BIBLIOGRAFIA sul TRIAMCINOLONE con ABSTRACTS

1. **Examination of purification methods and development of intravitreal injection of triamcinolone acetonide.**
Oishi M, **Maeda S**, **Nakamura A**, **Kurokawa N**, **Ohguro N**, **Tano Y**
Jpn J Ophthalmol. 2005 Sep-Oct;49(5):384-7
Department of Pharmacy, Osaka University Hospital, Osaka, Japan.

PURPOSE: Intravitreal injection of triamcinolone acetonide (TA) is used in ophthalmic treatment, but the reliability of commercially available TA preparations has still not been established. We evaluated two previously reported purification methods, and developed a more reliable TA injection which can be prepared in a hospital pharmacy. **METHODS**: We tested the two methods previously reported for purifying commercial TA preparations, the sedimentation and the filtration and backflushing methods. We developed a new TA injection made of pure TA suspended in 0.5% sodium hyaluronate. We measured the TA content in each preparation by high-performance liquid chromatography to evaluate the three methods. **RESULTS**: In the sedimentation purification method, the TA content of a nominal 4-mg preparation varied from 1.43 to 7.37 mg, and the average recovery rate was 91.6%. In the filtration and backflushing method, TA content was 0.10-10.33 mg and recovery was 59.5%. In the TA injection we developed, the mean TA content was 102.5% (SD, 0.24; CV, 2.9%). The stability of this preparation was 99% after sterilization, and 97% after 3 months of storage. **CONCLUSIONS**: The results of our investigation showed that the purification methods used for commercial preparations are simple and easy but not precise enough for an intravitreal injection. In contrast, the TA injection prepared by our method is reliable, stable, and safe enough for clinical use.

2. **A rabbit model for assessing the ocular barriers to the transscleral delivery of triamcinolone acetonide.**
Robinson MR, **Lee SS**, **Kim H**, **Kim S**, **Lutz RJ**, **Galban C**, **Bungay PM**, **Yuan P**, **Wang NS**, **Kim J**, **Csaky KG**.
Exp Eye Res. 2005 Sep 14; National Eye Institute, National Institutes of Health, Bethesda, MD, USA.

Transscleral delivery of triamcinolone acetonide into the vitreous using sub-Tenon's injections may be a safer alternative to reduce the sight-threatening complications of direct intravitreal injections. However, sub-Tenon's injections have demonstrated low and poorly sustained vitreous drug levels in animal studies. To improve our understanding of the clearance mechanisms of corticosteroids, we evaluated vitreous drug levels following sub-Tenon's injection of triamcinolone acetonide in rabbits with selective elimination of conjunctival lymphatic/blood vessels and the choroid. Pigmented rabbits were given a sub-Tenon's injection of a preservative-free triamcinolone acetonide formulation of either a 10- or 20-mg dose in the superotemporal quadrant. The effect eliminating both conjunctival and choroidal clearance was evaluated by injecting the drug, followed by immediate euthanasia, effectively terminating both lymph and blood flow in the conjunctiva and choroid. To inhibit only the clearance from conjunctival lymphatics/blood vessels of a sub-Tenon's injection of triamcinolone acetonide, a group of rabbits had a 'conjunctival window' created by incising an 7mmx7mmx7mm square through the conjunctiva to bare sclera in the superotemporal quadrant. To eliminate only the clearance of drug from the choroidal circulation, cryotherapy was performed in another group of rabbits creating a chorioretinal scar in the superotemporal quadrant. Following the sub-Tenon's drug injection, the eyes were enucleated in all groups after 3hr and vitreous drug levels were measured with HPLC. In normal animals, a 10-mg sub-Tenon's injection showed no detectable vitreous drug levels; however, a 20-mg injection showed positive vitreous drug levels. This suggested that collectively, the transscleral clearance mechanisms inhibiting delivery into the vitreous may be saturated with a drug depot that has a higher release rate. A 10-mg sub-Tenon's drug depot was able to deliver drug into the vitreous when both the conjunctival and choroidal drug clearance was eliminated by euthanizing the animal immediately following the drug injection. In rabbits that had only a 'conjunctival window', selectively eliminating conjunctival drug clearance, vitreous drug levels were detected. However, in rabbits that had only cryotherapy, selectively eliminating choroidal drug clearance, vitreous drug levels were not detected suggesting that the conjunctival lymphatics/blood vessels may be an important barrier to the transscleral delivery of triamcinolone acetonide. Variability in the vitreous drug levels between

rabbits in each group precluded statistical testing. In summary, the rabbit appeared to demonstrate saturable ocular barriers to transscleral delivery of triamcinolone acetonide into the vitreous following a sub-Tenon's injection. The results suggested that the conjunctival lymphatics/blood vessels may be an important barrier to the delivery of triamcinolone acetonide to the vitreous in this rabbit model. The barrier location and clearance abilities of the ocular tissues are important to consider when developing a successful transscleral drug delivery system. Animal models, retaining the dynamics of blood and lymph flow, may improve the basic understanding of the ocular barriers involved with transscleral drug transport and warrants further investigation.

3. **Vitreomacular adhesion and the defect in posterior vitreous cortex visualized by triamcinolone-assisted vitrectomy.**
Doi N, **Uemura A**, **Nakao K**, **Sakamoto T**.
Retina. 2005 Sep;25(6):742-5.
Department of Ophthalmology, Faculty of Medicine, Kagoshima University Graduate School of Medicine and Dental Sciences, Kagoshima, Japan.

PURPOSE: To study the vitreomacular adhesion and the contractile force of posterior hyaloid, which are shown in triamcinolone acetonide (TA)-assisted pars plana vitrectomy (PPV). DESIGN: Interventional case series. **METHODS**: Twenty-eight eyes with diabetic macular edema (DME) without posterior vitreous detachment (PVD) received TA-assisted PPV. Surgical PVD was performed by an aspiration of vitrectomy probe, and the dynamic changes of posterior vitreous cortex and residual vitreous cortex were evaluated. **RESULTS**: A premacular defect was formed in the detached posterior vitreous cortex during surgical PVD in 27 of 28 eyes. Immediately thereafter, the small defect expanded into a large hole in the detached posterior vitreous cortex in all cases. A residual vitreous cortex was left on the macula in 22 eyes. **CONCLUSIONS**: These observations demonstrate a firm vitreoretinal adhesion in the central macula and suggest that the enlargement of the defect of posterior vitreous cortex may be extrusion of vitreous out through the premacular dehiscence into the preretinal space, or a tangentially contractile force may exist in the posterior vitreous cortex. Both macular adhesion and the traction of vitreous cortex might contribute to the pathogenesis of DME and other vitreomacular disease.

4. **Difference in clearance of intravitreal triamcinolone acetonide between vitrectomized and nonvitrectomized eyes.**
Chin HS, **Park TS**, **Moon YS**, **Oh JH**
Retina. 2005 Jul-Aug;25(5):556-60
Department of Ophthalmology, Inha University Hospital, Inchon, South Korea.

PURPOSE: To study the difference in clearance of intravitreal triamcinolone acetonide quantitatively between vitrectomized and nonvitrectomized eyes. **METHODS**: Eighty-four eyes of 42 rabbits were divided in 2 groups: 42 right eyes underwent standard pars plana vitrectomy (vitrectomized group), and 42 left eyes were not operated on (nonvitrectomized group). All eyes received intravitreal injections with 0.1 mL (0.3 mg) of triamcinolone acetonide. Every 12 eyes were obtained by killing 6 rabbits 1, 2, 4, 7, 12, 20, or 30 days after intravitreal injection. Each eye was enucleated and immediately frozen at -70 degrees C. The frozen vitreous was prepared for measuring the concentration of triamcinolone acetonide. Triamcinolone acetonide was quantified by high-performance liquid chromatography and ultraviolet absorbance detection. **RESULTS**: After 30 days, triamcinolone acetonide was detected only in 1 eye (0.22 microg/mL) in the vitrectomized group compared with 4 of 6 eyes (0.92 +/- 1.25 microg/mL) in the nonvitrectomized group. The coefficient of logarithmic regression was -0.12 in the vitrectomized group and -0.08 in the nonvitrectomized group. Triamcinolone acetonide decreased 1.5 times more rapidly in the vitrectomized group than in the nonvitrectomized group. The half-life of triamcinolone acetonide was 1.57 days in the vitrectomized group and 2.89 days in the nonvitrectomized group. **CONCLUSION**: Intravitreal triamcinolone acetonide decreases more rapidly in the vitrectomized eye than in the nonvitrectomized eye. Therefore, the faster clearance of intravitreal triamcinolone acetonide must be considered when planning intravitreal injection of triamcinolone acetonide in the vitrectomized eye.

5. **Staining of the internal limiting membrane with intravitreal triamcinolone acetonide.**
Tognetto D, **Zenoni S**, **Sanguinetti G**, **Haritoglou C**, **Ravalico G**.
Retina. 2005 Jun;25(4):462-7
Eye Clinic, University of Trieste, Trieste, Italy.

PURPOSE: To evaluate the use of triamcinolone acetonide to stain the internal limiting membrane (ILM) during vitreoretinal surgery. **METHODS**: A prospective clinical interventional case series study was performed, including 16 patients who underwent pars plana vitrectomy. Seven patients had proliferative diabetic retinopathy with macular edema. Seven patients had epiretinal membranes. One patient had a retinal detachment with a cystoids macular edema and proliferative vitreoretinopathy. One patient had a pseudophakic cystoids macular edema. After vitrectomy, 2 mL triamcinolone acetonide suspension was injected into the vitreous cavity. The ILM was peeled, as it was evidenced by the particles of triamcinolone that adhered to its surface. The ultrastructure of tissue harvested during surgery was analyzed using transmission electron microscopy in selected cases to confirm the presence or absence of ILM. **RESULTS**: After the injection of triamcinolone, the visualization of the vitreous base and hyaloid was excellent in all patients. The particles of triamcinolone deposited on the retinal surface enabled the ILM to be stained. Once removed, the ILM was clearly distinguishable, floating in the vitreous cavity with particles of triamcinolone adhering to its surface. Ultrastructural analysis of tissue collected during vitrectomy confirmed that the removed tissue represented ILM. **CONCLUSION**: We observed that triamcinolone acetonide can be useful in staining the internal limiting membrane, thus greatly facilitating the retinal ILM peeling. The absence of particles of triamcinolone on the underlying retina enables the area where the ILM has already been removed to be identified.

6. **Visualization of residual perfluorocarbon liquid using intravitreal triamcinolone acetonide.**
Hirata F, **Tamura H**, **Ogura Y**.
Ophthalmic Surg Lasers Imaging. 2005 Mar-Apr;36(2):169-72
Department of Ophthalmology, Nagoya City University Medical School, Nagoya, Japan.

The visualization of transparent perfluorocarbon liquid (PFCL) using triamcinolone acetonide is described. Intravitreal injection of triamcinolone acetonide enabled visualization of residual PFCL intraoperatively. In addition, it was shown that triamcinolone acetonide could visualize PFCL in an in vitro preparation of balanced salt solution. This in vitro experiment confirmed that triamcinolone acetonide also could be adsorbed by PFCL outside the vitreous. Triamcinolone acetonide was helpful to visualize transparent PFCL both in vivo and in vitro, and may be useful at the end of vitrectomy to completely remove residual PFCL from the eye.

7. **Double visualization using triamcinolone acetonide and trypan blue during stage 3 macular hole surgery.**
Yamamoto N, **Ozaki N**, **Murakami K**.
Ophthalmologica. 2004 Sep-Oct;218(5):297-305.
Department of Ophthalmology, Tokyo Metropolitan Komagome Hospital, Tokyo, Japan.

PURPOSE: To study the usefulness of intravitreal injection of triamcinolone acetonide and trypan blue for facilitating visualization and dissection of the posterior vitreous cortex and internal limiting membrane (ILM) during vitrectomy in idiopathic stage 3 macular holes. **METHODS**: Pars plana vitrectomy was performed in 10 eyes of 10 patients with idiopathic stage 3 macular holes. After core vitrectomy had been performed, triamcinolone acetonide was injected over the posterior pole. After separation of the visualized posterior vitreous cortex, trypan blue was injected over the macular area. Excised specimens were examined by electron microscopy. **RESULTS**: Upon injection of triamcinolone acetonide, the posterior vitreous cortex and residual vitreous cortex could be visualized in all patients. The posterior vitreous cortex and residual vitreous cortex were completely removed. The ILM of the retina was stained faint blue and was successfully removed in all patients. Electron microscopy revealed that the triamcinolone-acetonide-

visualized layer and the trypan-blue-stained layer had different histological features. No complications related to the use of triamcinolone acetonide and trypan blue were encountered. **CONCLUSION**: Double visualization of the posterior vitreous cortex and ILM using triamcinolone acetonide and trypan blue during vitrectomy may facilitate separation of the posterior vitreous cortex from the retina and removal of the ILM around the macular hole in patients with idiopathic stage 3 macular holes.

8. **Visualization of the Cloquet canal during triamcinolone-assisted vitrectomy.**
Enaida H, **Hata Y**, **Ueno A**, **Ishibashi T**, **Torii H**, **Sakamoto T**.
Arch Ophthalmol. 2004 Oct;122(10):1564-5
Department of Ophthalmology, Kagoshima University School of Medicine, 8-35-1 Sakuragaoka, Kagoshima 890-8520, Japan

9. **Triamcinolone acetonide facilitates removal of the epiretinal membrane and separation of the residual vitreous cortex in highly myopic eyes with retinal detachment due to a macular hole**
Yamamoto N, **Ozaki N**, **Murakami K**.
Ophthalmologica. 2004 Jul-Aug;218(4):248-56.
Department of Ophthalmology, Tokyo Metropolitan Komagome Hospital, Tokyo, Japan

PURPOSE: To study the usefulness of intravitreal triamcinolone acetonide injection during vitrectomy in highly myopic eyes with retinal detachment due to a macular hole. **METHODS**: Pars plana vitrectomy was performed in 6 patients with retinal detachment resulting from a highly myopic eye with a macular hole. After separation of the posterior hyaloid and removal of any visible epiretinal membrane, triamcinolone acetonide was injected over the posterior pole. Excised specimens were evaluated by transmission electron microscopy. **RESULTS**: Upon injection of triamcinolone acetonide, the entire epiretinal membrane and residual vitreous cortex could be visualized in all patients. The epiretinal membrane and residual posterior vitreous cortex were completely removed. Successful reattachment was performed without retinal damage in all cases. Electron microscopy revealed a cellular epiretinal membrane within a collagenous matrix lining the smooth internal surface of the internal limiting membrane. No complications related to the use of triamcinolone acetonide were encountered. **CONCLUSION**: Intraoperative visualization of the epiretinal membrane and residual posterior vitreous cortex with triamcinolone acetonide was found to be a useful adjunct to vitrectomy. Using triamcinolone acetonide during vitrectomy may facilitate both removal of the epiretinal membrane around the macular hole and separation of the residual vitreous cortex from the retina in highly myopic eyes with retinal detachment.

10. **Triamcinolone acetonide-assisted peeling of the internal limiting membrane.**
Kimura H, **Kuroda S**, **Nagata M**.
Am J Ophthalmol. 2004 Jan;137(1):172-3
Nagata Eye Clinic, Nara-City, Japan.

PURPOSE: We report on a new technique to peel the internal limiting membrane (ILM) using triamcinolone acetonide (TA) to facilitate visualization during surgery. DESIGN: Interventional case series. **METHODS**: In four eyes of four patients with macular hole, TA was used during vitrectomy to visualize the hyaloid. After the posterior hyaloid was surgically separated from the optic nerve head and posterior retina, TA suspension was injected over the posterior pole. Intraocular forceps was used to peel the ILM in a circumferential manner around the macular hole. **RESULTS**: Numerous particles of TA were dispersed over the posterior retina as white specks. Once the ILM was peeled, the peeled area was clearly visualized as an area lacking the white specks. In all patients, the macular holes closed. No adverse reactions were observed during the 3-month follow-up period. **CONCLUSIONS**: TA-assisted ILM peeling is an effective and safe technique for macular hole surgery.

11. **Residual vitreous cortex after surgical posterior vitreous separation visualized by intravitreous triamcinolone acetonide.**
Sonoda KH, **Sakamoto T**, **Enaida H**, **Miyazaki M**, **Noda Y**, **Nakamura T**, **Ueno A**, **Yokoyama M**, **Kubota T**, **Ishibashi T**.
Ophthalmology. 2004 Feb;111(2):226-30
Department of Ophthalmology, Faculty of Medicine, Kyushu University Graduate School of Medical Science, Fukuoka, Japan

OBJECTIVE: To visualize the residual vitreous cortex (VC) on the retinal surface after surgical posterior vitreous separation (PVS) during a pars plana vitrectomy (PPV), especially in patients with diabetic retinopathy. **DESIGN**: Case-control study. **PARTICIPANTS**: Patients with proliferative diabetic retinopathy (PDR), diabetic macular edema (DME), branch retinal vein occlusion (BRVO), and rhegmatogenous retinal detachment (RRD). **METHODS**: A triamcinolone acetonide (TA)-assisted vitrectomy was performed on patients with the following diseases: PDR (40 eyes), DME (26 eyes), BRVO (11 eyes), and RRD (17 eyes). Eyes with no apparent preoperative posterior vitreous detachment were enrolled in this study. After performance of surgical PVS, the residual VC was visualized as a white gel highlighted by TA. Based on this finding, the residual VC pattern was then divided into 3 groups: (1) diffuse type (VC was diffusely present in the temporal vascular arcade), (2) focal type (a small island of VC was left), and (3) no residual VC. A multivariate analysis using analysis of variance was performed regarding the residual VC pattern, disease type, age, and the 3 different surgeons. MAIN OUTCOME MEASURES: Each surgeon determined the type of residual VC during the operation, and the results were confirmed by a postoperative review of the videotape records judged by the other 2 surgeons. RESULTS: Eighty percent of the PDR eyes demonstrated the diffuse type; 10%, the focal type; and 10%, no residual VC. Fifty-eight percent of the eyes with DME demonstrated the diffuse type; 19%, the focal type; and 23%, no residual VC. Eighteen percent of the BRVO eyes showed the diffuse type; 24%, the focal type; and 59%, no residual VC. Thirty percent of the RRD eyes showed the diffuse type; 30%, the focal type; and 40%, no residual VC. A multivariate logistic regression analysis showed that PDR was a predictor of the diffuse type of residual VC in comparison to RRD (odds ratio = 8.42, 95% confidence interval = 2.07-34.3). Neither age nor the surgeon was a significant factor for a specific type of residual VC. CONCLUSIONS: Diabetic eyes more often demonstrated the diffuse type of residual VC, even after surgical PVS. This information may be valuable for surgeons performing a PPV on patients with diabetic retinopathy.

12. **Introduction of a new method for the preparation of triamcinolone acetonide solution as an aid to visualization of the vitreous and the posterior hyaloid during pars plana vitrectomy**
Kumagai K
Retina. 2003 Dec;23(6):881-2

13. **Intravitreal crystalline triamcinolone acetonide as an additional tool in pars plana vitrectomy for complicated proliferative vitreoretinopathy?**
Jonas JB, **Sofker A**, **Hayler J**, **Degenring RF**.
Acta Ophthalmol Scand. 2003 Dec;81(6):663-5

14. **Possible benefits of triamcinolone-assisted pars plana vitrectomy for retinal diseases.**
Enaida H, **Hata Y**, **Ueno A**, **Nakamura T**, **Hisatomi T**, **Miyazaki M**, **Fujisawa K**, **Sakamoto T**, **Ishibashi T**.
Retina. 2003 Dec;23(6):764-70.
Department of Ophthlamology, Kyushu University Graduate School of Medical Sciences, Fukuoka, Japan.

PURPOSE: To study the advantages and complications of triamcinolone acetonide (TA)-assisted pars plana vitrectomy (PPV) for various retinal diseases. **METHODS**: This report is an interventional case series and nonrandomized study. One hundred seventy-seven eyes from 158 patients underwent PPV with or without TA. Group TA(+) consisted of 94 eyes and group TA(-) consisted of 83 eyes. The improvement in vision and postoperative complications were prospectively studied. **RESULTS**: Sixty-two percent of the eyes in group TA(+) and 49% of the eyes in group TA(-) had improved vision after surgery (P = 0.34). Twelve eyes in group

TA(+) and 12 eyes in group TA(-) had an intraocular pressure higher than 21 mmHg after the operation, with no statistically significant difference (P = 0.63). Four eyes with proliferative diabetic retinopathy in group TA(+) and five eyes with proliferative diabetic retinopathy in group TA(-) needed an additional filtering surgery. Group TA(+) (five eyes) had a lower incidence (P = 0.041) of reoperation caused by preretinal fibrous membrane formation than group TA(-) (13 eyes). No apparent corneal disorder or infectious signs were found in any eyes. **CONCLUSIONS**: Triamcinolone acetonide-assisted PPV appears to be potentially useful to reduce the incidence of reoperation owing to preretinal fibrosis with no serious complications.

15. **Triamcinolone-assisted pars plana vitrectomy for proliferative vitreoretinopathy.**
Furino C, **Micelli Ferrari T**, **Boscia F**, **Cardascia N**, **Recchimurzo N**, **Sborgia C**.
Retina. 2003 Dec;23(6):771-6
Department of Ophthlamology and Otorhinolaryngology, University of Bari, Italy.

PURPOSE: To determine whether triamcinolone acetonide (TAAC) staining facilitates posterior hyaloid and epiretinal membrane (ERM) removal in patients undergoing pars plana vitrectomy (PPV) for rhegmatogenous retinal detachment (RRD) with proliferative vitreoretinopathy (PVR). **METHODS**: Ten consecutive pseudophakic patients (10 eyes) underwent PPV for RRD with PVR. After a core PPV, a few drops of a commercially available TAAC aqueous suspension (40 mg/mL) with vehicle were injected into the mid vitreous cavity to visualize the posterior hyaloid, thus allowing a complete posterior hyaloidectomy. Next, 0.1 to 0.2 mL of TAAC was applied on the retinal surface to visualize and peel the ERMs. The tamponading agent was silicone oil (1,300 cs) in eight eyes and perfluropropane (C3F8 14%) in two eyes. The minimal follow-up period in all patients was 4 months. **RESULTS**: In all patients, intraoperative staining with TAAC consistently improved direct visualization and delineation of the posterior hyaloid and ERMs and facilitated their removal. No adverse reaction related to the use of TAAC was observed immediately postoperatively or 4 months after surgery. CONCLUSIONS: Intravitreal TAAC may be an important adjuvant tool in the delineation of posterior hyaloid and ERMs, allowing for a more complete and safer ERM removal in the surgical management of PVR complicating RRD. It is well tolerated with all its vehicle if used at low concentration and rapidly removed during surgery.

16. **Choroidal neovascularization characteristics and its size in optical coherence tomography.**
Kim SG, **Lee SC**, **Seong YS**, **Kim SW**, **Kwon OW**.
Yonsei Med J. 2003 Oct 30;44(5):821-7
The Institute of Vision Research, Department of Ophthalmology, Yonsei University College of Medicine, Seoul, Korea.

The classification, size and activity of choroidal neovascularization (CNV) by optical coherence tomography (OCT) were compared with those obtained by fluorescein angiography (FA) and Indocyanine green angiography (ICG). This study included 32 patients (32 eyes) diagnosed as having CNV. The etiology of CNV was found to be age-related macular degeneration (AMD) or non-AMD. Patients were studied retrospectively by FA, ICG, and OCT. Of the 13 eyes with AMD, the boundary of the lesion could not be defined using FA in 7 patients. Among the 7 poorly defined CNV cases by FA, the identification of the boundary was possible in one case by OCT. The mean diameter of the classic well-defined lesions was 3500 +/- 421 microm by FA, 2624 +/- 1044 microm by ICG, and 1927 +/- 1272 microm by OCT. The size of the CNV by OCT was always smaller than by FA or ICG. Of the 19 eyes with Non-AMD, the boundary of the lesion could not be defined by FA in 5 patients. Among the 5 poorly defined cases by FA, the identification of the boundary was possible in 3 cases by OCT. The mean diameter of the well-defined CNV lesions was 2153 +/- 759 microm by FA, 1929 +/- 673 microm by ICG, and 1322 +/- 566 microm by OCT. Retinal thickness, which represents retinal edema, was found to be proportional to lesion size, although the relationship was not statistically significant. Regardless of CNV type, FA, ICG and OCT used in combination increase the specificity of diagnosis if their findings are compared.

17. **Pars plana vitrectomy assisted by triamcinolone acetonide for refractory uveitis: a case series study.**
Sonoda KH, **Enaida H**, **Ueno A**, **Nakamura T**, **Kawano YI**, **Kubota T**, **Sakamoto T**, **Ishibashi T**.
Br J Ophthalmol. 2003 Aug;87(8):1010-4
Department of Ophthalmology, Kyushu University Graduate School of Medicine, Fukuoka, Japan.

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 Behcet'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 (Behcet'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.

18. **Visualizing vitreous using Kenalog suspension.**
Burk SE, **Da Mata AP**, **Snyder ME**, **Schneider S**, **Osher RH**, **Cionni RJ**.
J Cataract Refract Surg. 2003 Apr;29(4):645-51.
Cincinnati Eye Institute, Ohio 45242, USA.

We developed and evaluated a method of visualizing vitreous gel in the anterior segment. In this study, 0.2 mL of injectable triamcinolone (Kenalog) 40 mg/mL was captured in a 5 microm filter and rinsed with 2 mL of balanced salt solution (BSS). It was then resuspended in 5 mL of BSS and recaptured to thoroughly remove the preservative. The Kenalog particles were ultimately resuspended in 2 mL of BSS and injected into the anterior chamber through a 27-gauge cannula. Kenalog particles were trapped on and within the vitreous gel, making it clearly visible. The visualization provided direct observation of vitreous behavior in various experimental settings and assisted surgeons intraoperatively in the identification and removal of vitreous in the anterior segment.

19. **Submacular deposition of triamcinolone acetonide after triamcinolone-assisted vitrectomy.**
Enaida H, **Sakamoto T**, **Ueno A**, **Nakamura T**, **Noda Y**, **Maruoka K**, **Ishibashi T**.
Am J Ophthalmol. 2003 Feb;135(2):243-6
Department of Ophthalmology, Kyushu University Graduate School of Medicine, Fukuoka, Japan.

PURPOSE: We describe a case demonstrating a submacular deposition of triamcinolone acetonide (TA) after a TA-assisted vitrectomy for retinal detachment. **DESIGN**: Interventional case report. **METHODS**: A 48-year-old Japanese man with rhegmatogenous retinal detachment in his left eye underwent a TA-assisted vitrectomy, endolaser photocoagulation, and sulfur hexafluoride (SF(6)) gas tamponade. **RESULTS**: At the end of the surgery and the day after undergoing vitrectomy, the deposition of TA was observed between the retinal pigment epithelium and neurosensory retina in the submacular area. These TA granules disappeared after 2 weeks. Two months after the operation, the retina was observed to be successfully attached and no abnormality was observed in the macula. The patient's visual acuity improved to 20/16, and no ophthalmoscopic or functional damage was observed. **CONCLUSION**: No apparent adverse effect was found in this case demonstrating a submacular deposition of TA.

20. **Triamcinolone-assisted pars plana vitrectomy improves the surgical procedures and decreases the postoperative blood-ocular barrier breakdown.**
Sakamoto T, **Miyazaki M**, **Hisatomi T**, **Nakamura T**, **Ueno A**, **Itaya K**, **Ishibashi T**.
Graefes Arch Clin Exp Ophthalmol. 2002 Jun;240(6):423-9
Department of Ophthalmology, Faculty of Medicine, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-82, Japan.

PURPOSE: To determine the effect of a triamcinolone-assisted pars plana vitrectomy (PPV) on the visibility of hyaloid during surgery and the postoperative clinical outcome. **METHODS**: Thirty-one patients with proliferative retinal disease [8 with diabetic macular edema (DME), 10 with proliferative diabetic retinopathy (PDR), 13 with proliferative vitreoretinopathy (PVR)] underwent PPV, where the vitreous body was visualized by the intravitreal injection of triamcinolone solution during the operation. The visual acuity, intraocular pressure (IOP), tamponade, corneal pathology, after-cataract, vitreous hemorrhage, and necessity of reoperation, were thereafter examined for at least 3 months after surgery. The anterior chamber laser flare cell meter was used on postoperative day 8 in DME eyes with triamcinolone-assisted PPV and with routine PPV to evaluate the breakdown of the bloodocular barrier. **RESULTS**: The vitreous body was clearly seen by means of triamcinolone during surgery, which greatly helped us to perform a posterior hyaloid resection safely and thoroughly. Six of 8 DME eyes, 8 of 10 PDR eyes, and 5 of 13 PVR eyes showed an improvement in their vision postoperatively. No eye except one experienced IOP elevation above 21 mmHg for 7 days. Six eyes had vitreous hemorrhage. The DME eyes which received triamcinolone-assisted PPV showed significantly less breakdown of the blood-ocular barrier than those with routine PPV (Mann-Whitney U-test, $P<0.01$). **CONCLUSION**: Triamcinolone improved the visibility of the hyaloid and the safety of the surgical procedures during PPV and also inhibited the postoperative breakdown of the blood-ocular barrier. Although the long-term effects are still unknown, this method appears potentially useful as an improved treatment for proliferative retinal diseases.

21. **Triamcinolone acetonide as an aid to visualization of the vitreous and the posterior hyaloid during pars plana vitrectomy.**
Peyman GA, **Cheema R**, **Conway MD**, **Fang T**.
Retina. 2000;20(5):554-5
Department of Ophthalmology, Tulane University School of Medicine, New Orleans, Louisiana, USA.

22. **Human sclera: thickness and surface area.**
Olsen TW, **Aaberg SY**, **Geroski DH**, **Edelhauser HF**.
Am J Ophthalmol. 1998 Feb;125(2):237-41.
Department of Ophthalmology, Emory University, Atlanta, Georgia, USA.

PURPOSE: To assess the mean thickness and surface area of human sclera. **METHODS**: Fifty-five formalin-fixed eye bank eyes were hemisected from anterior to posterior. Crosssectional slides were taken to include a millimeter scale ruler in each photograph. Slide photographs were projected and the scleral silhouette sketched. Mean scleral thickness measurements with standard deviation were obtained. Twenty-five human eye bank eyes were used to determine total scleral surface area by either a computerized tracing method (17 globes) or volumetric calculations (eight globes) using fluid displacement. **RESULTS**: Mean scleral thickness +/- SD was 0.53 +/- 0.14 mm at the corneoscleral limbus, significantly decreasing to 0.39 +/- 0.17 mm near the equator, and increasing to 0.9 to 1.0 mm near the optic nerve. The mean total scleral surface area by surface area computerized tracings was 16.3 +/- 1.8 cm2 and, by the volume displacement method, was 17.0 +/- 1.5 cm2. **CONCLUSIONS**: Scleral thickness and surface area measurements from cadaver eyes are important for ophthalmic surgeons and have implications for transscleral diffusion.

23. **Pharmacokinetics of triamcinolone acetonide and its phosphate ester.**
Mollmann H, **Rohdewald P**, **Schmidt EW**, **Salomon V**, **Derendorf H**.
Eur J Clin Pharmacol. 1985;29(1):85-9

Triamcinolone acetonide in the form of its phosphate ester was given intravenously in two different doses (10 mg/kg and 80 mg). Plasma levels of the ester and triamcinolone acetonide were measured and pharmacokinetic parameters were calculated. The pharmacokinetics both of the phosphate and the free alcohol were dose-dependent. No unchanged ester was found in the urine, indicating complete conversion of the pro-drug. Triamcinolone was not a major metabolite of triamcinolone acetonide in humans. Renal clearance was low and independent of the dose. Only about 1% of the dose was found in the urine as triamcinolone acetonide.

24. **Radioimmunologic detection of triamcinolone-acetonide and its application in a study on the hydrolysis of water soluble corticoid esters**
Haack D, **Vecsei P**
Arzneimittelforschung. 1982;32(8):832-4

The rate of hydrolysis of different water soluble esters of corticoids was determined with newly developed specific radioimmunoassays in healthy subjects. It can be found, that triamcinoloneacetonide phosphate was significantly faster transformed into free form after i.v. application than the reference substances prednisolone- and methylprednisolone hemisuccinate. Moreover the plasma concentration of free triamcinolone-acetonide decreases much faster than that of free prednisolone and methylprednisolone. This shows, that triamcinoloneacetonide is distributed wider and very quickly, probably in the intracellular fluid volume. At this time it is not clear, whether only free steroids are biologically active or the water soluble derivatives as well. Our results can be of clinical importance because of the different rates of hydrolysis as well as of differences in the diffusion

25. **Treatment of intraocular proliferation with intravitreal injection of triamcinolone acetonide.**
Tano Y, **Chandler D**, **Machemer R**.
Am J Ophthalmol. 1980 Dec;90(6):810-6

We studied the inhibitory effect of triamcinolone acetonide on experimental intraocular proliferation. Autotransplantation of fibroblasts from rabbit rump skin into the vitreous cavity resulted in intravitreal strand formation and traction retinal detachment in 36 of 43 eyes (84%) over a period of three months. A single intravitreal injection of 1 mg of triamcinolone acetonide inhibited fibroblast growth and significantly reduced the number of retinal detachments in 15 of 44 eyes (34%). Retinal neovascularization caused by fibrous strands coming into contact with vacularized retina was also reduced by triamcinolone acetonide (31 of 43 control eyes [72%] vs eight of 44 treated eyes [18%]). Intravitreal corticosteroid therapy may be an important adjunct to the therapy of perforating injuries and massive periretinal proliferation

26. **Metabolism of triamcinolone acetonide-21-phosphate in dogs, monkeys, and rats.**
Kripalani KJ, **Cohen AI**, **Weliky I**, **Schreiber EC**.
J Pharm Sci. 1975 Aug;64(8):1351-9

The absorption, distribution and metabolic fate of triamcinolone acetonide-14C-21-phosphate were studied in the dog, monkey, and rat. A comparison of levels of radioactivity in blood or plasma, reached after intramuscular or intravenous administration, indicated that the drug was completely absorbed from the site of intramuscular injection within 10-15 min in all three species. Within 1-5 min after intramuscular or intravenous administration, the 21-phosphate ester was completely hydrolyzed to triamcinolone acetonide, which was present in the blood. The radioactivity was eliminated rapidly (t1/2 = 1-2 hr) from plasma (dogs, monkeys, and rats) and tissues (rats) after intramuscular or intravenous administration. In the three species, the major route of excretion was via the bile; however, the ratio of biliary to urinary excretion among the species varied considerably (from 1.5 to 15). In rats, excretion of radioactivity as expired carbon

dioxide accounted for only 2-3 percent of the dose. 6beta-Hydroxytriamcinolone acetonide was the major metabolite in urine of the three species. Hydrolytic cleavage of the acetonide group did not appear to be significant.