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The Application of Propofol Combined with Remifentanil and LMA in Laparoscopic Ovarian Cystectomy

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Abstract **Original Research Article**

Introduction: The application of Propofol combined with Remifentanil and Laryngeal Mask Airway (LMA) in laparoscopic ovarian cystectomy represents a significant advancement in the field of anesthetic techniques for minimally invasive gynecological surgeries. ***Aim of the study:*** The aim of this study was to evaluate the application of propofol combined with remifentanil and LMA in laparoscopic ovarian cystectomy. ***Methods:*** This cross-sectional study at North Bengal Medical Colleges and Bogura Medical College, Bangladesh from January 2015 - December 2018, included 120 female patients undergoing laparoscopic ovarian cystectomy. They were split into two groups of 60: Group A received remifentanil with propofol, and Group B received fentanyl with propofol for anesthesia, with LMA used in all cases. ***Result:*** There were no statistically significant difference ($p>0.05$) between the study groups in demographic characteristics. ASA grades I-III distributed comparably (p-values 0.6035 to 0.8529). Group-A had a shorter surgical time and less blood loss compared to Group-B. Hospital stay was shorter for Group-A than Group-B. Notably, Group-A showed significantly ($p\leq0.05$) better anesthesia induction and recovery times, and higher OAAS scores, indicating quicker recovery. Group-A also reported significantly ($p\leq0.05$) lower VAS scores for pain at various post-operation intervals, suggesting better pain management. Complications like nausea, pruritus, vomiting, and abdominal pain were slightly higher in Group-B, except for sore throat, which was equal in both groups. ***Conclusion:*** The use of propofol combined with remifentanil and Laryngeal Mask Airway for laparoscopic ovarian cystectomy has better anesthetic management, quicker recovery, more effective pain control, and fewer complications.

Keywords: Propofol, Remifentanil, Laryngeal Mask Airway (LMA), and Laparoscopic Ovarian Cystectomy.

I INTRODUCTION

According to reports, 4% of women referred to hospitals by the age of 65 have an ovarian cyst. These cysts might cause clinical difficulties [1]. Laparoscopic ovarian cystectomy, a minimally invasive surgical procedure, is widely recognized for its advantages in managing ovarian cysts, a common gynecological issue Gynecological doctors are increasingly accepting that laparoscopic surgery is the best option for women with benign ovarian cysts [2]. This technique, compared to traditional open surgery, offers benefits like reduced postoperative pain, shorter hospital stay, and quicker recovery [3]. However, the anesthetic management in laparoscopic procedures presents unique challenges, including the need for controlled ventilation and managing the physiological changes due to pneumoperitoneum and patient positioning [4]. In recent years, there has been a growing interest in optimizing anesthetic techniques to improve patient outcomes in laparoscopic surgeries. Propofol, a widely used intravenous anesthetic agent known for its rapid onset and short duration of action, has become a staple in anesthesia protocols [5]. Its popularity is attributed to its favorable pharmacokinetic profile, which allows for precise control over the depth of anesthesia and a relatively smoother recovery [5]. Remifentanil, a

potent, ultra-short-acting synthetic opioid, is often combined with propofol. Its rapid onset and offset and ease of titration make it an ideal choice for procedures like laparoscopic ovarian cystectomy, where maintaining hemodynamic stability is crucial [6]. The combination of propofol and remifentanil offers a synergistic effect, allowing for lower doses of each drug, thereby reducing the risk of side effects such as nausea, vomiting, and hemodynamic instability [7]. The use of the Laryngeal Mask Airway (LMA) in laparoscopic procedures has also gained popularity. Laryngeal mask is a new type of anesthesia device which integrates the advantages of mask and endotracheal intubation to maintain the airway [8]. The LMA provides a less invasive alternative to endotracheal intubation, with a lower risk of airway trauma and postoperative sore throat [9]. In the context of laparoscopic ovarian cystectomy, the use of LMA has been shown to facilitate a smoother induction and emergence from anesthesia, contributing to enhanced patient comfort and satisfaction [10]. The current study aims to investigate the application of propofol combined with remifentanil and the use of LMA in patients undergoing laparoscopic ovarian cystectomy. This combination, hypothesized to provide optimal conditions for surgery and anesthesia, including stable hemodynamics, adequate muscle relaxation, and rapid postoperative recovery, may represent a significant advancement in anesthetic practice for this procedure. This study will assess not only the anesthetic efficacy and safety of this combination but also its impact on patient recovery and satisfaction, addressing a critical gap in current research. This study intends to explore a novel anesthetic approach in laparoscopic ovarian cystectomy, potentially setting a new standard in the anesthetic management of minimally invasive gynecological surgeries. By combining propofol and remifentanil and utilizing LMA, this research could pave the way for more effective, patient-centric anesthetic protocols in laparoscopic surgeries.

II OBJECTIVES

To evaluate the application of propofol combined with remifentanil and LMA in laparoscopic ovarian cystectomy.

III METHODOLOGY & MATERIALS

This cross-sectional study was conducted in Department of Gynaecology, North Bengal Medical College & Bogura Medical College, Bangladesh, during the period from January 2015 to December 2018. Total 120 female patients who underwent laparoscopic ovarian cystectomy were included in this study. These patients were divided into two groups, group A and group B, each containing 60 patients. In the group A, patients were anesthetized with remifentanil combined with propofol. In the group B, patients were anesthetized with fentanyl combined with propofol. LMA was used on every patient. Consent of the patients and guardians were taken before collecting data. After collection of data, all data were checked and cleaned. After cleaning, the data were entered into computer and statistical analysis of the results being obtained by using windows-based computer software devised with Statistical Packages for Social Sciences version 22. After compilation, data were presented in the form of tables, figures and charts, as necessary. Numerical variables were expressed as mean and standard deviation, whereas categorical variables were count with percentage. P value ≤0.05 was considered statistically significant.

Inclusion Criteria:

- Female patients diagnosed with ovarian cyst
- Age between 18-70 years

Exclusion Criteria:

- Patients with chronic disease
- Patients transferred to another hospital
- Patients who did not give consent

IV RESULT

Table I demonstrates baseline information of the study groups. Group-A had an average age of 35.4 years (SD = 8.3), while Group-B averaged 36.6 years (SD = 7.2), both ranging from 18 to 70 years, indicating a similar age distribution (p-value = 0.3993). The Body Mass Index (BMI) was also comparable, with Group-A averaging 25.1 kg/m^2 (SD = 4.7) and Group-B 26.0 kg/m^2 (SD = 3.5), showing no significant difference (p-value = 0.5980). In terms of ASA grading, Group-A had 30 patients (50.0%) with grade I, 20 (33.3%) with grade II, and 10 (16.7%) with grade III. Group-B had 31 patients (51.7%) with grade I, 21 (35.0%) with grade II, and 8 (13.3%) with grade III, indicating a similar health status distribution (p-values ranging from 0.6035 to 0.8529). The cyst diameter was 5.5 cm (SD = 1.2) in Group-A and 5.3 cm (SD = 1.4) in Group-B (p-value = 0.4025). Table II shows clinical indicators and anesthetic effects. Clinically, Group-A had a mean surgical time of 90.3 minutes (SD = 20.5), compared to 95.1 minutes (SD = 23.5) in Group-B (p-value = 0.2356). Intraoperative blood loss was slightly lower in Group-A, averaging 50.9 mL (SD = 15.6), compared to 55.3 mL (SD = 18.2) in Group-B (p-value = 0.1577). The average hospital stay was 7.3 days (SD = 3.2) for Group-A and 8.4 days (SD = 3.7) for Group-B (p-value = 0.0842). Significant differences were observed in anesthesia induction time (3.8 min, SD = 1.3 for Group-A vs. 5.9 min, SD = 1.8 for Group-B, p-value < 0.0001), recovery time of spontaneous respiration (6.1 min, SD = 2.3 for Group-A vs. 8.6 min, SD = 2.7 for Group-B, p-value < 0.0001), and time for removing the laryngeal mask (10.7 min, SD = 2.6 for Group-A vs. 12.5 min, SD = 3.5 for Group-B, p-value = 0.0018). Table III presents Observer's Assessment of Alertness/Sedation Scale (OAAS) score of the study groups. The OAAS score at the time of recovery was

higher in Group-A (2.9, SD = 0.6) compared to Group-B (2.1, SD = 0.5, p-value < 0.0001). Similarly, at 5 minutes after laryngeal mask removal, Group-A scored 5.2 (SD = 0.8) versus 4.6 (SD = 0.9) in Group-B (p-value = 0.0002), indicating quicker recovery in Group-A. Table IV represents the Visual Analog Scale (VAS) score. Regarding pain assessment, Group-A reported significantly lower VAS scores at all time points: 2.2 (SD = 1.2) at 6 hours, 2.6 (SD = 1.1) at 24 hours, and 2.1 (SD = 0.8) at 48 hours post-operation. In contrast, Group-B had higher scores: 4.7 (SD = 1.5) at 6 hours, 5.2 (SD = 1.6) at 24 hours, and 4.2 (SD = 1.2) at 48 hours (p-values < 0.0001 at all time points). Figure 1 compares postoperative complications in two patient groups, Group-A and Group-B, after laparoscopic ovarian cystectomy. Group-A experienced lower incidences of nausea (6 patients), pruritus (1 patient), vomiting (3 patients), and abdominal pain (1 patient) compared to Group-B, which reported nausea in 8 patients, pruritus in 3, vomiting in 4, and abdominal pain in 2 patients. The incidence of sore throat was identical in both groups, with 1 case each. Overall, Group-B exhibited a slightly higher frequency of most complications, except for sore throat, which was equally prevalent across both groups.

Table-I: Baseline information of the study groups (N=120)

Characteristics	Group-A (n=60)	Group-B (n=60)	p-value
***Age (Year)**			
Mean ± SD	35.4 ± 8.3	36.6 ± 7.2	0.3993^{ns}
Range	18-70	18-70	
***BMI (kg/m^2)**			
Mean ± SD	25.1 ± 4.7	26.0 ± 3.5	0.5980^{ns}
****ASA grading**			
I	30 (50.0%)	31 (51.7%)	0.8529^{ns}
II	20 (33.3%)	21 (35.0%)	0.8450^{ns}
III	10 (16.7%)	8 (13.3%)	0.6035^{ns}
***Cyst diameter (cm)**			
Mean ± SD	5.5 ± 1.2	5.3 ± 1.4	0.4025^{ns}

*Data was analyzed using unpaired t-test and expressed as Mean ± SD
**Data was analyzed using Fisher exact test and expressed as frequency
n = Number of subjects
ns = Non-significant
P value ≤0.05 was considered statistically significant
ASA= American Society of Anesthesiologists

Table-II: Comparison of clinical indicators and anesthetic effects between the study groups (N=120)

Anesthetic Effect	Group-A (n=60)	Group-B (n=60)	p-value
Surgical time (minute)			
Mean ± SD	90.3 ± 20.5	95.1 ± 23.5	0.2356^{ns}
Intraoperative blood loss (mL)			
Mean ± SD	50.9 ± 15.6	55.3 ± 18.2	0.1577^{ns}
Hospital stay (Day)			
Mean ± SD	5.3 ± 3.2	6.4 ± 3.7	0.0842^{ns}
Anesthesia induction time (min)			
Mean ± SD	3.8 ± 1.3	5.9 ± 1.8	<0.0001^{s}
Recovery time of spontaneous respiration (min)			
Mean ± SD	6.1 ± 2.3	8.6 ± 2.7	<0.0001^{s}
Removing the laryngeal mask (min)			
Mean ± SD	10.7 ± 2.6	12.5 ± 3.5	0.0018^{s}

Data was analyzed using unpaired t-test and expressed as Mean ± SD
n = Number of subjects
ns = Non-significant
s= Significant
P value ≤0.05 was considered statistically significant

Table-III: Comparison of Observer's Assessment of Alertness/Sedation Scale (OAAS) score between the study groups (N=120)

OAAS score	Group-A (n=60)	Group-B (n=60)	p-value
At the time of recovery			
Mean ± SD	2.9±0.6	2.1±0.5	<0.0001^{s}
At 5 min after laryngeal mask removal			
Mean ± SD	5.2±0.8	4.6±0.9	0.0002^{s}

Data was analyzed using unpaired t-test and expressed as Mean ± SD
n = Number of subjects
s = Significant
P value ≤0.05 was considered statistically significant

Table-IV: Comparison of Visual Analog Scale (VAS) score between the study groups (N=120)

VAS Score	Group-A (n=60)	Group-B (n=60)	p-value
6 hours after operation			
Mean ± SD	2.2 ± 1.2	4.7 ± 1.5	<0.0001[s]
24 hours after operation			
Mean ± SD	2.6 ± 1.1	5.2 ± 1.6	<0.0001[s]
48 hours after operation			
Mean ± SD	2.1 ± 0.8	4.2 ± 1.2	<0.0001[s]

Data was analyzed using unpaired t-test and expressed as Mean ± SD
n = Number of subjects
s = Significant
P value ≤0.05 was considered statistically significant

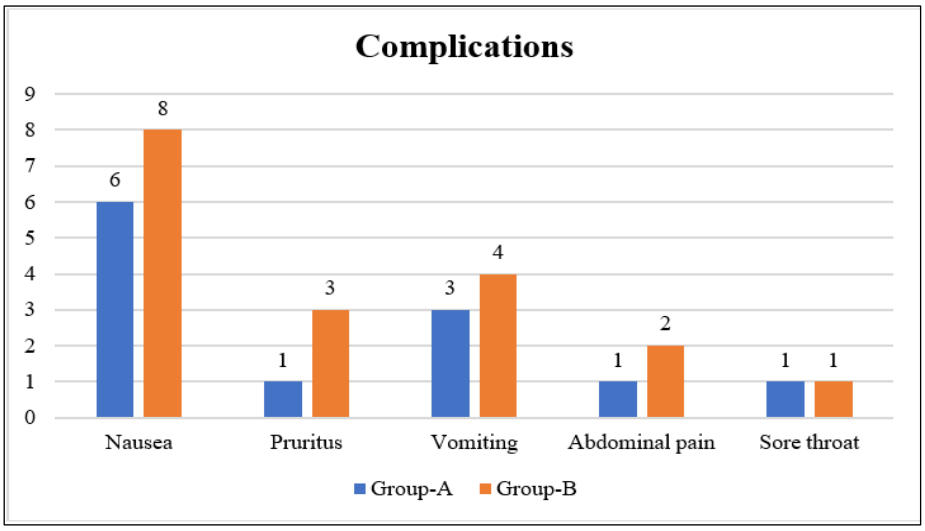

Figure 1: Complications between the study groups after operation (N=120)

V DISCUSSION

This cross-sectional study was conducted in Department of Gynaecology, North Bengal Medical College & Bogura Medical College, Bangladesh to evaluate the application of propofol combined with remifentanil and LMA in laparoscopic ovarian cystectomy. Total 120 female patients who underwent laparoscopic ovarian cystectomy were included in this study. These patients were divided into two groups, group A and group B, each containing 60 patients. In the group A, patients were anesthetized with remifentanil combined with propofol and LMA. In the group B, patients were anesthetized with fentanyl combined with propofol and LMA. In this study, Group-A demonstrated more favorable outcomes compared to Group-B, which received fentanyl combined with propofol. It is important to perform effective anesthesia during operation. Propofol is a quick and short-acting general anesthetic, which is mainly used to induce and maintain general anesthesia [11]. Both groups were well-matched in baseline characteristics, with Group-A having an average age of 35.4 years (SD = 8.3) and BMI of 25.1 kg/m^2 (SD = 4.7), and Group-B averaging 36.6 years (SD = 7.2) in age and 26.0 kg/m^2 (SD = 3.5) in BMI, indicating no significant differences (p-values: age = 0.3993, BMI = 0.5980). These demographic data are similar to other studies on laparoscopic ovarian cystectomy or gynaecology [12-14]. Clinically, Group-A showed a shorter mean surgical time of 90.3 minutes (SD = 20.5) compared to 95.1 minutes (SD = 23.5) in Group-B (p-value = 0.2356). The intraoperative blood loss was marginally lower in Group-A (50.9 mL, SD = 15.6) than in Group-B (55.3 mL, SD = 18.2), though not statistically significant (p-value = 0.1577). The cyst diameter was 5.5 cm (SD = 1.2) in Group-A and 5.3 cm (SD = 1.4) in Group-B (p-value = 0.4025). These findings are consistent with findings by Ding Y *et al.*,[12] and Xu Y *et al.*, [15], highlighting the role of anesthetics in surgical outcomes. Significant differences

were observed in anesthesia-related parameters. Group-A had a shorter anesthesia induction time (3.8 min, SD = 1.3) and recovery time of spontaneous respiration (6.1 min, SD = 2.3) compared to Group-B (5.9 min, SD = 1.8 and 8.6 min, SD = 2.7, respectively), with p-values < 0.0001. These findings echo the research by Xu Y *et al.*, [15], emphasizing the efficiency of remifentanil in anesthesia management. The OAAS scores further supported these results, with Group-A showing higher scores at recovery (2.9, SD = 0.6) and 5 minutes post-laryngeal mask removal (5.2, SD = 0.8) compared to Group-B (2.1, SD = 0.5 and 4.6, SD = 0.9, respectively), indicating quicker recovery (p-values < 0.0001). Xu Y *et al.*, [15] have similarly reported the benefits of remifentanil in enhancing patient alertness post-surgery. In terms of pain management, Group-A reported significantly lower VAS scores at 6, 24, and 48 hours post-operation (2.2, 2.6, and 2.1, respectively) compared to Group-B (4.7, 5.2, and 4.2, respectively), with p-values < 0.0001. This aligns with Xu Y *et al.*,[15] and Hohlrieder M *et al.*,[14] findings on the superior analgesic effects of remifentanil. Finally, Group-A experienced fewer postoperative complications like nausea, pruritus, and vomiting, consistent with Xu Y *et al.*, [15] and and Hohlrieder M *et al.*, [16] research on the side-effect profile of remifentanil versus fentanyl.

Limitations of the study

In our study, there was small sample size. Study population was selected from two centers, so may not represent wider population. The study was conducted at a short period of time.

VII CONCLUSION AND RECOMMENDATIONS

The use of propofol combined with remifentanil and Laryngeal Mask Airway has better anesthetic management, quicker recovery, more effective pain control, and fewer complications which makes it best suit for laparoscopic ovarian cystectomy. Further study with larger sample size is recommended. Comparison with other anesthesia is also recommended for better understanding.

REFERENCES

1. Bottomley, C., & Bourne, T. (2009). Diagnosis and management of ovarian cyst accidents. *Best practice & research Clinical obstetrics & gynaecology*, *23*(5), 711-724.
2. Yuen, P. M., Yu, K. M., Yip, S. K., Lau, W. C., Rogers, M. S., & Chang, A. (1997). A randomized prospective study of laparoscopy and laparotomy in the management of benign ovarian masses. *American journal of obstetrics and gynecology*, *177*(1), 109-114.
3. Damiani, Campo, Dargenio, & Garcea. (1998). Laparoscopic vs. laparotomic ovarian cystectomy in reproductive age women: an economic evaluation. *Gynaecological Endoscopy*, *7*(1), 19-23.
4. Okohue, J. E., Ikechebelu, J. I., Ola, B., Kalu, E., & Ibeanu, O. (Eds.). (2022). *Gynaecological Endoscopic Surgery: Basic Concepts*. Springer.
5. Kotani, Y., Shimazawa, M., Yoshimura, S., Iwama, T., & Hara, H. (2008). The experimental and clinical pharmacology of propofol, an anesthetic agent with neuroprotective properties. *CNS neuroscience & therapeutics*, *14*(2), 95-106.
6. Moerman, A. T., Herregods, L. L., De Vos, M. M., Mortier, E. P., & Struys, M. M. (2009). Manual versus target-controlled infusion remifentanil administration in spontaneously breathing patients. *Anesthesia & Analgesia*, *108*(3), 828-834.
7. Mertens, M. J., Olofsen, E., Engbers, F. H., Burm, A. G., Bovill, J. G., & Vuyk, J. (2003). Propofol reduces perioperative remifentanil requirements in a synergistic manner: response surface modeling of perioperative remifentanil–propofol interactions. *The Journal of the American Society of Anesthesiologists*, *99*(2), 347-359.
8. Boroda, N., Malesinska, M., Kars, M. S., & Smith, L. P. (2018). The use of laryngeal mask airway for adenoidectomy. *International Journal of Pediatric Otorhinolaryngology*, *107*, 42-44.
9. Karaaslan, E., Akbas, S., Ozkan, A. S., Colak, C., & Begec, Z. (2021). A comparison of laryngeal mask airway-supreme and endotracheal tube use with respect to airway protection in patients undergoing septoplasty: a randomized, single-blind, controlled clinical trial. *BMC anesthesiology*, *21*, 1-9.
10. Beleña, J. M., Núñez, M., Gracia, J. L., & Pérez, J. L. (2012). The Laryngeal Mask Airway Supreme™: safety and efficacy during gynaecological laparoscopic surgery. *Southern African Journal of Anaesthesia and Analgesia*, *18*(3), 143-147.
11. O'Connor, S., Zhang, Y. L., Christians, U., Morrison Jr, J. E., & Friesen, R. H. (2016). Remifentanil and propofol undergo separation and layering when mixed in the same syringe for total intravenous anesthesia. *Pediatric Anesthesia*, *26*(7), 703-709.
12. Ding, Y., Yuan, Y., Ding, J., Chen, Y., Zhang, X., & Hua, K. (2015). Comprehensive assessment of the impact of laparoscopic ovarian cystectomy on ovarian reserve. *Journal of minimally invasive gynecology*, *22*(7), 1252-1259.
13. Yun, X. Y., Chen, S. J., & Zheng, Q. W. (2022). Targeted Perioperative Nursing Combined with Propofol and Fentanyl for Gynecological Laparoscopic Surgery. *Evidence-Based Complementary and Alternative Medicine*, *2022*.
14. Hohlrieder, M., Brimacombe, J., Eschertzhuber, S., Ulmer, H., & Keller, C. (2007). A study of airway management using the ProSeal LMA® laryngeal mask airway compared with the tracheal tube on postoperative analgesia requirements following

gynaecological laparoscopic surgery. *Anaesthesia*, *62*(9), 913-918.

15. Xu, Y., Wu, J., Zhao, J., & Zhang, H. (2021). Hemodynamics and anesthetic effect of propofol combined with remifentanil in patients undergoing laparoscopic ovarian cystectomy under laryngeal mask airway anesthesia. *American Journal of Translational Research*, *13*(5), 5404.
16. Hohlrieder, M., Brimacombe, J., Von Goedecke, A., & Keller, C. (2007). Postoperative nausea, vomiting, airway morbidity, and analgesic requirements are lower for the ProSeal laryngeal mask airway than the tracheal tube in females undergoing breast and gynaecological surgery. *British journal of anaesthesia*, *99*(4), 576-580.