Short communication

Bubble mirror technique for express shunt surgery☆,☆

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A R T I C L E   I N F O

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A B S T R A C T

Surgical technique: The bubble mirror technique consists of the stabilization of the anterior chamber by means of a plug made with a combination of conveniently placed air and viscoelastic material. A line arises at interface between the air and viscoelastic where the anterior chamber angle reflected can be seen as in a mirror (bubble mirror).

Discussion: The viscoelastic–air plug offers three advantages in glaucoma surgery with the Ex-PRESS implant: (1) plug effect of viscoelastic, giving stability to the anterior chamber and preventing it from collapsing; (2) toning effect of the air bubble; and (3) specular effect at the interface, which allows the surgeon to visually control the chamber angle during the Ex-PRESS implantation.

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Maniobra del tapón especular para implante express

R E S U M E N

Técnica quirúrgica: La maniobra del tapón especular o «bubble mirror technique» consiste en la estabilización de la cámara anterior con una combinación de aire y viscoelástico colocados estratégicamente. En la interfase aire-viscoelástico de este taponamiento surge una línea donde se refleja, como en un espejo, el ángulo camerular.

Discusión: El tapón especular aporta 3 beneficios a la cirugía del glaucoma con implante Ex-PRESS: 1) efecto tapón del viscoelástico, que proporciona estabilidad a la cámara anterior,

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impidiendo su colapso; 2) efecto tono de la burbuja de aire; y 3) efecto especular de la interfase, que permite al cirujano el control visual del ángulo camerular durante la implantación del Ex-PRESS.

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**Introduction**

Ex-PRESS is a filtration device designed to reduce intraocular pressure (IOP).\(^3\) The insertion technique, protect to conduct scleral flap, spectacularly reduced complications.\(^5\) Obtaining results comparable to trabeculectomy for IOP reduction.\(^3,4\)

The bubble mirror technique arose after observing the reflection of the Ex-PRESS tip in the interface of the anterior chamber stabilizing plug which was routinely used for classic trabeculectomy, known as viscoelastic plug.\(^5\)

**Surgical technique**

The bubble mirror is built into stages, injecting air and viscoelastic in the anterior chamber.

Step I: anterior chamber stabilization with air, injecting a large bubble of filtered air with the aim of completely filling the anterior chamber (Fig. 1).

Step II: placement of the viscoelastic plug in the upper third of the anterior chamber, injecting low density viscoelastic so as to push the air bubble toward the lower part of the anterior chamber. The viscoelastic will be strategically located in the upper third, acting as separation between the air retained at the bottom and the internal area for implanting the Ex-PRESS shunt (Fig. 2).

The mirror interface appears in the air–viscoelastic separation line (Fig. 3). This slightly convex line made by the upper limits of the air bubble shows a mirror-like reflection of the chamber angle. This reflection indirectly makes visible several surgical maneuvers which cannot be seen directly. Observing the mirror interface, the surgeon is able to control the moment of entry of the pre-incision needed in the anterior chamber as well as watching the correct insertion of the Ex-PRESS implant in the chamber angle (Figs. 4 and 5).

**Discussion**

The advantages of the Ex-PRESS surgery include easy and quick implantation, filtration diameter standardization and absence iridectomy\(^6\).

The authors’ experience with Ex-PRESS implanted under scleral flap dates back to 2006. In 2009 the results of their experience were published, comparing two groups submitted to combined surgery: one with trabeculectomy and the other with Ex-PRESS4. The same plug was used in both groups as the mirror-like plug is the evolution of the trabeculectomy viscoelastic plug.\(^5\) Success rates (IOP under 21 mmHg without...
adjunctive treatment) after 15 months was of 90% with Ex-PRESS against 80% with trabeculectomy. These good results with Ex-PRESS and mirror plug paved the way for the progressive increase of this indication in the units, to the detriment of other techniques. In fact, in 2012 the authors implanted 77 Ex-PRESS, representing 85% of all anti-glaucomatous surgeries carried out in that year.

The recent addition of two ophthalmologists to the unit, having an experience of less than five anti-glaucomatous procedures per year, has allowed the authors to verify that the learning curve of this technique is extremely fast. Both surgeons successfully and safely completed their Ex-PRESS surgeries with mirror plug with the second procedure. In the past four years, the authors have trained two 4th term residents of other hospitals who opted for external rotation in our Glaucoma Unit. Both learnt and performed with ease the implantation of Ex-PRESS with mirror plug. In the open debate of Ex-PRESS versus trabeculectomy amongst the residents, the authors believe that both techniques are necessary for surgical training.

The construction of the mirror plug facilitates Ex-PRESS surgery as it provides three benefits: (1) plug effect for stabilizing the anterior chamber; (2) toning effect, necessary for puncture and insertion; (3) mirror effect, enabling the surgeon to see the chamber angle.

(1) **Plug effect**: The plug effect of the viscoelastic on the implantation duct maintains anterior chamber stability during pre-incision using needle and during Ex-PRESS insertion. The viscoelastic, strategically located in the upper area of the anterior chamber, flows through the puncture duct when the needle is withdrawn performing a sealing effect which prevents anterior chamber collapse. This plug effect is also evident during Ex-PRESS insertion as the viscoelastic seals all leak points, including the internal implant duct, avoiding ocular globe loss of pressure.

(2) **Ocular toning effect**: The air-viscoelastic combination provides the necessary tone to facilitate the pre-incision and insertion of the Ex-PRESS shunt.

(3) **Mirror effect**: The air-viscoelastic interface of the mirror plug reflects the chamber angle, enabling the surgeon to indirectly see the internal area of Ex-PRESS implantation. Accordingly, the surgeon is able to visualize surgical maneuvers which cannot be seen with direct observation. The reflection produced in the mirror bubble allows the surgeon to control the entry of the needle tip in the anterior chamber (Fig. 4). In addition, once the Ex-PRESS has been inserted, the surgeon is able to see the reflection of the internal duct in the mirror interface, verify the adequate implementation thereof (Fig. 5).

**Conflict of interests**

No conflict of interests was declared by the authors.

**REFERENCES**