Peri-Operative Changes In Blood Pressure And Rescheduling Of Patients For Laproscopic Cholecystectomy Under General Anaesthesia: An Observational Study In Normotensive And Controlled Hypertensive Patients

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KEYWORDS
Hypertension, Laparoscopic cholecystectomy, Hemodynamics, General anaesthesia.

ABSTRACT
Background: Hypertension (HTN) is considered as one of the most important reason of premature deaths globally as per World Health Organization.
Aim: To study the incidence of rise in blood pressure peri-operatively in normotensive and controlled hypertension patients and rescheduling of the surgical procedure in patients undergoing Laparoscopic Cholecystectomy.
Methods: Hundred patients scheduled for elective surgical procedures under general anesthesia belonging to ASA grade I and II were included in the study and were randomly divided into two groups with 50 patients in each group. In Group I (n=50), normotensive patients were included and in Group II (n=50), controlled hypertensive patients were included. Both the groups were compared in relation to the hemodynamic changes in perioperative complications.
Results HR, SBP, DBP were significant in intra-operative period at 30, 45, 60 and post-operatively at 0, 15 minutes in both groups ($p < 0.05$). $EtCO_2$ was significant at 15, 30, 45 minutes. SpO_2 was not significant ($p > 0.05$) among the study population.
Conclusion: Normotensive patients undergoing laparoscopic cholecystectomy have more hemodynamic stability (HR, SBP, DBP and SpO_2, $EtCO_2$) as compared to the controlled hypertensive patients. A controlled hypertensive patient shows more cardiovascular instability in comparison to normotensive patients. These patients needed more anaesthetic balance and more antihypertensive agents for intra-operative BP regulation.

Introduction:

Hypertension (HTN) is considered as one of the most important reasonof premature deaths globally as per World Health Organization. In India prevalence of hypertension is ranges between 17-21%, both in rural and urban states[(1)].

Hypertension is a common clinical problem. It affects around 1 billion individuals all around the world. Most of these patients have essential hypertension and approximately 30% remain undiagnosed. Incidence of hypertension increases with age[(2)].Laparoscopic surgeries like cholecystectomy, colectomy, Roux-en-Y gastric bypass, appendectomy, sleeve gastrectomy, and hysterectomy are common in United States with incidence of more than 2 million per year. Laparoscopic surgeries are of advantage in high risk cases like elderly population, obese patients, and in patients with additional co-morbidities[3]. With continuous development and advancement in technology, it has allowed us to use the procedure of laparoscopic cholecystectomy in patients with co-morbidities, but still there increased amount of matter of concern when the comes patients have cardiac co-morbidities[(4)].

Incidence of heart failure, cerebrovascular disease, ischemic heart disease, renal failure and end-organ damage are more commonly associated with hypertension. Also in hypertensive patients, there is higher incidence of perioperative cardiovascular deaths. This association helps in easy understanding of high incidence of heart failure/ischemic heart disease due to the adverse cardiovascular effects of surgeries and anaesthesia[(5,6)].

At the time of pneumoperitoneum, there are more chances of increase in mean arterial pressure, systemic

vascular resistance and decrease in cardiac output, combined effect of which leads to altered tissue perfusion. These changes are tolerated well in ASA I and ASAII patients, but can be harmful in patients with cardiac complaints and ASA III[7].

Epidemiological studies in India have shown that prevalance of hypertension is stabilized in urban population to about 25-30% but has increased in rural population from 15 to 25%. Treatment of hypertension is essential as it is a well-known risk factor for chronic adverse debilities such as cardiovascular diseases, renal diseases and stroke. As the duration and severity of hypertension increases there is a proportionate increase in the degree of end-organ damage, morbidity and mortality[8].

This study has been undertaken to study the incidence of rise in blood pressure peri-operatively in normotensive and controlled hypertensive patients and also to study the rescheduling of surgical procedure following detection of hypertension.

Material and methods:

After obtaining approval from the Institutional Ethical Committee, the present observational study was conducted in the Department of Anaesthesiology, Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana (Ambala), over a period of two year (2016-2018) on 100 adult patients, aged 20 – 60 years, of ASA-PS grade I and II, of either sex. Patients were divided into 2 groups of 50 each scheduled to undergo elective laparoscopic cholecystectomy under G.A.

INCLUSION CRITERIA:

- Age group between 20-60 yrs.
- ASA-PS grade I and II.
- Patients scheduled to undergo Laparoscopic Cholecystectomy surgery under G.A.
- Patients who are normotensive and controlled hypertensive i.e. SBP <140 & DBP <90.

EXCLUSION CRITERIA

- ASA-PS III and IV.
- Use of regional anaesthesia.
- History of burns, trauma or surgeries of airway.
- Patients with known cardiac illness.
- Patients with uncontrolled HTN i.e. SBP>140 and DBP>90.
- Adverse intraoperative events.

METHODOLOGY

Pre-anaesthetic check-up was done a day before surgery. Detailed history, physical examination including HR, BP, respiratory rate and systemic examination was done. Routine investigations including haemoglobin (HB), bleeding time (BT), liver function tests (LFT), renal function test (RFT), complete urine examination, random blood sugar (RBS), electrocardiography (ECG) and chest x-ray were done. Informed and valid written consent was obtained both for conduct of the study and for administration of GA. **Group-1 (N-50**) including normotensive patient and **Group-2 (N-50)** including controlled hypertensive patients were scheduled to undergo for laparoscopic cholecystectomy electively under general anaesthesia.

All patients were kept fasting overnight and premedicated with Tablet alprazolam 0.25mg and Tab. Ranitidine 150mg on the night prior to surgery and in the morning of surgery a sip of water.

Automated non-invasive Blood pressure was recorded three times in supine position at intervals of 2 minutes. Mean of systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial blood pressure (MAP) were calculated and recorded as baseline readings. All anti- hypertensive medications were continued and SBP, DBP and MAP were recorded in the ward 12 hours and 4 hours prior to the surgery.

Patient was shifted to pre-operative area 1 hour prior to surgery, and SBP, DBP and MAP were recorded 30minutes before the surgery. If the rise of DBP >110mmHg was observed, the case wasdeferred and if < 110 then optimization of the patient byadministrationofInj. midazolam in the dose of 0.05mg/kg IV was done via intravenous route. If the patient was optimized then he/she was shifted to operating room, ECG, SpO_2, $EtCO_2$ and NIBP monitors were connected. SBP, DBP and B.P were recorded every 15 minutes before starting intravenous fluids.

Following pre oxygenation for three minutes, the standard induction technique was applied to all the patients which includedInj. Nalbuphine 0.1 mg/kg + Inj. Propofol 2mg/kg + Inj. Vecuronium 0.1mg/kg. Airway was secured with cuffed Endotracheal tube (ETT) ID 8.0 for males and 7.5 for females, with direct laryngoscopy using Macintosh blade. Rest of the anaesthesia was maintained by oxygen (40%), nitrous (50%), isoflourane (1%) and inj. Vecuronium.

HR, SBP, DBP, $EtCO_2$ was recorded at the following points of time, In pre-operative period 30 minutes before surgery, Intra-operatively, At 0, 15, 30, 45, 60 minutes during surgery and Post-operatively at 0, 15, 30 minutes. Subsequent SBP, DBP and SpO_2, $EtCO_2$was recorded just after fixing the ETT and at intervals of 15 minutes, thereafter every 15 minutes till post-extubation.

At the end of surgical procedures, IV ondensetron 4mg was administered for prophylaxis. Neuromuscular blockade was reversed by appropriate dose of with Inj. Neostigmine 0.05mg/kg and Glycopyrrolate 0.01mg/kg administered intravenously. All the patients were extubated and shifted to post anaesthesia care unit.

Patients was observed for any adverse effect like hypertension, bradycardia.

In post-operative care unit (PACU), SBP, DBP and SpO_2 were recorded immediately on arrival of the patient and after 30 minutes.

STATISTICAL ANALYSIS:

All the data were described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using Student t-test and Mann Whitney *U* test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test was performed and exact test was used when the expected frequency is less than 5. A probability value (*p* value) less than 0.05 was considered statistically significant.

All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

Results:

Study population was comparable with regard to demographic profile. On comparison, the difference was statistically non significant (p>0.05) [Table 1].

Table 1: Demographic profile among the study population

Variables	Group 1	Group 2	P value
Age (years)	38.80±10.57	42.70±10.48	0.067
Sex M/F	22.0/78.0	24.0/76.0	0.812
ASA I/II	30/20	28/22	0.761

In pre-operative period (30 minutes before surgery), the heart rate in group 2 was (93.80$\pm$12.57) was higher than group 1(89.12$\pm$13.57). On comparison the difference was statistically non significant (p > 0.05). In group 2 intra-operative period heart rate at 15, 30, 45 and 60 minute was higher than group 1. On comparison the difference was statically significant (p<0.05) [Table 2].

Table 2: Mean distribution of heart rate in beats per min (BPM) in pre-operative and intra-operative period in both the groups

Heart rate (bpm)	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p- value
HR- pre 30	89.12±13.57	93.80±12.57	0.077
HR- in 0	91.00±10.65	95.48±12.52	0.057
HR- in 15	91.66±10.44	99.66±12.82	0.001
HR- in 30	90.28±8.84	97.04±10.598	0.001
HR- in 45	89.38±9.97	94.98±8.07	0.002
HR-in 60	87.76±11.08	95.60±8.97	0.000

In Pre-operative period (30 minute before surgery), SBP in group 2 was higher as compared to group 1. On comparison the difference was insignificant (p>0.05). In intra-operative period the SBP in group 2 was persistently higher at 15 min (152.32±15.07), 30 min (147.56±1o.34), 45 min (146.94±9.32) and 60 min (145.48±9.30) which was statistically significant (p<0.05) [Table 3].

SBP (mmHg)	Group 1 (Mean±SD)	Group 2 (Mean±SD)	P value
SBP- pre 30	139.12±12.12	142.40±15.07	0.087
SBP -in 0	140.82±14.16	142.30±14.76	0.184
SBP- in 15	139.22±19.71	152.32±19.71	0.000
SBP- in 30	132.22±14.00	147.56±10.34	0.000
SBP- in 45	133.94±13.61	146.94±9.32	0.000
SBP- in 60	134.12±12.13	145.48±9.30	0.000

In post-operative period at 0 minute and 15 minute, systolic blood pressure was significant with p value <0.05 [Table 4].

Table 4: Mean distribution SBP (mmHg) in post-operative period in both the groups

Variables	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p- value
SBP- post 0	137.96±14.80	144.08±8.61	0.001
SBP- post 15	135.48±12.47	142.42±7.21	0.000
SBP- post 30	132.20±11.84	134.04±6.33	0.165

The DBP was persistently high in group 2 at 15, 30, 45 and 60 minutes intra-operatively (p<0.05) [Fig 1] .

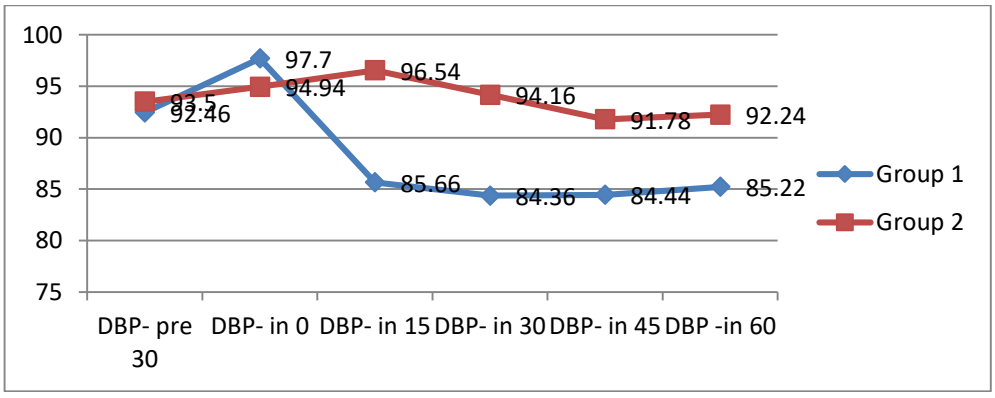

Fig 1.

In post-operative period, DBP in group 2 was significantly high at 0 and 15minute ($p<0.05$) [Fig 2].

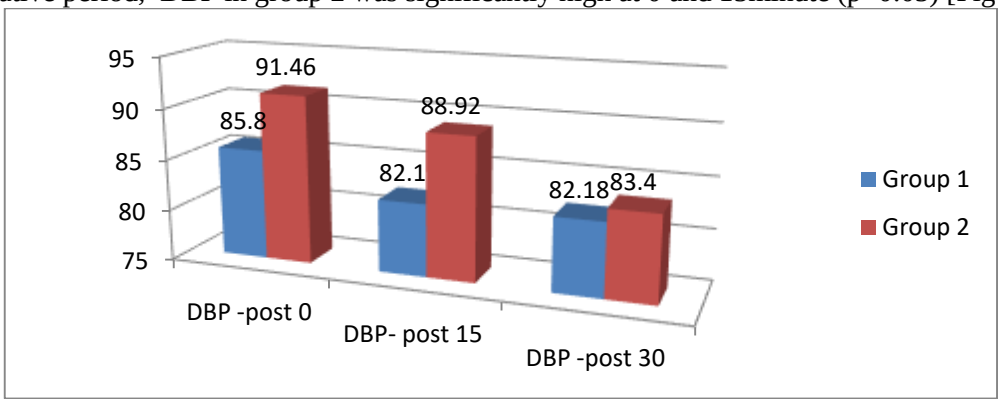

Fig 2.

The EtCO2 was persistently higher in group 2. On statistical analysis, the difference was significant at 15, 30, and 45 minute in intra-operative period ($p<0.05$) [Fig 3].

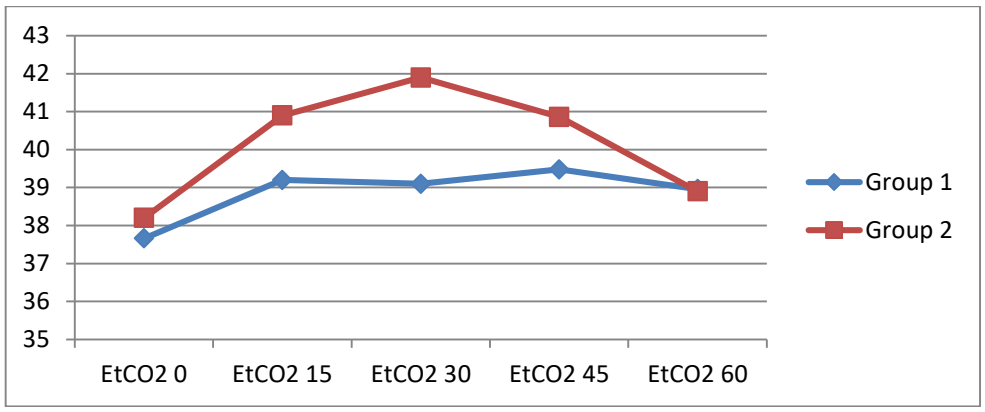

Fig 3.

Discussion:

Perioperative hypertension often occurs due to anxiety and stress in pre-operative period, and discontinuation of antihypertensive medications. It may also be caused during the induction of anaesthesia and intra-operative period due to pain-induced stimulation leading to vasoconstriction. Other causes of peri-operative hypertension include hypothermia, hypoxia, shivering and intravascular volume overload by intra-operative fluid therapy.

In the present study, there was no statistically significant difference in HR pre-operatively (0 min), between the two groups. However, from the time of induction to 60 minutes and in post-operative period 0, 15 minute thereafter, there was significant difference in the HR between the two groups.In the study conducted by Slavicakvolik et al[9], they found that the maximum HR in two groups was 89.1±16.2 and 89.2±14.7 ($p=0.97$) in normotensive and hypertensive group respectively also, the minimum HR noted was, 59.5±12.4 and 56.6±7.9 ($p=0.19$) and bradycardia seen in 3% patients in normotensive group as compared to 5% patients in hypertensive group. In the study conducted by Walter Viterbo da Silva Netoet al[10], they found that the HR in two groups was 76.1±18.0 in group 1 and 72.4±12.3 in group 2 ($p=0.13$), at the time of anaesthetic induction. During administration of induction agents, HR was 65.7±4.3 in group 1 and 64.1±11.0 in group 2 ($p=0.28$). At the time of laryngoscopy and tracheal intubation, HR in both groups was 69.8±13.9 in group 1 and 69.7±12.9 in group 2 ($p=0.96$). Five minute after intubation HR in both groups was 72.0±16.9 in group 1 and 70.1±13.9 in group 2 ($p=0.4$).

In the present study, there was no statistically significant difference in SBP pre-operatively (0min), between the two groups. However, from the time of induction to 60 minutes and in post-operative period 0, 15 minute thereafter, there was significant difference in the SBP between the two groups.Netoet al[10], they found that the SBP in two groups 143.3±17.7 in group 1 and 121.7±14.0 in group 2 ($p<0.01$), at the time of anaesthetic induction. During administration of induction agents, SBP was 114.5±15.9 in group 1and 97.9±12.9 in group

2 (p<0.01). At the time of laryngoscopy and tracheal intubation, SBP in both groups was 122.6±20.9 in group 1 and 114.8±19.2 in group 2 (p<0.029). Five minute after intubation SBP in both groups was 119.0±18.4 in group 1 and 105.4±15.4 in group 2 (p<0.01).In the study conducted by K S Pohet al[11], they found that the SBP in two groups was 122.1±11.7 (p<0.01) in group 1 and 137.8±15.6 in group 2 (p<0.01) in pre-operative period. On arrival in OT change in BP was 15.1±17.7 in group 1 and 27.2±27.6 in group 2 both the groups had (p<0.01). In post-operative period maximum change in BP was -2.2±12.5 in group 1 and 0.13±17.2 in group 2 in both the group (p=0.50).

In the present study, there was no statistically significant difference in DBP pre-operatively and (0min), between the two groups. However, from the time of induction to 60 minutes and in post-operative period 0, 15 minute thereafter, there was significant difference in the DBP between the two groups.In the study conducted by K S Pohet al[11], they found that the SBP in two groups was 73.9±6.7 (p<0.01) in group 1 and 81.1±10.3 in group 2 (p<0.01) in pre-operative period. On arrival in OT change in BP was 5.0±11.3 in group 1 and 7.4±11.5 in group 2, both the groups had (p=0.26). In post-operative period maximum change in BP was -3.1±86 and -3.5±10.7 in group 2 in both the group (p=0.85).In the study conducted by Walter Viterbo da SilvaNetoet al[10], they found that the DBP in two groups 86.8±10.4 in group 1 and 75.5±9.3 (p<0.01), at the time of anaesthetic induction. During administration of induction agents, DBP was 70.4±2.4 in group 1and 57.8±9.9 in group 2 (p<0.01). At the time of laryngoscopy and tracheal intubation, DBP in both groups was 75.4±15.1 in group 1 and 71.1±15.0 in group 2 (p=0.10). Five minute after intubation DBP in both groups was 72.8±17.2 in group 1 and 64.3±13.0 in group 2 (p=0.0006).

In our study in both the groups there is was no rescheduling and cancellation of laparoscopic cholecystectomy surgery as patients were already detected, evaluated and treated for high blood pressure, if blood pressure rise in pre-operative period the blood pressure of the patients was optimized by giving Inj. Midazolam 1mg and patient and DBP was brought down to the level of 100mmHg and almost after 1 hour of optimization patient were taken for surgery. We found 10% controlled hypertensive patients whose DBP in between 100 – 110mmHg was optimized.The study done Wildner M et al (1991)[12] about the avoidable causes of cancellation during surgery and they found that hypertension was the commonest cause of deferral seen in 16.2% cases and the overall cancellation rate has been documented to be between 1-27%.

Conclusion:

Normotensive patients had the following advantages over controlled hypertensive patients.

Normotensive patients undergoing laparoscopic cholecystectomy had more hemodynamic stability (HR, SBP, DBP and SpO_2, $EtCO_2$) as compared to controlled hypertensive patients.

In our study, there was no cancellation and rescheduling of the patients as the blood pressure of patients (DBP >110) were optimized by giving Inj. Midazolam 1 mg. The DBP was reduced to around 100 mmHg and patients were then taken for surgery. We observed that 10% of controlled hypertensive patients had DBP between 100-110mmHg and were optimized.

Conflict of Interest: None

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