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Surgical Technique

Use of an anterior chamber maintainer in the surgical management of traumatic hyphaemas

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Abstract

Surgical intervention in traumatic hyphaemas becomes necessary when high intraocular pressure (IOP) is intractable and there is persistent corneal staining. Anterior chamber (AC) washout and elimination of blood clots have been described previously using one paracentesis. We describe the value of creating two paracenteses. The first one is made in the lower temporal quadrant and accommodates a 20-gauge anterior chamber maintainer (ACM) that is connected to a bottle of Balanced Salt Solution. The second paracentesis is made in an upper quadrant and serves to evacuate liquefied blood and blood clots. With an ACM in place, the fluctuations of intraoperative IOP are minimized and the AC depth is stabilized throughout the operation. The risk of renewed bleeding is reduced because of the continuous positive intraoperative IOP. The ACM is an important tool in the surgical management of traumatic hyphaemas because it facilitates AC washout and reduces iatrogenic damage to the iris and corneal endothelium.

Key words: hyphaema, iatrogenic damage, intraocular pressure, surgery, traumatic.

Introduction

Traumatic hyphaemas that need surgical intervention are generally total hyphaemas with raised intraocular pressure (IOP). Corneal transparency is often compromised and because the anterior chamber (AC) is filled with blood it cannot be viewed (Fig. 1a). At present, the accepted method of AC washout and blood clot evacuation is to use a single paracentesis of variable length.[1,2] When using an irrigation-aspiration device there are associated risks of iatrogenic damage to the iris and corneal endothelium because of the unstable AC depth. McCuen and Fung described a technique whereby a vitrectomy probe and an infusion connected to a needle were used to remove blood clots from the AC.[3] The present study describes a surgical technique and rationale for the systematic use of an anterior chamber maintainer (ACM) to stabilize AC depth and to control intraoperative IOP during the surgical management of traumatic hyphaemas.

Surgical technique

The surgical management of traumatic hyphaemas is performed in the operating theatre under general or local anaesthesia according to the patient's profile. Two separate limbal paracenteses are created for the evacuation of liquefied blood and any clots in a safe and atraumatic manner (Fig. 1b,c). A paracentesis is made, preferably on the lower temporal quadrant, to accommodate a 20-gauge ACM connected to a bottle of Balanced Salt Solution (Fig. 1b,c). Because the view of the AC is obscured by blood, the blade used to create the paracentesis has to be held parallel to the plane of the iris during AC penetration. Before inserting the ACM, a small amount of aqueous and liquefied blood is released by gentle intermittent pressure on the lower lip of the wound. This manoeuvre will decompress the AC and normalize the high preoperative IOP. After inserting the ACM into the paracentesis, the infusion bottle height is adjusted to 50 cm above the patient's head in order to maintain a continuous positive IOP of around 30 mmHg throughout the operation.[4] The bottle height can then be adjusted according to the surgeon's needs during the AC washout. A second paracentesis is created to allow evacuation of liquefied blood and blood clots (Fig. 1b). Our preference is to place the second paracentesis in the upper temporal or upper nasal quadrant to allow easy access for the surgeon's dominant hand. Most of the liquefied blood can be evacuated by intermittent pressure on the lower lip of the second paracentesis. An aspiration cannula can also be of use to complete the AC washout, as well as for mobilizing blood clots. Once the clot is partially engaged in the port of the

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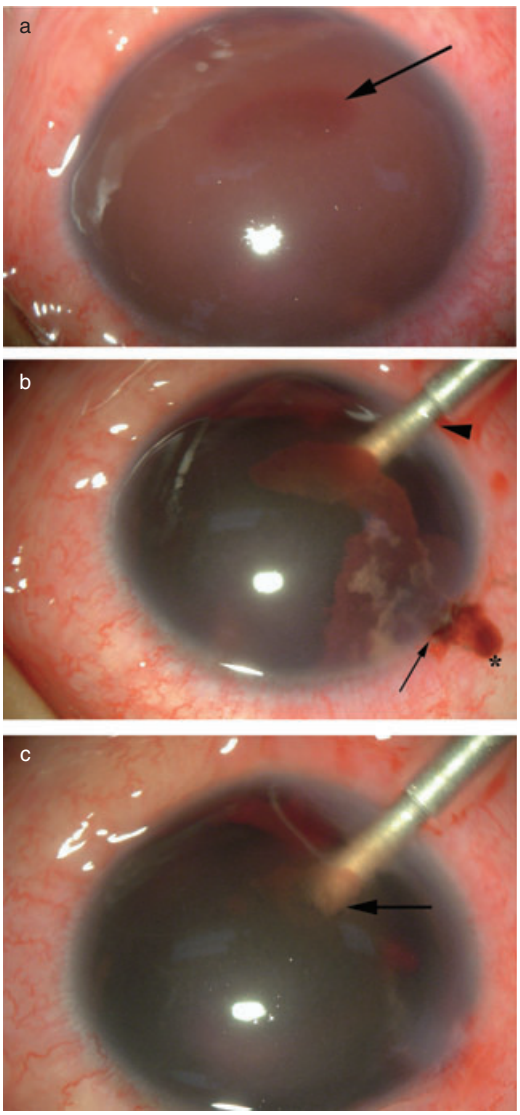

Figure 1. (a) Preoperative photograph of 1-week-old hyphaema in one eye of a 10-year-old child. Note the presence of liquefied blood and a blood clot in the anterior chamber (AC; indicated by the arrow). (b) Intraoperative stage in the procedure shows the hydro-expression of a blood clot (*) through the second upper temporal or upper nasal quadrant paracentesis (arrow) facilitated by the anterior chamber maintainer, which passes through the lower temporal quadrant paracentesis (arrowhead). (c) Intraoperative photograph of the eye following AC washout. Note the increased clarity of the AC. Arrow indicates where the clot has largely been removed from the internal corneal surface.

aspiration cannula, it can be pulled out via the paracentesis wound. The hydrostatic pressure generated by the ACM aids in hydro-expressing the blood clots without the necessity of introducing surgical instruments too far into the AC (Fig. 1b). This method of blood clot evacuation is preferred over extirpation by forceps, because it reduces the risk of iatrogenic damage to the iris and lens. When blood clots are firmly adherent to the iris or to the angle structures, it is more desirable to leave them in place and wait for them to dissolve naturally, thus avoiding rebleeding. Intraoperative haemorrhages can be controlled and arrested by raising the height of the infusion bottle for a few minutes. At the completion of the procedure (Fig. 1c), the surgeon can, at his or her own discretion, choose to suture the paracenteses or to leave them unsutured because of the mostly self-sealing nature of the wounds.

Results

Our technique has been performed on eight children, 6–10 years of age, requiring a monocular AC washout due to uncontrolled IOP and corneal staining resulting from a traumatic hyphaema. No additional bleeding or iris prolapse occurred during any of the operations. There was no significant postoperative inflammation, fibrin deposition or synechial formation. The follow ups were uneventful in all patients and secondary glaucoma has not been detected to date. In five out of the eight eyes, the corneas were completely clear shortly after the operation; in the remaining three patients the corneas progressively cleared over the period of the follow-up examinations.

Discussion

The use of an ACM during anterior segment surgery has been advocated in paediatric and adult cataract surgery.[5–8] The rationale for the use of an ACM during cataract surgery is multifold. Not only is the depth of the AC stabilized, but also the intraoperative IOP fluctuations are minimized. The use of an irrigation/aspiration device causes far more fluid turbulence in the AC than an ACM in combination with a separate aspiration cannula;[7,8,10] the ACM is also gentler to the corneal endothelium than an irrigation/aspiration device.[5–8,10] Thus, the intraocular tissues are subjected to less injury when an ACM is used during anterior segment surgery.[10] An ACM has also been suggested as a safer method for glaucoma surgery.[9] However, its systematic use for the surgical treatment of hyphaemas has not yet been explicitly reported in the literature, although an infusion needle has been suggested during automated removal of blood clots with a vitrectomy apparatus.[1] Here we demonstrate the use of an ACM for the surgical management of traumatic hyphaemas that facilitates blood and clot evacuation with minimal iatrogenic damage to the iris, lens and corneal endothelium. Intracameral manoeuvres are made safer because they are performed within a closed pressurized space and intraoperative IOP fluctuations are minimized in a similar manner to that during cataract surgery when using an ACM.

Surgeons unfamiliar with the use of ACMs in anterior segment surgery might argue that they are cumbersome and require superfluous surgical steps. However, in our experience the insertion of an ACM is relatively easy and does not significantly prolong the procedure. The additional paracentesis might be regarded as another possible route of postoperative infection, but these small paracenteses

(approximately 1 mm) are mostly self-sealing, and do not significantly increase the risk of infections.

Our Departments are major tertiary referral centres for ocular trauma with service areas containing several million people. Following the adoption of the systematic use of an ACM during the surgical management of traumatic hyphaemas, we have qualitatively observed an improvement in the intraoperative and postoperative outcomes. However, because of the great variability of traumatic hyphaemas, further studies will be needed to quantitatively support this clinical impression.

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