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Phacoemulsification Cataract Surgery without Viscoelastic Substance

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Abstract

Phacoemulsification cataract surgeries without viscoelastics substance could be safely performed by a bi-manual technique. Some advantages of this technique are related to avoid a intraocular pressure increase or anterior chamber inflammation associated with viscoelastics. Anterior chamber is maintained by the balance salt solution liquid circulation, which also help to conduct the capsulorhexis. Advantages are short time surgery, less cost and potentially fewer complications. Some limitations, intraocular lens must be one piece foldable and principally, patients with corneal endothelial pathology must be excluded.

Introduction

The cataract surgeries are widely performed around the world which are relevant to restore and maintain good sigh over the years [1]. This surgery take place into the anterior chamber of the eye and viscoleastics substance (VS) improves their outcome, because they could be useful to maintain stability and produce protection for the corneal endothelial cells as different publications shows [2-8]. Since 1970's, VS has begin to progress and today they are popular and indispensable for integral parts of intraocular surgery.

However, other problems could arise related with VS. Intraocular pressure (IOP) increase when VS remains into the anterior chamber occluding the trabecular meshwork [2,6,9]. Flare or Tyndall effect could be postoperative detected after cataract surgery, which in part is frequent, but in excess could be the manifestation of "Toxic anterior segment syndrome" after cataract surgery (TASS) and VS could be associated with this [10,11]. Also, an extra surgery-time is necessary to introduce the VS and to completely remove them from the anterior chamber trying to avoid the problems previously described. In part, VS help to perform a more secure surgery, moreover include other possible problems. Because of that, this work proposes a special technique to perform phaco emulsification cataract surgery without VS.

Technique Description

Patients selected for this technique was those with cataracts classified as NO1-NC1 to NO4-NC4 according the LOCS III classification (avoid NO5-NC5, NO6-NC6.). Patients with less than 2000 endothelial cells count preoperative were excluded for this procedure. As well as those patients with endothelial defects, pseudo exfoliation, post-traumatic cataracts, pupil sinequiae or small pupil, uveitis and/or previous vitroretinal surgeries.

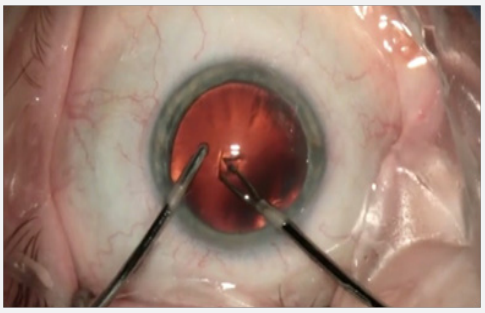

Figure 1: Two corneal incisions 1.1mm for micro-capsulorhexis and irrigation cannula.

After topical anesthesia was induced, two clear corneal incisions of 1.1mm were performed with v-lance near to the limbus. The first was at "two" o'clock, and immediately the irrigation cannula (1.1mm diameter) was introduced. The second incision was located at "ten" o'clock, and a micro-capsulorhexis clamp of 1.1mm diameter was introduced (Figure 1). It is important, that the size of the v-lance and the irrigation cannula must be the same to avoid leakage through the corneal incision. The irrigation bottle with balance salt solution (BSS) must be elevated at 80-100cm above the patient's head level under continous irrigation, to obtain a deep anterior chamber

space. This description is for right-handed surgeons. For left hander-surgeons "two" o'clock incision is for micropasulorhexis and at "ten" o'clock incision must be located the cannula.

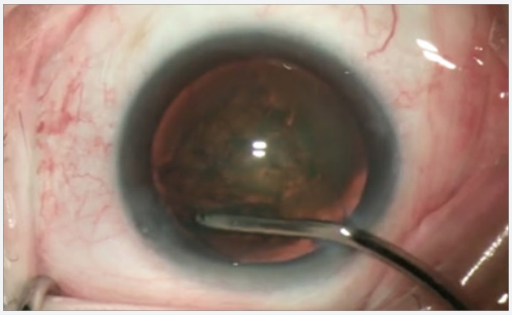

Figure 2: Hydrodisection performed with irrigation cannula which help to produce the nucleos rotation.

Capsulorhexis was performed, while the liquid (BSS) circulation in the anterior chamber produces a positive pressure which determines a stable and safe space to work. After that, hydrodisection was performed with the same irrigation cannula until a complete rotation of the nucleus was observed (Figure 2). During the learning curve, the first cases could be performed with the help of a regular cannula. Then, phacoemulsification, aspiration and mass extractions are performed (Figure 3).

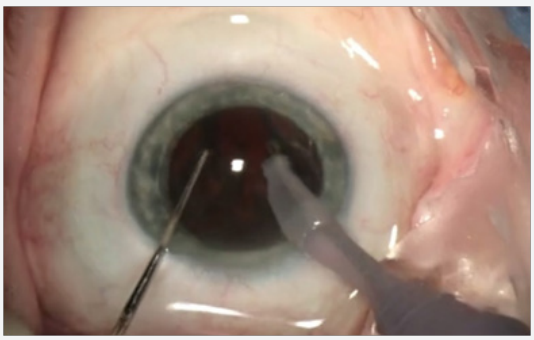

Figure 3: Phacoemulsification was performed.

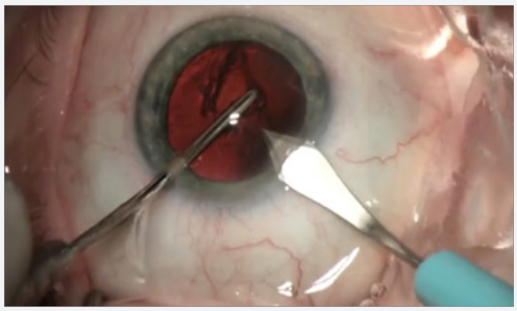

Figure 4: The corneal incision must be enlarged: 2.2mm to 2.8mm, according the phaco-emulsification tip.

After that, without remove the cannula, the second corneal incision was increased, 2.2mm up to 2.8mm, according the phaco device, for the IOL introduction (Figure 4). Only foldable one piece intraocular lens (IOLs) models with injector could be used. Three pieces IOLs models are not recommended for this procedure, because their haptics are hard and the capsule could be broken. When the intraocular lens cartridge was introduced through the incision, the anterior chamber space could suffer a small reduction because BSS outflow, but immediately the IOL injection begin, liquid leakage stop and the anterior chamber space is restored. The positive pressure expand the capsule and then the IOL is placed with the cannula help during the unfolding process to obtain the correct IOL position (Figure 5).

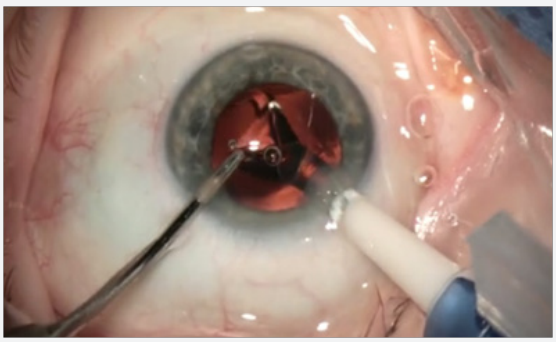

Figure 5: The intra ocular lens is injected.

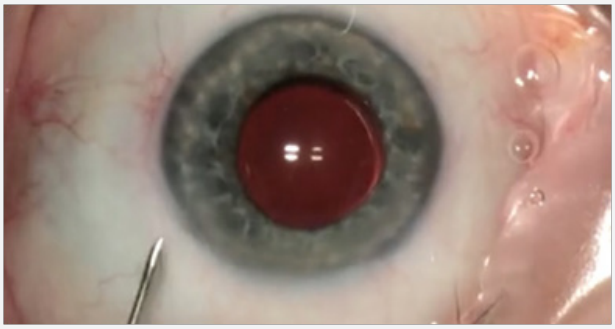

Figure 6: This picture shows the eye at the end of the surgery.

Finally, an intracameral antibiotic is injected and the surgery concludes (Figure 6). Video 1 show the principal steps of the technique to perform phaco-emulsification cataract surgery without VS, for left and/or right-handed surgeon.

Discussion

Lifetime increase, but ocular tissues is not prepared for last the years what we are living. Cataracts appear and the possibility to replace them with an IOL let many people stay able to keep their sight. Moreover, the improvements about the surgical techniques, device, equipment and tools, today is possible to resolve high orders refractive problems with IOL implantation (with or without removing the lens). The procedure to put an IOL into the eye, is short, accessible and secure. But is always possible to improve and adequate techniques in different environments.

The final cost of the surgery is influenced by medical supplies. In cataract surgeries, VS are one of those. They are useful, as different works demonstrated in the past. But VS is not only an extra surgery cost, moreover could be a potential postoperative problem, when the IOP rise or if anterior chamber inflammation

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appears and generate doubt about infection versus TASS, which could have different therapeutic approach and ending. To avoid these complications, a meticulous VS extraction must be performed. And in this part of the surgery, other problems could arise, even endothelial cell damage. Also, an extra time is required to introduce and to extract them and could be generated associated problems: more seconds the globe is open more risk and potential complications could be happened. Because of that, as will be discussed below, there are studies which try to avoid the use of VS, with different.

conclusion

Oksuz et al. [12], described a technique without VS to perform capsulorhexis, but they use it after hydrodisection and for the IOL implantation. Finally, they aspirated it from the anterior chamber. Schulze et al. [13], avoid their use, only during IOL implantation, without found difference in endothelial cell loss. In the past, Wright et al. [14], compare their results of small incision extracapsular cataract surgery using the anterior chamber maintainer without VS, and they finally show that the magnitude and range of the endothelial cell losses associate with this technique are significantly greater than those described following phacoemulsification. These authors finally recommend the use of VS for this extracapsular procedure. But in 2008 Sallet et al. [15], described a phaco emulsification cataract surgery technique completely performed without VS, where he found no difference in their clinical outcome comparing it with 50 patients operated with VS. However, Galan et al. [16], previously performed a similar technique with 1.6mm corneal incision and enlargement to 3.0 mm for IOL implantation with less success rate than Vallet G, which Vallet considered could be due to the narrower incisions performed by him of 1.2mm and 2.6mm for IOL implantation. The technique described in this work propose two corneal micro incision which are 1.1 wide and the enlargement of one of those to 2.2-2.8mm according the phaco emulsification tip (Vallet G open 2.6mm). Small corneal incisions could be in part the key to obtain better surgical results. Another difference with the technique described by Vallet, is about hydro disection, in the present technique, is performed by the irrigation cannula.

The technique described in this work have advantages, limitations and specific indications. Advantages, is possible to avoid complications related with VS (IOP elevation, TASS) performing a fast surgery easy to learn with less economical cost. Also, you don't need a third incision. Limitations are related about the IOL (three pieces IOL must be avoided) and also is not recommended for patients with endothelial corneal pathology, pseudo exfoliation syndrome, traumatic cataracts and/or history about previous vitreo retinal surgery. Moreover, endothelial cell count is a mandatory study to evaluate in the preoperative and to control in the postoperative follow up. The principal question which needs to be answered is if this technique doesn't have endothelial cell problems or more complications than the standard procedures. The author of this work start whit this technique in July 2015, and a prospective study is developing to evaluate their clinical outcome and complications. However, after fifteen hundred operated cases, these are some recommendations, if capsulorhexis is lost, always convert to viscoelastic, hydrodissection must be performed without pressing over the posterior capsule to avoid rupture, doing the IOL implantation should be obtained a well expanded anterior chamber, but if not, use VS. In summary, a bi-manual phacoemulsification micro-incision cataract surgery could be performed without the aid of VS, decreasing their economical cost in five to seven minutes, the technique is easy to learn and potentially with fewer complications, which must be scientific demonstrated in a future prospective study.

Acknowledgment

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