

Retinal Tears and Retinal Detachment

The retina is the neurosensory tissue that lines the back wall of the eye. Like the film in a camera, the retina is responsible for creating the images that one sees. The center of the retina is called the macula and is the only part capable of fine detailed vision, i.e. reading vision, recognizing faces, etc. The remainder of the retina, the peripheral retina, is for side vision. The retina outside the center of the macula, which makes up more than 95% of the retina, is not capable of the fine detailed vision.

When the retina detaches, it separates from the back wall of the eye and is removed from its blood supply and source of nutrition. The retina will degenerate and lose its ability to function if it remains detached. Central vision will be lost if the macula remains detached. The causes of retinal detachment can be divided into three main categories:

1. Rhegmatogenous Retinal Detachment

Due to a retinal break or tear that allows the liquid vitreous that fills the center of the eye ball to pass through the break and detach the retina. This is the most common type of detachment.

2. Exudative Retinal Detachment

Due to leakage from under the retina which creates fluid (exudate) that detaches the retina. Tumors and inflammatory disorders can create exudative detachments.

3. Traction Retinal Detachments

Due to pulling on the retina usually from fibro-vascular tissue within the vitreous cavity. Proliferative diabetic retinopathy is a common cause of traction retinal detachments.

Rhegmatogenous Retinal Detachment

This is the most common type of retinal detachment and usually occurs when the vitreous separates from the back wall of the eye. The vitreous is the clear gel that fills the central cavity of the eye. The formed vitreous gel liquefies with age and eventually falls away or separates from the retina. This is called a posterior vitreous detachment (PVD) and is a normal event occurring in most people sometime between 40–70 years of age. As the gel separates and falls away from the center of the retina, one will often see floaters. These appear as dots, spots, or curly lines that appear suspended in front of you and move with your eye. People often think these floaters are flying bugs. Flashes of light are also a common symptom of a PVD. These are due to pulling on the retina as the gel separates. This pulling stimulates the retina, resulting in a flash of light. If a retinal blood vessel is broken from the pulling, a vitreous hemorrhage can occur. A small amount of blood may be seen by the patient as a shower of spots. Larger hemorrhages can cause large dark blobs in the visual field or an overall decrease in vision. If the gel is abnormally adherent to the retina or the retina is weak in a certain area, a retinal tear can occur as the gel separates and pulls away from the retina. Fortunately, the great majority of PVD's do not cause a retinal tear. Sometimes, a PVD

can occur without any symptoms, and sometimes, there can be lots of annoying symptoms without any retinal breaks.

A retinal detachment can occur once there is a retinal break. The liquid vitreous passes through the break and goes under the retina. The retina will then start to detach from the underlying tissue. Since most tears occur in the peripheral retina, the detachment will first cause loss of a portion of the side vision. This can be seen as a curtain or dark shadow involving the peripheral vision. As the detachment extends towards the macula, the shadow will also enlarge. Central vision will be lost if the macula detaches. Without surgical repair, most rhegmatogenous detachments will eventually involve the entire retina and all vision will be lost.

If a retinal break is discovered before a detachment occurs, it can be treated to prevent the retina from detaching. Usually the laser is used to treat a retinal break. The laser creates a series of burns surrounding the break which eventually scar and seal the retina to the underlying tissue. This prevents fluid (liquid vitreous) from passing through the break and detaching the retina. Rarely, the laser cannot be used and a retinal cryoprobe is used to treat the break. The cryoprobe creates a freezing reaction which will produce scarring to surround the break. Once a detachment occurs it is almost always too late to use the laser or cryoprobe. This is why it is so important to be examined immediately if you have symptoms of a PVD (flashes, floaters, shower of spots). A thorough dilated examination with indirect ophthalmoscopy, contact lens exam and scleral depression is required to find retinal breaks and other areas at risk for detaching. If no breaks are found at the initial exam, it is important to be re-examined within 1–2 weeks or sooner if new symptoms develop. The vitreous can continue to separate and pull on the retina for several weeks or longer and the retina can develop a tear during this time. Even if a tear is discovered and treated, follow-up examination is necessary to be sure the laser reaction is working and that no additional tears have developed. Not all retinal breaks need to be treated. Many people have round or atrophic holes in their retina that are discovered on routine examination and, usually, these do not need to be treated. In general, however, if a retinal break is discovered in association with new symptoms of a PVD or there are other high risk factors for a retinal detachment (family history, very near sighted, detachment in other eye, history eye trauma, prior cataract surgery, etc...) treatment is indicated. Treatment of retinal breaks with the laser or cryoprobe is very successful and retinal detachment can usually be avoided if the retinal breaks are identified and treated. Unfortunately, sometimes a retinal tear will lead almost immediately to detachment or there may not be any symptoms of a PVD, retinal tear or detachment. For these and other reasons, many people will have a retinal detachment when first examined and will almost always require some sort of surgical repair.

Repair Of Rhegmatogenous Retinal Detachment

Fortunately, over 90% of retinal detachments can be repaired with a single procedure. Currently, there are 3 different surgical approaches to repairing a detachment: scleral buckle procedure, vitrectomy and pneumatic retinopexy.

1. Scleral Buckle

This surgical procedure has been in use for more than 40 years, and, until approximately 25 years ago, was the only procedure available. It is still commonly used for rhegmatogenous retinal detachments, especially when there are no complicating factors. The procedure involves localizing the position of all the retinal breaks, treating all retinal breaks with the cryoprobe and supporting all the retinal breaks with a scleral buckle. The buckle is usually a piece of silicone sponge or solid silicone. The type and shape of the buckle varies depending on the location and number of retinal breaks. The buckle is sewn onto the outer wall of the eyeball (sclera) to create an indentation or buckle effect inside the eye. The buckle is positioned so that it pushes in on the retinal break and effectively closes the break. Once the break is closed, the fluid under the retina (subretinal fluid) will usually spontaneously resolve over 1–2 days. Sometimes the surgeon elects to drain the subretinal fluid at the time of surgery. Most often, a scleral buckle procedure can be done with local anesthesia and as same day surgery (in and out of the hospital on the same day). Postoperatively, there are usually no positioning requirements and one can resume most activities within several days (except for anything that would jar the head).

2. Vitrectomy

Usually referred to as a Trans Pars Plana Vitrectomy (TPPV), this procedure was first used ~25 years ago and has been continuously refined and improved since then. Over the last 5–10 years a TPPV procedure has become the initial surgery of choice for repair of many retinal detachments. The procedure involves making small incisions into the wall of the eye to allow the introduction of instruments into the vitreous cavity (the middle of the eyeball). The first part of the procedure usually is the removal of the vitreous using a vitreous cutter. Then, depending on the type and cause of the detachment, a variety of instruments (scissors, forceps, pincers, lasers, etc...) and techniques (excision of tractional bands, air–fluid exchange, silicone oil fill, etc...) are used to reattach the retina. A TPPV can also usually be done as same day surgery and with local anesthesia. It is sometimes important to maintain a specific head position after surgery to keep the retina attached. More information regarding vitrectomy surgery can be found on the vitrectomy page.

3. Pneumatic Retinopexy

Since the 1980's this has been a popular way to repair a straight-forward rhegmatogenous retinal detachment, especially if there is a single break located in the superior portion of the retina. This procedure involves injecting a gas bubble into the middle part of the eye (vitreous cavity). It is then critical to position oneself so that the gas bubble covers the retinal break. If the break can be covered by the bubble, the subretinal fluid will usually resolve within 1–2 days. The retinal tear is either treated with cryopexy before the bubble is injected or with laser after the retina has flattened. The main advantages of this approach are that it can be done in the office, thus avoiding hospitalization and that it avoids some of the complications of scleral buckling surgery, although it has its own set of complications. The main disadvantages are the requirement for precise head positioning for up to 7–10 days following the procedure and a slightly lower initial success rate as compared to a scleral buckle or TPPV. If the retina is not reattached by a pneumatic retinopexy procedure, a scleral buckle and/or TPPV can be done at that point.

Surgical Results

Approximately 90% of rhegmatogenous detachments can be initially repaired with one or a combination of these procedures. Sometimes, a scleral buckle is combined with a TPPV. If the retina does not reattach or detaches again after initial reattachment, it is usually due to the development of scar tissue on the surface of the retina and tractional forces within the vitreous cavity. If this happens following a scleral buckle procedure, it is often necessary to do a TPPV to repair the detachment. Sometimes, an intraocular gas bubble can be injected and the retina reattached following positioning. If a TPPV was done initially, it is often necessary to go back and do another TPPV to remove the new scar tissue and/or perform a scleral buckle. If a pneumatic retinopexy was the initial procedure, another pneumatic can be done or a scleral buckle or TPPV can be performed. As one can tell, there is no set way to repair a detachment and all the available procedures can be used in different combinations and sequences depending on the specific situation.

Visual Results

The visual prognosis depends mainly on the pre-existing status of the retina before it detached. If the macula has not detached, the pre-existing vision will usually be retained following successful repair. However if the macula is detached and central vision is impaired by the detachment, there may be permanent loss of central vision even if the retina is successfully repaired. The longer the macula is detached, the more likely there will be loss of vision due to irreversible damage to the photoreceptor cells. In general, if the center of the macula is detached for more than 4–5 days, there may be significant loss of central vision following surgical reattachment.

Exudative Retinal Detachment

Exudative detachments are due to leakage of fluid from the tissue layers under the retina rather than leakage of fluid vitreous from the middle of the eye through a retinal break. The most important factor in dealing with an exudative detachment is determining its cause. Many conditions can cause an exudative detachment including tumors, inflammatory disorders, connective tissue diseases and macular degenerative conditions. The evaluation of an exudative detachment will usually consist of a complete ophthalmologic examination including angiography and ultrasonography, and a complete medical work-up. The treatment will of course depend on the particular cause of the detachment. The visual prognosis also depends on the underlying etiology.

Traction Retinal Detachments

If a retinal detachment is primarily due to traction, it is termed a traction retinal detachment. The traction is usually due to proliferative fibro-vascular tissue within the vitreous cavity that pulls the retina away from the back wall of the eye. Proliferative diabetic retinopathy is a common cause of traction retinal detachments. In proliferative diabetic retinopathy, abnormal vessels (neovascularization) grow from the retinal surface onto the back surface of the vitreous. This fibrovascular tissue can then pull the retina away from the back wall of the eye, thus creating a traction retinal detachment. Another common cause is Proliferative Vitreoretinopathy (PVR). PVR is the most common cause of failure of a scleral buckle procedure for a rhegmatogenous retinal detachment and occurs ~10% of the time. It is due to proliferation of cellular membranes (essentially scar tissue) in the vitreous cavity and on the surface of the retina. These membranes can contract and detach the retina.

A traction retinal detachment will usually need to be surgically repaired if it involves the macula. A TPPV is almost always required (see discussion of TPPV under Repair of Rhegmatogenous Retinal Detachments). Sometimes a scleral buckle is performed in conjunction with the TPPV, especially if there is a combined rhegmatogenous-traction detachment. A combined detachment usually occurs when the fibrovascular proliferation causing a traction detachment also pulls or rips a tear in the retina. Some traction detachments that involve the peripheral retina and are not threatening the macula can be observed without surgery.

The success rate and visual outcome of surgery for traction detachments depends mainly on the underlying cause of the detachment and the extent and location of involvement. Some traction detachments can be relatively easy to repair and others can be impossible to fix even with all the advanced surgical techniques that are available today.