Vitrectomy for Advanced Diabetic Retinopathy

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Laser therapy has been proven to be effective in the treatment of diabetic retinopathy and maculopathy, and remains the primary modality of treatment in these potentially sight-threatening complications of diabetes mellitus. However, in cases of advanced diabetic retinopathy, vitreous microsurgery (vitrectomy) may be necessary.

Diabetic vitrectomies are performed for the removal of persistent vitreous haemorrhage, tractional membranes which cause or are at risk of causing retinal detachments, and for the repair of tractional retinal detachments. Patients with uncomplicated vitreous haemorrhages are generally advised to wait a few months for spontaneous clearing. In the past, the recommended period of observation was six months. However, with recent advances in vitreous microsurgery, vitrectomy is now commonly done earlier if both patient and surgeon are in agreement for earlier intervention.

In vitrectomy, three 20 to 25 gauge micro-incisions are made at the pars plana of the eye. The pars plana is a safe-zone between the lens and retina, within which instruments may be inserted into the eye with minimum risk of damage to these intraocular structures. One site is assigned the port where fluid is infused into the eye to maintain intraocular pressure during the procedure; the other two incisions are used as access for the insertion of the light pipe and instruments like vitreous cutters, micro-surgical scissors, forceps and laser probes. The light pipe provides illumination within the eye so that surgery can be performed through the pupil and cornea, with the aid of a viewing system.

During vitrectomy, vitreous haemorrhage is removed by cutting and aspirating the vitreous gel. Tractional membranes are removed in sheets using micro-surgical scissors and forceps (delamination), or cut into smaller islands which cannot exert significant tractional forces on the retina (segmentation). Laser panretinal photocoagulation is often also performed. At the end of the surgery, temporary vitreous replacement agents like gas or oil may be injected into the vitreous cavity to help re-attach detached retina.

Photo Credit: Nikolay Suslov

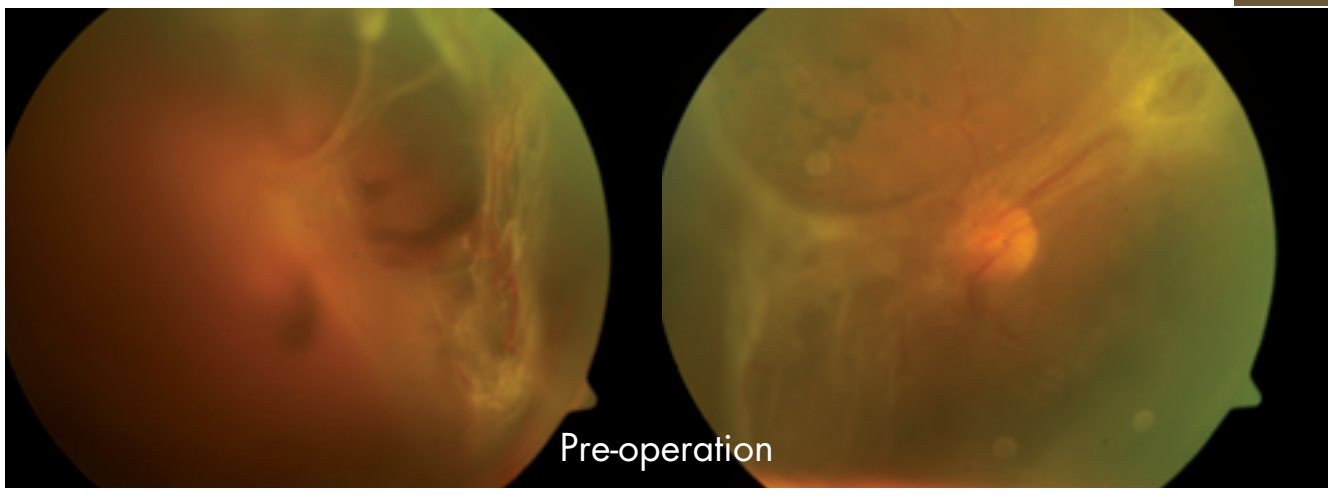
Pre-operative issues in the diabetes patients

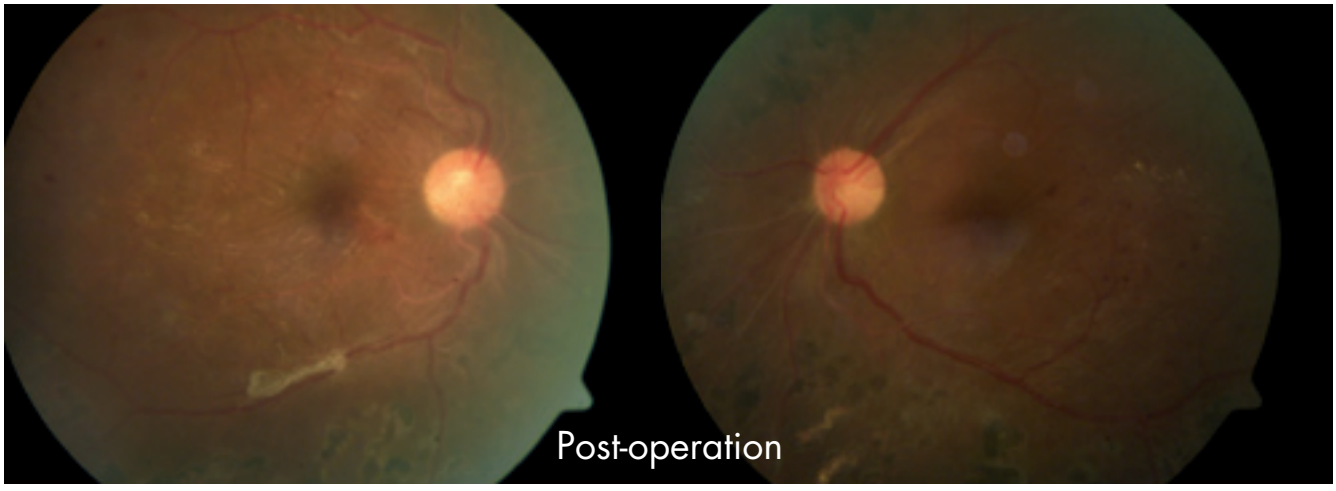
In preparing a patient for vitrectomy, several factors have to be considered. Glycaemic control is often suboptimal to begin with, and many diabetes patients also have other comorbidities that may complicate surgery and its outcome.

All intraocular surgeries risk the devastating complication of endophthalmitis. Although extremely rare (less than 0.1% after vitrectomy[1-3]), endophthalmitis is often blinding. Diabetes patients, with their higher risk of infections in general, are arguably at higher risk of endophthalmitis than the non-diabetic population. Tightening of glycaemic control prior to and in the immediate period after surgery will help reduce the risk of this complication. Therefore, apart from omission of diabetic medication on the day of surgery, they should be resumed after the patient returns normal feeds post-operatively.

As another measure against endophthalmitis, diabetes patients should be examined for possible infective foci like ulcers in their feet or discharging sores pre-operatively. Most diabetic vitrectomies are considered non-emergency surgeries, and many surgeons, when informed of infective lesions which may potentially contaminate the eye post-surgery, Prior to surgery, it is important to take note of medication the patient may be using. Anti-platelet agents and anti-coagulants may predispose to peri-

Today, more than 240 million people worldwide are living with diabetes. Within 20 years, this number is expected to grow to 380 million.





operative intraocular bleeding. The most severe type of intraocular bleeding is the suprachoroidal haemorrhage, which is potentially sight-threatening. Recurrence of vitreous haemorrhage in the immediate period after diabetic vitrectomy is not uncommon because of the continued ooze from the cut ends of the neovascular fronds, and often resolve spontaneously after a period of a few weeks. However, those on anti-platelet agents and anti-coagulants may suffer from more severe re-bleeds that may require longer to clear, or require further surgical drainage. The question of whether these agents should be stopped pre-operatively will require a joint decision between the ophthalmologist, physician and the patient, weighing the systemic risk of stopping these medications against the increased risk of peri-operative intraocular haemorrhage. There are no guidelines as to when it is safe to resume anti-platelet agents and anti-coagulants after vitrectomy, and many surgeons accept that they may be resumed within a day or two after surgery.

Apart from anti-platelet agents and anti-coagulants, many diabetes patientss are also on angiotensin-converting enzyme (ACE) inhibitors, either for their blood pressure lowering effects, or for their reported renoprotective benefits.The dry cough that ACE inhibitors sometimes induce can disrupt vitrectomy under regional anaesthesia. In these cases, it is best to temporarily stop their use, or replace it with another anti-hypertensive agent.

Post-operative issues in the diabetes patient

The use of gas or silicone oil as vitreous replacement after vitrectomy may be necessary to help reattach the retina. With the patient's head postured as instructed by the surgeon postoperatively, the gas or silicone oil will provide the maximum buoyant force against a detached retina. Gas is retained in the vitreous cavity for a period ranging from two weeks to two months, and requires no further procedure to remove it as it dissipates gradually and spontaneously. However, it is important to note that should the patient require another surgery under general anaesthesia within this period, the anaesthetist should be alerted to the presence of gas in the patient's eye as further administration of nitrous oxide during the second general anesthesia may cause sufficient expansion of the gas within the confines of the globe to cause a central retinal occlusion.

Children are not spared from this global epidemic, with its debilitating and life-threatening complications. Type 1 diabetes is growing by 3% per year in children and adolescents, and at an alarming 5% per year among pre-school children.

The same theory of gas expansion within the globe also precludes the patient from air-travel for the duration that gas remains in the eye. Silicone oil is generally used in more complex cases requiring longer term vitreous replacement to attain retinal stability. Unlike gas, it requires a second surgery for removal, but the advantage is its non-expansile nature which means it is not subjected to the same risk of volumetric changes as gas.

Severely ischemic diabetic eyes risk developing anterior segment neovascularisation after vitrectomy. This is reduced with adequate panretinal photocoagulation, but higher risks have been reported in cases in which cataracts had been removed at the same sitting. It is postulated that the lens of the eye forms a natural barrier against the egress of growth factors into the anterior segment, and its removal predisposes the eye to neovascularisation of the iris and angles, and therefore neovascular glaucoma. Optimising glycaemic control in the run-up to and for a period after surgery will reduce this risk.

Newer adjuncts to vitrectomy

Recently, intravitreal anti-vascular endothelial growth factor (anti-VEGF) agents have gained popularity in the treatment of diabetic eye diseases. While originally used in the treatment of age-related macular degeneration, anti-VEGF agents have shown benefit in the array of VEGF-driven diabetic eye complications ranging from retinopathy and maculopathy, to neovascular glaucoma.

Its benefit as a preoperative adjunct is in laying the groundwork for diabetic vitrectomy. It has been shown to cause regression of neovascular complexes and reduce their vascularity so that their removal during vitrectomy is easier, more complete and associated with less bleeding. Anti-VEGF agents are generally injected into the vitreous cavity a week or two prior to vitrectomy.

Due to the dramatic effects of intravitreal anti-VEGF agents, their use in various stages of diabetic retinopathy and maculopathy has surged. Unfortunately, as with any intraocular procedure, one must keep in mind the attendant risk of endophthalmitis with any intraocular procedure.

In trials for use of anti-VEGF agents in age-related macular degeneration, some cases of systemic complications like thromboembolic events were reported. These were later deemed to be unlikely to be related to the intravitreal administration of anti-VEGF agents. However, the fear remains in many ophthalmologists that these systemic risks may be amplified in diabetics and especially in those with multiple ischemic comorbidities. The other issue still being investigated is the long term effects of VEGF inhibition in diabetic eyes which are already ischemic to begin with.

Conclusion

Vitrectomy is reserved for advanced cases of diabetic retinopathy and serves to evacuate non-clearing vitreous haemorrhage, remove tractional membranes and repair detached retina.

With the advancement in vitreous microsurgery, vitrectomy has become safer and more successful. The interplay of perioperative issues and their management play a large part in the success of the surgery. In diabetes patients, many with multiple comorbidities, the general practitioner can play a vital role in their wholistic management.

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2. Mamalis N, Kearsley L, Brinton E. Postoperative endophthalmitis. Curr Opin Ophthalmol 2002; 13:14–18.
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It is estimated that 70,000 children under 15 develop type 1 diabetes each year (almost 200 children a day).