

Ocular Complications Following Laparoscopic Versus Open Abdominal Surgery Under General Anesthesia: A Comparative Observational Study

Vinod¹, Shivani B. H.², Sowmya C. A.³

¹Assistant Professor, Department of General Surgery, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India

²Assistant Professor, Department of Ophthalmology, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India

³Assistant Professor, Department of Ophthalmology, Sri Chamundeshwari Medical College, Hospital & Research Institute, Channarayana, Karnataka, India

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Corresponding Author: Dr. Vinod

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Abstract

Background: Ocular complications may occur following non-ocular surgery under general anaesthesia, ranging from minor ocular surface symptoms to corneal epithelial injury. This study compared the occurrence and pattern of postoperative ocular complications following laparoscopic and open abdominal surgery.

Methods: A hospital-based comparative observational study was conducted at Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, from May 2025 to May 2026. A total of 70 adult patients undergoing elective abdominal surgery under general anaesthesia were included, with 35 patients each in the laparoscopic and open surgery groups. Patients were assessed for postoperative ocular symptoms and signs, including eye discomfort, foreign-body sensation, dryness, redness, excessive watering, blurred vision, and corneal epithelial abnormalities. The frequency and pattern of ocular complications were compared between the two groups.

Results: Postoperative ocular complications were observed in 20 of 70 patients (28.6%). Complications were more frequent in the laparoscopic group (13/35; 37.1%) than in the open surgery group (7/35; 20.0%). Eye discomfort was the most common finding (12/70; 17.1%), followed by dryness (10/70; 14.3%) and foreign-body sensation (9/70; 12.9%). Corneal epithelial abnormalities were observed in 3 patients (4.3%). The frequency of complications showed an increasing trend with longer surgical duration.

Conclusion: Postoperative ocular complications were observed following abdominal surgery under general anaesthesia, with a higher observed frequency after laparoscopic surgery. Eye discomfort, dryness, and foreign-body sensation were the predominant findings. Adequate perioperative eye protection and postoperative ocular assessment are important, particularly following prolonged procedures.

Keywords: Ocular complications; laparoscopic surgery; open abdominal surgery; general anaesthesia; corneal injury; postoperative ocular symptoms.

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Introduction

General anaesthesia is routinely used for abdominal surgical procedures and is generally safe; however, ocular complications may occur during the perioperative period. Although most ocular complications are minor and transient, they may cause significant postoperative discomfort and visual symptoms. Corneal abrasion and other ocular surface injuries are among the commonly reported ocular complications following non-ocular surgery under general anaesthesia.[1,2]

During general anaesthesia, several mechanisms can predispose the eye to injury. Reduced tear production, loss of normal eyelid reflexes, incomplete eyelid closure, corneal exposure, and

mechanical trauma may result in ocular surface damage.[3,4] Patients may present postoperatively with eye discomfort, foreign-body sensation, dryness, redness, excessive watering, and blurred vision. Corneal epithelial injury may also occur and requires appropriate clinical attention when symptoms persist.[5]

The risk of perioperative ocular complications may be influenced by several factors, including patient characteristics, duration of anaesthesia and surgery, surgical positioning, and adequacy of eye protection. Longer surgical procedures have been associated with an increased risk of perioperative corneal injury, while appropriate eye protection during

general anaesthesia is considered an important preventive measure.[6,7] Published clinical reports have also emphasized early recognition and appropriate management of postoperative ocular symptoms to minimize morbidity.[5]

Laparoscopic abdominal surgery differs from open surgery because it involves pneumoperitoneum and may require specific operative positioning. These factors can produce physiological changes that may affect ocular parameters during surgery. Studies evaluating laparoscopic procedures have demonstrated that intraocular pressure may increase under certain combinations of pneumoperitoneum, anaesthetic technique, and surgical position.[8] The effects may be particularly relevant during procedures involving steep Trendelenburg positioning, where changes in venous pressure and head position can influence ocular physiology.[9]

Although changes in intraocular pressure do not necessarily indicate clinically significant ocular injury, these physiological effects provide a rationale for evaluating postoperative ocular symptoms following laparoscopic procedures. Perioperative corneal abrasions have been reported after non-ocular surgery, and their prevention depends on appropriate eye protection, careful positioning, and awareness of perioperative risk factors.[10,11] Large clinical databases have further demonstrated that perioperative corneal abrasions, although relatively uncommon, remain a recognized complication of anaesthesia and surgery.[12]

Despite the widespread use of laparoscopic abdominal surgery, comparative information regarding the frequency and pattern of postoperative ocular complications following laparoscopic versus open abdominal surgery remains limited. Therefore, the present study was undertaken to compare the occurrence and pattern of postoperative ocular complications following laparoscopic and open abdominal surgery under general anaesthesia, with particular emphasis on eye discomfort, foreign-body sensation, dryness, redness, excessive watering, blurred vision, and corneal epithelial abnormalities.

Materials and Methods

Study Design and Setting: A hospital-based comparative observational study was conducted at Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, from May 2025 to May 2026. The study was undertaken to compare the occurrence and pattern of ocular complications following laparoscopic and open abdominal surgical procedures performed under general anaesthesia.

Study Population: The study included patients undergoing elective abdominal surgery under general anaesthesia. A total of 70 patients were enrolled and categorised into two groups according to the type of surgical procedure performed:

laparoscopic surgery group and open abdominal surgery group.

Sample Size: A total of 70 patients were included in the study. The participants were distributed between the laparoscopic and open surgery groups for comparative assessment of postoperative ocular complications.

Inclusion Criteria

Patients were included if they:

1. Were adults undergoing elective abdominal surgery.
2. Underwent either laparoscopic or open abdominal surgery.
3. Received general anaesthesia for the surgical procedure.
4. Provided informed consent for participation.

Exclusion Criteria

Patients were excluded if they:

1. Had pre-existing significant ocular disease or visual impairment that could interfere with postoperative assessment.
2. Had a history of recent ocular trauma or ocular surgery.
3. Underwent emergency abdominal surgery.
4. Required conversion from laparoscopic to open surgery.
5. Were unwilling to participate in the study.

Data Collection: Demographic and relevant clinical information was recorded using a structured study proforma. Details regarding the type of surgery, surgical approach, duration of surgery, and general anaesthesia were documented. Patients were evaluated for ocular symptoms and signs before surgery and following the surgical procedure.

Preoperative Ocular Assessment: A baseline ocular assessment was performed before surgery to document the preoperative ocular status. Visual complaints and relevant ocular findings were recorded to distinguish pre-existing abnormalities from postoperative complications.

Intraoperative Assessment: Relevant perioperative information was recorded, including the type of surgical approach and duration of anaesthesia and surgery. In patients undergoing laparoscopic procedures, the laparoscopic approach and associated intraoperative factors were documented.

Postoperative Ocular Assessment: Patients were assessed following surgery for the development of ocular symptoms and signs. Particular attention was given to postoperative ocular complications such as eye discomfort, foreign-body sensation, dryness, redness, excessive watering, blurred vision, and corneal epithelial abnormalities. Findings were

documented systematically and compared between the laparoscopic and open surgery groups.

Outcome Measures

The primary outcome was the occurrence of postoperative ocular complications following abdominal surgery under general anaesthesia.

The secondary outcome was comparison of the frequency and pattern of ocular complications between patients undergoing laparoscopic and open abdominal surgery.

Statistical Analysis: Data were entered into a suitable database and analysed using appropriate statistical methods. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarised using mean and standard deviation or other appropriate measures. The frequency of postoperative ocular complications was compared between the laparoscopic and open surgery groups using

appropriate statistical tests. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee of Subbaiah Institute of Medical Sciences, Shivamogga. Written informed consent was obtained from all participants before enrollment. Participant confidentiality was maintained throughout the study, and the collected information was used exclusively for research purposes.

Results and Observations

A total of 70 adult patients undergoing elective abdominal surgery under general anaesthesia were included in the study. Patients were divided equally into laparoscopic and open abdominal surgery groups, with 35 patients in each group. The postoperative occurrence and pattern of ocular complications were compared between the two groups.

Table 1: Distribution of patients according to surgical approach

Surgical approach	Number of patients	Percentage
Laparoscopic surgery	35	50.0
Open abdominal surgery	35	50.0
Total	70	100.0

Table 2: Age-wise distribution of study participants

Age group (years)	Laparoscopic n (%)	Open n (%)	Total n (%)
18–30	4 (11.4)	3 (8.6)	7 (10.0)
31–40	8 (22.9)	7 (20.0)	15 (21.4)
41–50	10 (28.6)	9 (25.7)	19 (27.1)
51–60	8 (22.9)	10 (28.6)	18 (25.7)
>60	5 (14.3)	6 (17.1)	11 (15.7)
Total	35 (100.0)	35 (100.0)	70 (100.0)

Table 3: Sex-wise distribution of study participants

Sex	Laparoscopic n (%)	Open n (%)	Total n (%)
Male	21 (60.0)	22 (62.9)	43 (61.4)
Female	14 (40.0)	13 (37.1)	27 (38.6)
Total	35 (100.0)	35 (100.0)	70 (100.0)

Table 4: Distribution according to duration of surgery

Duration of surgery	Laparoscopic n (%)	Open n (%)	Total n (%)
<1 hour	8 (22.9)	11 (31.4)	19 (27.1)
1–2 hours	19 (54.3)	17 (48.6)	36 (51.4)
>2 hours	8 (22.9)	7 (20.0)	15 (21.4)
Total	35 (100.0)	35 (100.0)	70 (100.0)

Table 5: Preoperative ocular status of study participants

Preoperative ocular status	Laparoscopic n (%)	Open n (%)	Total n (%)
No relevant ocular abnormality	35 (100.0)	35 (100.0)	70 (100.0)

Table 6: Overall occurrence of postoperative ocular complications

Postoperative ocular complication	Laparoscopic n (%)	Open n (%)	Total n (%)
Present	13 (37.1)	7 (20.0)	20 (28.6)
Absent	22 (62.9)	28 (80.0)	50 (71.4)
Total	35 (100.0)	35 (100.0)	70 (100.0)

Table 7: Pattern of postoperative ocular symptoms and signs

Ocular symptom/sign	Laparoscopic n (%)	Open n (%)	Total n (%)
Eye discomfort	8 (22.9)	4 (11.4)	12 (17.1)
Foreign-body sensation	6 (17.1)	3 (8.6)	9 (12.9)
Dryness	7 (20.0)	3 (8.6)	10 (14.3)
Redness	5 (14.3)	2 (5.7)	7 (10.0)
Excessive watering	3 (8.6)	2 (5.7)	5 (7.1)
Blurred vision	4 (11.4)	2 (5.7)	6 (8.6)
Corneal epithelial abnormality	2 (5.7)	1 (2.9)	3 (4.3)

Table 8: Distribution of postoperative ocular complications according to duration of surgery

Duration of surgery	Laparoscopic: complication/total (%)	Open: complication/total (%)
<1 hour	1/8 (12.5)	1/11 (9.1)
1–2 hours	7/19 (36.8)	4/17 (23.5)
>2 hours	5/8 (62.5)	2/7 (28.6)

Table 9: Comparison of postoperative ocular complications between laparoscopic and open surgery

Outcome	Laparoscopic n (%)	Open n (%)	Total n (%)
Ocular complications present	13 (37.1)	7 (20.0)	20 (28.6)
Ocular complications absent	22 (62.9)	28 (80.0)	50 (71.4)
Total	35 (100.0)	35 (100.0)	70 (100.0)

Discussion

The present comparative observational study included 70 adult patients undergoing elective abdominal surgery under general anaesthesia, comprising 35 patients in the laparoscopic group and 35 in the open surgery group. The study evaluated postoperative ocular symptoms and signs and compared their occurrence between the two surgical approaches.

Postoperative ocular complications were observed in 20 of 70 patients (28.6%). The frequency was higher in the laparoscopic group (13/35; 37.1%) than in the open surgery group (7/35; 20.0%). This finding indicates a higher observed frequency of postoperative ocular complications following laparoscopic surgery in the present study. However, as the current results do not provide a calculated p-value, the observed difference should not be interpreted as statistically significant without formal statistical testing.

The occurrence of ocular symptoms after general anaesthesia is consistent with recognized perioperative mechanisms. General anaesthesia may reduce tear production and compromise normal eyelid closure, thereby increasing corneal exposure and ocular surface dryness.[3,4] Direct pressure or accidental contact with the eye during positioning or anaesthetic management may additionally contribute to corneal epithelial injury.[1,2]

In the present study, eye discomfort was the most frequently observed ocular symptom, affecting 12 patients (17.1%), followed by dryness in 10 patients (14.3%) and foreign-body sensation in 9 patients (12.9%). Redness, blurred vision, excessive watering, and corneal epithelial abnormalities were observed less frequently. This pattern is compatible

with the clinical presentation of perioperative ocular surface irritation and minor corneal injury described in previous studies.[4,5]

Corneal epithelial abnormalities were observed in 3 patients (4.3%). Although this represented a relatively small proportion of the study population, corneal epithelial injury is clinically important because perioperative corneal abrasion is one of the better-recognized ocular complications following non-ocular surgery.[2,6] Previous studies have emphasized that postoperative ocular discomfort should be recognized early because persistent symptoms may require ophthalmic evaluation and appropriate treatment.[5]

An important observation was the apparent relationship between duration of surgery and postoperative ocular complications. In the laparoscopic group, complications were observed in 12.5% of patients undergoing surgery lasting less than 1 hour, 36.8% of those undergoing surgery lasting 1–2 hours, and 62.5% of those undergoing surgery lasting more than 2 hours. In the open group, the corresponding frequencies were 9.1%, 23.5%, and 28.6%, respectively. Thus, an increasing frequency of complications with longer surgical duration was observed in both groups, with a more pronounced pattern among laparoscopic procedures.

This observation is consistent with previous literature identifying prolonged duration of surgery as an important risk factor for perioperative corneal injury.[6,7] Longer procedures may increase the duration of corneal exposure, ocular surface drying, and potential mechanical pressure on the eye. Therefore, prolonged operative duration may warrant particular attention to adequate ocular protection throughout the procedure.[3,6]

The higher observed frequency of ocular complications in the laparoscopic group may potentially be related to differences in operative and physiological conditions. Laparoscopic surgery requires pneumoperitoneum, and some procedures involve changes in surgical position. Previous studies have demonstrated that laparoscopic surgery can produce transient increases in intraocular pressure depending on the anaesthetic technique and surgical position.[8] Similarly, steep Trendelenburg positioning has been associated with alterations in intraocular pressure and ocular physiology.[9]

However, intraocular pressure, pneumoperitoneum pressure, and specific surgical positioning were not directly measured in the present study. Therefore, these factors cannot be established as causes of the higher frequency observed in the laparoscopic group. The present findings should consequently be regarded as an observed clinical difference requiring confirmation in larger prospective studies.

The predominance of relatively mild ocular symptoms in this study is clinically relevant. Previous reports indicate that most perioperative ocular surface injuries are recognized through postoperative symptoms such as pain, foreign-body sensation, irritation, and visual disturbance.[5,10] Appropriate perioperative precautions, including protection of the eyes and avoidance of direct pressure or exposure, are therefore important components of anaesthetic care.[11]

The findings of the present study also support the importance of systematic postoperative ocular assessment. Although perioperative corneal abrasions are not among the most frequent complications of surgery overall, they are a recognised adverse event associated with general anaesthesia and non-ocular procedures.[1,12] Early identification of symptoms can facilitate timely ophthalmic assessment, particularly when blurred vision or suspected corneal epithelial injury is present.

The study has several limitations. It was conducted at a single institution and included a relatively small sample of 70 patients. The assessment focused primarily on clinical ocular symptoms and signs, and detailed ophthalmic parameters such as intraocular pressure, tear-film measurements, corneal staining scores, and retinal examination were not included. In addition, the observational design limits the ability to establish causal relationships between surgical approach and ocular complications. Potential effects of specific surgical procedures, anaesthetic techniques, positioning, and other perioperative factors may also require evaluation in future studies.

Overall, the present study demonstrated that postoperative ocular complications occurred in a proportion of patients undergoing abdominal surgery under general anaesthesia, with a higher

observed frequency following laparoscopic surgery than open surgery. Eye discomfort, dryness, and foreign-body sensation were the predominant manifestations, while longer surgical duration was associated with an increased observed frequency of ocular complications. These findings emphasise the importance of adequate perioperative eye protection and systematic postoperative assessment for ocular symptoms, particularly following prolonged abdominal procedures.[6,11,12]

Conclusion

Postoperative ocular complications were observed in patients undergoing abdominal surgery under general anaesthesia, with a higher observed frequency following laparoscopic than open surgery. Eye discomfort, dryness, and foreign-body sensation were the commonest findings, with complications showing an increasing trend with longer surgical duration. Adequate perioperative eye protection and postoperative ocular assessment are therefore important, particularly after prolonged procedures.

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