Summary and Conclusion

Phacoemulsification is now the preferred method of most anterior segment surgeons for cataract extraction. In its early development, phacoemulsification of the nucleus was done in the anterior chamber after can-opener capsulotomy; the rate of endothelial cell loss was high. Such loss has been reduced by performing phacoemulsification in the posterior chamber and protecting the cornea with viscoelastic. However, this technique increased the risk of posterior capsular rupture with the danger of vitreous loss together with its possible posterior segment sequelae. The development of continuous curvilinear capsulorhexis technique by Gimbel and Neuhann in 1984 had dramatically changed the history of phacoemulsification. This was followed by developing various techniques for posterior chamber phacoemulsification starting with "divide and conquer nucleofractis" technique for in situ phacoemulsification by Gimbel in 1985. Another progress was made by the introduction of hydrodissection and hydrodelineation techniques allowing separation and mobilization of the nucleus within the capsule and minimizing its size. In addition, the advent of foldable IOLs, which can be implanted through 3.0 to 4.0 mm incisions, has led to better results. These advances have increased the interest in and acceptance of phacoemulsification.

The refractive aspect of cataract surgery has received considerable attention with the advent of modern small incision surgery. The amount of SIA can be controlled, and faster wound stability reduces the time required for visual rehabilitation. The two main elements to achieve emmetropia after phacoemulsification are accurate IOL power calculation and minimal postoperative astigmatism.

Preference had shifted from corneoscleral incisions to clear corneal incisions. One result of this change had been more induced astigmatism because the corneal incisions are closer to the visual axis.

The incision is more than a port of access to the anterior segment; it is the most important step of the operation, affecting ocular integrity and corneal stability. This seems to be especially important for clear corneal incisions. A precise cut and reproducible width (2.50 to 3.50 mm) and length (1.70 to 2.0 mm) are required. A two-step or hinged incision, and the use of a diamond knife can be very helpful. A single-step stab incision can create a superficial corneal flap that is extremely thin peripherally and can tear during the phacoemulsification procedure or the IOL implantation. Tunnels shorter than 1.70 mm might not be self-sealing, longer incisions (more than 2.0 mm) can cause diminished visibility intraoperatively secondary to corneal striae. All incisions larger than 4.0 mm should be sutured to be watertight. This was also emphasized by Menapace, who has studied the anatomy of clear corneal incisions in details. Otherwise wound leakage with the risk of endophthalmitis increases. We had used a single 10-0 nylon radial suture, which only apposed the tunnel wound edges and had mild influence on the magnitude of astigmatism. Tight sutures would produce local tissue compression, resulting in central steepening along the meridian of the incision and flattening 90° away. The sutureless clear corneal tunnel incisions are mainly suitable for foldable IOLs.

Clear corneal tunnel incisions are well tolerated by patients. No cautery is necessary, and this type of minimally invasive surgery can be performed using topical anaesthesia. The risk of hyphaema as reported with scleral pocket incisions is minimal. Visibility during phacoemulsification is better due to the shorter tunnel.

Early in the development of phacoemulsification, incisions were made at the superior meridian. It was soon realized that the supraorbital ridge limits the maneuverability of the phaco probe, increasing the procedure's technical difficulty. Most surgeons had shifted the incision site, so the phaco probe tunnels from the temporal aspect. This approach improves exposure during the surgery and provides natural drainage of fluid from the lateral canthus.

All self-sealing incisions produce a relaxing effect in the incision axis. That is why the standard approach of placing a sutureless clear corneal incision at 12 o'clock increases preoperative ATR astigmatism unless this is balanced by suturing. Suturing, however, delays stabilization by prolonging the astigmatic decay. Some surgeons had suggested that changing the incision site from a superior to a temporal position reduce the amount of SIA. A standard temporal approach may, however, worsen preoperative WTR astigmatism, although postoperative WTR may be less troublesome than ATR astigmatism. Instead, incisions can be used to reduce preoperative astigmatism simply by changing the incision site to the steeper meridian.

For several reasons, including the higher amount of corneal changes and the ATR shift, we did not choose the superior location and we used the temporal approach for clear corneal incisions.

This study comprised 46 eyes of 39 patients (23 men, 16 women) who had phacoemulsification with foldable IOL implantation between September 1999 and December 2000. The primary selection criteria were preoperative astigmatism less than 2.0 D and no ocular pathology other than nuclear cataract.

All incisions were two-step clear corneal tunnel incisions performed with a 3.20 mm disposable metal blade (Alcon Inc.). The depth of the preincision was about one-third the corneal depth. The tunnel length was 1.80 to 2.0 mm. The incision was enlarged to 4.10 or 4.50 mm before a foldable acrylic IOL (AcrySof, Alcon Inc.) was implanted with a forceps.

Incision construction was preceded by construction of two side-port incisions and placement of sodium hyaluronate 1% into the AC. It was followed by capsulorhexis, hydrodissection, stop and chop phacoemulsification technique to crack the nucleus, bimanual cortex removal, and IOL implantation in the capsular bag and aspiration of viscoelastic. The edges of the corneal stromal wound were hydrated with BSS. No sutures were used with 4.10 mm incisions (group A, n=28). One radial 10-0 nylon suture was used with 4.50 mm incisions (group B, n=18). At the end of surgery, the wound was checked for leakage and found to be watertight. All surgeries were performed using "Megatron" phacoemulsification machine (Geuder Co.).