

PASSIVE SHAVING: A NOVEL APPROACH FOR A MOBILE RETINA



Maintain better control when treating giant retinal tears, retinal dialysis, and bulbous retinal detachments.

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Countless improvements to vitrectomy have been implemented since its inception in the 70s with the aim of optimizing this procedure. Still, removing the vitreous body from the intraocular cavity continues to present challenges. One of the most significant is extracting the greatest amount of vitreous per unit of time, while maintaining a controlled IOP and preserving the retina from new breaks due to vitreoretinal traction.

TRIED AND TRUE

During vitrectomy for retinal detachment, surgeons must shave the peripheral vitreous as closely as possible without creating new tears in a highly mobile retina that is detached from the retinal pigment epithelium (RPE). Increasing the cut rate to the maximum level while decreasing the vacuum (thus reducing the suction force to levels that are easier to control) is one of the most widely used techniques to avoid excessive retinal movement and prevent iatrogenic damage, especially in bullous detachments or giant retinal tears.

Another effective method is to use heavy liquids, such as perfluorocarbon liquid, as a “third hand” to support the retina during the vitrectomy and prevent it from being cut and/or aspirated by the vitrector.

Each of these techniques, with the addition of scleral indentation and the use of vitreous staining agents, such as triamcinolone, allows for safe and efficient balance when maneuvering the peripheral vitreous, especially in a mobile or even extremely friable retina.

ADVANCES IN CUTTING TECHNOLOGY

With updates in the different vitrectomy systems available on the market, it is possible to increase the cutting frequency to between 15,000 and 20,000 cuts per minute (cpm), in both single-blade and bi-blade modes. This increase in cutting capacity enhances the vitrector dynamics, preventing excessive traction and retinal breakage during both core vitrectomy and shaving. With this technology, the tip of the

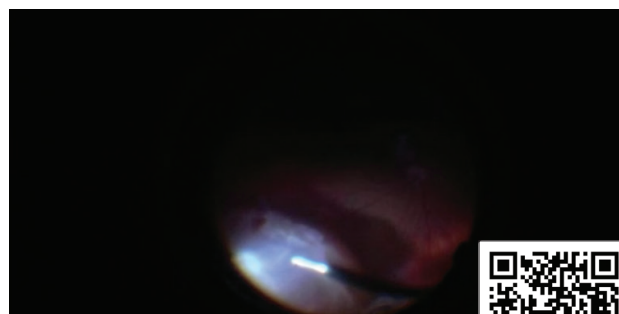
vitrector remains open almost the entire time, achieving a duty cycle (DC; the percentage of open port time for each complete cut cycle) close to 100% and thus reaching the so-called “ideal vitrectomy” cutter profile.

A NOVEL APPROACH TO SHAVING

Usually, in core vitrectomy mode, the vacuum and cut rate can be set to maximum because there is an extremely low risk of iatrogenic damage when working on a peripheral retina that is well attached to the RPE. On the other hand, in active shaving mode, surgeons should use high cut values (ie, between 7,000 and 10,000 cpm) and low vacuum values (ie, between 150 mm Hg and 250 mm Hg) to achieve a controlled vitrectomy without excessive traction of the peripheral retina from the RPE.

In the case of passive shaving, the much higher cut rate ensures a DC close to 100%, which allows vitreous to enter the vitrector passively due to the infusion pressure. In this passive shaving mode, active vacuum is not needed or is kept to a minimum. Thus, the vitreous is not actively aspirated by the vitrector, which helps to minimize the vitreous and retinal traction (Video 1).

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Video 1. Passive Shaving Technique in Retinal Detachment Repair





Figure. A vacuum setting between 0 mm Hg and 30 mm Hg in a linear mode is recommended, depending on the amount of vitreous that needs to be suctioned.

SETUP PEARLS FOR PASSIVE SHAVING

Vacuum: A vacuum setting between 0 mm Hg and 30 mm Hg in a linear mode is recommended. The setting can be maneuvered between these aspiration values depending on the amount of vitreous to be suctioned (Figure). Generally, the entire peripheral shave can be carried out with cutting and suction at 0 mm Hg.

Cut rate: The recommended values for passive shaving are between 15,000 cpm and 20,000 cpm, which can be achieved with the latest vitrectomy machines available on the market. The cut rate should be set to the maximum and in a fixed manner. Passive shaving cannot be achieved with cut rates of 7,000 cpm to 10,000 cpm, as the DC drops to approximately 50%, making the vitreoretinal interface much more turbulent and vulnerable to iatrogenic breakage.

IOP (infusion line): Based on the same principles of passive aspiration for drainage of subretinal fluid or perfluorocarbon liquid, the IOP should be set to the minimum level necessary to allow passive drainage through the tip of the vitrector, which should be open nearly 100% of

the time. This value is achieved with infusion pressure between 25 mm Hg and 40 mm Hg. We recommend starting passive shaving at 25 mm Hg and gradually increase IOP as needed. In the setting of dense vitreous, high-pressure levels (eg, 40 mm Hg) may be required, in contrast to more liquefied vitreous, which requires lower pressures.

BENEFITS AND LIMITATIONS

The main benefit of passive shaving is the possibility of working on detached, mobile retinal tissue in a much safer and more controlled way than is possible with active shaving (Video 2). In the case of retinal detachments associated with giant retinal tears and/or retinal dialysis, the manipulation of the flap is more predictable, allowing a generous and efficient removal of the vitreous adhered to the edge of the tear. The same applies with bullous retinal detachments, where a mobile retina can make surgery a challenge.

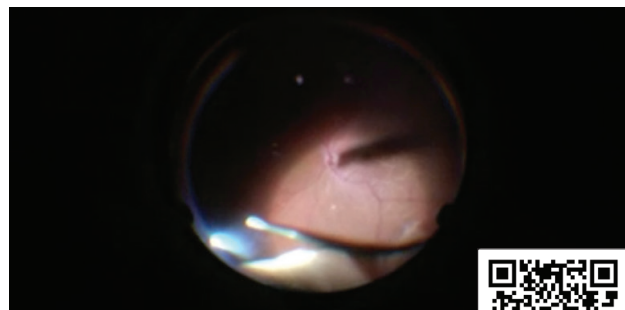
Other benefits are related to specific situations. For example, when shaving a highly adherent posteriorly attached vitreous base, passive shaving can prevent tearing of the retina. The same applies when dealing with extensive lattices along the peripheral retina and lesions associated with strong adherence between the vitreous and its edges.

One limitation of this technique is the fact that during a passive vacuum, the amount of vitreous that is aspirated by the tip is significantly reduced, so the shaving process will take longer than active shaving. For this reason, although a passive mode of vitrectomy can be set as the default for shaving, this technique is recommended when dealing with highly mobile retinas and for the treatment of giant retinal flaps. It is therefore recommended to configure the machine for active and passive shaving modes, such that the attached retina can be approached by the first mode and the detached retina by the second mode, making the surgery more secure and effective.

FINAL PEARLS

Passive shaving is a safe and effective option for dealing with a peripheral detached retina as well as a highly adherent vitreoretinal interface, where less traction applied during the procedure leads to a mostly physiological release of the vitreous from the retina, avoiding iatrogenic damage of the tissue and other intraoperative complications. ■

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Video 2. Passive Shaving Allows for Improved Stability During Vitrectomy



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