- 1 Faust EC, Russel PF, Jung RC. In: *Craig and Faust's clinical parasitology*. 8th ed. Philadelphia: Lea and Febiger, 1974: 356-8.
- 2 Yamaguchi T. *A colour atlas of clinical parasitology*. 1st Ed. London: Wolf Medical, 1981: 170.
- 3 Duke-Elder S. *System of ophthalmology*. 2nd Ed. London: Kimpton, 1965: 416-7.
- 4 Burnett HS, Parmelee WE, Lee RD, Wagner ED. Observations on the life cycle of *Thelazia californiensis*. *J Parasitol* 1957; 43: 433.
- 5 Knierin R, Jack MK. Conjunctivitis due to *Thelazia californiensis*. *Arch Ophthalmol* 1975; 93: 522-3.
- 6 Manson-Bahr PEC, Apter FIC. *Manson's tropical diseases*. 18th Ed. London: Bailliere Tindall, 1982: 604.

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Sedation with nasal ketamine and midazolam for cryotherapy in retinopathy of prematurity

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Sedation of infants in ophthalmology is a challenge for the anaesthetist. Often general anaesthesia is not required but a quiet and immobile patient is necessary if the examination/treatment is to be successful.

We report on a 44-day-old, 1.3 kg baby who was to receive cryotherapy treatment for retinopathy of prematurity (ROP) and who was successfully sedated with nasal ketamine and midazolam. This simple and non-invasive method might be of interest to the paediatric ophthalmologist. More cases are required to assess its safety and reliability.

Case report

This surviving twin baby girl was born at 26 weeks of gestation with a birth weight of 770 g. In the neonatal intensive care unit, she had bronchopulmonary dysplasia and suffered from respiratory distress syndrome, apnoea and bradycardic episodes, and septicaemia.

She was intubated and ventilated for 33 days and required oxygen therapy sometimes at a fraction of inspired oxygen of 1.0 for a total of 44 days. Episodes of bradycardia occurred throughout.

Ophthalmic check up revealed: right eye: ROP grade 2 in zone II, left eye: ROP grade 3 in zone II with plus disease (hyperaemia of the iris, vasodilatation, and tortuosity of the vessels in the fundus).

In view of this, cryotherapy was indicated. The parents refused their consent for general anaesthesia but agreed to sedation.

Preoperatively, apart from the ophthalmic problem, this baby had no neurological deficits, was breathing spontaneously, and had normal behaviour for age.

For the past 18 months, our department of anaesthesia has used nasal ketamine and midazolam for paediatric sedation in computer tomography with good results (Louon and Reddy unpublished data, under review). We decided that this technique could be used in this difficult patient.

On admission to the operating theatre, the baby was awake and not intubated. Monitoring included electrocardiography, oxygen saturation, a precordial radio stethoscope, and temperature. Intravenous access was available. An oxygen tubing was positioned in front of the baby's nares should oxygen be necessary.

A mixture containing midazolam (5 mg/ml) 1.8 ml, ketamine (50 mg/ml) 1.6 ml, and normal saline 0.6 ml (total 4 ml) was prepared and a dose of 0.25 ml/kg body weight given, half of the required volume (0.4 ml) being instilled in each nostril. The total dose received was midazolam 0.9 mg and ketamine 8 mg. Within 4 minutes, the child was properly sedated (drowsy, motionless, but not anaesthetised).

After topical anaesthesia with amethocaine chloride 1%, transconjunctival cryotherapy of the avascular area in front of the ridge was performed with a broad tip in both eyes.

During the whole 12 minute procedure, the pulse rate remained between 140 and 150 with no episode of apnoea or bradycardia. Oxygen saturation remained, without oxygen, in the range of 94% except on two 30 second occasions when it dropped to 90%. A short course of oxygen (1 l/min) increased it to 98%. Operating conditions were excellent for the ophthalmologist without any untoward movements.

The postoperative period in the special care baby unit was uneventful except for one brief episode of bradycardia resolved by bag ventilation.

Ophthalmic assessment at discharge, 6 weeks after treatment, showed significant regression with ROP grade 1 in zone III in both eyes.

Comment

Anaesthesia for short non-invasive ophthalmic procedures in small babies poses a problem to the anaesthesia and ophthalmology departments.

If general anaesthesia is chosen, the baby will often be intubated. Because of limited space while the ophthalmologist is working, a mask cannot be applied, especially with low birth-

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weight babies. There will be then also a need for an intravenous line. A short non-invasive ophthalmic procedure is changed into a lengthy and invasive anaesthesia technique.

Our previous experience with a nasal ketamine midazolam mixture in babies suggests that it is an attractive alternative for short ophthalmic procedures. A study is under way to use it for different procedures in babies and small children such as ophthalmic examinations, YAG laser treatment, and cryotherapy for ROP.

Nasal administration of drugs is not a new idea and has been used for some time. Pharmacokinetics of intranasal midazolam at a dose as low as 0.2 mg/kg showed that the hypnotic threshold of 100 ng/ml was obtained with 5–10 minutes and this correlated well with sedation.¹ Pharmacokinetics of intranasal ketamine were studied by Russel and Aldrete.² The dose was 4–6 mg/kg and the onset of action within 8–12 minutes. Compared with intramuscular or intravenous routes, intranasal administration is a non-invasive, pain-free method and has a fast onset of action.^{3–5} High bioavailability, rapid peak serum levels, and perhaps absorption through the cribriform plate result in a rapid onset of sedation.³

We would like to stress that this technique

requires skilful supervision and adequate monitoring. We do not recommend it to be used by untrained staff in outpatient departments or outside the hospital. Low birthweight babies should recover in a high dependency area.

The absence of respiratory depression, arterial oxygen desaturation with satisfactory sedation suggests that this technique is safe and efficient for non-invasive ophthalmic procedures. A large series is required to evaluate potential side effects in this specific indication.

We have presented a novel technique of intranasal administration in a low weight baby requiring cryotherapy for ROP. The side effects were minimal and the operating conditions excellent.

- 1 Malinovsky JM, Le Normand Y, de Dieuleveult, Lepage JY, Cozian A. Midazolam pharmacokinetics in children after intranasal administration. *Anesthesiology* 1990; 73 (suppl): 110.
- 2 Aldrete JA, Roman de Jesus JC, Russel LJ. Intranasal ketamine as induction adjunct in children: preliminary report. *Anesthesiology* 1987; 67: 514.
- 3 Russel LJ, Aldrete JA. Intranasal ketamine: preliminary pharmacokinetics. In: *Proceedings of the 9th World Congress of Anesthesiologists*. Washington DC, 1988: 864, Abstracts Vol 11.
- 4 Walberg EJ, Wills RJ, Eckert J. Plasma concentrations of midazolam in children following intranasal administration. *Anesthesiology* 1991; 74: 233–5.
- 5 Avram MJ, Fragen RJ, Caldwell NJ. Dose finding and pharmacokinetic study of intramuscular midazolam. *J Clin Pharmacol* 1987; 27: 314.

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Congenital third nerve palsy associated with mid-trimester amniocentesis

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Amniocentesis is the presumed cause of many types of penetrating fetal injuries including skin marks,¹ ocular perforation,^{2–7} limb, chest, and abdominal trauma.^{8–10} The following report describes how it may also cause neuro-ophthalmic disease and adds to other reports^{2 11 12} that suggest it is an important cause of congenital intracranial damage.

Case report

A 3 month male infant was referred because his right eye had never opened. He was born at term following uneventful labour and vaginal delivery. Amniocentesis had been performed at 17 weeks of gestation because of advanced maternal age. Ultrasound was used to localise the placenta. Two unguided attempts were then made to aspirate amniotic fluid by stabs through one abdominal site. Both times the fluid was stained with blood, which to our knowledge was not analysed to determine its source.

Ocular examination showed a complete ptosis on the right. A diagnosis of total third nerve palsy was made by finding an externally ophthalmoplegic eye that was deviated down and out (Fig 1). Ocular movements on the left were normal. The infant fixated more actively with the

Figure 1 Right ptosis associated with hypotropia and exotropia.