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A CLINICAL STUDY ON PREVALENCE OF INTRAOPERATIVE COMPLICATIONS DURING MANUAL SICS BY RESIDENTS

Ophthalomology

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ABSTRACT

Background: Manual Small Incision Cataract Surgery (MSICS) is a commonly performed procedure in developing countries, often carried out by residents in teaching hospitals. The surgical outcomes and complications can be influenced by the experience level of the surgeon, and understanding these complications is crucial for improving training protocols and patient safety. **Objective:** To evaluate the intraoperative complications associated with MSICS performed by residents and assess how these complications vary over the course of their training. **Methods:** This observational study included 100 patients diagnosed with senile cataract who underwent MSICS performed by residents at Basaweshwar Teaching and General Hospital, Kalaburagi. Intraoperative complications such as posterior capsule rupture, premature entry, and vitreous prolapse were recorded. Data were analyzed based on the residents' experience levels, comparing outcomes between the first and last six months of training. **Results:** In the present study, various intraoperative complications were observed during cataract surgeries. Premature entry into the anterior chamber was noted in 37 patients, making it the most frequently encountered complication. Descemet's membrane detachment occurred in 25 patients, followed by button holing in 21 cases. Posterior capsule rupture was observed in 16 patients, while vitreous loss was reported in 13 patients. **Conclusion:** The study highlights a clear learning curve, with reduced intraoperative complications as residents gain more experience. Structured and hands-on training is essential for improving surgical outcomes in MSICS.

KEYWORDS

Manual Small Incision Cataract Surgery, Intraoperative Complications, Residents Training

INTRODUCTION

Manual Small Incision Cataract Surgery (SICS) technique has become a cornerstone in the management of cataract-induced visual impairment, offering a cost-effective, efficient, and high-quality alternative to phacoemulsification.[1]

In teaching hospitals, where a significant portion of cataract surgeries are conducted by residents under supervision, the procedure also serves as a critical component of surgical training. However, the learning curve for SICS is steep, and intraoperative complications are not uncommon during the initial stages of the residents' training. This clinical study focuses on analyzing these complications, their frequency, causes, and potential mitigation strategies to enhance patient safety and surgical outcomes.[2] By analyzing the relationship between supervision and complication rates, this study aims to shed light on best practices for resident training in manual SICS.[3] Over time, as residents gain more experience and confidence, they can progress to more complex procedures.[4] Recognizing and managing these complications promptly is essential for ensuring the safety and success of the surgery.[5] With appropriate training and careful management, many of these complications can be effectively handled, leading to favorable surgical outcomes.[6]

The complexity and type of cataract being operated on is another significant factor that influences intraoperative complications.

Simulation-based training has emerged as a key solution to address this challenge, offering residents the opportunity to practice and refine their surgical skills in a controlled, risk-free environment.[7] Virtual simulators are often more adaptable than mechanical ones, allowing residents to practice on various cases and encounter different levels of complexity, thus better replicating the diversity of real-world surgeries.[8]

MATERIAL & METHODS

Source of Study: Patients presenting and operated in Department of Ophthalmology, Basaweshwar Teaching and General Hospital, attached to Mahadevappa Rampure Medical college, Kalaburagi.
Study Design: Observational Study
Place of Study: Department of Ophthalmology, Basaweshwar Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Kalaburagi
Sample Size (n): 100
Sampling Technique: Stratified sampling technique will be applied to select study subjects following inclusion and exclusion criteria. Information will be collected through prepared proforma for each patient.
Study Duration: 1st May 2023 to 31st October 2024(18 months)
Study Methods: A study was conducted on patients diagnosed with senile cataract and admitted for cataract surgery in the ophthalmology inpatient department at Basaweshwar Teaching and General Hospital, Kalaburagi. Each case was operated on by ophthalmology residents.

Each operated case was observed for intra-operative complications and noted.

Data Collection

Data collected prospectively for each patient undergoing cataract surgery by the residents. The following data were recorded:

1. Preoperative Data: Demographic information: Age, gender, medical history, and ocular history. Preoperative visual acuity, intraocular pressure, and findings from slit-lamp examination. Type and grade of cataract. Any comorbidities or risk factors for surgical complications.
2. Surgical Data: Surgeon details: Level of resident (junior, senior), and whether the surgery was performed independently or with supervision. Surgical time: Duration of the procedure. Type of anesthesia: Local or regional anesthesia. Surgical techniques used: Type of incision, technique of capsulorhexis, phacoemulsification or manual extraction, and use of any adjuncts (e.g., capsular tension rings, iris hooks).
3. Intraoperative Complications: Definition and categorization of complications based on severity (minor vs. major). Types of complications: Posterior capsule rupture (PCR), vitreous loss, iris prolapse, zonular dialysis, incomplete capsulorhexis, corneal endothelial injury, wound leak, and others. Timing of complications: At which step of the procedure the complication occurred (e.g., during capsulorhexis, nucleus extraction, or IOL implantation).
4. Supervision and Intervention: The level of supervision provided during the procedure (attending surgeon present, or procedure performed independently). Interventions performed to manage the complications, including the use of specific surgical techniques or instruments. Duration of supervision, if applicable.
5. Postoperative Data: Postoperative complications (e.g., infection, raised intraocular pressure).Visual acuity on the first postoperative day and at follow-up visits (1 week, 1 month, and 3 months). Any additional interventions required postoperatively due to complications (e.g., need for vitrectomy, retinal consultation).

RESULTS

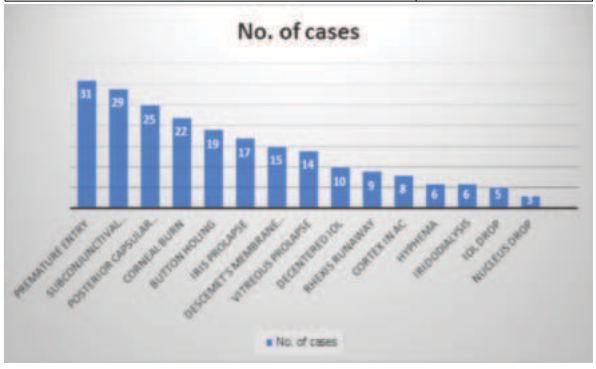
The age distribution of patients reveals that most of the patients

(25.44%) fall within the 50-59 age group. The gender distribution of patients shows male preponderance, 55(55%) individuals are male, while 45(45%) are female. The most common type was SMC (Senile Mature Cataract), found in 23 patients, followed by Posterior Subcapsular Cataract in 20 patients and Cortical Cataract in 18 patients. The majority of patients had only PL + PR adequate followed by 12 patients each with 6/60-6/24 and 6/36-6/24. The most common range of visual improvement was 6/24–6/18, observed in 27 patients, closely followed by 6/36–6/18 in 25 patients.

Table 1 illustrates the distribution of intraoperative complications encountered during cataract surgery in the study population. The most frequently observed complication was premature entry, noted in 31 cases, followed closely by subconjunctival hemorrhage (SCH) in 29 cases and posterior capsular rupture (PCR) in 25 cases. It was observed that first-year residents had the highest average number of complications per case at 4.

Table 1: Distribution of Intraoperative Complications

Intraoperative Complication	Number of Cases
Premature entry	31
SCH (Subconjunctival hemorrhage)	29
PCR (Posterior capsular rupture)	25
Corneal burn	22
Button holing	19
Iris prolapse	17
DMD (Descemet's membrane detachment)	15
Vitreous prolapse	14
Decentered IOL	10
Rhexis runaway	9
Cortex in AC	8
Hyphema	6
Iridodialysis	6
IOL drop	5
Nucleus drop	3



Graph 1 : Distribution of Intraoperative Complications

DISCUSSION

The age distribution of patients reveals that 18.42% are under 50 years of age, while 25.44% fall within the 50-59 age group. In a study conducted by Shivkumar C. et al.[9], it was noted that the majority of their patients were >50 years of age which is in strong agreement with the findings of the present study.

The gender distribution of patients shows that 55 individuals are male, accounting for the majority of the group, while 45 are female. Both Gupta S. et al.[10] and Shivkumar C. et al.[9] reported that the majority of subjects in their studies were males. Thus, the findings in our study strongly correlate with these studies.

The most common type of cataract observed was SMC (Senile Mature Cataract), found in 23 patients, followed by Posterior Subcapsular Cataract in 20 patients and Cortical Cataract in 18 patients. These findings highlight the predominance of advanced cataract types, particularly mature and posterior subcapsular forms, in the study cohort. In a study conducted by Zafar S. et al.[8], they reported that 40% of their subjects had posterior subcapsular cataract, whereas senile mature cataract and cortical cataract was noted in 30% patients each which agrees to some extent with the findings of the present study.

The majority of patients (38 out of 100) had only perception of light with projection of rays adequate (PL + PR adequate), indicating severe visual impairment prior to surgery. This distribution highlights a predominance of significantly reduced preoperative vision in the study population. In a study conducted by Zafar S. et al.[8], it was noted that the majority of the patients had a BCVA around 20/4000, whereas in a study conducted by Shivkumar C. et al.[9], it was noted that the mean vision was 0.26 (+/-0.24) logMAR.

The most common range of visual improvement was 6/24–6/18, observed in 27 patients, closely followed by 6/36–6/18 in 25 patients. Overall, the results demonstrate a favourable visual outcome for the majority of patients at 1-month postoperative follow-up. It was noted in a study conducted by Gupta S. et al.[10] that there was significant improvement in the postoperative BCVA in surgeries performed by residents who had already performed more than 300 surgeries. Zafar S. et al.[8] reported that 95.2% of the patients had improved BCVA in the postoperative period.

It was observed that first-year residents had the highest average number of complications per case at 4, followed by second-year residents with an average of 3 complications per case. These findings very strongly correlate with the findings of studies done by Gupta S. et al.[10] and Shivkumar S. et al.[9] in which it was reported that there was an inverse relationship between frequency of complications and the years of experience the resident had.

The most frequently observed complication was premature entry, noted in 31 cases, followed closely by subconjunctival haemorrhage (SCH) in 29 cases and posterior capsular rupture (PCR) in 25 cases. Less frequent complications included rhexis runaway (9 cases), cortex in the anterior chamber (8 cases), hyphema and iridodialysis (6 cases each), IOL drop (5 cases), and nucleus drop in 3 cases. These findings highlight the spectrum of challenges encountered intraoperatively, emphasizing the need for careful surgical technique and intraoperative vigilance. In a study conducted by Zafar S. et al.[8], they reported that only 9.1% of their subjects had intraoperative complication whereas in another study conducted by Gupta S. et al.[10], they reported that only 2.6% patients had intraoperative complications and 1.78% of the patients had postoperative complications.

Table 2: Comparison of Our Study Results with Other Studies

Parameter	Present Study	Gupta S. et al. (2018)10	Zafar S. et al. (2019)8	Shivkumar C. et al. (2022)9	
Sample Size	100 patients	13,159 surgeries by 38 residents	22 eyes of 17 patients	152 patients with pseudoexfoliation	
Age Group	Majority >50 years	Mean age not specified	Mean age not specified	All >50 years	
Gender Distribution	55% Male, 45% Female	Male predominance	Not specified	Male predominance	
Common Cataract Types	SMC (23%), PSC (20%), Cortical (18%)	Not detailed	SMC (30%), PSC (40%), Cortical (30%)	Pseudoexfoliation-related cataract	
Preoperative Vision	Most had PL+PR or <6/60	Not detailed	Mean BCVA ~20/4000	Mean vision: 0.26 (±0.24) logMAR	
Postoperative Vision	Most improved to 6/24–6/18	Significant improvement with >300 surgeries	95.2% improved BCVA	Mean BCVA at 3 months: 0.07 logMAR	
Complication Rate	Premature entry (31%), SCH (29%), PCR (25%)	2.60% intraoperative, 1.78% postop	9.1% intraoperative	Zonular dialysis (3.3%), PCR (0.7%), Iridodialysis	

Resident Training Impact	Compli-cations inversely related to ex-perience	Compli-cations inversely related to experience	Compli-cations inversely related to ex-perience	Senior residents only; 66.7% programs train SICS	Compli-cations in-versely related to ex-perience

One of the primary strengths of this study is its focus on real-world surgical performance in a teaching hospital setup. Cataract surgery is often the first major ophthalmic procedure performed by residents, and the steep learning curve associated with MSICS demands careful monitoring of surgical outcomes. The present study addresses this need by categorizing complications according to the year of residency. This approach enables objective assessment of resident progress and serves as an evidence-based guide for curriculum modifications in surgical training programs.

A noteworthy contribution of this research lies in its detailed analysis of preoperative and postoperative visual acuity outcomes. With a large proportion of patients presenting with severely diminished vision (PL+PR or <6/60), the study confirms the effectiveness of MSICS in significantly restoring functional vision, as demonstrated by postoperative gains to the 6/24–6/18 range in the majority of cases.

CONCLUSION

This study highlights the incidence of intra-op complications encountered during manual SICS done by residents during SICS done by residents.

A progressive decline in the average number of complications from first-year to third-year residents demonstrates that clinical proficiency improves significantly with hands-on exposure and experience. The study also confirms the effectiveness of MSICS in achieving substantial visual rehabilitation, with the majority of patients showing notable improvement in postoperative visual acuity. Common complications such as premature entry, subconjunctival hemorrhage, and posterior capsular rupture were more frequent among less experienced surgeons, reinforcing the need for enhanced training, mentorship, and early case selection based on difficulty. Therefore, it is recommended that residency programs incorporate high-volume cataract surgery exposure, continuous performance audits, and skill-based learning strategies to ensure patient safety and optimize surgical success in resource-limited settings.

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