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Discussion

# Equatorial sub-Tenon blocks: Animal model training

Shashi B. Vohra

*Department of Anaesthesia, Birmingham and Midland Eye Centre, City Hospital, Sandwell and West Birmingham Hospitals NHS Trust, Birmingham, B18 7QH, UK*

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ABSTRACT

*Background and objective:* Sub-Tenon's blocks (STB) provide effective operating conditions for ophthalmic surgery. Originally performed by surgeons STB are now increasingly administered by anaesthetists in the UK. STB requires expertise in handling surgical instruments. The traditional way of gaining expertise used to be by practicing on the patients, this is no longer advisable, or desirable.
*Materials and methods:* This article describes an animal eye model, equipment and teaching process for STB that the author has set up in a wet lab setting at Birmingham and Midland Eye Centre. Advantages and disadvantages of other methods of animal and non animal simulation are discussed.
*Results:* The trainees acquire bi-manual dexterity and develop confidence through hands-on practice on the animal eye before proceeding to perform the procedure on the patients.
*Conclusion:* The isolated pig eye animal model is a practical, inexpensive and reproducible method of teaching novice trainees in performing sub-Tenon blocks. The training is the first of its kind in the UK, and is highly successful.



Sharp needle orbital blocks such as retrobulbar (intraconal) and lately peribulbar (extraconal) have been the mainstay of ophthalmic anaesthesia for many years. Peribulbar extraconal blocks were developed as a safer alternative to the retrobulbar technique. Despite various modifications in the techniques, unfortunately both these types of sharp needle blocks continue to be associated with serious complications such as brainstem anaesthesia, retrobulbar haemorrhage and globe perforation amongst others. These blocks are particularly risky in patients with high myopia, bleeding disorders, blepharospasm, and anatomical aberrations. Patients undergoing complex or repeat intraocular procedures are especially vulnerable to them [1–6]. These blocks are also not easy to teach or learn.

Sub-Tenon's block originally described by Turnbull in 1884 gained popularity after Stevens published his technique in 1992 [7–10]. They are predictable, efficacious, and above all safer than sharp needle blocks. Their usage for ophthalmic surgery is now well established [11–13]. Up until a few years ago these were primarily performed by the ophthalmologists. With a pressing need to improve safety and theatre through-put some institutions in the UK have developed a dedicated anaesthetist delivered sub-Tenon service which in its wake has brought about an ongoing need for training novice anaesthetic trainees.

Ophthalmic blocks have traditionally been taught on patients in theatre. The old model of teaching regional anaesthesia used to be "see one, do one, teach one". This model does not lend itself to any eye block, least of all to sub-Tenon's. The current culture is to 'see' a few blocks being performed by the senior clinician and then to attempt the procedure on patients under direct supervision. This form of teaching and training is risky to patients.

Simulations help to reduce potential complications. Sharp needle eye blocks are generally simulated on a human skull or its synthetic replica to show anatomical landmarks and demonstrate needle trajectory. Sub-Tenon block are however difficult to simulate on a skull or plastic moulds as the procedure calls for a delicate dissection of the layers of the globe. Anaesthetic trainees whilst used to 'needles' are not familiar with the micro instruments needed for STB. To train the anaesthetic trainees in what is an essentially a surgical technique the author has developed an animal model which is realistic, effective, reproducible and inexpensive.

## 1. Materials and methods

The novice trainees first observe a few sub-Tenon's blocks using a classic Stevens technique being performed in operating theatre. The teaching process consists of revision of theory before proceeding to the practical aspects. This includes anatomy of the

*E-mail address:* shashi@vohra.org.uk.

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eye, description of the STB, pharmacology of the drugs used, monitoring, complications, their management, as well as a run-through of resuscitation.

The trainees are then taken to the laboratory to practice on the animal model.

### 1.1. Eyes

Fresh isolated pig's eyes are used for teaching the sub-Tenon's block as they are very similar to human eyes in their overall shape. The eyes are obtained weekly from a local abattoir. They are procured intact with their optic nerve, muscles and the anterior structures by removing the entire content of the orbits from pig carcasses. As there is no damage to the globe itself these isolated eyes form perfect specimens for teaching sub-Tenon's blocks. The eyes can be stored unpreserved in a refrigerator without losing their quality for up-to a week (Fig 1).

The laboratory in our institution is maintained by the ophthalmology department and all tissues are handled in accordance with the national animal tissue act.

**Fig. 1.** Isolated pig eyes.

### 1.2. Equipment

The equipment used for simulation include eye speculums (e.g. Barraquer) Moorfields forceps, Westcott curved spring scissors, metal posterior sub-Tenon cannula (Stevens's design), 5 ml luerlock syringes, hypodermic needles, gloves and a polystyrene block or something similar for anchoring the isolated eye specimen (Fig 2).

### 1.3. Hands on practice

The technique is conducted on a one-to-one basis. Prevention of ocular and neural trauma is an important aim of this training. The procedure is performed standing at the 'head end' of the isolated pig eye. An imaginary 'nose' forms the midline. The 'eye' is anchored on to the polystyrene block to simulate a 'supero-lateral' gaze by tethering the extra-ocular muscles with four hypodermic needles (Fig 3). The block can be practiced for 'right' or the 'left' eye, depending on the position of the gaze relative to the imaginary 'nose'.

Mock local anaesthetic 'eye drops' are instilled. 'Aseptic precautions' are observed and insertion of the speculum is practiced. A fold of the joint layer of conjunctiva and underlying Tenon's capsule is lifted in the inferomedial quadrant of the globe approximately 5 mm away from limbus using a Moorfields forceps with the left (non dominant) hand (Fig 4).

A small nick is then made at the proximal fold of this tent with the Westcott spring scissors held in the right (dominant) hand (Fig 5). Distal lip of the conjunctival incision is held up with the forceps and tip of the closed scissors is passed just a few millimetres through the incision to form a small tunnel (Fig 6). The scissors is then opened just a little keeping the tip in view at all times until sub-Tenon space is opened and sclera is exposed. Deep dissection is avoided. The trainees are reminded to keep the angle of the scissors such that the tip does not penetrate the globe. Care is taken to avoid a double puncture of conjunctiva. A metal blunt tipped curved cannula (Stevens's) loaded with prefilled syringe is then gently slid along the episcleral surface along this tunnel up-to the ***equator of the globe*** whilst holding the lip of the incised conjunctiva with the forceps (Fig 7). Once the cannula is in place the forceps is let go and the syringe is supported with the left hand to prevent metal cannula making contact with cornea.

Following a mock negative aspiration, an injection of 2–3 mls of fluid (water) is made. The sub-Tenon space opens up with hydro-

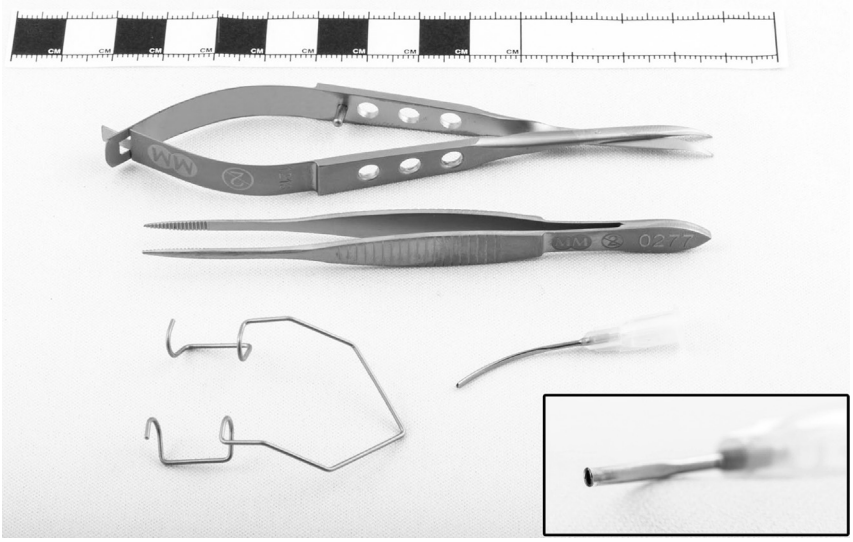

**Fig. 2.** Instruments: Westcott spring scissors, Moorefields forceps, Speculum, Sub-Tenon metal cannula.