



Minimally Invasive Cataract Surgery – A Continuous Trend in Ophthalmology

a report by
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Over the last 40 years, the natural trend of cataract surgery has been towards minimising surgical trauma, improving outcomes and faster recovery for the patient. This trend can be tracked by the progressive decrease in the incision size used for cataract surgery, which began with small-incision cataract surgery (incisions of less than 4mm) and was followed by continuous improvement in instrumentation and intraocular lens (IOL) technology.¹ Today, this trend has made it possible to perform cataract surgery through sub-2mm and even sub-1mm incisions.² This new trend is called microincisional cataract surgery (MICS), or alternatively phakonit and biaxial phacoemulsification. These techniques target cataract surgery through the minimum incision size possible, aiming to minimise surgical trauma, decrease surgically induced astigmatism and eliminate optical disturbances in the corneal optics caused by the incision and the wound-healing process.¹

This decrease in incision size has challenged both the phacoemulsification industry and IOL technology. Phacoemulsification devices have been improving in terms of their fluidics and the surgical control provided to the surgeon, allowing surgeons to use ultrasonic phacoemulsification power less and less, instead using the fluidics and the vacuum to eliminate cataracts. The consequences of these improvements have been demonstrated in clinical trials:³ the hammering effect of the phacoemulsification probe causes shock waves and surgical trauma to the intraocular anterior segment structures, so moving away

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from the use of phacoemulsification decreases surgical trauma. However, the most important consequences have been for the cornea: surgically induced astigmatism is eliminated when incisions are decreased to less than 2mm.³

Corneal aberrations are also unchanged or minimally changed following MICS.⁴ In terms of IOL technology, the advent of MICs has led industry to create new IOLs that can be injected through sub-2mm incisions.⁵ However, the challenge is ongoing, given that – as is usual in the history

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of cataract surgery – cataract incision size is years ahead of progress in IOL technology. Sub-1mm IOLs present a future challenge that remains unsolved; in order to achieve this goal, IOL technology would need to create injectable materials or extra-thin IOLs that are capable of entering through these ultra-small incisions without creating an optical imbalance or instability in the IOL during the post-operative period.

In practical terms, cataract surgery is moving forwards. Standard coaxial phacoemulsification is moving towards microcoaxial technology, in which surgery can be performed through a single incision of around 2mm. MICS with two incisions of 1.2–1.5mm is capable of removing all types of cataract, and surgery is ended with sub-1.8mm incisions. The differences between macrocoaxial technology and MICS are not yet clear, and the outcomes of both techniques are probably similar.⁶ However, the progress of future cataract surgery will likely be more influenced by manual microincisional techniques than by macrocoaxial techniques, as irrigation and aspiration, when separated, lead to a further decrease in cataract incision size. Moreover, irrigation and aspiration will be used as tools, rather than just as fluidic elements.¹

During the next five years, definite progress in IOL technology and phacoemulsification techniques and technology will become evident. These improvements will provide cataract surgery with even safer outcomes and faster recovery, introducing a future in which cataract removal will be possible through punctures rather than through incisions. ■

1. Alió JL, Rodríguez-Prats JL, Galal A, MICS (Microincision Cataract Surgery). In: *Highlights of Ophthalmology International*, Miami, 2004.
2. Agarwal A, Agarwal A, Agarwal S, et al., Phakonit: Lens removal through a 0.9 mm corneal incision, *J Cataract Refract Surg*, 2001;27(10):1548–52.
3. Alió J, Rodríguez-Prats JL, Halal A, Ramzy M, Outcomes of

- microincision cataract surgery versus coaxial phacoemulsification, *Ophthalmology*, 2005;112:1997–2003.
4. Elkady B, Alió JL, Ortiz D, Montalban R, Corneal optical quality following Micro-incision Cataract Surgery (MICS), *J Cataract Refract Surg*, 2007; in press.
5. Alió JL, Rodríguez-Prats JL, Galal A, Advances in microincision cataract surgery intraocular lenses, *Curr Op Ophthalmol*,

2006;17:80–93.

6. Yao K, Tang X, Ye P, Corneal astigmatism, high order aberrations, and optical quality after cataract surgery: microincision versus small incision, *J Refract Surg*, 2006;22:S1079–82.

