

## Commentary: Surgically induced astigmatism in manual small-incision cataract surgery incision types: Is the correlation linear?

Cataract surgery has undergone a significant evolution in the last decade. The primary aim of any cataract surgery is visual rehabilitation and achieving the best uncorrected visual acuity (UCVA).<sup>[1]</sup> While phacoemulsification remains the most modern cataract surgery technique, manual small-incision cataract surgery (MSICS) remains the technique of choice in many parts of the world where cost-effectiveness is a priority and surgical volumes are high.<sup>[2]</sup> Given the high volumes of MSICS in the developing world, optimizing outcomes with this technique is vital. With MSICS, surgically induced astigmatism (SIA) has been a subject of concern as it adversely affects visual outcomes. SIA is astigmatism produced in an operated eye due to surgically induced corneal change. It is one of the major causes of blurring, halos, ghosting, and patient dissatisfaction post surgery.<sup>[3]</sup> Several pre-, intra-, and postoperative factors affect the SIA in MSICS.<sup>[3]</sup> The preoperative factors include the type and magnitude of astigmatism and corneal and scleral changes. The intraoperative factors include the incision (type, length, location, and architecture), suture (type and material), cauterization of the wound, and tilt of the intraocular lens (IOL). The postoperative factors consist of wound healing, suture slippage and cutting, intraocular pressure (IOP), and wound dehiscence. Of these, the type and placement of incision for MSICS are modifiable factors studied in this paper.

Jauhari *et al.*,<sup>[4]</sup> in 2014, performed a comparative analysis of SIA in various incision types in MSICS but with slightly lower patient numbers. The current study also uses the same template and confirms their findings of minimal SIA with chevron incision. Also, in both these studies, the straight incision was associated with the highest SIA. A similar paper by Patra *et al.*<sup>[5]</sup> compared four types of incisions, including a boat-shaped incision. Their findings also confirmed the superiority of chevron incision in terms of SIA. Rohatgi *et al.*<sup>[6]</sup> described results comparing a 6-mm frown incision versus a 5-mm modified chevron incision and describe superior SIA outcomes with the latter. In a further study,<sup>[7]</sup> they also compared 5-mm and 7-mm inverted-V superior chevron incisions, with no significant difference between the two methods. The effect of placement of incisions on SIA has also been elucidated in previous studies. Gokhale *et al.*<sup>[8]</sup> compared SIA in superior versus temporal incisions and found that SIA was less in temporal and supero-temporal incisions compared to superior incisions. In their randomized control trial, Mallik *et al.*<sup>[9]</sup> also demonstrated reduced SIA with temporal compared to the superior approach. While the effect of suturing the sclera tunnel is known to affect the SIA, a recent study by Ahmed<sup>[10]</sup> in 2021 showed no difference in SIA with or without suturing of the sclera tunnel.

The strength of the present study<sup>[11]</sup> is the comparison of three different incision techniques: chevron, straight, and frown. While the groups are not randomized, the data shows preoperative astigmatism to be similar between all three groups, thereby minimizing any confounding. Notably, the

present study excludes patients with with-the-rule (WTR) astigmatism from the frown incision technique. It is interesting to note in their results that while SIA was least in the chevron incision group, there were significant intergroup differences in SIA between all three groups. Also, the SIA in all three groups was lower than the known average SIA of 1.0 to 3.0 D in the literature. They also studied the postoperative UCVA and best-corrected visual acuity (BCVA) following these three techniques, and their results showed that the number of patients achieving BCVA of 6/18 or better was similar between the groups. Perhaps the most crucial concept in reducing SIA with MSICS is placing the incision within the astigmatic neutral funnel, as described by Paul Koch. Rajappa and Bhat<sup>[12]</sup> in 2020 described the placement of a 4.5-mm U-shaped scleral incision in this zone. Their final mean SIA values of  $0.29 \pm 0.21$  D were even lesser than the mean SIA values in the present study with the chevron incision ( $0.34 \pm 0.22$  D). They concluded that achieving a phaco-comparable SIA with MSICS was possible using a small-incision within the neutral zone. Their study achieved a BCVA of 6/9 or better in 95% of cases. While the superiority of the chevron incision has been demonstrated in this study, Patra *et al.*<sup>[5]</sup> identified that the steep learning curve associated with this technique has prevented its widespread acceptance. Similarly, the U-shaped incision technique described by Rajappa and Bhat<sup>[12]</sup> also poses difficulty with the maneuvering of instruments. When applying the study's findings to clinical situations, these difficulties must be factored in. In conclusion, these results demonstrate that it is possible to minimize SIA in MSICS to a level comparable with phacoemulsification by modifying the type and placement of incisions.

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