USE OF SULPHUR HEXAFLUORIDE IN TRABECULECTOMY

USO DEL HEXAFLUORURO DE AZUFRE EN LA CIRUGÍA FILTRANTE DEL GLAUCOMA

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Trabeculectomy (TBT) is the most utilized filtrating surgery in glaucoma. Patients with histories of eye inflammation, diabetes, collagen diseases, pseudo-exfoliation, long-term use of topical anti-glaucoma medication, previous laser trabeculoplasty, filtrating and/or cataract surgery, or in the cases in which we consider combined surgeries and in general all situations in which we suspect a rupture of the blood-aqueous barrier (BAB), usually develop immediately after the surgical procedure important inflammatory reactions in the anterior chamber (AC) which fosters the failure of the procedure. Due to the fact that the success of filtrating surgery depends on the healing of the fistula and surrounding tissue, the possibility of utilizing antimetabolites such as 5-fluoracyle and mytomicine-C for modulation purposes has given rise to great interest, although its use is not free of complications.

The hypotony related to hyposecretion or hyperfluorination, and the ensuing flattening of the AC (ACF) can give rise to a variety of undesirable events such as corneal or lens decompensation, cystoid macular edema or papiledema. As a treatment for ACF in the postop of TBT, the use sodium hyaluronate, gases or a combination of both has been proposed (1-4).

The use of viscoelastics for stabilizing the CA after TBT has been suggested for intraop and postop use. Of the variety of viscoelastics proposed, the most efficient seems to be Healon®5 (sodium hyaluronate 2,3%) due to its viscoadaptive properties which allow it a greater permanence in the CA as it is cleared in 2-4 days.

The use of perfluorated gases such as perfluoropropane (C_3F_8) combined with viscoelastics is indicated for cataract-like phakic or pseudo-phakic because it induces the development of an anterior capsular cataract in the contact area between the bubble and the lens. At present, the use of sulphur hexafluoride (SF_6) is proposed due to its minimum cataract-generating action and low endothelial damage risk (1), although its expansion capacity and permanence time are lower.

SF_6 is expandable in concentrations over 20%, increasing its volume in 150% when injected pure. The main restrictions of volume changes of the gaseous bubble injected in the CA are the fact of being in a non-hermetic cavity, because the filtrating (membrane) serves as escape route and therefore the permanence time is lower when injected in the vitreous cavity.

Our experience with SF_6 injected in the CA began in 1991 as a preventive treatment against relapse of post-traumatic hyphema (5). As of 2003, we utilized it regularly injected in CA at the end of the TBT in glaucoma with rupture of the BAB, as a way to prevent the premature closure of the fistula or athalamia due to excess filtration.

At present, our protocol for ACF after TBT (6) consists of medical treatment with antibiotic and topical steroids, utilizing only cyclopegic in pseudophakic because we aim at adding surgical treatment with Healon5® (0.15 mL) and SF_6 (0.1-0.2 mL of a mixture with air at concentrations between 20 and 100% in direct relationship with the degree of athalamia) injected in the anterior chamber, and it is important that the phakic patients have little contact between the gas and the lens due to the possibility of causing anterior subcapsular cataract (1).

The purpose of the gas is to seal the fistula and deepen the CA until the aqueous gradually substitu-

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tes it, and the purpose of the viscoelastic is to protect the corneal endothelium and lens as well as to slow the exit of gas through the fistula. It must be taken into account that expansive gases are lighter than water and therefore will deposit in the upper part of the CA, whereas sodium hyaluronate, being heavier, will descend to the lower part. Healon®5 is injected through the service paracentesis made in the previous surgery (if non-existent, we carry out a paracentesis with the 20G blade), and the SF_6 is injected directly at 180º of the former through the limbus to avoid it being expelled. Surgery is performed as usual, ambulatory with local anesthesia. If general anesthesia is utilized, the anesthetist must be advised 15 minutes prior to the gas injections so as to substitute nitrous oxide (if in use) to avoid an excessive volume increase of the CA due to the passage of nitrogen.

For preparing the SF_6 an insulin syringe is taken (1cc, 40 UI) with metal needle size 30G in sterile conditions. The tip of the needleless syringe is connected to a non-pyrogen, 0,22-micron dual microfilter Millex-GS®, and in turn connected to the tube of the gas container (which is usually found in the vitreo-retina operating room). SF_6 is also available in single doses, which is useful particularly for surgeons who don't have larger containers in their hospital. The desired amount of gas is withdrawn and the syringe is taken out with one of the two microfilters to obtain the desired concentration in admixture with air. This concentration usually ranges between 20 and 40% for first operations and in subsequent interventions the use of SF_6 can reach 100%. Subsequently, the needle is fitted, taking care to keep it pointing downwards to avoid leaks through the tip.

After completing the intervention, to inject the SF_6 the syringe with the desired concentration is taken, changing the needle by a cannula to inject it through the service paracentesis in order to form a bubble leaving a free peripheral space all around of about 1 mm, which is usually equivalent to injecting a volume of 0.2 cc. Thereafter, we force its passage to the sub-tenon space, pressing transconjunctivally with a blunt instrument on th edges of the scleral flap, achieving in this manner a cleaning effect in the path of the fistula to remove hematic remains, inflammatory mediators, fibrin, etc. thus enhancing early cicatrization. This maneuver is made in the first check-up 24 hours later in the practice if we find a tonometry above 15 mmHg and we do not observe the formation of a blister. What we usually find is that the SF_6 passes spontaneously to the subtenon space where it remains 4 to 7 days. In the CA we observe remains of the gas during 2-3 days, and its permanence may increase up to 7 days if we have also injected sodium hyaluronate (1-2.3%).

In our experience we have observed transient stromal edema with spontaneous resolution at 2-3 days, no anterior subcapsular cataract, and the follow-up studies with mirror microscope do not exhibit any unforeseen abnormalities in the endothelium.

The post-surgical handling of TBT is essential to ensure long-term filtration. We consider that the use of SF_6 in surgery for mechanically modulating filtration as well as to utilize it for resolving postop complications such as athalamia due to hyper-filtration with negative Seidel, a simple, safe and effective method. The use of SF_6 has caused us to reduce the time of anti-metabolites, thus avoiding the complications derived from its use. At present SF_6 is included in the usual protocol of all TBTs or in combined phaco-TBT operations we perform.

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