

Ultrasound Guided Ophthalmic Blocks

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Dear Sir/Madam,

Ultrasound (USG) has been widely used for various regional blocks due to increase in the success rate and safety. Ophthalmic surgeries in adults are mostly performed under regional and topical anaesthesia. Common regional blocks used for ophthalmic surgery are peribulbar block, sub-Tenon's block and retrobulbar block. USG guided ophthalmic blocks may have potential advantages over the blind techniques as it allows real-time visualisation of ocular anatomy, needle and spread of local anaesthetic and may help to reduce complications like globe perforation, intramuscular injection, optic nerve injury etc. A pre-block scan is useful to assess the size, shape and axial length of the globe. It is particularly valuable in patients with altered ocular anatomy like high myopia, staphyloma, scleral banding to decrease the risk of accidental needle perforation of the globe.¹

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Orbital USG enables real-time visualisation of the globe, the extraocular muscle cone, optic nerve, as well as the needle and spread of the local anaesthetic. Under USG, the posterior chamber of the globe appears anechoic and periorbital area appears hyperechoic. The optic nerve is less echogenic than the periorbital fat and is not always distinctly delineated. The extraocular muscles appear as echogenic bands lateral to the optic nerve and divide the orbit into intraconal and extraconal compartments.²

Ophthalmologist and anaesthesiologist should be aware that excessive ultrasonic exposure can lead to multiple bio-effects ranging from acute corneal burn to premature cataract formation.³ US Food and Drug administration and British Medical Ultrasound Society have issued guidelines to safeguard the eyes from sonic-induced injury.^{4,5} For ophthalmic USG, mechanical index (indicates the ability to cause cavitation and mechanical stress to tissues) and thermal index (indicates the ability to raise tissue temperature by 1°C) have been reduced from 6.0 and 1.9 to 0.23 and less than 1.0 respectively. Many new generation USG devices have "orbital" mode which automatically reduces the mechanical index and thermal index within accepted limits. USG transducer should not be in contact with the eye for more than 90 seconds continuously.

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Both linear and curved-array transducers can be used for ophthalmic USG. High frequency transducers (8-20 MHz) are appropriate to visualise the superficial orbital structures. High frequency, narrow sized “hockey-stick” transducer is preferred due to the relatively small size of the eye and physical constraint of the orbital rim, especially in deep, sunken eyes.⁶ Orbital sonography is technically easier with the eyelid closed. The eye can be viewed in its long (longitudinal) or short (transverse) axis. The block technique is completed in two stages. First, the needle is inserted in the standard manner. Second, the transducer is positioned on the closed eyelid before completing the block under real-time USG guidance.²

USG guided Peribulbar Block:

At the infero-temporal quadrant of the orbit, 25 G, 1 inch needle is directed posteriorly, parallel to the orbital floor up to a depth of 25 mm/needle-hub junction. USG transducer is now placed over the closed eyelid. Once the position of the needle tip outside the muscle cone is confirmed, 6-12 mL of local anaesthetic is then injected. Another alternative approach is through the medial canthus of the eye, in which the needle is introduced at the medial junction of the lids and directed posteriorly up to a depth of 15 mm.⁷

USG guided Retrobulbar Block

In retrobulbar block, 25 G needle is directed towards the apex of the orbit and advanced gradually in a slight medial and cephalad direction under real-time USG guidance to a depth of 25-35 mm. After confirming the needle tip location inside the intra-conal space, 2-4 mL of local anaesthetic solution is injected.⁷

USG guided sub-Tenon’s block

In sub-Tenon’s block, preferably at the infero-nasal quadrant of the globe, a small, blunt and curved Westcott scissors is used to create a small opening in the conjunctiva and Tenon’s capsule, approximately at 4:30 (right eye) or 7:30 (left eye) position, 5-10 mm away from limbus. A blunt metal or plastic cannula is inserted in the episcleral space and directed posteriorly following the curve of the globe. A superficial or deep injection with 3-5 mL of local anaesthetic can then be performed.⁷ A characteristic ‘T sign’ is visualised on USG, which is formed by the local anaesthetic tracking under Tenon’s capsule up to the posterior pole, which is intersected by the optic nerve.⁸

Limitations of USG in Ophthalmic blocks

Advanced procedural skill set and ultrasound equipment adhering to international guidelines are prerequisites to perform these blocks safely. Furthermore, USG guided blocks may be time consuming. So this might not be a favourable technique especially in a ophthalmic set up with high patients turnover. Patient may feel discomfort due to pressure of the transducer on the eye.

Also, if too much pressure is applied over the closed eyelids, the globe/extraocular muscles might be pushed closer towards the needle tip. Hence, it is important to apply gentle contact pressure while using USG probe over the eyelids. An extra assistant is required for injection of the drug.

USG guided ophthalmic blocks can be considered for patients with myopic eyes, staphylomas and/ or presence of any scleral band across the globe.

Safety offered by USG guided ophthalmic blocks in contrast to the conventional 'blind' technique, should encourage more anaesthesiologists and surgeons to use in upcoming years.

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Conflicts of interest

There are no conflicts of interest.

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