YAG Laser Goniopuncture

After Non-Penetrating Glaucoma Surgery

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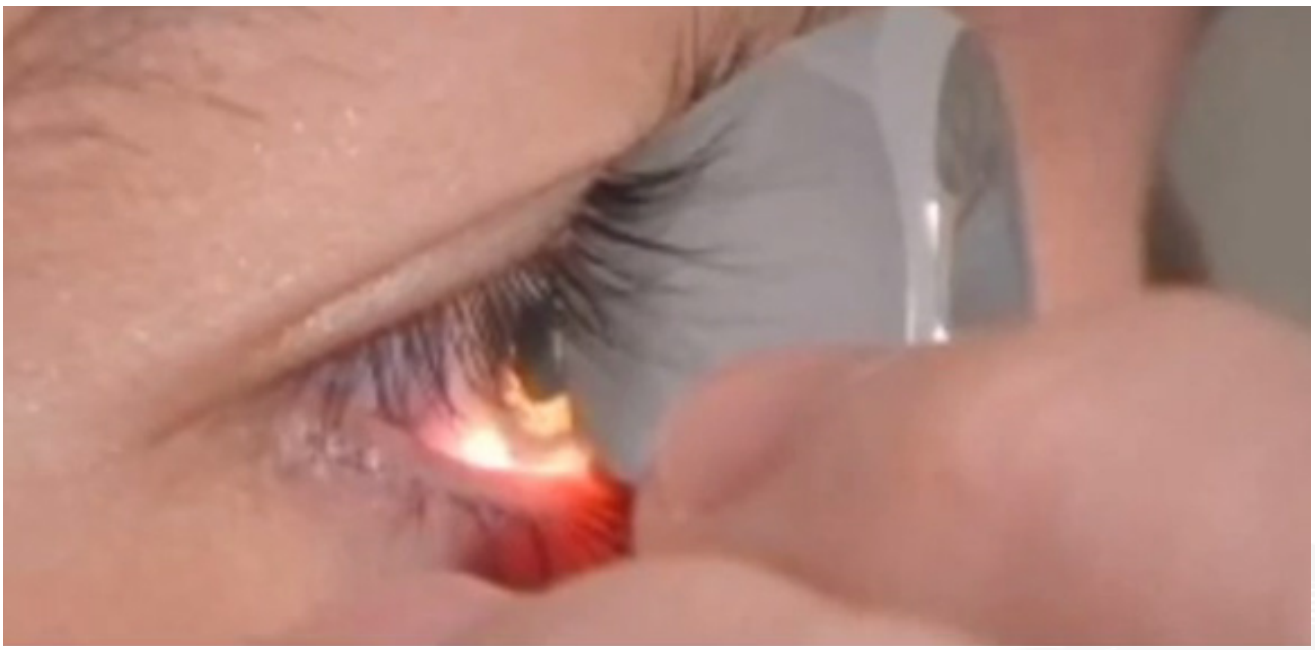
WHAT IS YAG LASER GONIOPUNCTURE?

YAG laser goniopuncture (”goniopuncture” for short) is a procedure that has been used for over a decade to achieve further lowering of the intraocular pressure (IOP) after Non-Penetrating Glaucoma Surgeries (NPGS). Canaloplasty is just one of many different Non-Penetrating Glaucoma Surgeries.

In Non-Penetrating Glaucoma Surgery a “window” is created between the anterior chamber and a surgically created reservoir in the wall of the eye (sclera). A very thin membrane (called “Descemet’s membrane”) covers this window regulating flow into the scleral lake and out of the eye. Without this membrane the IOP could be too low (hypotenous) after surgery. Over time, however, either the window or the lake can scar down.



Video Credit: Nd:YAG Laser Goniopuncture Performed on the Eye Shown in Figure 2 via JAMA Ophthalmology on YouTube: http://youtu.be/_DqyZW-dmRY

The YAG laser creates a very small spot of super-heated plasma. This plasma expands rapidly creating a microscopic tear in the tissue near where the laser beam is aimed. Creating these small tears in Descemet's membrane allows fluid to flow unrestricted from the anterior chamber into the scleral lake. Greater flow out of the eye results in a lower IOP.

How Well Does YAG Laser Goniopuncture Work?

Although there are no available studies that specifically address the question of how well goniopuncture works after canaloplasty, there are multiple studies that have evaluated goniopuncture after other types of Non-Penetrating Glaucoma Surgeries.

In one study evaluating goniopuncture after a type of NPGS called "deep sclerectomy" the procedure worked quite well to achieve additional IOP lowering after the effect of deep sclerectomy wore off.[1] Goniopuncture reduced the IOP by an average of just over forty percent (42%) and some IOP reduction was noted in all eyes after goniopuncture.

Another study of eyes that had previously had deep sclerectomy showed that IOP was lowered by almost 50% after goniopuncture.[2] Additionally, the benefit of goniopuncture was maintained for years. Not everyone, however, responded to goniopuncture. The IOP was essentially unchanged in fifteen percent (15%) of those who underwent goniopuncture in this study.

1 Ambressin A, Shaarawy T, Mermoud A. Deep sclerectomy with collagen implant in one eye compared with trabeculectomy in the other eye of the same patient. J Glaucoma 2002;11:214-220.

2 Shaarawy T, Mansouri K, Schnyder C, et al. Long-term results of deep sclerectomy with collagen implant. J Cataract Refract Surg 2004;30:1225-1231.

When Can YAG Laser Goniopuncture Be Performed?

YAG laser goniopuncture can be performed at any time after Non-Penetrating Glaucoma Surgeries such as Canaloplasty. In general goniopuncture is recommended if the post-surgical IOP rises above the desired target IOP. Another reason to consider goniopuncture would be if the surgeon notes evidence of scarring of the Descemet's window or scleral lake.

Risks Of YAG Laser Goniopuncture[3]

Fortunately, there appear to be very serious few risks of YAG laser goniopuncture. The most commonly encountered complications are as follows:

1 Blood in the Anterior Chamber (Hyphema)

This is the most common "complication" after goniopuncture. It is most often due to reflux of blood through the natural drainage system back into the eye. Occasionally, however, it can be from the laser beam hitting a small vessel in the area of the window. It is transient and resolves over one to two weeks. During the time the blood is present it can partially block the drainage system leading to a temporary rise in IOP.

2 Iris Prolapse Blocking the Window

This may occur in up to 10% of eyes that undergo goniopuncture. If the iris blocks the window then the IOP will rise. A change in the appearance of the pupil (peaking or ovalization) may also be noted with this complication.

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3 Vuori M-L. Complications of neodymium:YAG laser goniopuncture after deep sclerectomy. Acta Ophthalmol Scand 2003;81:573-576.

This complication is more common with narrow angles, brown iris color, and high (>25mmHg) pre-goniopuncture IOP. Pilocarpine drops may be used prior to goniopuncture in order to limit the risk of iris incarceration in the window. A laser iridotomy (hole in the iris) may also be performed either at the time of goniopuncture or after in order to prevent or treat this complication.

3 Scarring of the Window (Peripheral Iris Synechiae)[4][4]

This is more common with iris prolapse though it can also occur without it. If the iris or scar tissue blocks the window then the IOP will rise.

4 Elevated IOP

Intraocular pressure (IOP) elevation is most commonly due to hyphema or iris blocking the window.

5 Choroidal Detachment

The choroid is the tissue that lies between the eye wall (sclera) and the retina. Goniopuncture is performed in the angle near the choroid. If the choroid detaches then fluid can leave the eye through the uveoscleral outflow pathway. This may occur in up to one in twenty eyes (5%) that undergo goniopuncture.[5][5] If too much fluid leaves the eye through this route then the IOP could be too low (hypotony). These detachments are generally transient but may be followed by a short period of elevated IOP.

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4 Kim CY, Hong YJ, Seong GJ, et al. Iris synechia after laser goniopuncture in a patient having deep sclerectomy with a collagen implant. J Cataract Refract Surg 2002;28(5):900-902

5 Mermoud A, Karlen M-E, Schnyder CC, et al. Nd:YAG goniopuncture after deep sclerectomy with collagen implant. Ophthalmic Surg Lasers 1999;30(2):120-125

6 Hypotony

An IOP that is too low after goniopuncture is rare. When it occurs it is generally transient and may be secondary to choroidal detachment.

7 Severing the Stent in Schlemm's Canal

During Canaloplasty a suture is placed in the Canal of Schlemm in order to stent it open. If the laser beam hits the suture it could result in a loss of tension and partial closure of the canal. This could then lead to a rise in IOP.

Other Risks

Although unlikely, the following complications are also possible:

- Iritis (inflammation in the eye)
- Vitreous hemorrhage (blood in the back of the eye)
- Tearing the zonules (zonules hold the lens in position)
- Retinal detachment
- Shallow or flat anterior chamber
- Induced cataract
- Corneal decompensation (swelling of the cornea with blurred vision)

In Summary

YAG laser goniopuncture is an effective, quick, and relatively safe in-office procedure that can be performed at almost any time after Non-Penetrating Glaucoma Surgeries such as Canaloplasty. It should be considered whenever the IOP is not well-controlled after Non-Penetrating Glaucoma Surgery.

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