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CLINICAL STUDY

Variation in anaesthesia for the laser treatment of retinopathy of prematurity—a survey of ophthalmologists in the UK

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Abstract

Purpose **Laser treatment for retinopathy of prematurity (ROP) may be associated with systemic stress for the infant. No national consensus on the optimum method of anaesthesia for the treatment of ROP currently exists. This study ascertains the anaesthetic practices employed for the treatment of ROP by ophthalmologists in the United Kingdom (UK), and also their attitudes towards these practices.**

Materials and methods **A postal questionnaire was sent to 46 consultant ophthalmologists identified as performing treatment for ROP in the UK. The consultants were asked to estimate the annual number of babies with ROP that they treated with laser, what methods of anaesthesia they employed, for comments regarding the arrangements for, and types of anaesthesia employed and whether they believed that the neonatal stress response to laser treatment was associated with a significant risk of systemic complications.**

Results **In all, 35 (76%) questionnaires were returned. A total of 30 (86%) respondents reported performing laser treatment for ROP. Of these, 15 (50%) used general anaesthesia for all cases and 11 (37%) intravenous sedation combined with topical anaesthesia for all cases. Oral sedation combined with topical anaesthesia, rectal chloral hydrate and paracetamol combined with topical anaesthesia, intravenous ketamine combined with topical anaesthesia, and subtenon's local anesthesia were used by one (3%) respondent each. There were no ophthalmologists using subconjunctival or topical anaesthetic alone or treating without anaesthesia.**

Conclusion **This survey reveals considerable variation in practice among UK ophthalmologists regarding the anaesthetic methods employed in the treatment of ROP, and their beliefs regarding the systemic stress associated with treatment.**

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Introduction

Peripheral retinal ablative therapy has been shown to be beneficial in terms of both anatomical and functional outcome in the treatment of threshold retinopathy of prematurity (ROP).[1] Ablation using argon and diode laser is now the most common method for the treatment of ROP because it is effective and because laser equipment is increasingly available.[2]

ROP treatment may be associated with significant systemic stress and potentially life-threatening cardiorespiratory events.[3] There is variation in the methods and availability of different forms of anaesthesia used during ROP treatment between different eye units, with no national consensus or Royal College guidelines regarding this issue. We set out to investigate the methods of anesthesia used during the treatment of ROP on a national level by

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performing a survey of ophthalmologists treating ROP in the United Kingdom (UK).

Materials and methods

During December 2003, an enquiry was sent to all Regional Advisors of the Royal College of Ophthalmologists ophthalmic training programmes in the UK. Contact details of all consultant ophthalmologists who performed treatment of threshold ROP in their region were requested. In March 2004, a postal questionnaire was sent to all ophthalmologists identified by the enquiry and additional consultants identified at the meeting of the British and Eire Association of VitreoRetinal Surgeons (BEAVRS) in 2003, known to treat ROP. A stamped addressed envelope was provided for their response. Those ophthalmologists not responding to questionnaire were sent a repeat questionaire.

The postal questionnaire consisted of four questions regarding anaesthetic policies for the laser treatment of threshold ROP. The consultants were asked: (1) to estimate the annual number of babies with threshold ROP for which they perform laser treatment; (2) what type of anaesthesia they employ during laser treatment of ROP in extubated babies; (3) whether or not they believe that the neonatal stress response to laser treatment for ROP is associated with a significant risk of serious systemic complications; (4) for their general comments regarding the arrangements for, and types of anaesthesia employed during laser treatment of ROP.

Results

A response was received from 17 of 20 (85%) regional advisors, identifying 33 ophthalmologists performing ROP treatment. The authors identified 13 additional ophthalmologists by polling the BEAVRS meeting in 2003, giving a total of 46 ophthalmologists performing treatment for ROP in the UK.

A response was received from 35 of 46 (76%) opthalmologists. Five respondents excluded themselves because they screened for but did not perform treatment for ROP, leaving a total of 30 respondents that performed treatment for ROP.

Numbers of babies treated per annum

In total, 15 (50%) ophthalmologists reported treating between 1 and 4 babies per annum, seven (23%) treated 5–9 babies, four (13%) treated 10–14 babies, three (10%) treated 15–20 babies per annum, and one (3%) did not specify the number of babies treated.

Methods of anaesthesia employed during laser treatment of ROP

A total of 15 (50%) ophthalmologists reported using general anaesthesia (GA) (including intravenous (i.v.) sedation with ventilation, i.v. sedation with paralysis and ventilation, paralysis and ventilation with analgesia, or i.v. pancuronium with morphine and ventilation and topical anasethesia) for all cases, and 11 (37%) used i.v. sedation combined with topical anaesthesia for all cases. Oral sedation combined with topical anaesthesia, rectal chloral hydrate and paracetamol combined with topical anaesthesia, i.v. ketamine combined with topical anaesthesia, and subtenon's local anaesthesia (LA) were used by one (3%) respondent each. There were no ophthalmologists using subconjunctival or topical anaesthetic alone or treating without anaesthesia.

Views regarding the significance of the neonatal stress response to treatment

In response to the question 'Do you believe that the neonatal stress response to laser treatment for ROP is associated with a significant risk of serious systemic complications?', 21 (70%) ophthalmologists answered 'yes', five (17%) answered 'no', while four (13.3%) were uncertain.

Additional comments

In all, 23 (77%) respondents provided additional comments. Reasons stated for the preferential use of GA rather than other methods of anaesthesia included a perception that patients were more stable during and after treatment, a belief that babies recovered most quickly following GA, the ease of treating both eyes simultaneously, and a desire to ensure adequate anaesthesia in order to allow sufficient laser treatment without the need for subsequent retreatments. Four respondents favoured GA because of previous unfavourable personal experiences while using i.v. sedation during which the baby's distress was felt to occur owing to inadequate sedation. One respondent felt that babies were generally more stable following GA administered by specialist paediatric anaesthetists rather than neonatologists.

Reasons stated for specifically not using GA included difficulties in arranging anaesthetic cover without unduly delaying treatment (three respondents), a desire to avoid the systemic side effects and potential complications of GA (2 respondents), and a belief that babies were more unstable and required a longer

recovery period following GA (two respondents) compared to i.v. sedation.

Four respondents stated that the anaesthetic methods they employed were dictated by the policy of local neonatalogists or anaesthetists rather than their own preference. One of these respondents would prefer to use i.v. sedation but used GA owing to local anaesthetic policy, while another respondent preferred GA but used i.v. sedation because of local neonatal policy.

Regarding the need for an anaesthetist to be present during treatment, three respondents stated that they routinely performed treatment in the neonatal unit in the presence of only a neonatal nurse, without an anaesthetist being present, although a neonatologist was available on the unit.

Regarding the environment in which laser treatment was performed, five respondents felt it was best performed in the neonatal unit in order to enable seamless post-treatment supervision. Two of these respondents routinely treated babies under GA in the neonatal unit.

Discussion

Guidelines for screening of ROP and indications for treatment are well established.[4–6]

A 1993 survey of 118 neonatal units in the UK reported a wide variation in the type of anaesthesia employed for the treatment of ROP, with GA employed in 57% of units, LA with or without sedation being used in 23% of units, and both GA and LA in 20% of units. The majority of units at the time of the survey were using cryotherapy for the treatment of ROP.[7] Laser therapy has since become the most widely used treatment modality for threshold ROP and is generally regarded to be at least as effective as cryotherapy, and the advantages of using laser over cryotherapy have been well documented.[8–11]

Treatment of ROP may be associated with significant systemic stress. Babies undergoing treatment are frequently unwell and suffering from other complications of preterm delivery. Although laser treatment *per se* may not necessarily be painful, the very strong light stimulus from the indirect ophthalmoscope and manipulation of the globe may be both stressful and painful for the baby, even if a topical LA has been administered. Oxygen saturation significantly decreases and pulse rate significantly increases during physical manipulation of the eye, and variations in these parameters may be associated with significant neonatal distress.[12–14] The use of topical anesthesia alone is associated with an increased incidence of potentially life-threatening cardiorespiratory events when compared to the use of GA.[15]

The current survey shows that the methods and availability of different forms of anaesthesia used during laser treatment of ROP varies widely. Although a number of ophthalmologists who perform ROP treatment may have been overlooked during the initial stage of the survey, we are confident that most were identified. The 41 ophthalmologists identified in the current survey compares well with the 37 ophthalmologists identified as treating ROP in a 1995 survey involving the entire consultant membership of the Royal College of Ophthalmologists and clinical directors of all the neonatal units in the UK.[16]

In units without readily available paediatric anaesthetists, ophthalmologists have developed a variety of alternative strategies to enable laser treatment of ROP to be performed including the use of i.v. sedation, oral sedation combined with topical anaesthesia, rectal chloral hydrate and paracetamol combined with topical anaesthesia, and intravenous ketamine combined with topical anaesthesia. In our own local neonatal unit, we encountered practical and organisational difficulties in obtaining timely anaesthetic cover to perform GA and so developed a technique of subtenons LA for the treatment of ROP in the absence of a paediatric anaesthetist.

That 17% of respondents did not think, and 13% were uncertain, whether or not the neonatal stress response to laser treatment for ROP is associated with a significant risk of serious systemic complications indicates that many regard the nervous system of preterm babies to be so immature that they do not perceive pain. Interestingly, none of these respondents employed GA during laser treatment for ROP. The denial of pain perception in neonates has traditionally been associated with fear of side effects of analgesics, which can cause profound respiratory depression and sedation. This explains why many neonatologists still intubate neonates awake without any sedation. An extensive literature is available to show that the neuroanatomical and neuroendocrine systems of neonates is sufficiently developed to perceive pain and that severe pain can increase neonatal morbidity.[17,18]

Possible reasons for the wide variation in anaesthetic practises revealed by the survey include differing beliefs and experiences of individual ophthalmologists, neonatologists, and anaesthetists regarding the relative safety of different methods of anaesthesia and resource limitations. Larger units may have a greater ability to plan and coordinate local arrangements for anaesthetic support.

Further work is required to determine the relative safety and efficacy of the different forms of anaesthesia employed during the treatment of ROP.

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