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Pars Plana Vitrectomy

(Contributed by Dr. Bernhard Spiess)

For more than 25 years pars plana vitrectomy (PPV) has been used in the management of chronic endogenous uveitis in humans. The main goal was to improve vision by clearing the media or removing membranes. However, PPV in eyes with chronic uveitis also altered or diminished the severity as well as the frequency of uveitis relapses. There is evidence that PPV has a beneficial effect on the clinical course of chronic endogenous posterior uveitis possibly by physically removing any resident inflammatory cells with the vitreous.(REF?) Despite the reported complications (i.e. vitreal hemorrhage, cataract formation, retinal detachment) following PPV, the majority of the patients were able to switch from rigorous systemic preoperative medication to simple eye drops or no treatment at all.(REF?)

Vitrectomy has been studied in experimental, protein-induced uveitis in rabbits[8, 9], but it was not until 1991 that PPV has been described in the management of ERU.[1] PPV has since been used in the treatment of ERU primarily in Europe.[2, 3] Similarly to the human counterpart, the most common complications reported in horses are transient hypopyon, vitreal and/or retinal hemorrhage, retinal detachment, and cataract formation.[3]

In the majority of reported cases of ERU in Europe, antibodies to, DNA of, or cultured *Leptospira sp.*, organisms has been identified in serum, aqueous humor, or vitreous samples. This suggests that ERU is probably often a sequel of systemic *Leptospira* infection.[4-9]

Patient selection

Because of the possible serious complications of PPV, patient selection is of great importance. All patients are examined by slit-lamp biomicroscopy, indirect and direct ophthalmoscopy and applanation tonometry. Ultrasonography is performed in cases with opaque media. The diagnosis of ERU must be confirmed and is based on the description earlier in this chapter, but there must be characteristic signs of acute or chronic uveitis and a documented history of recurrent episodes of acute uveitis. Horses with dense vitreal

opacity may benefit most from vitrectomy, not only by decreasing recurrent episodes, but also by improving vision by removal of vitreal debris.

Horses ideally are operated in the quiescent stage of the disease. Because of the trans-pupillary visualization of the vitrectomy probe during the procedure, the optical media (i.e. cornea, anterior chamber, lens) should be as transparent as possible. The pupil should dilate maximally with no or few posterior synechiae. Pre-existing focal cataracts are likely to progress following PPV and should be taken into consideration when selecting patients. In patients with secondary glaucoma, phthisis bulbi, or preexisting retinal detachment, PPV should not be recommended. Owners should be carefully informed on the surgery, as well as the possible intra- and postoperative complications.

Pre- and postoperative medication

Topical 0.1% dexamethasone drops in combination with Neomycin and Polymyxin B are administered QID beginning one week prior to surgery. Systemic nonsteroidal anti-inflammatory drugs (i.e. flunixin meglumine) are administered beginning three days preoperatively. The pupil is dilated with 1% atropine drops on the day of surgery. Postoperatively, topical Dexamethasone/Neomycin/Polymyxin B eye drops are continued TID for 2 weeks, and then tapered over another 4 weeks. Systemic NSAIDs are continued for one week.

Surgical technique

A standard two-port PPV is performed in lateral recumbence under general inhalation anesthesia. The eye is prepared for intraocular surgery. After draping, an eyelid speculum is inserted. A lateral canthotomy may improve exposure of the globe, however, this is usually not necessary. A limbal stay-suture in the 12 o'clock position is placed for globe manipulation. A limbal-based conjunctival flap is prepared and the sclera exposed medially and laterally to the dorsal rectus muscle. Using a CO₂-laser, a first sclerotomy is performed 10 mm posterior to the limbus. A right-handed surgeon will place this first entry to the left of the rectus muscle. A double-ended lacrimal dilator may be used to enlarge the sclerotomy if necessary. The irrigation port is inserted and its footplate secured to the sclera with 2 sutures (4-0 Polyglactin 910) (FIGURE). (Figures to be used are from the first

edition and ones that I have taken - Bernhard - I will send these to you to review and you can replace if you wish) With the vitrectomy unit in continuous irrigation mode and the fluid containing bottle positioned 85 cm higher than the surgical site, the intraocular pressure will be around 40 mm Hg. Balanced salt solution with 40 mg of Gentamicin added per 500 ml is used as irrigation fluid. A second laser sclerotomy is performed, again 10 mm posterior to the limbus and to the right of the rectus muscle. The vitrectomy probe is carefully inserted and advanced in the direction of the center of the vitreous (Figure). Again, the sclerotomy may be enlarged with a lacrimal dilator if necessary. Both sclerotomies should be tight enough to prevent leakage of irrigation fluid, which would make maintenance of IOP difficult. The vitrectomy probe should be held at an approximately 70-degree angle and passed toward the optic nerve, taking care to avoid touching the lens when inserting the probe. The probe tip should be held with the aspiration port facing the surgeon (Figure). . The central and anterior parts of the vitreous can be removed by direct visualization through the dilated pupil. Indirect ophthalmoscopy using a 20 D lens is used to visualize posterior and peripheral parts of the vitreous. Alternatively, a custom-made equine vitrectomy contact lens (Acrivet, Berlin, German) can be used to visualize the posterior segment through the operating microscope (Figure). Aspiration of vitreous can easily be observed, especially if there are inflammatory materials. Estimating the distance between the probe and its shadow cast onto the retina will help the surgeon to avoid touching the retina. Throughout the entire procedure the intraocular pressure (IOP) should be maintained at approximately 40 mm Hg. Slight wrinkling of the retina, seen with the aid of the ophthalmoscope indicates that the IOP may be too low. Vitrectomy should be interrupted until a normal IOP is restored. The procedure is continued until all turbid vitreal material has been removed. Under continuous irrigation, the vitrectomy probe is removed and the sclerotomy closed with one or two single interrupted sutures using 4-0 Polyglactin 910. Subsequently the irrigation port is removed. Remaining peripheral vitreous will usually prevent fluid from escaping through this sclerotomy, which is closed with 4-0 Polyglactin 910. The conjunctiva is closed with Polyglactin 910 in a continuous pattern. A canthotomy is closed with a figure-of-eight suture using 4-0 non-absorbable suture materials. At the end of surgery, 20 mg of methylprednisolone may be injected subconjunctivally in the inferior bulbar conjunctiva.

Some differences performing in this procedure in the horse have been established. To avoid uveal hemorrhage both sclerotomies are performed using a CO₂ Laser in continuous mode at 50 W. Commercially available standard vitrectomy probes are too short for use in horses. A 55mm oscillating vitrectomy with a guillotine-like chopping blade probe is used at 12.0 Hz, an aspiration vacuum of 400 mm Hg and a flow rate of 15 mL/min (Figure). High oscillation frequency, moderate suction, and low flow are used to minimize vitreoretinal traction and decrease the incidence of iatrogenic retinal breaks.

Complications

Intraoperative complications include lens trauma, vitreal/retinal hemorrhage, and retinal detachment. Maintaining IOP at around 40 mm Hg and using a CO₂ laser for the sclerotomies instead of surgical blades can avoid hemorrhage. Touching the retina should also be avoided as it results in immediate hemorrhage and subsequent detachment. Early postoperative complications (less than 3 months) include cataract formation and retinal detachment. Late complications occurring after 3 months include cataract formation as well as recurrence of active uveitis.

Long-term results

Seventy-three percent of horses that underwent pars plana vitrectomy showed no further recurrence of uveitis. Twenty-two continued to suffer from recurrent episodes of uveitis. The remaining horses were reported to have experienced only one more episode of uveitis, which was easily controlled with topical anti-inflammatory therapy.REF
Vitreous samples of every horse were submitted and 78% were positive for *Leptospira spp.* MAT serology. The most common serovars were *L. grippothyphosa*, *L. copenhageni*, *L. Bratislava*, *L. canicola*, *L. pyogenes* and *L. Pomona*. Of the *Leptospira*-positive horses, 81% showed no further recurrences after vitrectomy, while of the *Leptospira*-negative patients 83% had further recurrences. Therefore, this suggests that pars plana vitrectomy represents a successful surgical therapy for horses suffering from *Leptospira*-related ERU, while patients testing negative for *Leptospira sp.* are poorer candidates for this surgery. They may, however, be more suitable candidates for the implantation of cyclosporin-releasing devices.

Clinical experience would suggest that aqueous humor and/or vitreous samples of horses suffering from ERU should be tested for *Leptospira* sp., and that the decision to perform pars plana vitrectomy should be based on these results. In another study of 38 cases 5 eyes showed recurrence of uveitis between 10 days and 3 years postoperatively.REF Thirty-three eyes showed no recurrence during a follow-up period of up to 5 years. Vision remained stable in 28 eyes and improved in one eye. The remaining eyes showed marked vision loss as a result of cataracts (3), phthisis bulbi (22), or unknown cause (22). Of the 5 eyes with recurrent uveitis 2 demonstrated marked loss of vision, while 3 maintained preoperative vision.REF

In an earlier study of 43 eyes post PPV, 42 remained free of recurrent uveitis during a follow-up period of 67 months.REF 70% of these eyes retained some vision. The most common complication was cataract formation in 19/43 eyes, followed by phthisis bulbi in 6 eyes, and retinal detachment in 4 eyes.

In selected patients with consenting owners, PPV offers a promising alternative to conventional therapy. With few exceptions, eyes show no recurrence of uveitis after PPV. However, a significant number of postoperative complications cause visual impairment or blindness. The most common long-term postoperative complication appears to be cataract formation. It is unclear, whether pre-existing lenticular opacities progress despite PPV or if the progression is caused by the procedure. Touching the posterior lens capsule during PPV invariably leads to focal cataracts, which very often progress. Retinal and vitreal hemorrhage is the most common intraoperative complication. Maintaining a high normal IOP, careful manipulation of the vitrectomy probe, and avoidance of touching the retina usually prevents such complications. Choroidal hemorrhage can be avoided with the use of a CO2 laser instead of a surgical blade. Despite these complications, PPV appears to be a promising method for long-term control of leptospiral induced equine recurrent uveitis.

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