

Regional nerve block of the upper eyelid in oculoplastic surgery

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PURPOSE. *To establish the efficacy of a regional nerve block of the upper eyelid and its effect on levator motor function.*

METHODS. *Forty-one patients underwent surgery on 54 upper eyelids by one surgeon, after administration of a regional nerve block at the supraorbital notch. The amount of pain experienced by patients due to the local anesthetic injection and surgery was determined by using visual analogue scores. The effect of the local anesthetic injection on levator function was determined by comparing the measured levator function prior to and following administration. Any complications attributable to the regional sensory nerve block were recorded.*

RESULTS. *Ninety-two percent of patients found the injection painless, and the rest reported negligible pain. The mean pain score for the injection was 2 (SD 1.3, range 0–6). The mean pain score for the surgery was 0.3 (SD 0.6, range 0–3). No significant difference was found in levator function prior to and following the injection (pre-function: 14.4 mm, post-function: 13.4 mm, $p=0.01$). One patient had hematoma formation at the site of injection.*

CONCLUSIONS. *A regional nerve block of the upper eyelid achieves effective sensory anesthesia, without compromising motor function. This helps in an accurate assessment of intraoperative height during upper lid surgery. (Eur J Ophthalmol 2006; 16: 509-13)*

KEY WORDS. *Anesthesia, Eyelid, Supraorbital*

Accepted: January 22, 2006

INTRODUCTION

Most contemporary oculoplastic surgery is performed under local anesthesia (1). The move away from general anesthesia has proved both efficient and cost effective, as all but the more major eyelid surgery can now be performed as a day-case procedure. Local anesthesia also has the advantage of allowing patient cooperation during surgery, which can aid in the prediction of postoperative outcomes.

In most upper lid procedures, the local anesthetic is usually administered by an infiltrative technique into the subcutaneous and deeper tissues. Although this method

usually provides adequate anesthesia, it produces distortion of the tissues and runs the risk of producing bleeding in the operative site, which further distorts the anatomy, making accurate surgery more difficult.

When operating on the upper lid, accurate postoperative lid height is an important goal. When comparing postoperative upper lid height immediately after surgery to final height achieved, there is often a discrepancy.

Factors explaining this difference include the mechanical effect of the local anesthetic and hemorrhage on the lid, and paralysis of the orbicularis and levator muscles by local diffusion of the anesthetic.

A regional nerve block given away from the operative

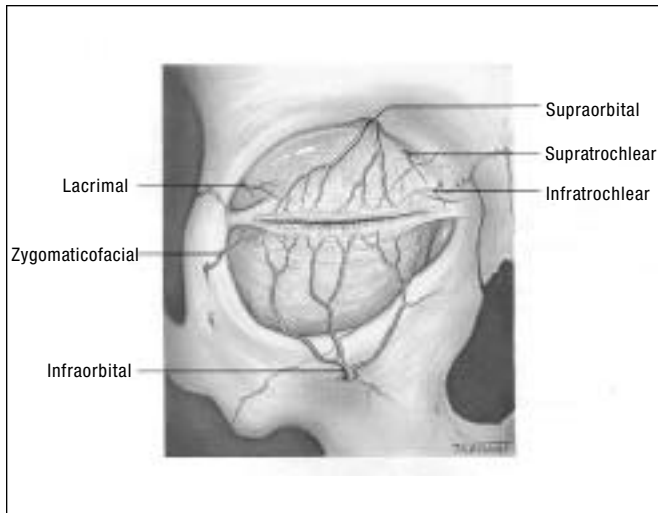


Fig. 1 - Sensory innervation of the eyelids (from reference 7)



Fig. 2 - Palpation of the supraorbital notch.

site has the theoretical advantage of providing more ideal operating conditions, by avoiding the mechanical and paralytic effects of a volume of local anesthetic injected directly into tissues being operated on. A sensory nerve block of the upper eyelid has been described in the ophthalmic literature for many years (2).

However, in modern oculoplastic practice, the technique is not commonly used. The use of a regional anesthetic blockade in this area has been most frequently employed in the treatment of refractory migraine and facial pain syndromes in the area of the supraorbital nerve (3).

The sensory innervation of the upper eyelid is supplied by the branches of the ophthalmic division of the trigeminal nerve.

The majority of the full thickness of the upper lid is innervated by the supraorbital and supratrochlear branches (Fig. 1). We have used a regional nerve block in the region of the supraorbital notch during various upper lid procedures, and studied the efficacy of this anesthesia and assessed its effect on levator motor function.

TABLE I - RANGE OF SURGERY PERFORMED

Surgical procedure	Number
Blepharoplasty	25
Ptosis repair (anterior levator repair, brow suspension)	21
Tumor excision and direct closure	4
Anterior lamella repositioning and lid split	2
Upper lid lowering (levator recession)	2

METHODS

Between October 2003 and March 2004, 42 consecutive patients underwent upper lid surgery to give a total of 54 operated lids. All surgery was performed by a single surgeon (T.A.). Informed consent for the procedure was achieved in all cases. The age range of the patients was 27 to 83 years, with a female to male preponderance of 30 to 12. All patients were anesthetized by means of the regional nerve block described below.

Procedure (Figs. 2-4)

The supraorbital notch is palpated at the junction of the medial one third and lateral two thirds of the superior orbital margin. A 25-gauge needle is introduced just lateral to the notch to avoid the supraorbital vessels. The needle is directed posterior and superiorly, following the curve of the orbital roof, and advanced until it touches the roof. It is then withdrawn slightly and the anesthetic agent is injected. The anesthetic agent used in our series was 2% lignocaine with 1:200,000 adrenaline. It is important not to inject more than 1 mL of the drug, since more may cause the drug to seep out and cause paresis of the motor nerve supply. Pressure is then applied over the site of injection for 1 minute.

The following data were collected: type of operation, levator function immediately prior to and following the injection, pain scores at the time of injection and for the operation, time of onset of anesthesia, duration of



Fig. 3 - Local anesthesia introduced just lateral to the supraorbital notch.

anesthesia, complications of the injection, and number of top-up injections required.

Levator functions were ascertained by measuring the maximum vertical excursion of the upper lid in millimeters, while excluding the action of frontalis. Pain scores were assessed by an independent observer by means of a visual analogue score (range 0–10).

RESULTS

Table I shows the range of upper lid surgery carried out in this series. The local anesthetic technique was generally well tolerated (Fig. 5). The mean pain score for the injection was 2 (SD 1.3, range 0–6). The regional block achieved a good level of anesthesia (Fig. 5). The mean pain score for surgery was 0.3 (SD 0.6, range 0–3), with 82% of patients registering no pain at all. The onset of anesthesia was found to be at a mean of 3.3 minutes (range 2–4 min), and the duration of anesthesia tended to last approximately 4 hours, and extended above the forehead as far as the scalp overlying the vertex of the skull.

Figure 6 illustrates the change in levator function prior to and after the regional anesthesia. Three cases were associated with marked loss of levator power; however, the majority of patients showed little difference in levator function before and after the injection, and overall, there was no statistical difference in function (paired t-test $p=0.01$).

There was one case of upper lid hematoma, which re-



Fig. 4 - Pressure applied over the site of injection for 1 minute.

mained preseptal clinically, and was effectively controlled by local pressure. Only one patient required a top-up of anesthetic during surgery, and this was administered by means of local infiltration at the medial end of the upper lid.

DISCUSSION

The sensory nerve supply of the upper eyelid is supplied by the ophthalmic division of the trigeminal nerve (4). The lateral, central, and medial parts of the skin and conjunctiva of the eyelid are innervated by the lacrimal, supraorbital, supratrochlear, and infratrochlear branches, respectively, as shown in Figure 1.

A frontolacrimal nerve block was first described by Hildreth and Silver (2). This technique recommended the use of a 4cm needle introduced just lateral to the supraorbital notch, and in a posterior and upward direction, aiming to administer a small amount of local anesthetic at the point of bifurcation of the frontal and lacrimal nerves. In our experience, we have found that a more anterior site of injection still provides a good level of sensory anesthesia across the width of the full thickness of the upper lid. This allows the use of a shorter needle with less risk of damaging orbital blood vessels.

In our series of cases, the majority showed no significant difference in the preinjection and post-injection levator function. However, in three cases, there was a marked loss of levator power following administration of the anesthetic. These cases were believed to be due to an exces-

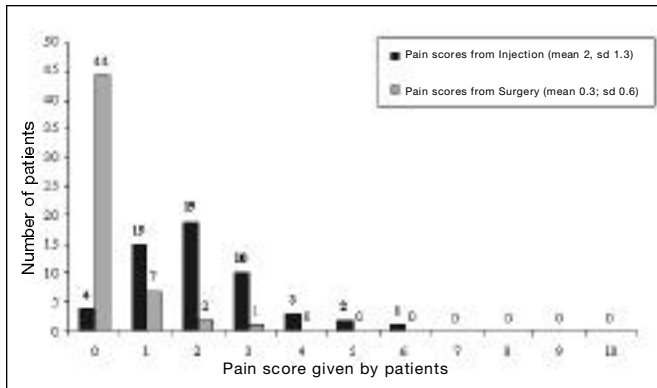


Fig. 5 - Histogram of the pain scores for the local anesthetic injection and surgery.

sive amount of local anesthetic injected in the earlier cases of the study. Although providing an adequate sensory block, it is clear that in these cases, diffusion of the local anesthetic reached the levator muscle, causing its paresis. We have found that less than 1 mL of local anesthetic is required by this technique to provide an effective sensory nerve block, and higher volumes should be avoided.

The extent of anesthesia was only found to be deficient in one of the cases in this series. In this case of a levator recession, the medial end of the lid was not adequately blocked. A medial top up was required, and was administered by local infiltration. Due to the site of injection, it is likely that the predominant anesthetic effect is concentrated around the supraorbital and supratrochlear nerves. Theoretically, when using this technique, the areas of the upper lid most likely to require further anesthesia are the medial and lateral extremities, which are supplied by the infratrochlear and lacrimal nerves respectively. Small amounts of locally infiltrative anesthetic can be injected into the tissues, but it is also possible to block these nerves regionally, by further small injections under the superior orbital rim medial to the trochlea, and in the region of the lacrimal gland, once again minimizing the distortion of the upper lid tissues.

The results of this study have shown that a regional nerve block in the region of the supraorbital notch can provide effective anesthesia, while being well tolerated. Since the sensory nerve supply of the full thickness of the upper lid is blocked, surgery on both the anterior and posterior lamellae is possible with the single injection. The anesthesia was also found to extend as far as the mid-point of the scalp, which represents the area innervated by the supraorbital and supratrochlear nerves. This makes

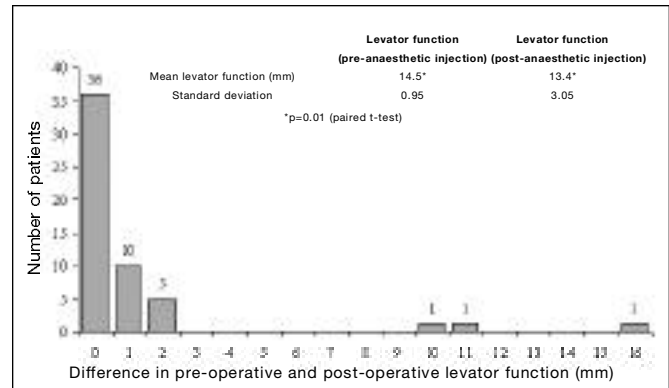


Fig. 6 - Histogram demonstrating the effect of the anesthetic injection on levator function, measured as the difference between the pre-operative and postoperative levator function.

the regional block an effective option for procedures above the brow such as brow suspension and brow lift, particularly if they are combined with an upper lid procedure.

There is little effect on the levator muscle and minimal distortion of the tissues of the upper lid. These characteristics provide excellent operating conditions for the surgeon, and can make estimation of postoperative lid height easier. In ptosis surgery, even when care is taken intraoperatively to adjust sutures controlling upper lid height and contour, the postoperative lid level may differ from that achieved on the operating table (5). This difference is due to paresis of the levator muscle, both predating surgery, in the case of neurogenic ptosis, and that caused by local anesthetic action. Temporary paresis of the orbicularis muscle during surgery can also affect the postoperative outcome.

Collin and O'Donnell have described an adjustable suture technique for upper eyelid surgery in cases of ptosis and lid retraction (6), which may be useful against the unpredictability of postoperative results, especially in cases of thyroid lid surgery, that are well known for their variable results. The adjustable suture technique does, however, require a two-stage operative approach on successive days, and also relies on good patient cooperation.

The fact that the regional nerve block produces little motor paralysis means that the surgeon can effectively disregard factors associated with reduced power of the levator and orbicularis muscles caused by local anesthetic. This should allow the postoperative lid height to be more comparable with that achieved on the operating table. In addition, the lack of local anesthetic volume in the tissues reduces the mechanical effect on the lid

height during the operation. The benefits of lack of tissue distortion are seen in most lid procedures. In the case of blepharoplasty, the amount of excess skin can more easily be assessed and excised. Similarly, when excising tumors and preparing skin grafts an unaffected operating field is desirable.

In summary, this study has shown that a regional sensory nerve block of the upper eyelid is easily and safely achieved by a single injection of local anesthetic in the region of the supraorbital notch. There is minimal distortion of the tissues, allowing more ideal operating condi-

tions, and levator function is not significantly altered by the technique.

No authors have any proprietary interest.

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