· Brief report ·

Shifting bubble sign, a useful tip in manual dissection of deep anterior lamellar keratoplasty

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Abstract

• Here we describe shifting bubble sign in manual dissection of deep anterior lamellar keratoplasty (DALK). This sign can be noticed in more than 99% of patients. It is very useful in phakic keratoconic eyes, the leading indication for DALK. We believe that our small modification can help surgeons early in learning curve to avoid inadvertent anterior chamber penetration during the final stages of DALK.

• KEYWORDS: shifting bubble sign; deep anterior lamellar keratoplasty; application
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INTRODUCTION

Recently, deep anterior lamellar keratoplasty (DALK) has received much attention, because this technique preserves patient's own healthy corneal endothelium and thereby eliminates the risk of endothelial rejection, the most common cause of graft failure.

Several different techniques have been used to facilitate lamellar dissection[1-7]. In 1999, Melles *et al*[7] described a method of manual corneal dissection at the level of Descemet's membrane using a specially designed spatula by DORC (Netherlands Institute for Innovative Ocular Surgery, Rotterdam/The Netherlands). Today, this technique is widely used by many surgeons due to its simplicity and safety. One of the crucial steps in this technique is trephinization of recipient's cornea on a viscoelastic-filled pocket within the lamellar dissection.

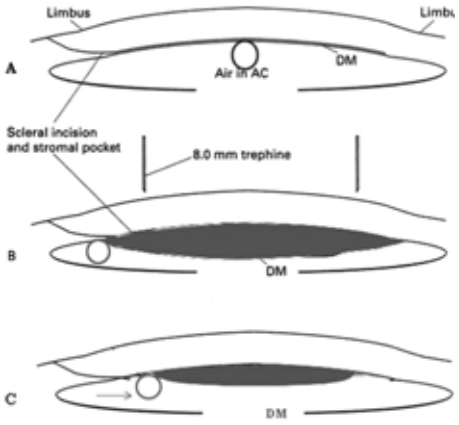

Figure 1 A: Illustration showing that after completion of corneal lamellar dissection, air is replaced with BSS in AC, but a small air bubble is left; B: When OVD is injected into the corneal pocket; air bubble shifts peripherally and is trapped in the far peripheral angle; C: If OVD escapes from the pocket before or during trephinization of host bed, air bubble shifts centrally again and stays at the far peripheral margin of pocket.

During this step, if ophthalmic viscoelastic device (OVD) escapes from the corneal pocket, the posterior wall of pocket comes in contact or close to the anterior wall. This increases the risk of inadvertently cutting both layers and entering the anterior chamber (AC). In our unpublished case series of DALK (216 cases), who have undergone Melles' manual dissection technique, we had three cases (1.4%) with AC perforation during trephination.

SURGICAL TECHNIQUE

Using the novel concept of shifting bubble sign[8], we performed a small modification of Melles' original technique. After completion of corneal lamellar dissection, air is replaced with balanced salt solution (BSS) in AC, but a small air bubble is left (Figure 1A). When OVD is injected into the corneal pocket, air bubble shifts peripherally and is trapped in the far peripheral angle (Figure 1B). At this stage, it may take the shape of a crescent rather than a spherical bubble. If OVD escapes from the pocket before or during trephinization of host bed, air bubble shifts centrally again and stays at the far peripheral margin of pocket (Figure 1C, 2A, 2B, 2C). Since the pocket is filled with OVD, it will not collapse rapidly even in the case of frank perforation. Therefore, the

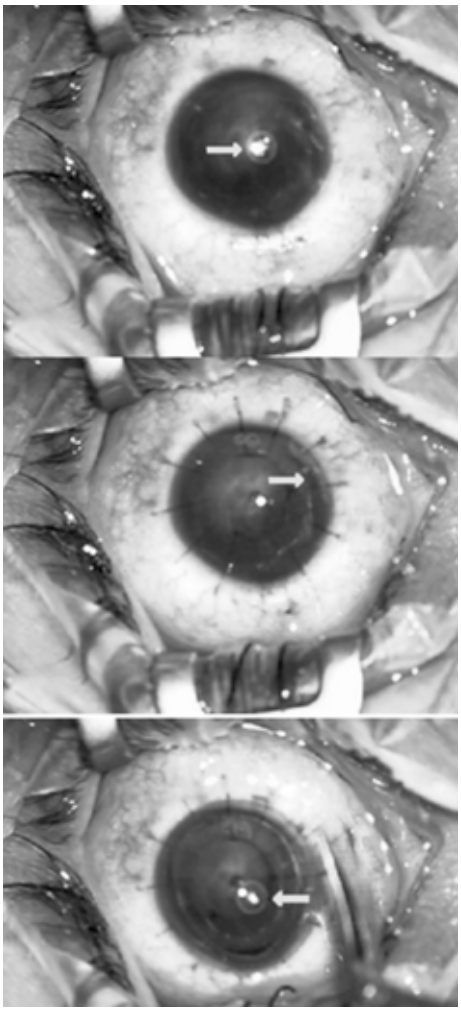

Figure 2 Intraoperative photographs showing the same steps illustrated in Figure 1.

surgeon has enough time to react properly. Recognition of this shifting bubble sign can alert the surgeon to re-inject the OVD and reform the pocket.

RESULTS

In our unpublished case series of DALK (216 cases), who have undergone Melles' manual dissection technique, we noticed shifting bubbles in all patients except in 2 patients. It was useful in all of the phakic keratoconic patients.

DISCUSSION

Although, this sign is not consistent in all cases, especially those with weak posterior lens zonular/vitreous support, it applies in phakic keratoconic eyes, the leading indication for DALK. In our case series, we did not notice shifting bubbles only in two patients. The first patient was a highly myopic woman who had post-LASIK ectasia. The second patient was a mentally retarded teenager who had keratoconus and cataract. He underwent simultaneous phacoemulsification and DALK. Therefore, this sign can be noticed in more than 99% of patients. We believe that this small modification can help surgeons early in learning curve to avoid inadvertent AC penetration during the final stages of DALK.

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移动气泡征在深板层角膜移植术中的应用

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摘要

我们报道了移动气泡征在深板层角膜移植术(deep anterior lamellar keratoplasty, DALK)中的应用。这一体征见于99%以上的患者。有晶状体的圆锥角膜是DALK最主要的适应证,这一体征对这类患者非常有用。我们认为对手术方法的小改进将帮助医师缩短此类手术的学习过程,避免前房穿透在手术最后阶段的发生。

关键词:移动气泡征; 深板层角膜移值术; 应用