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PART 1 Surgical Retina

SECTION 5 Vitreous Surgery: Additional Considerations

c00131 131 Complications in Vitreoretinal Surgery

Kourous Rezaei

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p0120 A complication is an unanticipated event that arises either from the original disease, the treatment, an independent cause, or a combination of above. As surgeons we are trained to predict and treat expected events during surgery. However, unexpected events are the ones that are most dangerous and usually lead to undesirable outcomes. In general, the question is not whether an unexpected event will happen but when it will occur. The early recognition of an impending unexpected event is crucial for its successful management.

The knowledge of how to predict, treat, and prevent unexpected events during surgery is extremely valuable and would make vitreoretinal surgery safer, leading to improved visual outcome for patients. The more one is acquainted with unexpected events the less they are considered "unexpected" since one has already seen these events happen and knows how they were handled and therefore the factor of surprise is eliminated. p0125

In this chapter, experienced surgeons from around the world share with you their unexpected experiences during retinal surgery and show how they handled some of the most unusual surgical cases. Further, they share their surgical pearls on how to predict, prevent, and treat these unusual surgical situations. p0130

SUBLUXATED INTRAOCULAR LENS WITHOUT HAPTICS s0010

Renaud Duval p0135

Removal of intraocular foreign bodies usually relies on the use of forceps or magnets (in the case of magnetic objects). Removing a round, smooth optic of an intraocular lens (IOL) that is missing both haptics cannot be done in the usual fashion. Using forceps would damage the underlying macula. However, a 25-gauge (G) soft-tip cannula placed on the extrusion line can induce sufficient vacuum to lift the IOL to a position where it can be grasped safely. This technique should be kept in mind when dealing with light foreign bodies that lack grasping points. p0140

In Video 131.1, a 72-year-old patient is presented with a history of blunt trauma to the left eye leading to superior iris loss and IOL expulsion from the globe through a superior sclerolimbal rupture. Following primary repair by a general ophthalmologist, the patient was referred for management of aphakia and vitreous hemorrhage. The hemorrhage cleared over the ensuing weeks, and the patient was re-operated for peeling of an epiretinal membrane followed by correction of aphakia with a scleral-fixated IOL. p0145

After removal of the vitreous hemorrhage and indocyanine green-assisted peel of the epiretinal membrane, a three-piece IOL was injected into the eye through a 2.75-mm clear corneal incision and the haptics were externalized through sulcus-based sclerotomies. While attempting to tuck the second haptic into its intrascleral tunnel, sudden motion of the forceps caused by forcing against an overly tight tunnel led to separation of the haptic from the optic. Subsequent maneuvers to cut the IOL and remove it by the "pacman" technique led p0150

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to the separation of the second haptic and complete dislocation of the now haptic-less optic on the macular surface. Creating a wider scleral pocket and avoiding the use of the haptics to stabilize the IOL while cutting it for explantation may have minimized the risk of haptic separation.

s0015 POSTERIOR SYNECHIAE AND SMALL PUPIL DURING VITRECTOMY

p0155 Ehab El Rayes

p0160 Posterior synechiae secondary to inflammation may lead to miotic pupil and limit visualization during vitrectomy surgery. Additional pharmacotherapy may be applied for dilation; however, it has a limited role when posterior synechiae are present. Mechanical stretching of the pupil would be the next option. To safely dilate the pupil one may either use iris hooks or iris stretching rings such as the Malyugin ring or the Morcher ring.

2 p0165 In this Video 131.2 a Morcher ring, a 7-mm PMMA ring, is introduced into the anterior chamber by dialing it in through a 2-mm corneal incision. The inferior pupillary margin is engaged first, thus providing a 6-mm opening for visualization. Viscoelastic is injected into the anterior chamber to maintain the depth and to keep the media clear. Removing the cataract can easily be performed through the ring which maintains a dilated pupil (even in cases with floppy iris). Phacoemulsification and IOL implantation are performed. Identifying the tip of the infusion cannula before starting the vitrectomy is important and can now be easily achieved through a dilated pupil and clear media. Vitrectomy is carried out in the usual manner. Once the posterior segment procedure is completed the Morcher ring will be removed by dislodging it from the pupillary margin and then dialing it clock- or anticlockwise, via the corneal incision, to exit the eye.

s0020 INDUCTION OF PVD IN RETINAL DETACHMENT

p0170 Andre Gomes

p0175 Inducing posterior vitreous detachment (PVD) is a key step during vitrectomy surgery for retinal detachment. Induction of PVD; however, is not always easy and the strong vitreoretinal adherence especially in young patients can make this step challenging.

3 p0180 The patient in Video 131.3 presented with strongly adherent posterior hyaloid and a thin and mobile retina. The induction of PVD was first attempted in the usual manner by applying suction over the peripapillary area followed by suction at more peripheral areas of the fundus. These attempts were followed by using micro-serrated forceps and end grasping forceps in an attempt to peel the internal limiting membrane (ILM) while the posterior hyaloid was still attached. To improve the visualization of ILM, brilliant blue dye was injected into the eye. Attention was given to prevent any subretinal exposure. Inducing openings in the posterior hyaloid/ILM/retina interface allowed fluid to gain access underneath the posterior hyaloid and make the induction of PVD easier. Peeling the ILM in patients with adherent posterior hyaloid can make the induction of PVD easier and safer.

s0025 INDUCTION OF PVD IN HIGH MYOPIA

p0185 Ramin Tadayoni

p0190 One surgical challenge during vitrectomy for retinal detachment in high myopia is the induction of posterior vitreous detachment which is one of the initial steps of the surgery. Missing this step may cause postoperative complications including increased risk for retinal redetachment.

p0195 This technical difficulty in high myopia is generally a combination of poor visualization of the posterior hyaloid, presence of vitreoschisis, and the strong adhesion of the posterior hyaloid to the surface of the retina, particularly in younger patients. The strongly adherent posterior hyaloid associated with large pockets of liquefied vitreous may make the usual techniques used for the PVD induction not very successful. Further, in high myopia the presence of vitreoschisis may give the appearance of posterior hyaloid separation while in fact the hyaloid is still attached. Visualizing the vitreous with triamcinolone acetonide suspension may help identifying the posterior hyaloid during surgery. It is usually diluted with balanced salt solution (BSS) to a lower concentration (typically 1/5) before injection into the eye. Further, new imaging technologies such as intraoperative optical coherence tomography (OCT) may help identify the status of the posterior hyaloid during surgery.

In Video 131.4 a complex situation is presented: an attached posterior hyaloid is identified by intraoperative OCT (RESCAN 700®, Carl Zeiss Meditec, Germany) during a 25G vitrectomy (Constellation®, Alcon, TX, USA) for a posterior retinal detachment secondary to macular hole in high myopia. The vitreous cannot be visualized by the surgeon through the microscope (without OCT). Diluted triamcinolone acetonide suspension is injected over the optic nerve to visualize the posterior hyaloid and allow its safe peeling. p0200 4

IATROGENIC RETINAL BREAKS DURING PEELING s0030

Manish Nagpal p0205

One of the risks involved during membrane peeling is the formation of iatrogenic breaks. Their immediate detection and management is crucial to prevent a negative outcome. p0210

The following tips may help avoid making an iatrogenic break during peeling and also help their management if formed. p0215

1. Use a wide-angle viewing system during vitrectomy surgery to be able to evaluate optimally the periphery of the retina. o0115
2. Peel membranes in a radial fashion and avoid anteroposterior pulling. o0120
3. If iatrogenic breaks are formed, assess the location and extent of the break, mark the edges, and assure adequate endolaser when the retina is reattached. o0125

In Video 131.5 a patient is presented with a semi-open funnel retinal detachment with proliferative vitreoretinopathy (PVR). Core vitrectomy is performed and perfluorocarbon liquid (PFCL) is injected over the disc to stabilize the retina. A circumferential membrane over the disc is gradually peeled to allow the flattening of the posterior pole under the PFCL liquid. p0235 5

The residual inferior traction is reassessed and the responsible epiretinal membrane is peeled to release this traction. During the peel the peripheral inferior retina is stretched and an iatrogenic break is formed. A wide-angle viewing system allowed the immediate detection of the break. The extent of the break and its location is assessed and diathermy is applied to mark the edges and to control the bleeding. Fluid–air exchange is performed and subretinal fluid is drained through the break. Once the retina is flattened, laser endophotocoagulation is applied around the break to assure adequate retinopexy. p0240

INTERNAL LIMITING MEMBRANE PEELING s0035

Sjakon Tahija p0245

Creating an edge of the ILM at the beginning of its peeling is the part of the procedure that is associated with the highest risk for retinal bruising and damage. In Video 131.6 the surgeon is performing pars plana vitrectomy for proliferative diabetic retinopathy in a type 1 diabetic patient. After removing the p0250 6

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vitreous hemorrhage, endolaser photocoagulation was applied to the retina. Since macular striae were present it was decided to peel the ILM, which was stained with brilliant blue dye. The ILM appeared very adherent and frequent regrasping of the edge became necessary. When grasping the edge of the ILM nasal to the fovea, one of the retinal folds was pinched, causing retinal bruising and hemorrhage. The intraocular pressure (IOP) was raised to prevent further bleeding and the ILM was peeling completed. The blood clot could not be removed using the back flush technique so it was gently massaged away from the fovea using the silicone tip of a flute needle.

p0255 To avoid this complication, it is best to initiate the ILM peeling inferiorly and further away from the center of the macula. Any visual field defect caused by the peeling would be in the superior field and less noticeable by the patient. Good staining, high magnification, and slow motion peeling would also minimize iatrogenic trauma during ILM peeling.

s0040 SUBRETINAL INJECTION OF BRILLIANT BLUE

p0260 Arturo Alezzandrini, Francisco Rodriguez

p0265 In vitreous surgery, staining of the ILM with vital dyes is widely performed, and surgical outcomes have improved in many vitreoretinal disorders such as macular holes and epiretinal membranes. The dyes currently utilized for different steps during vitrectomy surgery are: triamcinolone acetonide for vitreous visualization; indocyanine green, infracyanine green, and brilliant blue for ILM staining; and trypan blue for epiretinal membrane identification. One of the main complications that is observed during injection is the subretinal injection of the dye.

p0270 In Video 131.7 a series of steps are demonstrated to prevent this complication:

o0130 1. Dye is injected away from the fovea while the IOP is decreased.
o0135 2. A dual-bore cannula with multiple fluid egress vents is used to allow faster pressure relief during injection, eliminating the fluid jet stream.
o0140 3. Dye is injected over the light pipe, thus avoiding direct impact of the dye on the macula.

s0045 REOPENING OF PERIPHERAL RETINAL BREAKS DURING SURGERY FOR SUBMACULAR HEMORRHAGE

p0290 Carl Regillo

p0295 Submacular hemorrhage secondary to neovascular age-related macular degeneration (AMD) is a treatment dilemma for physicians and patients.

p0300 The patient in Video 131.8, with submacular hemorrhage secondary to neovascular AMD, was managed with subretinal tissue plasminogen activator (tPA) and pneumatic displacement as described by Tamer Mahmoud and colleagues. During the initial core vitrectomy, there was evidence of a previously partially treated horseshoe retinal tear, and the posterior lip of the tear did not appear to have laser marks. We proceeded with submacular tPA injection. This was followed by injection of filtered subretinal air, resulting in bullous elevation of the retina. In fact, the air made the retina too bullous and actually displaced it temporally towards the tear. When we tried to subsequently laser the break, the detached retina was in the way, making the view extremely difficult. The air bubbles migrated towards the break and opened it up. The solution to the problem was to go to air and perform an air–fluid exchange, which helped to tamponade the retina so that we were able to aspirate over the break and flatten this area out so that it could be successfully lasered.

There are several potential ways to prevent opening up existing peripheral breaks in such cases. If breaks are found to be present preoperatively, they can be reinforced in the office a week or two ahead of time. Intraoperatively, if extensive subretinal fluid or air injection is being planned, it may be best to inspect the peripheral retina before the injection and, if breaks present, laser the breaks upon identifying them and minimize the volume of fluid or air subsequently injected under the retina. p0305

It should be noted that the use of air in addition to a solution of tPA has not been proven to enhance or aid in the displacement of macular subretinal hemorrhage. A more conservative, safer approach utilizing just the subretinal tPA solution without subretinal air may be preferred approach. Further studies are warranted before routinely adopting the subretinal air technique. p0310

SURGICAL MANAGEMENT OF HYPOTONY MACULOPATHY s0050

Jose Garcia Arumi p0315

Low intraocular pressure after vitrectomy surgery (postoperative hypotony) is generally due to the failure of the ciliary body to produce aqueous humor. This may be due to fibrous traction from anterior PVR, cyclodialysis, or ciliary body detachment. A diagnosis can be made with ultrasound biomicroscopy (UBM) that visualizes the ciliary body, and tissues around it. p0320

Video 131.9 presents a 54-year-old patient with a history of vitreous hemorrhage after trauma who had undergone a 23G vitrectomy procedure elsewhere. Three months later he developed hypotony maculopathy and was referred for evaluation. Upon examination the best corrected visual acuity was 20/400 and intraocular pressure was 4 mmHg. The UBM suggested a cyclodialysis cleft and ciliary body detachment extending 360°. The OCT scan indicated increased macular thickness associated with hypotony maculopathy and chorioretinal folds which were visualized on fluorescein angiography. p0325

The patient underwent a 23G pars plana vitrectomy surgery followed by posterior hyaloid separation, brilliant blue dye staining, and removal of the internal limiting membrane (ILM) in the macular area. Peeling the ILM decreases the rigidity of the retina and eases the opening of the macular folds once the hypotony is resolved. Transconjunctival cryotherapy was applied to the sclera 2.5 mm posterior to the limbus using a curved spherical retinal probe. Eight spots were applied: two spots per quadrant, each with a duration of 10 seconds and a temperature of −80 °C (avoiding the ciliary body). Following cryopexy, fluid–air exchange is performed and 6% C_3F_8 gas was injected into the eye for tamponade. The postoperative course was unremarkable. Two weeks after surgery the best corrected visual acuity improved to 20/25 and IOP was 15 mmHg. Ultrasound biomicroscopy indicated that the ciliary body had reattached to the scleral spur, closing all the clefts. p0330

Key steps in the management of hypotony maculopathy are: p0335

- Performing preoperative UBM. u0145
- Peeling the ILM during the surgery. u0150
- Applying transscleral cryotherapy to the pars plana (avoiding the ciliary body). u0155
- Gas tamponade. u0160

INTRAOPERATIVE CHOROIDAL DETACHMENT s0055

Homayoun Tabandeh p0360

Intraoperative choroidal detachment may occur as a result of displacement of the infusion cannula into the suprachoroidal p0365

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space, or it may represent suprachoroidal hemorrhage. Furthermore, continued infusion into the suprachoroidal space from a displaced infusion cannula could result in stretching and subsequent rupture of blood vessels traversing this space causing the additional suprachoroidal hemorrhage. Conversely, intraoperative suprachoroidal hemorrhage may result in displacement of the infusion cannula into the suprachoroidal space, further exacerbating the choroidal detachment.

p0370 Early detection is an important first step. Intraoperative visualization of ora serrata in the absence of scleral depression may be an early warning sign indicating choroidal detachment. Once a choroidal detachment is suspected, surgery should be stopped and the situation assessed, establishing the possible cause. Intraoperative displacement of infusion cannula can be identified by inspection of the infusion cannula internally and externally. Risk factors for infusion cannula displacement include intraoperative manipulations, oblique placement of the cannula, preoperative choroidal detachment and hypotony. Visualizing the tip of the cannula prior to opening the infusion flow at the beginning of the surgery is an important step that helps in identifying a misplaced cannula in the suprachoroidal space. In eyes with preexisting choroidal detachment, a straight cannula entry aiming towards the center of the vitreous cavity (instead of beveled incision), reduces the chance of suprachoroidal placement of the infusion cannula. Securing the infusion line by a tape helps reduce the chances of cannula displacement during surgical manipulations.

p0375 Once a displaced infusion cannula is recognized, the infusion flow should be closed immediately. The infusion line is disconnected from the cannula (leaving the cannula in place) and immediately reinserted through one of the other available cannulas (the tip needs to be visualized prior to reopening the infusion), therefore maintaining the intraocular pressure. The original infusion cannula will be left in the original location to allow drainage of fluid from the suprachoroidal space. Once the choroidal detachment is reduced, an attempt may be made to reposition the displaced cannula. Alternatively the cannula may be removed and a new cannula maybe inserted, utilizing a straight entry, aiming towards the center of the vitreous cavity. A modified version of this technique may be used in the management of intraoperative suprachoroidal hemorrhage.

1p0380 In Video 131.10, a patient with diabetic retinal detachment underwent pars plana vitrectomy. Towards the end of surgery, progressive choroidal detachment was noted. The infusion cannula was inspected and was noted to have been displaced into the suprachoroidal space. The infusion line was disconnected from the cannula, leaving the displaced cannula in place. The infusion line was immediately reinserted through one of the remaining cannulas, maintaining the IOP. The displaced cannula was left unplugged in the suprachoroidal space to allow drainage of fluid. The posterior segment was inspected. The choroidal detachments were found to have subsided. An attempt was made to reposition the cannula, without success. Subsequently the cannula was removed and a new cannula was inserted with a straight entry, aiming towards the center of the vitreous cavity. The infusion line was relocated and the surgery was continued uneventfully.

s0060 MASSIVE SUPRACHOROIDAL HEMORRHAGE (SCH)

p0385 Jose Garcia Arumi

p0390 Massive suprachoroidal hemorrhage generally implies the rupture of the short or long posterior ciliary artery branches during intraocular surgery or after penetrating trauma. The incidence of suprachoroidal hemorrhage in vitreoretinal surgery is low. Systemic risk factors include advanced age, hypertension, atherosclerosis, diabetes, and bleeding disorders. Ocular risk factors include high myopia (decreased scleral rigidity and the increased fragility of the choroidal vasculature), prior history of retinal detachment surgery, preoperative hypertension, and intraocular inflammation. Main intraoperative risk factors are elevated blood pressure or heart rate during surgery, prolonged intraocular hypotony, scleral manipulation, and extensive cryopexy.

p0395 The goal in the management of suprachoroidal hemorrhage during surgery is to stop the bleeding by increasing the intraocular pressure, closing the surgical wound, and lowering the systemic blood pressure. Emergency drainage sclerotomies may induce transient hypotony and stimulate rebleeding. Further, they increase the risk of retina/uveal tissue incarceration due to the high pressure.

p0400 Suprachoroidal blood may not necessarily require drainage. This particularly applies to sectorial hemorrhages that do not involve the posterior pole and the macula. During the follow-up, dynamic B-scan ultrasound can help in assessing the degree of liquefaction of the suprachoroidal blood clot and indicate the adequate timing for the drainage procedure, which is usually 10–14 days after the incident.

p04051 In Video 131.11 a 25G infusion cannula is placed into the anterior chamber through the inferior limbus and the IOP is set at 30 mmHg. A radial sclerotomy is performed parallel to the rectus muscle in the quadrant with the most suprachoroidal hemorrhage. The infusion pressure allows a controlled drainage of the liquefied blood through the sclerotomy. After a partial drainage, 23G cannulas are inserted into the eye through the pars plana and a limited vitrectomy is performed followed by removal of the posterior hyaloid. Injection of PFCL into the vitreous cavity induces an internal tamponade which further displaces the liquefied blood towards the periphery and allow its drainage through the sclerotomy. The eye may then be filled with gas or silicone oil.

SUPRACHOROIDAL HEMORRHAGE DURING CATARACT SURGERY s0065

Kazuaki Kadonosono p0410

p0415 Suprachoroidal hemorrhage is a rare but severe complication that usually results in poor vision. Intraoperative hypotony is one of the main risk factors resulting in choroidal effusion with subsequent rupture of small arteries traversing the suprachoroidal space. In addition, prolonged hypotony may directly result in rupture of the short or long posterior ciliary arteries or vortex veins. The greatest risk for suprachoroidal hemorrhage during cataract surgery occurs immediately after nucleus removal, when the eye is at greatest risk of prolonged hypotony.

p04202 The 73-year-old patient presented in Video 131.12 had had phacoemulsification elsewhere. While aspirating the cortex, the posterior capsule was ruptured with subsequent vitreous loss. Effort was made to implant the IOL into the bag; however, suddenly the choroid became elevated and suprachoroidal hemorrhage was recognized and surgery was stopped. The patient was referred for evaluation and management to our clinic. One week after the original surgery the patient was brought back to the operating room for drainage of the suprachoroidal blood. Iris retractors were placed to have a better visualization of the anterior chamber. An infusion cannula was inserted into the anterior chamber to maintain the IOP. It was noted that patient still had a large blood clot in the suprachoroidal space. A scleral cutdown was performed superotemporally and tissue plasminogen activator was injected into the suprachoroidal space to dissolve the clot. The sclera was depressed with a cotton swab to aid its removal. An

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infusion cannula could now be placed through the pars plana into the vitreous cavity and vitrectomy was performed.

s0070 SUBRETINAL PERFLUOROCARBON BUBBLE

p0425 Maria H. Berrocal

p0430 Subretinal perfluorocarbon liquid (PFCL) after vitrectomy surgery is one of the most dreaded complications of its use. The risk factors for subretinal migration of PFCL include:

o0165 1. Large breaks.
o0170 2. Posterior breaks.
o0175 3. Residual traction on the breaks.
o0180 4. Multiple small bubbles during injection.
o0185 5. Turbulence during injection.
o0190 6. Injecting directly in the direction of the break.

Although extrafoveal subretinal PFCL bubbles could be monitored (although it has been reported that they can migrate inferiorly and if close to the fovea would need to be removed), submacular PFCL bubbles would have adverse impact on visual acuity and need to be removed.

p0465 To decrease the likelihood of getting subretinal/submacular PFCL bubbles, one may relieve all traction on the breaks prior to the injection of PFCL into the eye; use a dual-bore cannula for PFCL injection or use an aspirating instrument (in the other hand) during the injection (in valved trochar systems); inject with a slow speed over the optic nerve to form a single bubble and inject inside the forming PFCL bubble; use valved cannulas to decrease the amount of turbulence during the injection procedure; and keep the PFCL level below the peripheral breaks. Washing out the residual PFCL bubbles with balanced salt solution (BSS) or infusion fluid after the removal of the main bubble may avoid having residual PFCL bubbles inside the vitreous cavity after surgery.

p0470 Utilizing a dual-bore cannula that has a side port for injection may prevent damage to the retina from the PFCL jet stream during the injection procedure. This may particularly be an issue when utilizing 25- and 27G vitrectomy systems.

p0475 Very small amounts of residual PFCL bubbles inside the vitreous cavity may be tolerated although the patient may complain of seeing the bubble when laying back. Larger amounts of PFCL in the vitreous can cause inflammation and should be removed.

13 p0480 In Video 131.13 the patient presents with a rhegmatogenous retinal detachment with star fold and inferior PVR. An encircling no. 41 band was placed and tied superonasally; 27G vitrectomy was performed with complete vitreous removal. PFCL was injected into the eye to flatten the retina and subretinal fluid was drained through the superior retinal tear. The PFCL was injected with a 30G needle. Multiple PFCL bubbles were dispersed inside the vitreous cavity. Air–fluid exchange was performed and laser endophotocoagulation was applied around the break and the lattice degeneration inferiorly. Residual PFCL bubbles were washed out multiple times and no residual bubbles were visible. Air–gas exchange was performed and the eye was filled with 14% C_3F_8 gas.

p0485 Postoperatively, a small subretinal PFCL bubble was detected near the peripheral break on the buckle. Laser was applied around the bubble to prevent its migration towards the posterior pole. The retina has remained attached and the subretinal PFCL bubble has not moved for over a year.

s0075 PERFLUOROCARBON-INDUCED MACULAR HOLE

p0490 Yusuke Oshima

p0495 Perfluorocarbon (PFCL) liquid is a very useful tool for flattening the detached retina during vitrectomy, especially in giant retinal tear detachment or detachment associated with proliferative vitreoretinopathy. Special attention should be given to PFCL injection during surgery, especially in small-gauge surgery where resistance to the injection is increased due the narrower size of the injection lumen.

In Video 131.14 PFCL is injected over the macula. A macular hole is formed due to the pressure caused by the injection stream. The surgeon should keep in mind to gently inject PFCL over the optic nerve (or nasal to it) and avoid injecting it directly over the macular area. Further, the injection should be done by the surgeon (rather than an assistant) and a safe distance from the surface of the retina should be kept during the injection procedure (one has the tendency to move closer to the surface of the retina during the injection). If any resistance is felt during the PFCL injection, the cause needs to be evaluated outside the eye instead of applying additional pressure. In this case a standardized macular hole surgical technique was performed including peeling the ILM followed by fluid–air exchange and gas tamponade. p0500 14

GIANT RETINAL TEAR WITH SLIPPAGE ON ENCIRCLING SCLERAL BUCKLE s0080

Carl Regillo p0505

A combined pars plana vitrectomy (PPV) with encircling scleral buckle (SB) was being performed for a giant retinal tear (GRT) extending approximately 180° in a phakic patient. Despite meticulous drying of the edge of the retina during fluid–air exchange, when the perflurocarbon liquid (PFCL) was completely removed, there was posterior slippage of the retina. Another attempt with the same technique, again paying close attention to patiently removing as much fluid over the PFCL as possible, yielded the same results. The scleral buckle was then loosened significantly and the same technique was attempted. This time, the retina did not slip. We hypothesize that excessive cerclage effect of the encircling scleral buckle promoted posterior slippage which was resolved by loosening the buckle (Video 131.15). p0510 15

Posterior slippage of the retina in the setting of a GRT-related retinal detachment is generally from anterior fluid (i.e. the layer of fluid between the PFCL and the infused air) displaced posteriorly through the large break. To minimize this effect, it is important to remove all of the anterior fluid in the vitreous cavity before removing the PFCL under air along with any anterior subretinal fluid above the PFCL meniscus by extruding over the break. p0515

In this case, presumably there was the additional factor of excessive 360° of scleral buckle indentation. A "high" indentation may be undesirable and, therefore, best avoided to minimize slippage. Furthermore, there is no proof that encircling significantly enhances the success rate of vitrectomy for retinal detachment repair, with or without GRT. Many surgeons would argue that this combined approach (i.e., PPV plus SB) is not necessary and only adds to the surgical morbidity. p0520

PVR AND SUBRETINAL MEMBRANE s0085

Stanislao Rizzo p0525

Subretinal membranes are associated with rhegmatogenous retinal detachment due to proliferative vitreoretinopathy (PVR). Several surgical techniques are available for the removal of subretinal membranes during PVR surgery. p0530

When the subretinal membrane is in the form of branching bands and the extent of the membrane can be visualized through the retina, the membrane can be removed using forceps passed through preexisting retinal breaks or small p0535 retinotomies. However, if the membrane is in the form of diffuse sheets or the extent of subretinal membrane cannot be visualized, peripheral retinotomy may become necessary followed by folding the retina and removal of the subretinal membrane under direct visualization.

16 p0540 In Video 131.16, after performing core vitrectomy and meticulous peripheral vitreous shaving with 360° scleral depression, attention is directed towards the proliferative membranes. Intravitreal triamcinolone acetonide suspension was used to highlight these membranes, Mature preretinal membranes were peeled with forceps and a pick in a bimanual fashion using chandelier light for illumination. The removal of subretinal membranes was attempted through a small access retinotomy. However, the retinal folds still remained, indicating the presence of residual subretinal membranes inducing traction and folding of the retina. The small retinotomy was not sufficient to visualize and remove all the subretinal membranes. It was decided to perform an inferior 180° retinotomy to relieve the traction and to visualize and remove all the residual subretinal membranes. Subsequently perfluoron was injected into the eye to flatten the retina and endolaser photocoagulation was applied around the edges of the retinotomy. The eye was filled with silicone oil up to the posterior iris plane.

s0090 A PROBLEM DURING 27G VITRECTOMY

p0545 Carl Claes

p0550 Constant monitoring and visualizing the instruments (specially their tips) during surgery is very important to detect 17 any breakage while operating. In Video 131.17 a 27G pars plana vitrectomy is performed with a valved trochar system. A posterior vitreous detachment was induced and core vitrectomy was completed. During the ILM peeling a small retinal hemorrhage was passively aspirated with the 27G silicone-tipped flute needle, after which the ILM peeling continued unremarkably.

p0555 Suddenly a foreign body was visualized superior to the optic nerve: a barely visible transparent silicone tip of the flute needle. It probably got stuck in the 27G valved trochar and detached from the flute needle. During consecutive instrument exchange through the trochar, the silicone tip was inadvertently mobilized into the eye and fell on the retina.

p0560 An attempt was made to remove the silicone tip by slipping it into the tip of 27 G forceps as a sleeve covering the forceps arm. This maneuver unfortunately widened the diameter of the 27G forceps and the sleeve got stuck in the valved trochar. To overcome this problem, the silicone tip was regrasped and in a bimanual fashion the silicone tube was pulled over one of the arms of the forceps. The silicone tip was pulled upwards to the shaft of the forceps, allowing the forceps to secure the silicone tip and remove it.

s0095 VITREOUS INCARCERATION IN SCLEROTOMIES

p0565 Maria H. Berrocal

p0570 Vitreous incarceration may occur at the sclerotomy sites and can cause traction and peripheral retinal breaks. There has been a decrease in the incidence of this complication due to a decrease in size of the sclerotomies and the use of trocar cannulas. Nevertheless, it can still occur, particularly if a significant amount of peripheral vitreous remains near the sclerotomy sites. Additional predisposing factors for vitreous incarceration into the sclerotomy sites include elevated intraocular pressure during trocar removal, not using valved cannulas, and removing the trochars without an instrument inside their lumen.

Vitreous incarceration may be avoided by: p0575

1. Thorough removal of the peripheral vitreous around the sclerotomy sites. o0195
2. Careful examination of the peripheral retina around sclerotomy sites using scleral depression. o0200
3. Avoiding increased IOP during trocar removal. o0205
4. Performing a partial air–fluid exchange to have air seal the sclerotomies. o0210
5. Placing the light pipe inside the cannula during its removal (pushing back incarcerated vitreous). o0215
6. Inspecting the sclerotomy sites for vitreous strands. o0220
7. Suturing the leaking sclerotomies. o0225

Vitreous incarceration does not always cause peripheral breaks or detachments, but can potentially be a tract for entry of bacteria into the eye and consequent endophthalmitis as well. During the postoperative period it can only be detected if the peripheral retina is visualized and a peripheral break or detachment occurs. The management is to treat the secondary complications that ensue, namely new breaks, opening of existing breaks, and redetachment.

The 62-year-old female patient in Video 131.18 presented p0615 18 with a pseudophakic total rhegmatogenous retinal detachment with one tear identified at 11 o'clock. Since the patient had to travel by air she did not want a gas bubble in the eye. It was decided to proceed with a scleral buckling procedure and an encircling scleral buckle with a no. 41 band was placed around the eye under visualization with microscope. The band was measured and was left with a circumference of 70 mm. A trochar-cannula with a chandelier light was inserted into the eye to serve as light source. The fundus was visualized under the microscope using the wide-angle viewing system. A vitrectomy was not performed.

External drainage was performed by scleral cutdown: p0620 applying cautery to the scleral edges and choroidal bed, and puncturing the choroid with a 30G needle under direct visualization with the microscope. The chandelier light was removed and an illuminated endolaser probe was inserted into the eye through the same cannula to laser around the break. The cannula was removed, the sclerotomy site was not sutured, and the conjunctiva was closed. On the first postoperative day the retina was completely attached. A week later the patient returned with a recurrent retinal detachment and a break near the sclerotomy site (for chandelier light) with vitreous strand visible incarcerating into the sclerotomy. A reoperation was recommended and pars plana vitrectomy was performed with SF_6 gas and additional laser treatment. The retina has remained attached.

ARGUS II ARRAY IMPLANTATION s0100

J. Fernando Arevalo p0625

In Video 131.19 an Argus II array was implanted in the usual p0630 19 manner in a retinitis pigmentosa (RP) patient with bare light perception vision. Core and peripheral vitrectomy was performed with the assistance of triamcinolone acetonide. The microelectrode array was then inserted through a temporal sclerotomy (5.2 mm). The array was positioned over the macula, and then tacked using a custom retinal tack. However, the retinal tack dislodged from the implant, and fell into the vitreous cavity. The retinal tack needed to be removed, similar to an intraocular foreign body (IOFB). The microelectrode array was then placed again over the macula and was stabilized using a new retinal tack without any further issues.

Pearls on how to avoid this complication: p0635

- Open a large inferonasal sclerotomy to tack the array and enlarge it further if necessary (19G). u0230

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- u0235 Assure that the tack is engaged perpendicular to the tack holder.
- u0240 When using bimanual techniques to place the array over the macular area, make sure that the tack does not move from its proper position. If it does, exchange it for a new tack before attempting to tack the array.
- u0245 Practice the tacking procedure before the surgery. This is a unique maneuver that is only performed during the Argus II surgery.

s0105 SUBRETINAL SF_6 GAS AFTER RETINAL DETACHMENT SURGERY

p0660 Stratos Gotzaridis

p0665 Postoperative subretinal SF_6 gas is a rare finding after retinal detachment surgery. It may occur due to the turbulence during the injection of gas near a large retinal break especially if there is persistent subretinal fluid opening the break. The positioning of the patient, location, and size of the break may worsen the situation during the postoperative period.

2 p0670 The patient in Video 131.20 presented at postoperative day 1 with subretinal gas and total retinal detachment. The patient was brought back to the operating room. A 25G trocar was placed through the corneal limbus into the anterior chamber and was attached to the infusion line. Through a corneal tunnel the endodiathermy probe was introduced into the eye and an anterior retinotomy was made to allow the aspiration of the gas with the vitreous cutter. The infusion fluid pushed the retina back to its original position, allowing the insertion of an infusion cannula through the pars plana.

p0675 A new retinotomy was created for further drainage of subretinal gas/ fluid and allow the flattening of retina. Once the retina was flattened, endolaser was applied around the retinotomies, followed by intravitreal gas injection. The patient was asked to maintain a facedown positioning posture for 7 days.

s0110 REMOVAL OF A LARGE GLASS INTRAOCULAR FOREIGN BODY

p0680 Grazia Pertile

2 p0685 The patient in Video 131.21 suffered penetrating ocular trauma with a large piece of glass from a broken bottle. During the initial surgery the lens remnants were removed and the corneoscleral wound was sutured with 10-0 nylon sutures, but the foreign body was left behind, and the vitreous hemorrhage prevented the direct visualization of the fundus. Postoperatively, the vitreous cavity and retina were monitored with B-scan ultrasonography. After a couple of weeks a retinal detachment developed. Vitrectomy was performed with the purpose of removing the blood and intraocular foreign body and reattaching the retina. The surgeon who performed the surgery reported that the repeated attempts to remove the glass from the vitreous cavity were unsuccessful due to the very large size of the foreign body, which was irregular in shape and slippery. Different types of intraocular forceps were tried but none was able to grasp the foreign body to remove it.

At this point the patient was referred to our department. The visual acuity was light perception. The cornea was reasonably clear but there was a large corneoscleral wound involving the center. The temporal half of the iris was missing and nasally there were points of iris root disinsertion with a mild hyphema. B-scan ultrasonography confirmed the diagnosis of a total retinal detachment. p0690

Twenty-gauge vitrectomy was started by inserting an illuminated infusion cannula. After the removal of the blood, a total retinal detachment with extensive proliferative vitreoretinopathy and multiple posterior retinal breaks was visualized; these perhaps resulted from multiple unsuccessful attempts to remove the large piece of glass. The foreign body was located in the inferonasal quadrant, with an irregular triangular shape. The length was around 15 mm and the width was 9 mm. p0695

A basket that is generally utilized by the urologists for the removal of kidney stones was used to remove the foreign body. This retractable instrument with a diameter of 1.1 mm was introduced through an enlarged sclerotomy site. With this device, a thin network made of memory metal was then extruded inside the eye paying attention not to touch the retina while trying to engage the object with the basket. The large piece of glass is gently moved inside the basket with the help of an illuminated spatula, which permitted us to lift it up from the retina and guide it toward the metal network. The illumination from the spatula allowed us to overcome the shadow that was projected by the large foreign body. (When the object is large, it is crucial to start the maneuver from the most posterior part. In this way, you promote a spontaneous movement inside the basket due to the gravity and prevent it from rotating and getting stuck in the retina.) Finally, the metal network was retracted with the object inside. Once brought behind the iris plane the large size of the foreign body could be appreciated. The next step was to find the least invasive method of taking the basket with the object inside it out of the eye. In general, when the foreign body is firmly held with an instrument, it is best to enlarge the same sclerotomy with the other hand and remove it through a scleral incision at 3–4 mm posterior to the limbus. However, in this case we would have cut the sclera for more than one quadrant in addition to the extensive corneal wound and the corneoscleral incision already present in the superonasal quadrant. We chose to reopen the corneoscleral incision used during the previous operation. But this approach was tricky because the slippery foreign body needed to be regrasped. In order to reduce the risk of dropping the foreign body, the basket was directed toward the corneoscleral incision that was kept open with a spatula and then the basket was slowly opened while with the left hand the piece of glass was grasped with forceps. The basket was retracted after at least one-third of the foreign body was extruded with forceps. The wound was sutured, the membranes were removed, the retina was flattened, and silicone oil tamponade was injected. p0700

The accompanying videos for this chapter can be found online at http://www.expertconsult.inkling.com. p0705

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