Rapid onset of ptosis indicates accurate intraconal placement during retrobulbar anaesthetic injection

James P Morgan, Louis G Clearkin

Abstract

Background—Anecdotal evidence has previously suggested that retrobulbar local anaesthetic (LA) injection is accompanied by the rapid onset of ptosis. Here the validity of this potentially valuable sign is tested.

Methods—25 patients received a retrobulbar injection and the times for development of ptosis and akinesia in other extraocular muscle groups were recorded and compared. The effects of retrobulbar injections were also studied on posterior orbital structures in 10 patients using low frequency ultrasound.

Results—The mean time of onset of ptosis was 4.76 seconds, an order of magnitude less than times recorded for akinesia in other muscle groups. Ultrasonography revealed a significant distension of the extraocular muscle cone during retrobulbar injection.

Conclusion—Ptosis develops significantly more rapidly than other motor effects in retrobulbar anaesthesia and can therefore be taken as an indicator of accurate intraconal placement. Retrobulbar injection is associated with significant distension of the extraocular muscle cone.

(R Br J Ophthalmol 2001;85:363–365)
injection. An “Ultramark 9” (Advanced Technology Laboratories) ultrasound scanner, emitting a 3.0 MHz beam from a 20 mm diameter, phased array probe was used. This equipment is commonly used in vascular scanning. Conventional two dimensional and colour Doppler modes are available.

Data were analysed using non-parametric tests because they did not follow a strictly normal distribution. The Mann–Whitney test was used to compare times of onset of ptosis with times of paralysis in other individual muscle groups. The Kruskal–Wallis test was used for multiple group comparisons.

Results

GENERAL OBSERVATIONS

After injection, the development of ptosis followed a predictable, almost stereotypical, pattern. In all cases, ptosis causing complete or almost complete (minimum 90%) abolition of the palpebral fissure developed within approximately 5 seconds of its onset. Of the remaining cases of incomplete initial ptosis, some progressed slowly to complete ptosis while the remainder remained unchanged. As it was difficult to determine whether a lid was continuing to close slowly or had indeed already stopped, the times recorded for development of “maximal” ptosis are questionable. We noted that a mild proptosis often accompanied the injection.

TIMES OF EXTRAOCULAR MUSCLE PARESIS

The times of action of the retrobulbar injections on the various muscle groups are presented in Table 1. The mean time of onset of ptosis was 4.76 seconds (range 2–11, SD 1.98). This compared with a time of 82.75 seconds (20–240, 56.3) for maximal ptosis. Other means were 66.88 seconds (15–210, 54.23) for abduction, 79.55 seconds (20–225, 61.1) for downgaze, 105.2 seconds (20–285, 82.9) for upgaze, and 111.1 seconds (20–300, 73.82) for adduction. Because values for maximal ptosis were unreliable and nearly all eyelid closure occurred shortly after the onset of ptosis, we relied on the latter value in our conclusions. Tests show this value to be statistically distinct from times recorded for the other groups (p<0.0001). Differences among the latter have in turn been shown not to be statistically significant (p=0.119). These other extraocular muscle groups did not succumb to the effects of injection in any recognisable pattern.

ORBITAL ULTRASOUND

The 10 ultrasound recordings of typical retrobulbar injections confirmed that the injection needle tip, where visible, was clearly within the muscle cone. It is therefore clear that the injections were indeed “retrobulbar”. A reproducible, gross distension of the extraocular muscle “cone” (best appreciated on video) and slight anterior displacement of the globe were seen soon after the injection began. Representative still photographs are presented in Figure 1.

Discussion

In our study, rapid development of ptosis accompanied all retrobulbar injections. In addition, onset of ptosis preceded akinesia of all other muscle groups. This occurred several orders of magnitude more rapidly, suggesting perhaps that different mechanisms of action operate. The timings, together with ultrasonic confirmation of the intraconal nature of the injections, prove that rapid early ptosis during retrobulbar injection indicates accurate intraconal placement of the LA. Awareness of this clinical sign could help prevent the administration of unnecessary “top up” injections, as well as providing a valuable source of feedback to the anaesthetist.

The elevators of the upper lid, levator palpebrae superioris and Müller’s muscle, are innervated by the distal part of the superior division of the third nerve and post-ganglionic sympathetic fibres respectively. On its own, the demonstration of microanatomical differences (such as small overall nerve diameter or
Between the superior and inferior divisions of the third nerve would not be sufficient to explain the phenomenon of early ptosis, because superior rectus, which is also supplied by the third nerve, is initially spared. Total blockade of the small sympathetic fibres that innervate Müller’s muscle would produce a ptosis equivalent to that in complete Horner’s syndrome. However, as this produces at most mild to moderate ptosis (1–4 mm), it could not be responsible for the almost complete ptosis seen immediately after retrobulbar injection.

We note with interest that the range of time over which ptosis developed (2–11 seconds) coincided closely with the time scale for distension of the extraocular muscle cone recorded on ultrasound. While it was not possible for this study to establish a causal link, we would like to point out that extraocular muscle weakness and ptosis have been induced in the past by the administration of saline retrobulbar injections. The possibility of a mechanical cause for the early development of ptosis in retrobulbar anaesthesia cannot therefore be discounted.

Contributors please note:

Communications from all countries except the UK and Republic of Ireland should be sent to Professor C Hoyt, Editor, British Journal of Ophthalmology, University of California, Department of Ophthalmology, 10 Kirkham Street, K 301, San Francisco, CA 94143-0730, USA (tel: 001 415 502-6871; fax: 001 415 514-1521).

Manuscripts from the UK and the Republic of Ireland should be sent to Professor Andrew Dick, UK Editor, British Journal of Ophthalmology, Division of Ophthalmology, University of Bristol, Lower Maudlin Street, Bristol BS1 2LX (tel: +44 (0) 0117 929-4496; fax: +44 (0)117 929-4607).

Rapid onset of ptosis indicates accurate intraconal placement during retrobulbar anaesthetic injection

James P Morgan and Louis G Clearkin

Br J Ophthalmo 2001 85: 363-365
do: 10.1136/bjo.85.3.363