Use of suxamethonium in open eye injuries: a dilemma with explosive consequences

Open globe injury requires emergency surgical intervention. Patients are at high risk of pulmonary aspiration of gastric contents if a period of starvation is not possible. Suxamethonium, a traditional depolarizing muscle relaxant, is often administered to facilitate smooth tracheal intubation because of its rapid onset, complete reliability and short duration of action. However, suxamethonium has been linked to increasing intraocular pressure.

The normal intraocular pressure is 16±5 mmHg, with mean diurnal variations of up to 5 mmHg, and values over 21 mmHg considered pathological. For patients with suspected or proven open globe injuries or those with glaucoma, acute rises in intraocular pressure can have devastating effects. This is associated with a theoretical risk of expulsive haemorrhage from co-contraction of the extraocular muscles compressing the globe (Kelly et al, 1993). Therefore the use of suxamethonium in patients with open eye injuries is controversial.

The case for suxamethonium

Suxamethonium's short duration of action (approximately 10 minutes) provides a 'safety net' for the ophthalmic anaesthetist when dealing with a difficult or impossible intubation, as in trauma cases. Suxamethonium may induce an increase in intraocular pressure of 10 mmHg, but laryngoscopy and tracheal intubation also increase intraocular pressure by 10–15 mmHg as a result of sympathetic cardiovascular responses (Cunningham and Barry, 1986). Physiological responses such as blinking, coughing and forced eye closure also elevate intraocular pressure up to 5 mmHg, 40 mmHg and 70 mmHg respectively (Edmondson, 1997).

There have been no published cases of actual vitreous extrusion following suxamethonium use (Edmondson, 1997). A study of 15 patients undergoing elective enucleation compared intraocular pressure change post-suxamethonium administration in the injured eye following detachment of extraocular muscles to that of the uninjured eye with muscles intact. The authors concluded that extraocular muscle co-contraction does not contribute to intraocular pressure elevation after suxamethonium administration (Kelly et al, 1993).

Induction agents, thiopentone and propofol, administered with suxamethonium in rapid sequence induction and intubation, can abolish intraocular pressure elevation as measured by applanation tonometry (Khosravi et al, 2007). A 2008 Cochrane meta-analysis of 37 studies showed suxamethonium was superior to rocuronium (relative risk 0.86) (Perry et al, 2008).

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The case against suxamethonium

Suxamethonium's effects on intraocular pressure have been well documented since it was licensed in 1955. Suxamethonium is also associated with other hazards: hyperkalaemia, malignant hyperthermia, bradycardia and prolonged apnoea in pseudocholinesterase-deficient patients.

There are alternatives to suxamethonium which do not increase the intraocular pressure, e.g. rocuronium 0.6 mg/kg (Vinik, 1999). Rocuronium has no effect on intraocular pressure while creating optimal intubation conditions 1–2 minutes post-administration. Although it has a clinical duration of action of approximately 31 minutes (range 15–85 minutes) an emergent repair of ruptured globe is likely to last longer than 45 minutes. The rapid-acting, non-depolarizing muscle relaxant rocuronium is therefore an excellent alternative to suxamethonium. The long duration of action was thought to be a limitation of rocuronium, but the introduction of sugammadex, a reversal agent, may overcome this. Thus in cases of penetrating eye injuries and situations where even minor increases in intraocular pressure should be avoided (as in glaucoma) rocuronium should be the drug of choice.

Conclusions

Confronted with this dilemma, anaesthetists face two additional challenges: provision of anaesthetic care for the patient with a traumatic eye injury amid multisystem trauma, and manipulation of anatomical and physiological variables affecting the eye in order to preserve vision. In the case of open globe injury, where rapid sequence induction and intubation is needed, it is vital to achieve an adequate depth of anaesthesia irrespective of which muscle relaxant is used. The ultimate aim is to maintain a stable intraocular pressure since the eye does not have its own pressure-sensitive feedback mechanism. This is possible with suxamethonium if adjuncts are used to prevent increases in intraocular pressure. Close liaison with ophthalmic surgeons may reveal such associated risks to be grave and in these instances rocuronium remains a valuable alternative. **BJHM**

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