Surgical Technique

Pars-plana fluid aspiration for positive vitreous cavity pressure in anterior segment surgeries

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Positive vitreous pressure due to misdirection of aqueous or choroidal effusion leads to shallowing of the anterior chamber (AC) before or during anterior segment surgeries. This shallow AC if not addressed makes surgery difficult and increases the risk of surgical complications. Methods to prevent and manage this condition described in literature are not without problems. We describe a minimally invasive technique of passing a 30G needle through the pars-plana to aspirate misdirected fluid from vitreous cavity either as a prophylaxis just before surgery or during it, thereby decreasing positive vitreous pressure. This technique, used in 12 eyes, seems to be effective in patients with angle-closure glaucoma, malignant glaucoma, and per-operative sudden increase in vitreous pressure during surgery. Small-incision surgeries are ideally suited for this procedure. This minimally invasive technique is simple to perform and complications are unlikely to be more than what is seen with intravitreal injections.

Key words: Anterior segment surgeries, pars-plana fluid aspiration, positive vitreous pressure

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Positive vitreous pressure during anterior segment surgery can lead to intraoperative problems such as difficult manipulation of instruments in the anterior chamber (AC), corneal endothelial damage, recurrent iris prolapse through the wound or paracentesis sites, posterior capsule rupture, and vitreous prolapse. Multiple pre- and intraoperative risk factors have been documented.[1,2]

Various methods have been described to overcome this positive pressure which include relieving external pressure on the globe, proper positioning of the instruments, dry insertion of phaco needle, capsule protection with a second instrument, injection of a retentive ophthalmic viscoelastic device, use of the AC maintainer, vitreous dehydration with intravenous (IV) mannitol, vitrectomy through the pars-plana using a 25/23G vitrector, and vitreous aspiration with 20/23G needle.[2] Large-bore needle aspiration can cause vitreous traction and extrusion of vitreous through the site of entry leading to an increased risk of infection and vitreoretinal traction, especially in the setting of underlying increased vitreous pressure.[3]

In an attempt to circumvent the problems of vitreous traction and the need for vitreous cutters, we describe here the technique of using a 30G needle to aspirate fluid in the vitreous cavity in patients undergoing anterior segment surgeries.

Methods

The pars-plana fluid aspiration described herein was done as part of the primary anterior segment surgery in patients with suspected positive vitreous pressure from September 2014 to November 2015. A complete clinical examination was done for all the patients before and after surgery. Immediate and late postoperative findings were also recorded. A retrospective chart review was done of all patients. Institutional Review Board (IRB) and Ethics Committee Clearance were obtained to describe the procedure, the indications, and outcomes. (IRB Min No. 10346 dated 19.10.2016).

The aspiration was done just before the entry into the anterior segment of the eye (after draping) in patients who had high intraocular pressure (IOP) or where an aqueous misdirection was suspected, like in angle-closure glaucoma (phacomorphic glaucoma, primary angle closure, and malignant glaucoma). During surgery, aspiration was done when there was a sudden unexplained rise in IOP with shallowing of AC, and all external causes such as lid speculum issues, hand position, and instrument position were ruled out. Mannitol was not given for any of the patients.

Surgical technique

A 30G needle (PRICON, 12 mm in length) on a dry 2 cc plastic syringe with rubber washer or glass syringe is inserted 3.5 mm behind the limbus either trans-sclerally or trans-conjunctivally in the quadrant of the incision. The needle is inserted through

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the pars-plana and directed toward the optic disc as is done for intravitreal injections. The entire 12 mm of the metal needle is inserted into the vitreous cavity [Fig. 1]. Once the needle is fully in the eye, the plunger of the syringe is pulled gently to create a negative pressure. If the needle hits a pocket of fluid at the first instance, fluid will come into the syringe immediately. In case no fluid is aspirated, the needle tip may be moved anteriorly toward the lens taking care not to injure the lens or to the sides and aspiration would be repeated. If the tap continues to be dry, the needle maybe withdrawn by 5 mm and similar aspiration maybe done. Once the fluid is aspirated, gentle aspiration should be continued and the syringe should be removed out of the eye so that the fluid if any present, closer to the pars-plana, gets aspirated or is allowed to escape out of the eye. If the tap is absolutely dry and there is no evidence of softening of the globe, one can repeat this maneuver 2–4 clock hours away from the first site. The eye becoming soft signals the success of the procedure. The aspirated fluid will flow out like water from the syringe [Video 1]. Removal of fluid creates adequate space in the AC to continue the surgery.

Demographic data and pre- and postoperative clinical findings including visual acuity, IOP, slit lamp, and indirect ophthalmoscope findings were recorded. Operative findings, timing of the vitreous tap, and the outcomes were also recorded.

Results

A total of 12 patients underwent the procedure during the 15-month period. Five men and seven women between the ages of 38 and 80 years underwent this procedure. The right eye was involved in four patients. Patients were followed up from 4 weeks to 20 months. The preoperative visual acuity ranged from 6/12 to hand movements. Last recorded postoperative vision in 8 of the 12 patients was 6/6, and in four patients it was between 6/12 and 6/36. Indications for the intervention, timing of aspiration, and outcomes are described in Table 1. The amount of fluid aspirated ranged from 0.2 to 0.5 ml. All patients had an IOP of <18 mmHg at the last follow-up visit and were not on any antiglaucoma medication. Other than vitreous hemorrhage in one patient, there was no evidence of retinal tears or retinal hemorrhage in any patient postoperatively.

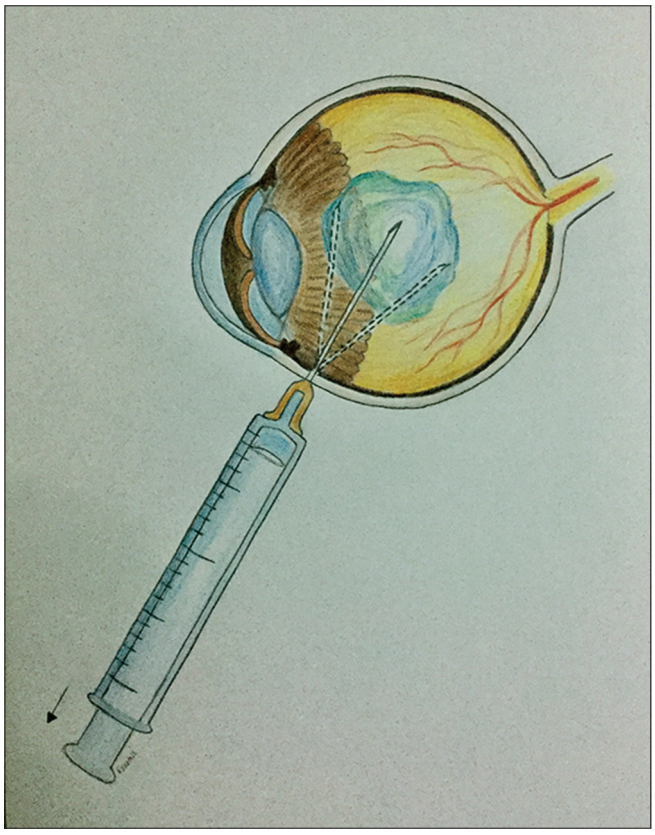

Figure 1: Pars-plana vitreous aspiration with a 30G needle, demonstrating the directions to move the needle tip in the eye

Discussion

Pars-plana aspiration of the vitreous cavity is used for a variety of indications including suspected endophthalmitis,[4] vitreous biopsy,[5] and Chandler's procedure. Vitreous aspiration is associated with complications such as vitreous traction and retinal detachment.[2]

In conditions such as phacomorphic glaucoma and other angle-closure glaucoma where the IOP is high prior to surgery, it is a common practice to give IV mannitol[6] to reduce the pressure before surgery so as to prevent per-operative, positive pressure-related complications.[7] Mannitol is not without systemic side effects, especially in older patients, and patients can become restless during surgery due to mannitol-induced diuresis.

If external pressure on the eye is ruled out, positive vitreous pressure and the resultant shallowing of AC are due to intraocular causes. Increased content in the vitreous cavity due to misdirected aqueous or irrigating fluid can cause raised posterior chamber/vitreous pressure, making it difficult to do surgery in the anterior segment. In primary or secondary angle-closure disease, the pupillary block causes the aqueous to be misdirected back into the vitreous cavity.[2] Choroidal effusion produced by hypotony reduces vitreous volume causing a positive vitreous pressure; it also causes anterior rotation of the ciliary body and misdirection of aqueous. In the current era of sutureless small-incision surgeries, suprachoroidal hemorrhage is a very rare cause of positive vitreous pressure during surgery.

Pars-plana aspiration with a 30G needle allows us to remove misdirected fluid alone without aspirating formed vitreous[8] because the viscosity of formed vitreous precludes aspiration through a 30G needle.[9] The 12-mm length of the needle reduces the possibility of hitting the retina in any quadrant except in the quadrant one has inserted the needle. Therefore, it is important that the needle tip is directed away from the site of injection.

Unlike aspiration with larger-bore needle, unnecessary traction on the vitreous which in turn can pull on the retina causing retinal tears is avoided with a 30G needle. The fine needle path through the sclera allows only fluid to egress out of the eye, and if there is a choroidal effusion, this too can flow out to reduce the posterior chamber pressure. This is probably what enabled us to continue surgery in the patient who had no fluid aspirated from the vitreous cavity. A bloody egress of fluid from the 30G port should raise the suspicion of a suprachoroidal hemorrhage. Pars-plana aspiration of fluid is an easier and safer alternative to IV mannitol to reduce posterior chamber and vitreous pressure before or during surgery. Unlike in the past where large corneal incisions made insertion

Table 1: Indications and outcomes of pars-plana vitreous aspiration using 30G needle

Clinical setting; (age/gender of patient)	P1 - P2 - P3 (mmHg)	Timing of pars-plana aspiration	Fluid aspirated (ml - corrected to the nearest 0.1 ml)	Significant findings noted postoperatively
Trabeculectomy for secondary angle closure - postcataract surgery with IOL (76/male)	42-24-13	Intraoperative	Not measured	Cystoid macular edema/disc pallor
Phacoemulsification with IOL (38/female)	14-14-10	Intraoperative	0.2	Nil
Phacoemulsification with IOL (80/male)	18-18-18	Intraoperative	0.2	Nil
MSICS with IOL (65/female)	15-15-12	Intraoperative	Not measured	Severe uveitis
Malignant glaucoma - IOL explantation (66/female)	46-19-12	Preoperative	0.2	Central retinal vein occlusion
MSICS with IOL - phacomorphic glaucoma (50/female)	34-26-12	Preoperative	0.2	Severe uveitis
MSICS with IOL - phacomorphic glaucoma (51/female)	64-10-18	Preoperative	0.5	Nil
Phacoemulsification with IOL - primary angle-closure glaucoma (79/male)	28-18-18	Intraoperative	Not measured	Secondary glaucoma on medication
Phaco triple - angle-closure glaucoma (48/male)	64-28-14	Preoperative	0.3	Nil
Phaco triple - chronic angle-closure glaucoma (44/female)	32-15-18	Intraoperative	Dry tap	Disc pallor
AC reformation+PI-secondary angle closure - postcorneal tear repair and IOL (50/female)	38-38-8	Preoperative	0.5	Failed trabeculectomy
Phacoemulsification with IOL in vitrectomized eye (70/male)	16-16-18	Intraoperative	0.4	Vitreous hemorrhage

P1: IOP at presentation, P2: Preoperative IOP, P3: Postoperative IOP. MSICS: Manual small-incision cataract surgery, IOL: Intraocular lens, AC: Anterior chamber, PI: Peripheral iridectomy

of needles through the pars-plana difficult during surgery, it is easy in small-incision surgeries with closed AC.

Aqueous aspirate measurement was overlooked in three patients due to anxiety surrounding the surgery. The aspirate amount of 0.2–0.5 ml seems to be enough to make the surgery safe. Rarely, when too much fluid is aspirated, the lens iris diaphragm goes back more than normal and can make phacoemulsification or expression of nucleus in manual small-incision cataract surgery more difficult. Titration of the aspirate if needed can be done by the scrub nurse observing the aspirate. A 0.3 ml aspirate is enough to proceed with surgery. Since formed vitreous does not get aspirated, it is unlikely that the globe will collapse.

The shallowing of AC in a vitrectomized eye [Case 12, Table 1] is most unusual and could have been due to misdirection of fluid or viscous agent (methyl cellulose) through the zonular defects caused during his previous vitrectomy procedure. The vitreous hemorrhage this patient had was the only complication that could be directly attributed to the pars-plana aspiration and this cleared without sequelae.

Complications of endophthalmitis and retinal detachments due to vitreous traction are a possibility with this procedure, but the incidence is unlikely to be any more than what is seen with the widely used intravitreal anti-vascular endothelial growth factor injections,[10] which also uses 30G needles. As opposed to intravitreal injections, this procedure is done under much more sterile conditions. The aspiration done here reduces IOP, thus decreasing the chance of vitreous extruding through the 30G needle tract.

Conclusion

Thirty gauge needle fluid aspiration could be considered as an alternative to 27G vitrectomy in aqueous misdirection, especially in a resource-constrained setting.

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Conflicts of interest

There are no conflicts of interest.

References

1. Reddy MK. Complications of cataract surgery. Indian J Ophthalmol 1995;43:201-9.
2. Kaplowitz K, Yung E, Flynn R, Tsai JC. Current concepts in the treatment of vitreous block, also known as aqueous misdirection. Surv Ophthalmol 2015;60:229-41.
3. Chalam KV, Gupta SK, Agarwal S, Shah VA. Sutureless limited vitrectomy for positive vitreous pressure in cataract surgery. Ophthal Surg Lasers Imaging Retina 2005:518-22.
4. Han DP, Wisniewski SR, Kelsey SF, Doft BH, Barza M, Pavan PR, *et al*. Microbiologic yields and complication rates of vitreous needle aspiration versus mechanized vitreous biopsy in the Endophthalmitis Vitrectomy Study. Retina 1999;19:98-102.
5. Manku H, McCluskey P. Diagnostic vitreous biopsy in patients with uveitis: A useful investigation? Clin Exp Ophthalmol 2005;33:604-10.
6. Weiss DI, Shaffer RN, Wise BL. Mannitol infusion to reduce intraocular pressure. Arch Ophthalmol 1962;68:341-7.
7. Kolker AE. Hyperosmotic agents in glaucoma. Invest Ophthalmol 1970;9:418-23.
8. Haseler LJ, Sibbitt RR, Sibbitt WL Jr., Michael AA, Gasparovic CM, Bankhurst AD, *et al*. Syringe and needle size, syringe type, vacuum generation, and needle control in aspiration procedures. Cardiovasc Intervent Radiol 2011;34:590-600.
9. Smith JM, Mathias MT, Oliver SC, Mandava N, Olson JL, Quiroz-Mercado H, *et al*. The influence of needle gauge and infection source on vitreous aspirate cultures. Br J Ophthalmol 2016;100:453-5.
10. Falavarjani KG, Nguyen QD. Adverse events and complications associated with intravitreal injection of anti-VEGF agents: A review of literature. Eye (Lond) 2013;27:787-94.