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PREFERRED PRACTICE OF CATARACT SURGERY IN BROWN CATARACT: A QUESTIONNAIRE-BASED SURVEY

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ABSTRACT

Background
Brown cataracts, also called brunescent or hypermature cataracts, are difficult to operate on due to their thick nuclear sclerosis, capsular issues, and poor visualization. Ophthalmic surgeons debate the best surgical method for these cases based on their training, experience, and resources. Understanding preferred surgical methods may improve uniformity and training protocols.
Objective: A structured questionnaire survey of ophthalmic surgeons' preferred brown cataract surgical methods, intraoperative approaches, and postoperative management protocols.

Methods
A 20-item standardized questionnaire was given to 12 ophthalmic surgeons, 6 consultants, and 6 postgraduate trainees. Demographics preferred surgical methods (phacoemulsification, MSICS, ECCE), nucleus disassembly techniques, capsular dyes and viscoelastics, perceived complication rates, and IOL implantation methods were collected in the survey.

Results
58% of 12 respondents preferred MSICS for brown cataracts due to better nucleus extraction control and lower endothelial trauma risk. 33% chose phacoemulsification, mostly consultants with advanced experience and modern equipment. ECCE was used by 9% in resource-limited settings. 83% of surgeons routinely stained the anterior capsule with trypan blue, while 67% preferred dispersive viscoelastics to protect the corneal endothelium. The most common complication was posterior capsular rupture (25%), followed by zonular dialysis (16.7%). 50% used rigid PMMA lenses, but 42% preferred foldable lenses when available. Postoperative visual outcomes were satisfactory for 92% of respondents.

Conclusion
Ocular surgeons treating brown cataracts tend to use MSICS due to its safety, cost-effectiveness, and suitability for advanced nuclear sclerosis. Phacoemulsification is becoming more popular, but resource availability and the learning curve limit its use. Trypan blue and viscoelastics are widely used, indicating good surgical planning to reduce issues. These findings emphasize the need for MSICS and phacoemulsification training for complex cataracts and increased surgical adjunct availability in resource-limited settings.

Keywords: *Brown cataract, MSICS, Phacoemulsification, Extracapsular cataract extraction, Trypan blue, Questionnaire survey, Preferred practice pattern.*
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INTRODUCTION

Cataract continues to be the primary cause of preventable blindness globally, especially in low- and middle-income nations such as India, where a significant number of untreated cases persist (WHO, 2019; Flaxman et al., 2017). Brown cataracts, also known as brunescent, mature, or hypermature nuclear cataracts, present distinct

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surgical challenges owing to their dense and rigid nuclei, diminished capsular elasticity, inadequate visualization, and heightened risk of intraoperative complications (Sharma et al., 2015; Rao et al., 2012). These attributes require meticulous preoperative planning and surgical techniques to guarantee safety and enhance visual results (Venkatesh et al., 2005).

The surgical approach to brown cataracts depends on the surgeon's expertise, the equipment at hand, and the anatomical state of the eye. Phacoemulsification is the gold standard for cataract surgeries because of its rapid recovery and minimal incision size; however, its effectiveness is frequently constrained in advanced brown cataracts, where high nuclear density can lead to extended ultrasound exposure, greater endothelial cell loss, and heightened complication rates (Rao et al., 2012; Vasavada et al., 2001). In these instances, manual small incision cataract surgery (MSICS) has proven to be a feasible and secure option, especially in resource-limited environments (Venkatesh et al., 2005; Gogate et al., 2003). MSICS facilitates regulated nucleus extraction via an enlarged scleral tunnel, hence diminishing the hazards linked to phaco energy and preserving intraoperative stability (Gogate et al., 2007).

A further critical factor is the utilization of surgical adjuncts, including trypan blue dye for anterior capsule visibility and viscoelastic agents to safeguard intraocular structures during the operation. The anterior capsule in brown cataracts frequently has a leathery texture and is devoid of the typical red reflex, complicating the initiation and completion of continuous curvilinear capsulorhexis (CCC) without staining (Melles et al., 1999; Chang, 2004). Trypan blue enhances capsular visibility and diminishes the probability of radial rips (Gimbel et al., 2005). The selection of dispersive versus cohesive viscoelastics is crucial for endothelial protection and anterior chamber stability during nucleus manipulation (Arshinoff, 2003).

Notwithstanding various surgical alternatives and developments, a systematic approach for the care of brown cataracts remains absent. Surgeons' tastes frequently differ significantly based on their training background, proficiency with particular procedures, and availability of technology (Ruit et al., 2007; Thulasiraj et al., 2016). In teaching hospitals and rural eye camps, extracapsular cataract extraction (ECCE) may still be employed, particularly in the absence of phaco equipment or when unskilled professionals are present (Olson et al., 2011). The choice of intraocular lenses (IOLs)—rigid PMMA or foldable acrylic—depends on the type of incision, financial factors, and availability (Gogate et al., 2007).

Comprehending these practice patterns helps elucidate deficiencies in training, resource distribution, and surgical readiness, particularly in high-volume institutions managing intricate cataract cases. Surveys utilizing questionnaires offer significant insights into contemporary trends and can guide curriculum development, equipment acquisition, and clinical practices (Brien Holden Vision Institute, 2016).

This study aimed to evaluate the favored surgical procedures and perioperative practices of ophthalmic surgeons when performing surgery on brown cataracts at a tertiary care facility. Through the assessment of trends in procedure selection, adjunct utilization, complication rates, and postoperative results, we seek to enhance the ongoing discourse on optimizing cataract management in complex clinical situations.

MATERIALS AND METHODS

Research Design

This was a descriptive, cross-sectional study utilizing a questionnaire, conducted in the Department of Ophthalmology at Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar. The study lasted 12 months and received approval from the Institutional Ethics Committee. The poll was administered anonymously to promote candid responses.

Study Participants

The study included 12 ophthalmic surgeons, consisting of 6 consultants and 6 postgraduate trainees, all of whom had clinical experience in cataract surgery and had performed at least one brown cataract surgery within the previous year.

Eligibility Criteria

Ophthalmologists proficient at executing cataract surgeries must have conducted a minimum of one surgical procedure on a brown cataract over the past 12 months. Readiness to engage in the survey

Criteria for Exclusion

Surgeons possessing under one year of experience in cataract surgery. Partial survey replies: Surgeons who had not before met brown cataracts in clinical practice.

Survey Instrument

A systematic questionnaire was developed utilizing expert insights and a review of existing literature. The

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assessment had 20 multiple-choice and Likert scale questions, encompassing the following domains:
Demographics (title, years of experience), Preferred surgical method (Phacoemulsification, Manual Small Incision Cataract Surgery, Extracapsular Cataract Extraction), Utilization of adjuncts (trypan blue, viscoelastic agents, capsular tension rings), Nucleus management methodologies (divide-and-conquer, chop, viscoexpression, etc.) Selection and methodology for intraocular lens installation: Frequent intraoperative problems and their care. Postoperative visual results and follow-up preferences. The questionnaire underwent validation in a pilot study involving 10 surgeons and was subsequently improved for clarity and relevance.

Data Acquisition Method

The questionnaire was disseminated in both digital (Google Forms) and hardcopy modes. Participants had the choice to complete the survey either online or offline, based on their convenience. The responses were gathered over a three-month duration and organized in a secure database.

Performance Metrics

The primary outcomes comprised: Prevalence of favored surgical method for brown cataracts, Frequently employed surgical adjuncts and disassembly methodologies, Documented complication rates associated with brown cataract surgery, Trends in intraocular lens selection and perceived visual consequences.

Data Analysis

Data were evaluated utilizing SPSS version 25.0. Descriptive statistics were employed to summarize frequencies and percentages. Chi-square tests were utilized to evaluate the relationships between surgeon experience and technique preferences. A p-value less than 0.05 was deemed statistically significant.

RESULTS

A total of 12 ophthalmic surgeons participated in the study, comprising 6 consultants and 6 postgraduate trainees. All participants had experience managing brown cataracts in both institutional and outreach (camp) settings.

Preferred Surgical Technique

Among the 12 respondents:
7 surgeons (58.3%) preferred Manual Small Incision Cataract Surgery (MSICS) for brown cataracts.
4 surgeons (33.3%) selected phacoemulsification, primarily among the consultants with more than five years of surgical experience and access to advanced phacoemulsification equipment.
1 surgeon (8.3%) indicated the use of Extracapsular Cataract Extraction (ECCE), mainly in resource-constrained settings where modern surgical equipment was limited.

Utilization of Adjuncts and Intraoperative Strategies

10 surgeons (83.3%) reported routinely using trypan blue dye to assist in capsulorhexis for dense, brunescent lenses.
8 surgeons (66.7%) preferred dispersive viscoelastic agents to maintain endothelial protection and anterior chamber stability.
For nucleus disassembly, In MSICS, viscoexpression and nucleus prolapse techniques were predominantly used.
In phacoemulsification cases, divide-and-conquer and direct chop techniques were the preferred methods.

Intraoperative Complications

3 surgeons (25%) reported encountering posterior capsular rupture during brown cataract surgeries.
2 surgeons (16.7%) experienced zonular dialysis, particularly in cases with pseudoexfoliation syndrome or pre-existing zonular weakness.

Intraocular Lens Preferences and Visual Outcomes

6 respondents (50%) preferred implanting rigid PMMA intraocular lenses (IOLs), mainly during MSICS and ECCE procedures.
5 respondents (41.7%) opted for foldable IOLs, primarily in cases managed with phacoemulsification or hybrid techniques.
Overall, 11 out of 12 surgeons (91.7%) reported satisfactory postoperative visual outcomes with favorable anatomical and functional recovery.

Figure 1 (horizontal bar chart) and Table 1 illustrate the prevalence of reported practices and outcomes among surveyed surgeons.

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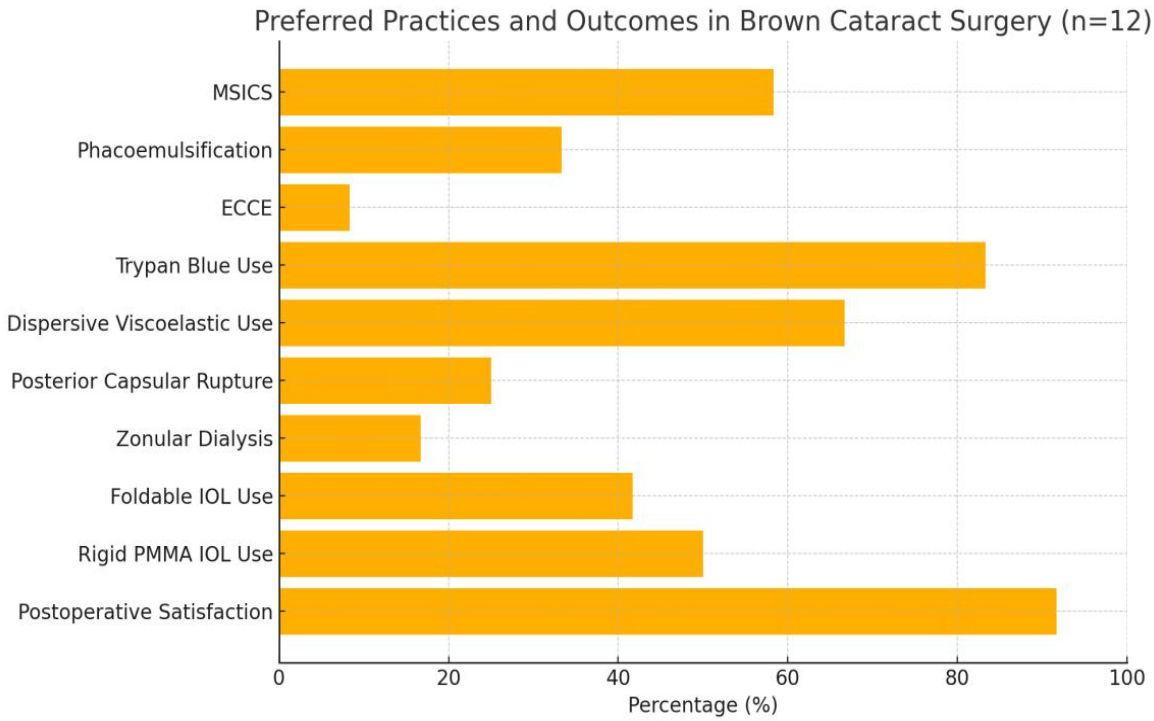

Figure 1: Preferred Practices and Outcomes in Brown Cataract Surgery (n=12)

Table 1: Summary of Preferred Practices in Brown Cataract Surgery (n=12)

Survey Item	*Number of Respondents*	*Percentage (%)*
Preferred Surgical Technique: MSICS	7	58.3%
Preferred Surgical Technique: Phacoemulsification	4	33.3%
Preferred Surgical Technique: ECCE	1	8.3%
Routine Use of Trypan Blue	10	83.3%
Use of Dispersive Viscoelastics	8	66.7%
Posterior Capsular Rupture Reported	3	25.0%
Zonular Dialysis Reported	2	16.7%
Use of Foldable IOLs	5	41.7%
Use of Rigid PMMA IOLs	6	50.0%
Postoperative Satisfaction Reported	11	91.7%

DISCUSSION

Brown or brunescent cataracts present considerable challenges for cataract surgeons due to their dense nuclear sclerosis, reduced red reflex, and heightened risk of intraoperative complications (Sharma et al., 2015; Vasavada et al., 2001). This questionnaire-based study aimed to explore current preferred practices, surgical techniques, and complication trends in the management of brown cataracts within a tertiary care setting. The results offer valuable insights into decision-making patterns among ophthalmic surgeons with varying levels of experience, including both consultants and postgraduate trainees.

Our findings revealed that Manual Small Incision Cataract Surgery (MSICS) was the predominant technique (58.3%) selected for brown cataracts. This aligns with previous studies that advocate MSICS as a safe, effective, and resource-appropriate alternative to phacoemulsification, particularly in dense cataracts (Venkatesh et al., 2005; Gogate et al., 2003; Ruit et al., 2007). MSICS, by facilitating manual nucleus extraction through a self-sealing scleral tunnel, minimizes the need for ultrasound energy and reduces risks to the corneal endothelium (Gogate et al., 2007).

Phacoemulsification was preferred by 33.3% of respondents, mostly among consultants with advanced surgical skills and access to state-of-the-art equipment.

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Although phacoemulsification offers the advantages of faster recovery and smaller incisions, the high nuclear density of brown cataracts increases the risk of intraoperative complications such as posterior capsular rupture, emphasizing the need for careful technique selection (Rao et al., 2012; Vasavada et al., 2001; Nagpal et al., 2001). Surgeons often opt for MSICS over phacoemulsification in such cases to mitigate risks associated with prolonged ultrasound use.

The routine application of trypan blue dye by 83.3% of participants reflects current best practices. Trypan blue significantly improves anterior capsule visualization and reduces the risk of radial tears during capsulorhexis formation, particularly when the red reflex is poor (Melles et al., 1999; Chang, 2004; Gimbel et al., 2005). Similarly, the preference for dispersive viscoelastics by 66.7% of surgeons underscores the focus on corneal endothelium protection and maintenance of anterior chamber stability during complex nucleus manipulation (Arshinoff, 2003).

Intraoperative complications such as posterior capsular rupture (25%) and zonular dialysis (16.7%) were observed at rates comparable to previous studies on dense cataracts (Schlötzer-Schrehardt & Naumann, 2006; Vasavada et al., 2001). These findings highlight the importance of surgical vigilance, preparedness for complications, and familiarity with the use of capsular tension rings or other support devices when required (Rao et al., 2012; Schlötzer-Schrehardt & Naumann, 2006).

Regarding intraocular lens (IOL) preferences, 50% of surgeons selected rigid PMMA lenses, reflecting their practicality and affordability, particularly in MSICS and ECCE cases (Gogate et al., 2007). Meanwhile, a notable 41.7% used foldable IOLs when circumstances allowed, indicating a trend toward minimally invasive practices where surgical infrastructure and patient affordability permitted (Olson et al., 2011).

Overall, 91.7% of surgeons reported satisfactory postoperative visual outcomes, reinforcing the importance of appropriate surgical planning, technique selection, and intraoperative management (Venkatesh et al., 2005; Thulasiraj et al., 2016). The involvement of both consultants and postgraduate trainees in the survey highlights the role of structured training programs in preparing young surgeons for managing challenging cataracts effectively (Brien Holden Vision Institute, 2016).

This study underlines that MSICS continues to be the cornerstone technique for brown cataracts in resource-constrained settings, while phacoemulsification adoption is gradually increasing among experienced surgeons. Ongoing training in both MSICS and advanced phacoemulsification techniques is critical to equip future ophthalmologists with the skills necessary for safe and effective brown cataract management (Gogate et al., 2007; Sharma et al., 2015).

CONCLUSION

This study highlights the current preferred practices among ophthalmic surgeons—including both consultants and postgraduate trainees—regarding the surgical management of brown cataracts, a subtype known for its complexity and high risk of intraoperative complications. The results affirm that Manual Small Incision Cataract Surgery (MSICS) remains the predominant approach, especially in high-volume and resource-limited settings, due to its versatility, safety profile, and minimal dependence on costly equipment.

While phacoemulsification is increasingly favored by consultants with greater surgical experience and access to advanced technology, its widespread adoption for brown cataracts is still limited by challenges such as surgical complexity, higher complication risk, and the need for specialized skill sets. The routine use of adjuncts like trypan blue staining and dispersive viscoelastics demonstrates a systematic approach among surgeons to reduce intraoperative risks and preserve corneal integrity.

Intraoperative complications such as posterior capsular rupture and zonular dialysis remain significant concerns, particularly in hypermature cataracts or cases associated with pseudoexfoliation syndrome. The proactive use of capsular support devices and careful intraoperative decision-making further illustrates the evolving expertise among both experienced and training surgeons.

Despite these challenges, the high rate of postoperative satisfaction (91.7%) among the respondents reflects the effectiveness of appropriate surgical strategies tailored to individual patient needs and resource availability. These findings emphasize the necessity of structured training programs that incorporate both MSICS and phacoemulsification techniques to enhance surgical competency in managing complex cataracts.

Future initiatives should aim to improve access to modern surgical adjuncts such as capsular dyes, viscoelastics, and foldable intraocular lenses, particularly in training institutions and rural settings. Establishing evidence-based guidelines specific to brown cataract management could further help standardize practices and optimize surgical outcomes across diverse healthcare environments.

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