

Does Laparoscopic Lens Contamination Effect Operative Time? A Study on the Frequency and Duration of Lens Contamination and Commonly Used Measures to Maintain Clear Vision

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ABSTRACT

Objective: To determine factors affecting lens fogging and different methods used for decreasing lens fogging and operation time.

Methods: This cross-sectional study was conducted in General surgery department of Gulab Devi Hospital, Lahore from January 2022 to July 2022. A total of 70 patient undergoing laparoscopic surgery were recruited in this study. Operative time, duration of time the lens remained cleaned or dirty, time wasted during cleaning, methods used for cleaning of lens and causes of lens contamination were the variables of this study.

Results: Total operative time in all 70 laparoscopic procedures was found to be 53 hours and 13 minutes with a mean of 43.8 ± 8.3 minutes. A total of 288 lens contamination events were observed in all these operations with an average of 4.11 lens contamination events per case. According to study an average, 60.9% of the operational time lens remained clear, 31.2% of the operational time lens remained contaminated and 7.92% of the operative time was spent in cleaning the laparoscope.

Conclusion: Our study demonstrates that a significant period of a laparoscopic surgery is performed with foggy display. A lot of time is wasted in lens cleaning.

Key Words: Fogging, Laparoscopic lens, Lens cleaning techniques

Authors' Contribution:

^{1,2} Conception; Literature research; manuscript design and drafting; ^{2,3} Critical analysis and manuscript review; ^{1,4} Data analysis; Manuscript Editing.

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Introduction

Laparoscopy is a type of surgical procedure in which a small scope called laparoscope is inserted into the abdomen to visualize abdominal contents that allows

surgery to be performed. A laparoscope is a rigid thin tube which is connected with a camera. The laparoscope is inserted into abdomen from a small incision as the laparoscope moves forward the camera sends video signals to the monitor which displays the video.

Laparoscopic trolley consists of monitor, camera, insufflator and light source. The first laparoscopic procedure was performed by George Kelling of Dresden Germany. In 1901 he performed laparoscopy on a dog. First human laparoscopic procedure was performed by Hans Christian Jacobaeus of Sweden in 1910.¹ In 1947 Raoul Palmer wrote first publication on modern diagnostic laparoscopy, proceeded by Hans Frangenhiem and Kurt Semm publication who practiced carbon dioxide hysteroscopy in 1970s.² Popularization of laparoscopic surgery in United Kingdom was done by Patrick Steptoe. A book "laparoscopy in gynaecology" was published in 1967.³ First laparoscopic appendectomy was performed by Semm from Germany in 1981.⁴

Laparoscopy is becoming very popular in all surgical fields especially in general surgery department. In general surgery diagnostic laparoscopy is performed most frequently. Indications for diagnostic laparoscopy are acute appendicitis, metastatic carcinoma, gynecological condition, carcinoma of pancreas, tuberculous peritonitis and perforated peptic ulcer disease. In general surgery surgical procedures which are done by laparoscopy are: laparoscopic cholecystectomy, laparoscopic appendectomy, sleeve gastrectomy, hernia repair by laparoscopy and laparoscopic intra-abdominal lymph node biopsy. Laparoscopic cholecystectomy is most frequent procedure performed in the general surgery⁵. These procedures are performed by inflating abdomen with carbon dioxide to create space for visualization this is known as pneumo-peritoneum.

Laparoscopic surgery has revolutionized the surgical field by its advancement. It is less painful as compared to open surgery, it has faster recovery than open repair, it has minimal scar as compared to open surgery and it has decreased direct contact of surgeon with patient due to which the chance of transfer of virus or other microorganism is decreased.⁶ Fogging of laparoscopic lens is a major cause of blurry visual field while performing laparoscopy and it results due to condensation as well as particulate debris⁷. This lens fogging results in increase per operative time. Many techniques are available to improve vision during laparoscopy. These include anti fog solutions, touching a visceral organ, use of warm water or scope warmer, sterile cloth can be used which can be dry or wet.⁸

The current study was planned to determine factors affecting lens fogging and different methods used for decreasing lens fogging and operation time. As no such study is present in our setup so this study will help in better patient management.

Methodology

This cross sectional study conducted in general surgery department Gulab Devi Hospital Lahore from January 2022 to July 2022. The study was conducted after approval from institutional review board and consent of the patients. A total of 70 patient undergoing laparoscopic surgery were recruited in this study. The patients in which laparoscopic surgery was converted into open were excluded from this study. Operational time was taken from creation of pneumo-peritoneum to removal of ports after specimen extraction. Operative time, duration of time lens remained cleaned or dirty, time wasted during cleaning, methods used for cleaning of lens, their duration and causes of lens contamination were the variables of this study. Data were collected on prescribed questionnaire and analyzed on SPSS version 24.0.

Results

A total of 70 patients undergoing laparoscopic surgery were recruited. The mean age of patient was 41.66 ± 13.0 years ranging from 20 to 80 years. The mean weight of patients was 72.3 ± 16.8 kg ranging from 41 kg to 110 kg. Out of these 70 patients, 18(25.71%) were males and 52(74.3%) were female. All the patients underwent laparoscopic cholecystectomy. Out of these 70 laparoscopic surgeries, 44 (62.8%) surgeries were performed by Professor, 22 (31.4%) by Associate Professor and only 4 (5.7%) by Assistant Professor. In all patients 10 mm port size was used for camera insertion. The time duration between creation of pneumo-peritoneum to removal of ports after gall bladder extraction in all 70 laparoscopic procedures was found to be 53 hours and 13 minutes with a mean of 43.8 ± 8.3 minutes.

A total of 288 lens contamination events were observed in all these operations with an average of 4.11 lens contamination events. The major causes of

lens contamination were, fogging due to cautery 53.2%, condensation of vapors 34.5% and blood contamination 12.3% (Fig 1). According to study, 60.9% of the operational time lens remained clear, 31.2% of the procedural time lens remained contaminated and 7.92% of the procedural time was wasted in cleaning the laparoscope. In total, 288 events 4 hours and 13 minutes were spent in cleaning of lens. Different modalities used for lens cleaning were removing gas 18.6%, cleaning with warm saline 15.7%, tapping with visceral organ 23.3%, cleaning with warm saline and tapping with visceral organ 22.9%, removing gas and cleaning with warm saline 19.5%. In most of operations more than one technique was used. Mean time spent in lens cleaning by tapping viscera was 08.2 ± 0.9 seconds, removing gas 16.3 ± 1.3 seconds, cleaning with warm saline 20.8 ± 2.1 seconds. Out of these modalities tapping with abdominal viscera was most common and least time-consuming modality.

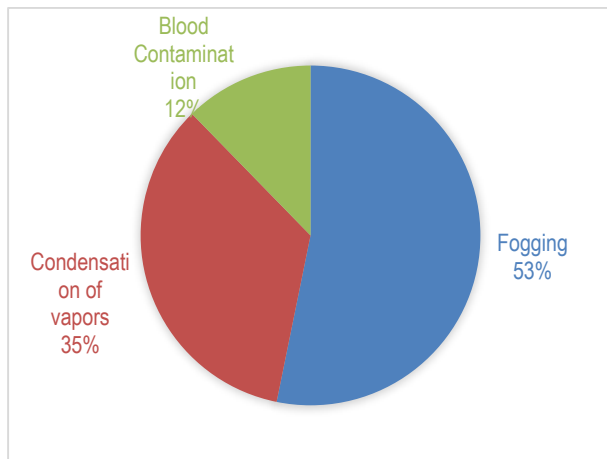


Figure 1: Causes of lens contamination

Discussion

In our study, 70 laparoscopic surgical procedures from single specialty were taken. A total of 53 hours 13 minutes' surgery was documented in which lens remained clear in 60.9% of the operation time, 31.2% of operational time lens remained contaminated and 7.9% of operational time was lost during cleaning of lens. This resulted in an increase in operation time and patient anesthesia was also prolonged. This contamination could have resulted in per operated iatrogenic injuries and complications. This data is similar to other international

studies. According to study conducted at King's College London in which 25 laparoscopic procedures were observed. Around 64 hours per operative time was documented for these 25 laparoscopic surgeries. According to study 56% of the procedural time was spent with a clear vision, 37% with impaired vision and 07% of the procedural time was wasted in cleaning of lens.⁹ During most of operations more than one technique was used. Different modalities used for lens cleaning were removing gas 18.6%, cleaning with warm saline 15.7%, tapping with visceral organ 23.3%, cleaning with warm saline and tapping with visceral organ 22.9%, removing gas and cleaning with warm saline 19.5%. These modalities used by us for cleaning lens are similar to the documented modalities in national and international literature.¹⁰⁻¹¹ According to our study organ tapping was the least time-consuming modality for lens cleaning. In literature studies have shown that light source attached with laparoscope can reach to a high temperature that can lead to burn of tissue that can produce smoke and more laparoscopic lens contamination.¹²⁻¹³ No such event was documented in this study. In our study major causes of lens contamination were, fogging due to electro cautery, condensation of water vapors and blood contamination. These findings are comparable to the causes reported in some international literature.¹⁴⁻¹⁵ According to study conducted by Golestani et al., the major causes of lens contamination were, condensation of vapors, fogging due to electrocautery, blood contamination and tissue debris.¹⁵

A novel technique has been established for the cleaning of laparoscope during operation which is known as novel intracavitary laparoscopic cleaning device (NILCD). It is used to correct impaired visual field without wastage of per operative time. It cleans laparoscopic lens efficiently without removing from the operative cavity. Golestani et al., published their data regarding use of NILCD during different laparoscopic procedures. In their study they used NILCD in 167 operations of different specialties. A total of 984 lens contaminations events were documented during this study. The use of NILCD removed the need of scope removal in 90.14% events.¹⁵

Conclusion

Our study demonstrates that a significant period of a laparoscopic surgery is performed with foggy display. A lot of time is wasted in lens cleaning which can be saved by reducing contamination and using perfect techniques to clean lens.

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