

1 **Comparative Analysis of Surgically Induced Astigmatism and**
2 **Visual Outcomes: Manual SICS vs Phacoemulsification in Hard**
3 **Nuclear Cataracts.**

4 **Abstract**

5 **Background:** Hard nuclear cataracts pose surgical challenges, especially in developing
6 countries.

7 **Purpose:** To compare surgically induced astigmatism (SIA) and visual outcomes between
8 Manual Small Incision Cataract Surgery (SICS) and phacoemulsification.

9 **Methods:** A prospective comparative study was conducted on 100 patients with grade III–V
10 nuclear cataracts. Patients were divided into two groups: SICS (n=50) and phacoemulsification
11 (n=50). Postoperative visual acuity and SIA were assessed at 1 week and 6 weeks.

12 **Results:** Early postoperative visual acuity was significantly better in the phacoemulsification
13 group. Mean SIA was higher in SICS (1.3 ± 0.3 D) compared to phacoemulsification (0.6 ± 0.2
14 D) ($p < 0.05$). At 6 weeks, final visual outcomes were comparable between both groups.

15 **Conclusion:** Phacoemulsification provides faster visual recovery with lower SIA; however,
16 SICS remains a safe and cost-effective alternative with comparable final outcomes.

17 **Keywords:** SICS, Phacoemulsification, Surgically Induced Astigmatism, Hard Cataract, Visual
18 Outcome

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20 **Introduction**

21 Cataract is the leading cause of avoidable blindness globally. Management of hard nuclear
22 cataracts remains challenging due to increased nucleus density and associated surgical risks.
23 Phacoemulsification, with its small incision size, offers rapid recovery and minimal astigmatism,
24 whereas Manual Small Incision Cataract Surgery (SICS) is cost-effective and widely practiced in
25 resource-limited settings.

26 Surgically induced astigmatism (SIA) plays a crucial role in determining postoperative visual
27 quality. The magnitude of SIA depends on incision size, site, and healing characteristics. This
28 study aims to compare SIA and visual outcomes between SICS and phacoemulsification in
29 patients with hard nuclear cataracts.

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33 **Materials and Methods**

34 **Study Design**

35 Prospective, comparative, interventional study.

36 **Study Population**

37 100 patients with grade III–V nuclear cataracts attending a tertiary care center.

38 **Inclusion Criteria**

- 39 • Age > 40 years
- 40 • Hard nuclear cataracts (Grade III–V)
- 41 • Willing for surgery and follow-up

42 **Exclusion Criteria**

- 43 • Corneal opacity or irregular astigmatism
- 44 • Previous ocular surgery
- 45 • Coexisting retinal pathology

46 **Grouping**

- 47 • Group A: SICS (n=50)
- 48 • Group B: Phacoemulsification (n=50)

49 **Surgical Technique**

- 50 • **SICS:** Superior scleral tunnel (6–7 mm incision)
- 51 • **Phacoemulsification:** Clear corneal incision (2.8–3.2 mm)

52 **Outcome Measures**

- 53 • Best Corrected Visual Acuity (BCVA)
- 54 • Surgically Induced Astigmatism (calculated using keratometry)

55 **Follow-Up**

56 Postoperative day 1, 1 week, and 6 weeks

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58 **Statistical Analysis**

59 Data analyzed using appropriate statistical tests (independent t-test). A p-value < 0.05 was
60 considered significant.

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62 Results

63 • Visual Outcomes:

64 Early postoperative BCVA was significantly better in the phacoemulsification group ($p < 0.05$). At 6 weeks, no statistically significant difference was observed.

66 • Surgically Induced Astigmatism:

67 ○ SICS: 1.3 ± 0.3 D

68 ○ Phacoemulsification: 0.6 ± 0.2 D

69 The difference was statistically significant ($p < 0.05$).

70 • Complications:

71 Minimal intraoperative complications in both groups. Phacoemulsification showed
72 increased difficulty in very dense nuclei.

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74 Discussion

75 This study highlights that phacoemulsification induces significantly less astigmatism due to
76 smaller incision size, resulting in faster visual rehabilitation. However, SICS demonstrated
77 comparable final visual acuity at 6 weeks.

78 In hard cataracts, phacoemulsification may require higher energy levels, increasing endothelial
79 risk. SICS, on the other hand, provides a safer and more practical option, especially in high-
80 volume settings.

81 These findings are consistent with previous literature indicating that while phacoemulsification is
82 technologically superior, SICS remains indispensable in developing countries.

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84 Conclusion

85 Phacoemulsification offers better early visual outcomes and lower SIA. However, Manual SICS
86 provides comparable final visual acuity and remains a cost-effective and reliable technique for
87 managing hard nuclear cataracts.

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