Pars plana vitrectomy assisted by triamcinolone acetonide for refractory uveitis: a case series study


Aim: To examine the outcome of a triamcinolone acetonide (TA) assisted pars plana vitrectomy (PPV) for refractory uveitis.

Methods: Six patients suffering from proliferative vitreoretinopathy (PVR) with refractory uveitis underwent a TA assisted PPV. The patients consisted of one with Vogt-Koyanagi-Harada disease, one with acute retinal necrosis, one with Behçet’s disease, and three with sarcoidosis. TA was inoculated into the vitreous cavity to visualise the vitreous. In four of six patients, 4 mg of TA were intentionally left in the vitreous cavity to reduce the degree of postoperative inflammation.

Results: The vitreous body was clearly seen using TA during surgery, which greatly helped us to perform a posterior hyaloid resection safely and thoroughly. As we previously observed in other disease, TA allowed us to visualise the transparent vitreous and thus was helpful in removing the vitreous cortex from the retina completely in uveitis. One patient (Behçet’s disease, in whom TA was intentionally left) showed an elevated intraocular pressure (IOP) transiently after surgery which was controllable by topical eye drops. The remaining TA diminished day by day and had almost completely disappeared within a month from operation.

Conclusion: TA improved the visibility of the hyaloid and the safety of the surgical procedures and no serious complications were observed after TA assisted PPV in uveitis. Although the long term effects are still unknown, this method appears to be potentially useful as an improved treatment for PVR associated with refractory uveitis.

In some types of refractory drug uncontrollable uveitis, inflammatory cells are exhaled into the vitreous cavity. Ocular inflammation induces retinal gliosis and the activation of pigment epithelial cells, which sometimes causes subsequent proliferative vitreoretinopathy (PVR) which is directly related to the loss of vision in patients with uveitis. In such cases, a pars plana vitrectomy (PPV) is the only way to maintain the visual functions. Owing to advances in the technical development of pars plana vitrectomy (PPV), the indications for a PPV in uveitis has continued to increase.

In general, PPV in uveitis is more difficult to perform than in other diseases. Postoperative complications, such as cataract, high ocular pressure, and recurrence of PVR, are frequently induced by prolonged ocular inflammation. In fact, infiltrating macrophages have been shown to play a major part in the formation of the epiretinal membrane in an animal study. It is therefore important to establish an effective ways to prevent and manage postoperative ocular inflammation in patients with uveitis. Although various surgical techniques and instruments have been developed in PPV, the removal of the residual vitreous cortex remains an uncertain procedure because of the transparency of the vitreous and also because inappropriate procedures can sometimes result in severe complications.

Triamcinolone acetonide (TA) is a water insoluble steroid that inhibits various inflammatory reactions. Peyman et al. originally described the intravitreal injection of TA during a vitrectomy. TA granules twine around the vitreous body and thus allow the transparent vitreous to be visualised and therefore helps surgeons to achieve a complete removal of the vitreous from the retina. We previously reported that TA assisted PPV improves the effectiveness of such surgical procedures, tends to obtain better visual outcome, and decreases the postoperative blood-ocular barrier breakdown. TA actually improved the visibility of the vitreous body during PPV, which ensured the safety of the surgical manoeuvres. Thus far, TA assisted vitrectomy did not have any apparent adverse effects on postoperative findings or visual outcome.

In the present study, we performed TA assisted PPV for the treatment of several kinds of refractory uveitis and examined the postoperative outcome. In some cases, 4 mg of TA was intentionally left after a vitrectomy to reduce the degree of postoperative inflammation.

PATIENTS AND METHODS

Patient selection

The patients with uveitis were included in the present study, which was carried out with the approval of the appropriate institutional review board and was performed in accordance with the ethical standards laid down in the 1989 Declaration of Helsinki. The possible merits and risks of the present treatment were explained to the patients before surgery and informed consent was obtained from all patients.

Patients who underwent TA assisted PPV at Kyushu University Hospital from April 2000 to June 2001 were enrolled in this study. All cases were examined postoperatively for 2 months or longer.

Surgical procedures

A TA aqueous suspension was left standing for 30 minutes and the vehicle of TA (Kenakol-A, Bristol Pharmaceuticals KK, Tokyo, Japan) was discarded according to a previously described method. The remaining TA (40 mg) suspension was mixed with 5 ml balanced salt solution (BSS, Santen, Osaka, Japan) and this procedure was repeated twice. Thereafter, the final suspension was used for the following procedure as a TA suspension.

Firstly, the standard phacoemulsification was performed when needed. The standard PPV using three sclerotomies,
removing the vitreous up to the vitreous base, was performed and
the following procedures were added. A core vitrectomy
was performed and 0.5–1.0 ml of TA solution was injected
with a 27 gauge needle into the mid-vitreous cavity. The TA
granules were trapped in the gel structure of the vitreous.
Thereafter, the posterior cortical vitreous appeared as a white
gel and a break of the posterior hyaloid cortex appeared on the
retinal surface. After the vitrectomy was sufficiently per-
formed, the residual vitreous cortex which trapped TA was
removed either by a silicone tipped needle or ILM forceps.
Some eyes underwent retinal endolaser photocoagulation
when needed. Finally, an intraocular lens was inserted and
silicone or SF6 gas tamponade was performed in some cases.
After the conjunctiva was closed, gentamicin was injected
subconjunctivally.

In addition, aciclovir (40 mg/ml) was dissolved in the infu-
sion solution during PPV and silicone oil tamponade was per-
formed in case 5.

**Intentional TA leaving**

Basically, we remove the TA granules from the eye using a sili-
cone tipped needle after PPV. A small amount of TA granules
were usually left on the inferior retina; however, the exact
amount of TA left in the eye was not measured. To control
ocular inflammation post-surgery, four of six patients had 4
mg of TA intentionally left in the vitreous cavity after the
complete removal of the vitreous.

**Postoperative examination**

The patients were clinically examined for more than 4 months
after surgery. Postoperatively, we carefully checked the best
corrected visual acuity, while also identifying any elevation or
symptoms of intraocular pressure (IOP), ocular inflammation,
infected, or a need for reoperation. Ocular inflammation was
corrected visual acuity, while also identifying any elevation or
after surgery. Postoperatively, we carefully checked the best
posterior hyaloid separation. The edge of this hyaloid is held with a surgical forceps (arrow). (B) The
membrane is gradually removed. (C) The macular area (arrow) is then free from the residual vitreous cortex.

**Figure 1** Intraoperative findings regarding the removal of the residual vitreous cortex (case 1). (A) A thin hyaloid membrane (arrow) is left on
the posterior retina even after the surgical posterior hyaloid separation. The edge of this hyaloid is held with a surgical forceps (arrow). (B) The
the posterior retina even after the surgical posterior hyaloid separation. The edge of this hyaloid is held with a surgical forceps (arrow). (B) The

**RESULTS**

**The individual preoperative conditions**

Three female patients had had uveitis associated with sarcoi-
dosis (cases 1–3). Although all three patients had already been treated by systemic and topical steroids, their
condition did not improve. Thereafter, severe vitreous opacity
and partial tractional retinal detachment occurred. A patient
with Behçet’s disease and underwent PPV because of retinal
detachment induced by the traction of proliferative tissues in
the vitreous that was confirmed by the examination of
B-mode ultrasound examination (case 4). A patient with
Vogt-Koyanagi-Harada (VKH) disease (case 5) underwent
PPV because of her rhegmatogenous retinal detachment.
Although the correlation between VKH and the retinal
detachment was not clear, she actually had prolonged ocular
inflammation due to a relapse of VKH disease when she had
PPV. Another patient (case 6) had acute retinal necrosis
induced by an infection of herpes simplex virus type 1 (HSV-
1), which was diagnosed based on virus DNA amplifications
by polymerase chain reaction (PCR) in the aqueous humour.
At the time of PPV, the peripheral retina became necrotic and
multiple retinal holes existed at the necrotic portion.

**During surgical procedures**

During the surgery, the posterior hyaloid was clearly seen as a
white powdery gel after the injection of TA suspension. In
most cases, the posterior hyaloid could be separated from the
retina by the gentle aspiration of a vitrectomy probe or silicone
tipped needle; thus no iatrogenic retinal tear was formed dur-
ing this procedure. Of note, the islands of the thin posterior
hyaloid membrane (residual vitreous cortex) were scatteringly
observed on the retinal surface even after the surgical
posterior vitreous detachment was completed by the routine
method (Fig 1). It is very difficult to recognize the island of the
hyaloid membrane without the aid of TA solution. TA also
greatly improved the visibility of the obscure peripheral vitre-
ous.

**Postoperative evaluation**

At the end of the follow up period, the retina was attached in
all six cases. No eye required additional PPV, filtering surgery,
or cataract surgery. After surgery, the intentionally left TA
gradually disappeared within a month in the vitreous cavity
(Fig 2).

In five of six cases, the visual acuities were improved after
TA assisted PPV (Table 1). Case 4 did not show an
improvement in the visual acuity. Her optic disc had been seri-
ously damaged by Behçet’s disease, and we could not even
observe her fundus before operation because of a dense cata-

tact.

As shown in Table 2, ocular inflammation in both the ante-
rior chamber and anterior vitreous cavity was reduced in all
cases post-TA assisted PPV. This tendency became apparent in
the vitreous cavity compared to the inflammations in the
anterior chamber. To confirm the conditions of posterior seg-
ment of the eye, fluorescein angiography (FAG) was per-
formed after TA assisted PPV. In all six cases, the condition of
the retinal vessels was generally fair. Figure 3 showed the rep-
resentative photographs of FAG (cases 3, 4, and 6). There were
no inflamed lesions such as a severe hyperfluorescein area, non-perfusion area because of vessel occlusion or oedema. Collectively, we can conclude that the TA used during PPV reduced the degree of postoperative ocular inflammation effectively.

An IOP elevation is a common complication of treatment involving ocular TA injection. In a previous study, 25% of the eyes with an intraocular injection of TA experienced an IOP elevation and as much as 4 mg of triamcinolone was injected into the eyes of the patients. One patient transiently showed an elevated IOP after surgery (case 4). However, she also had partial goniosynechia and complete posterior synechia of the iris as a result of Behçet’s disease, thus her IOP was elevated (45 mm Hg) and uncontrollable by topical and systemic antiglaucoma drugs by the time she was referred to our clinic. We assume that her postoperative IOP elevation was due to the pre-existing goniosynechia rather than to the side effects of TA.

The intraoperative use of steroids might also increase the risk of postoperative infection. In this series of examinations,

Table 1  Patients’ demography and treatment outcome

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Kind of uveitis</th>
<th>Preoperative visual acuity</th>
<th>Postoperative visual acuity</th>
<th>Combined surgery</th>
<th>TA leave</th>
<th>Follow up (month)</th>
<th>Complication</th>
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<td>27</td>
<td>sarcoidosis</td>
<td>HB</td>
<td>20/20</td>
<td>PEA+IOL implantation</td>
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<td>30</td>
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<td>HB</td>
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<td>61</td>
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<td>20/30</td>
<td>PEA+IOL implantation</td>
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<tr>
<td>4</td>
<td>F</td>
<td>36</td>
<td>Behcet disease</td>
<td>HB</td>
<td>HB</td>
<td>PEA+IOL implantation</td>
<td>+</td>
<td>6</td>
<td>IOP elevation</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>58</td>
<td>VKH</td>
<td>HB</td>
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<td>–</td>
<td>8</td>
<td>none</td>
</tr>
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<td>20/50</td>
<td>20/30</td>
<td>PEA</td>
<td>–</td>
<td>10</td>
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HM = hand movement, PEA = phacoemulsification and aspiration, IOL = intraocular lens.

Table 2  Preoperative and Postoperative inflammation

<table>
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<tr>
<th>Patient No</th>
<th>Preoperative</th>
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<th>2 month</th>
<th>Preoperative</th>
<th>1 month</th>
<th>2 month</th>
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<tbody>
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<td>++</td>
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</tr>
<tr>
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<td>–</td>
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<td>–</td>
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</tr>
<tr>
<td>4</td>
<td>+</td>
<td>±</td>
<td>–</td>
<td>invisible</td>
<td>±</td>
<td>–</td>
</tr>
<tr>
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<td>+</td>
<td>+</td>
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<td>–</td>
<td>+++</td>
<td>±</td>
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we did not see any infections even in the patient with acute retinal necrosis caused by an infection of HSV-1. In addition, cataract formation is another complication of ocular steroid treatment. All patients underwent lens extraction before PPV (case 5 had already undergone cataract surgery before PPV), and thus the effect of TA assisted PPV on cataracts could not be determined.

DISCUSSION

In this study, TA assisted PPV was performed in patients with refractory uveitis. TA actually improved the visibility of the vitreous body and residual vitreous cortex during PPV, which thus ensured the safety of the surgical manoeuvres. In addition, the TA assisted vitrectomy did not have any apparent adverse effects on the postoperative findings in uveitis patients. After surgery, the intentionally left TA gradually disappeared within a month in the vitreous cavity (Fig 2). Since the clearance time of triamcinolone in the vitreous is much longer than that of water soluble steroids, the anti-inflammatory effect lasts for a long time. The remaining TA effectively suppressed the postoperative intraocular inflammation that tends to be associated with uveitis (Table 2). On the other hand, we should be aware of the side effects caused by steroids and infection for approximately 1 month after surgery.

In uveitis patients, ocular inflammation after PPV tends to induce various complications. Inflammatory cells can secrete various chemical mediators and cytokines, which can induce the invasitreal migration of secondary inflammatory cells, such as glial cells and retinal pigment epithelial (RPE) cells. In the most serious cases, these cells can proliferate, produce an extracellular matrix, and contract the residual vitreous cortex, thus leading to secondary tractional retinal detachment. Therefore, reducing postoperative inflammation by the administration of TA appears to be an effective method of PPV for refractory uveitis. TA actually improved the visibility of the vitreous during PPV, it had a great potential to reduce postoperative inflammation both in the anterior and posterior segment of the eye without any side effects. If future randomised studies can show the beneficial effects on visual and surgical outcome, TA assisted vitrectomy should thus become accepted as a new method for performing a vitrectomy in uveitis patients.

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Authors’ affiliations
K-H Sonoda, H Enaido, A Ueno, T Nakamura, Y-I Kawano, T Kubota, T Ishibashi, Department of Ophthalmology, Kyushu University Graduate School of Medicine, Fukuoka, Japan
T Sakamoto, Department of Ophthalmology, Kagoshima University, Kagoshima, Japan

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