Editorial

Impact of surgical incision on corneal curvature and corneal astigmatism in cataract surgery

Gurinder Singh[1,2]^

[1]Department of Ophthalmology, The University of Kansas Medical Center, Kansas City, KS, USA; [2]The University of Missouri-Kansas City Medical Center, Kansas City, MO, USA

Correspondence to: Gurinder Singh, MD, MHA. Clinical Professor of Ophthalmology, 10710 West 130th Terrace, Overland Park, Kansas 66213, USA. Email: gurindersingh555@hotmail.com.

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This editorial in response to the published article titled "*Changes in corneal curvature and aberrations after cataract surgery*" by Dai, Ruan, and Wang *et al.* (1) is to reflect back on the evolution of cataract surgery. We started with the basic procedure of 'couching' to restore vision in blind eyes caused by mature or hypermature cataracts (2). Next came the procedure of 'intra-capsular cataract removal' with 180° corneo-scleral incision using von-Graefe's knife, initially without any suture closure of the wound that followed by suturing the wound. Aphakic corrective glasses would suffice to restore 'functional vision' in those early days of cataract surgery.

In an effort to improve the procedure, we invented 'extra-capsular cataract removal' and then the 'phacoemulsification' techniques. Came along the development of intra-ocular lens implants of numerous designs. Some were placed in front of the iris and some behind, some were placed in the capsular bag, some supported in the pupil or in the ciliary sulcus. We cannot overlook the role of different forms of contact lenses, such as hard contact lenses, gas-permeable lenses, soft contact lenses and now toric lenses, to give patient the best possible vision by correcting spherical and astigmatic aberrations.

Despite all these improvements we have been dodged by the problem of astigmatism, either pre-operative or post-operative. We have tried to deal with this issue by placing the sutures either loosely or tightly in large corneo-scleral incisional wounds and counter the preoperative astigmatism. Selective cutting of tight sutures post-operatively has been applied, sometimes with success other times not (3-7). Similarly, the role of continuous versus interrupted suturing of cataract surgery wounds has been studied to overcome post-operative astigmatism by altering the corneal curvature (8). There was an era in the history of cataract surgery when different types of keratoscope were installed on the operating microscope (9-12) to alter anterior corneal curvature and change corneal astigmatism intra-operatively. Surgeon's intent and effort were to achieve the most spherical mires of keratoscope's images projected on the corneal surface as possible by placing either tight or loose sutures. Similarly, a small air bubble would be injected into the anterior chamber of the operated eye that would guide to control intra-operative corneal astigmatism by achieving a spherical air-bubble while suturing the corneo-scleral wound. But, post-operative wound healing would nullify those efforts of making corneal curvature the most spherical possible intra-operatively.

As we know, two-thirds of the convergence of light happens at the corneal surface or the tear film. And, aspherical curvature of the corneal surface leads to most of the post-operative astigmatism. That is why most of the research work had been focused on the anterior surface of the cornea to manage astigmatism. Corneal incision influences both anterior and posterior curvatures of the cornea along with the stromal layer. It becomes imperative to include the posterior corneal curvature or surface and

^ ORCID: 0000-0003-2850-4115.

the stromal layer of cornea in our research while solving the problem of post-operative astigmatism. Similar research work as of authors Dai, Ruan and Wang *et al.* (1) needs to be applauded and encouraged. This article further supports, as we have seen over the years, that smaller the corneal incision lesser is the change in corneal curvature or corneal astigmatism. Injecting an air bubble intra-operatively, in a way, was taking posterior corneal curvature into account while correcting astigmatism, though newer technology is more precise and sophisticated in defining the changes in and the influence of posterior curvature of the cornea.

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