutic purposes. It has been used as a

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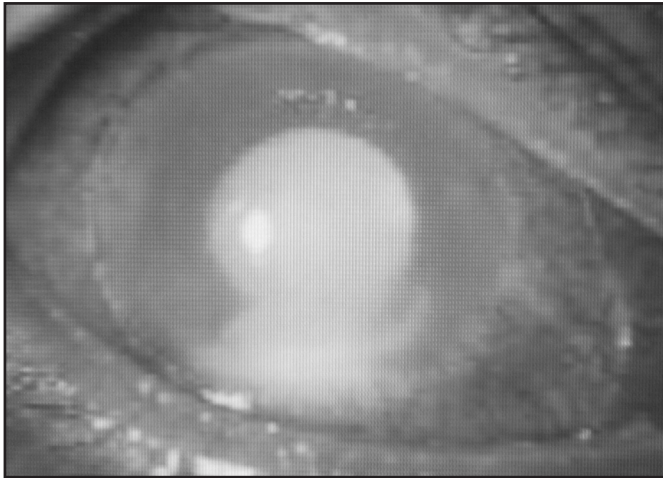


Fig. 1: Anterior segment photograph of the left eye showing fibrinous reaction and hypopyon in anterior chamber.



Fig. 2: Generic methylene blue and trypan blue in their vials.

dye for Gram stain, Wright stain and Jenner stain. It has found uses in many different areas of clinical medicine ranging from dementia to cancer chemotherapy. Recently it has been discovered to have photosensitising potential and has been recognised in various antimicrobial fields especially in blood disinfection.

In the treatment of methaemoglobin, MB facilitates oxidation-reduction reaction in situ. MB has two opposite effects on haemoglobin². It activates the dormant reductase enzyme which reduces MB to leuco methylene blue. In lower concentration it converts methaemoglobin to haemoglobin. However in higher concentration it converts the ferrous iron of reduced haemoglobin to ferric iron which results in methaemoglobin¹.

In this patient, concentrated MB of 1% has been injected intracamerally. Although the anterior chamber was thoroughly washed-out by the operating surgeon, the intraocular inflammation may have occurred because of leaching of dye from the stained capsule; the staining which had persisted till a week after the operation. The mechanism of ocular toxicity is unknown. This may be related to the oxidation-reduction effect of MB at the level of the retina resulting in necrosis or may be related to photosensitizing effect of MB with resultant production of oxidizing radicals^{1,2}.

The effects of accidental intraocular injection of MB into human eyes have not been widely reported. However in animal models, MB shows no major side effects on the external surface of the eye.

In studies various dyes has been injected intracamerally to study the safety efficacy of dye injections³. Intracameral injection of 0.05ml of 0.2% MB for one minute showed no damage to the corneal endothelium under transmission electron microscope. Corneal endothelial toxicity will begin to occur when MB of 0.5% is injected intracamerally.

Trypan blue has been widely used to stain the anterior capsule during difficult cataract surgery. This dye stains selectively the basement membrane of the anterior capsule. MB probably acts in the same way to stain the anterior capsule. However a concentration of 0.1% is sufficient for staining the anterior capsule without staining other structures and causing ocular toxicity.

Accidental injection of MB is rare. MB has little use in ophthalmology, mainly for external purposes only. Although MB stains capsules, it can be toxic to ocular structures in concentrations above 0.5%. In the event of an accidental injection into an eye, we suggest an immediate thorough copious anterior chamber wash-out under dim illumination to limit its toxicity to the eye. In phacoemulsification, the surgery should be stopped if capsulorrhexis has not been performed. Besides, the crystalline lens could function as a barrier to limit the toxicity of ME to the posterior segment. Performing the cataract surgery may also further disperse the MB posteriorly. Intensive topical steroids and antibiotics should be commenced immediately. Peri-ocular steroids may have a role in this instance. Intracameral steroid also can be utilised but has high risk steroid response in susceptible individuals and this elevation in intraocular pressure can often be difficult to control.

Dyes in multiple-use vials are cheap and frequently used when cost is a factor. However, these vials are often poorly labelled and are of generic shape (Figure 2). Potential accidents like the one described above can easily happen. The utilisation of single use preparations such as Vision Blue will minimise these accidents.

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