

Comparison of Various Anaesthetic Techniques for Laparoscopic Tubal Ligation- A Prospective Study

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Abstract

Background: Present study was conducted to compare various anaesthetic techniques for laparoscopic tubal ligation using general anaesthesia with intubation, general anaesthesia with mask ventilation and total intravenous anaesthesia. **Subjects and Methods:** Sixty female patients having age between 20-40 years belonging to ASA grade I undergoing laparoscopic tubal ligation were randomly divided into three groups- Group I (GA with ET intubation), Group II (GA with mask ventilation) and Group III (TIVA with Inj. Propofol). General anaesthesia in group I was induced with Inj. Sodium Pentothal 4-6 mg/kg and Inj. Suxamethonium Chloride 1-2 mg/kg followed by ET intubation. In group II, GA was induced with Inj. Sodium Pentothal 4-6 mg/kg and Group III patients were induced with Inj. Propofol 2mg/kg. **Results:** There were no significant difference found between 3 groups with regards to age, weight and duration of anaesthesia. The incidence of increase in Heart rate (>20/min) and increase in blood pressure (>11-20 mm Hg) were significantly less in group III. The incidence of PONV was also found less in group III as compared to group I and II. **Conclusion:** Rapid and smooth induction with good intraoperative hemodynamic stability and decrease in incidence of post-operative nausea and vomiting makes TIVA with Inj. Propofol a better choice.

Keywords: General anaesthesia, TIVA, Laparoscopic tubal ligation, vomiting.

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Introduction

Laparoscopic tubal ligation is a family planning programme commonly conducted as day care surgery. It is the most frequently performed endoscopic operation in current gynaecological practice.^[1] Laparoscopic tubal ligation is a surgical procedure in which the fallopian tubes are tied and cut, sealed, cauterized or blocked using laparoscopic techniques. Advantages of this approach to female sterilization over mini laparotomy are that the incision are small and can be cosmetically placed, operating time is short and procedure can be performed on a day care basis.

The pneumoperitoneum and the positions required for laparoscopy induce pathophysiological changes that complicate anaesthetic management. The duration of laparoscopy, the risk of unsuspected visceral injury and difficulty in evaluating the amount of blood loss are other factors that make anaesthesia for laparoscopy, a potential high risk procedure.^[2] As a result of frequency and complexity of surgery, it is imperative that the anaesthesiologist has the clear understanding of the procedure, the physiological changes and the potential complications of the procedure. Laparoscopic sterilization can be performed with various anaesthetic techniques.^[3]

(1) General anaesthesia with ET intubation.

(2) General anaesthesia with mask ventilation.

(3) Total intravenous anaesthesia.^[4]

(4) Regional anaesthesia (Spinal and epidural)

(5) Local anaesthesia with sedation.^[5]

(6) General anaesthesia with laryngeal mask airway.^[6]

This study was undertaken to evaluate various anaesthetic techniques for laparoscopic tubal ligation with the view point of;

(1) Safety and suitability of technique

(2) Changes in vitals

(3) Surgeon's acceptance and comfort

(4) Patient's acceptance

(5) Per and postoperative complications

(6) Cost effectiveness of the Perioperative technique

Subjects and Methods

Ethical approval was taken from hospital's research ethics committee and informed consent was taken from the study participants. 60 female patients belonging to ASA grade I was selected for study. Patients having valvular heart disease, ischemic heart disease, bronchial asthma, tuberculosis, obesity were excluded. History of present and past illness, surgery in past, drug reactions and obstetric history recorded. General and systemic examination was done. Investigations like haemoglobin, urine-routine and

microscopic examination, chest x-ray (P/A) and other investigations (if needed) (blood urea, S.creatinine, blood sugar, S.bilirubin, ECG) were advised. All patients were fasting overnight and pre medicated with Inj. Glycopyrrolate 0.004 mg/kg i.v., Inj. Midazolam 0.02 mg/kg i.v. and Inj. Fentanyl 1 µg/kg i.v. 20 minutes before induction of anaesthesia.

3 types of Anaesthetic techniques were studied in 3 different groups:

Group-I: 20 cases of general anaesthesia with endotracheal tube intubation.

Group-II: 20 cases of general anaesthesia with mask ventilation.

Group-III: 20 cases of total intravenous anaesthesia using Inj. Propofol.

In Group-I, GA was induced with Inj. Sodium Pentothal 4-6 mg/kg (2.5%) i.v., Inj. Suxamethonium Chloride 1-2 mg/kg i.v. followed by endotracheal intubation. Anaesthesia was maintained with oxygen, nitrous oxide, Isoflurane and Inj. Suxamethonium Chloride (10 mg) intermittently.

In Group-II, Inj. Sodium Pentothal 4-6 mg/kg (2.5%) i.v. was used as an induction agent and anaesthesia was maintained by spontaneous ventilation with oxygen, nitrous oxide and Isoflurane.

In Group-III, GA was induced with Inj. Propofol 2 mg/kg i.v., Inj. Suxamethonium chloride 1-2 mg/kg i.v. and maintenance was done by continuous infusion of Inj. Propofol 100-130 µg/kg/min i.v. and Inj. Suxamethonium Chloride (10 mg) intermittently i.v. Lithotomy position with 15-200 Trendelenburg was given. Intra operative monitoring included pulse rate, blood pressure, respiration, End tidal CO₂, continuous ECG monitoring, pulse oximetry, body temperature, gas pressure (mmHg) and gas flow (L/min). Inhalation agent was discontinued once the laparoscope had been removed. When visualization was complete, the abdomen was manually compressed, to remove as much CO₂ as possible. Post-operative pain relief was given in all patients with Inj. Diclofenac Sodium 75 mg I/M. Post-operative monitoring was done with recording of pulse, blood pressure, SpO₂, respiration and level of consciousness.

Results

There was no significant difference between 3 groups with regards to age, weight or duration of anaesthesia. [Table 1 & 2]

In Group-A, 15 patients had increased HR > 20/min, 5 patients had increased HR between 16-20/min and no patient had increased HR between 0-10/min. In Group-B, 14 patients had increased HR > 20/min, 6 patients had increased HR between 16-20/min and no patient had increased HR between 0-10/min. In Group-C, 16 patients had increased HR between 6-10/min, 4 patients had increased HR between 16-20/min and no patient had increased HR > 20/min. Difference between 3 groups were statistically significant. (p<0.05) [Table 3]

In Group A, 10 patients had increased systolic B.P. between 0-10 mmHg, 8 patients had >11-20 mmHg and 2 patients had <0-10 mmHg. In Group B, 16 patients had increased systolic B.P. between 11-20 mmHg, 4 patients had increased systolic

B.P. between 0-10 mmHg. In Group C, 10 patients had decrease in systolic B.P. between 0-10 mmHg, 4 patients had increased systolic B.P. between 11-20 mmHg, 3 patients had increased systolic B.P. between 0-10 and 3 patients had decrease in systolic B.P. between 11-20 mmHg. Differences between 3 groups were statistically significant. (p<0.05) [Table 4]

Table 1: Age wise distribution of the patients

Age in years	No. of Patients							
	Group A		Group B		Group C		Total	
	No.	%	No.	%	No.	%	No.	%
20-25	03	15	04	20	03	15	10	16.66
26-30	04	20	08	40	06	30	18	30
31-35	10	50	05	25	07	35	22	36.66
36-40	03	15	03	15	04	20	10	16.66
Total	20		20		20		60	

Table 2: Age, Weight and Duration of anaesthesia compared between 3 groups

	Group A	Group B	Group C	P value
Age (Years)				
Mean	31	29.7	31.4	0.18
Range	20-40	22-38	23-39	
Weight (kg)				
Mean	46.1	51.95	49.2	0.09
Range	42-60	45-60	44-58	
Duration of Anaesthesia (min)				
Mean	20.25	19.2	19.2	0.1
Range	15-25	15-20	15-20	

Test applied chi-square test, statistically significance at p<0.05

Table 3: increase in HR considering preoperative as baseline

HR/min	No. of Patients				P value
	Group A	Group B	Group C	Total	
0-5	0	0	0	0	0.01*
6-10	0	0	16	16	
11-15	0	0	0	0	
16-20	5	6	4	15	
> 20	15	14	0	29	
Total	20	20	20	60	

Test applied chi-square test, * indicates statistically significance at p<0.05

Table 4: Per-operative Changes in Systolic Blood Pressure

Systolic Blood Pressure (mmHg)	No. of Patients				P value
	Group A	Group B	Group C	Total	
< 11-20	0	0	3	3	0.05*
< 0-10	02	0	10	12	
> 0-10	10	04	03	17	
> 11-20	08	16	04	28	
Total	20	20	20	60	

Test applied chi-square test, * indicates statistically significance at p<0.05

Table 5: changes of MAP among study participants

MAP = SBP + 2.DBP / 3	No. of Patients			
	Group A	Group B	Group C	Total
< 11-20	10	0	02	12
< 0-10	01	0	09	10
> 0-10	09	06	07	22
> 11-20	10	14	02	26
Total	20	20	20	60

In Group A, 10 patients had increased MAP between 11-20

mmHg, 9 patients had increased MAP between 0-10 mmHg and 1 patient had decreased MAP between 0-10 mmHg. In Group B, 14 patients had increased MAP between 11-20 mmHg, 6 patients had increased MAP between 0-10 mmHg. In Group C, 9 patients had decreased MAP between 0-10 mmHg, 7 patients had increased MAP between 0-10, 2 patients had increased MAP between 11-20 mmHg and 2 patients had decreased MAP between 11-20 mmHg. [Table 5]

In Group-B significant differences were found between before insufflation mean and that at end of insufflation.^[7] ETCO₂ of Group A and C patients (Assisted / controlled ventilation) were kept between 32-42 mmHg by increasing RR. No arrhythmias were found in any patient. [Table 6]

In Group A, 16 patients had increased RR between 0-5/min 4 patients had increased RR between 6-10/min. In Group B, 14 patients had increased RR between 6-10/min and 6 patients had increased RR between 0-5/min. In Group C, 16 patients had increased RR between 0-5 and 4 patients had increased RR between 6-10/min. Difference between 3 groups were statistically significant. (p<0.05) [Table 7]

In Group-A one patient, in Group-B 2 patients and in Group-C no patient had nausea/vomiting. In Group-A 5 patients, in Group-B 6 patients and in Group-C 5 patients had abdominal pain. In Group-A one patient, in Group-C one patient and no patient in Group-B had sore throat. O₂ saturation does not show any significant changes. Emergence: Emergence was smooth in all patients. Patients were fully conscious and responding to verbal command and were shifted in ward. In Group-III, there was rapid recovery time 10-30 seconds. In Group-II and I, recovery time was approximately 5-7 minutes.

Table 6: ETCO₂ immediately before insufflation compared with immediately after the laparoscope was removed

ETCO ₂	Group A	Group B	Group C	P value
Before insufflation				
Mean	33.7	33.05	32.9	0.02*
Range	32-36	30-35	30-35	
End of Insufflation				
Mean	34.55	48.1	33.6	0.06
Range	36-42	42-55	36-42	

Test applied chi-square test, * indicates statistically significance at p<0.05

Table 7: Change in RR considering per-operative value as baseline

RR/min	No. of Patients				P value
	Group A	Group B	Group C	Total	
< 0-5	0	0	0	0	0.02*
> 0-5	16	6	16	38	
> 6-10	4	14	4	22	
> 10	0	0	0	0	
Total	20	20	20	60	

Test applied chi-square test, * indicates statistically significance at p<0.05

Discussion

Tubal ligation can be performed under local anaesthesia with sedation but it has its own limitations. Subba B, Gupta I, Singh H (1991),^[9] had observed that there was increase in respiratory rate by 17% under local anaesthesia in response to hypercarbia produced by CO₂. General anaesthesia has been recommended for tubal ligation to prevent such

complications.

In our study, 15 patients in Group A and 14 patients in Group B had increase HR > 20/min. In Group C, no patient had increase HR > 20/min. In Group A, 8 patients, in Group B 16 patients and in Group C 4 patients had increased systolic B.P. > 11-20 mmHg. This shows that hemodynamic stability well maintained in Group C.

Baratz and Karis (1969),^[10] Seed, Shakespeare and Muldoon (1970), Marshall et al (1972) have shown an increase in the PaCO₂ when patients breathed spontaneously during laparoscopy. Keneflick JP, Leader JR, Taylor JP (1987),^[7] have observed that moderate hypercarbia occurred with mask ventilation. In our study in Group B, patients showed increase in ETCO₂ between the pre-insufflation phase and the end of insufflation.

In Group A, one patient and in Group B 2 patients had post-operative nausea/vomiting. In Group C, no patient had nausea/vomiting. This suggests that induction and maintenance with Propofol prevents post-operative nausea and vomiting. These results are supported by Gan TJ, Ginsberg B, Grant BS (1996).^[11]

G/A without intubation (Group B) had advantages of avoiding tracheal irritation and administration of a muscle relaxant, avoid sore throat. But it had some drawbacks such as airway is not protected so there are chances of aspiration. Peterson et al (1983) revealed that almost 1/3 of deaths associated with laparoscopy were related to anaesthetic complications during general anaesthesia without intubation. G/A with ET intubation (Group A & C) gives protection against aspiration and makes controlled ventilation possible. Hypercarbia can be avoided by hyperventilation. And it provides good muscle relaxation.

In Group C, hemodynamic stability maintained per-operative, no acceptable changes in vitals during intubation and extubation, rapid recovery time (10-30 sec) and minimal complications e.g. nausea/vomiting. So patients can be discharged early and avoids hospital stay.

Conclusion

All the 3 anaesthetic techniques are safe and acceptable to most of gynaecologists and patients. So the preference of technique can also be decided by:

- The facilities available
- surgeon's speed to operate
- Patient's factors
- Anaesthetists own choice

In our study, we found Rapid and smooth induction with good intraoperative hemodynamic stability and decrease in incidence of post-operative nausea and vomiting makes TIVA with Inj. Propofol a better choice.

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