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DEMOGRAPHIC FACTORS AFFECTING HAEMODYNAMIC RESPONSE IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE, OBSERVATIONAL STUDY

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ABSTRACT

An observational study was undertaken to evaluate the factors affecting the haemodynamic changes during laparoscopic cholecystectomy performed under GA in 65 non-obese ASA-I & ASA-II patients of age group 18-60 years in a minimal invasive surgery O.T. at a tertiary centre, over a period of 6 months. During surgery, intra-abdominal pressure was 12mmHg and head tilt of 25 degree was maintained. Baseline parameters like age, sex, pulse, B.P., body weight, PaO_2, ASA grade were recorded. Haemodynamic changes in respect to pulse, B.P., were noted intraoperatively at 10 minute intervals. The B.P. rise during operation was treated accordingly with GTN infusion. A multivariate analysis was done to elucidate any correlation between age, sex, duration of operation or ASA grade with the extent of hemodynamic change. The study revealed that there was significant rise of systolic B.P. in 78% cases, significant rise of both systolic and

diastolic B.P. in 69% cases. There was no age or sex preponderance regarding significant B.P. rise. ASA grade II patients had a greater preponderance of B.P. rise and operations of duration > 60 minutes had a significant correlation with B.P. rise.

KEY WORDS: laparoscopic cholecystectomy, haemodynamic change.

[Abreviations; B.P.- blood pressure, C I- cardiac index, GTN- glyceryl trinitrate, GA- general anaesthesia, ASA- American Society of Anaesthesiologists, BMI- body mass index}.

INTRODUCTION

Minimal invasive surgery has gained a milestone over the recent years due to minimum trauma, morbidity & hospital stay. However, the pneumoperitoneum and the patient positioning required for laparoscopy induce pathophysiological changes that complicate anaesthetic management.[2] These changes associated with positioning may be influenced by the extent of tilt, age of the patient, intravascular volume status, associated cardiac disease.[1] Perhaps under these conditions of relative hypovolaemia, blood would pool in the lower body, venous return would be diminished and cardiac function would be compromised.[12] Major hemodynamic complications associated with laparoscopic procedures include alterations in arterial blood pressure, dysrhythmias and cardiac arrest.[2] Hence stringent monitoring is essential to prevent life threatening complications.

AIMS AND OBJECTIVES

This study was conducted to determine whether factors like age, sex, body weight, ASA grade, or duration of operation have any influence on the extent of hemodynamic change associated with laparoscopic cholecystectomy. Determination of such factors could probably prevent or reduce the incidence of intraoperative and postoperative morbidity and mortality. It would also enable the surgeons and the anaesthetists in proper patient selection and timely intervention to prevent catastrophe.

MATERIALS AND METHODS

65 patients of either sex, aged 18-60 years, ASA I, II with normal BMI and undergoing laparoscopic cholecystectomy of envisaged duration of 40-90 minutes at minimally invasive surgery unit of a tertiary hospital in Kolkata, were taken into study for a period of six months with prior written informed consent & institutional ethical committee approval.

ANAESTHETIC PROTOCOL

Patients fulfilling the inclusion criteria, properly screened preoperatively and anaesthetically fit for operation were taken into study. The baseline criteria including age, sex, body weight, SpO_2 (by pulse oximetry), pulse and BP (both systolic and diastolic) were recorded. Premedication comprising of Inj glycopyrrolate 0.2 mg/kg, inj. fentanyl 2µg/kg, inj. ondansetron 0.1mg/kg were administered. Induction was done with inj. thiopentone sodium 2.5% at 5mg/kg body weight and endotracheal intubation was done following inj succinylcholine 1mg/kg administration. GA was maintained with 33% O_2 and 66% NO_2 and inj. vecuronium bromide 0.1mg/kg body weight. Inj. proppfol in syringe pump was started at a rate of 10-20ml/hr. After induction of pneumoperitonium, & GTN infusion at the rate of 0.01µg-0.1µg/kg/min started in cases of excess BP rise, requirement being titrated according to BP rise. Propofol was continued till desufflation was done. Non-invasive monitoring of pulse, B.P., SpO_2, $ETCO_2$, ECG, temperature & urine output was maintained throughout the operation. Intraoperative analgesia was supplemented with inj. Diclofenac sodium at 3mg/kg body weight. Intra-abdominal pressure was maintained at 12mm Hg by CO_2 insufflator & a head tilt of 25˚ was allowed. Excess rise of B.P. as more than 20% of baseline value was treated with GTN infusion. The extent of intraoperative rise of both systolic & diastolic B.P. or any alteration of pulse rate were noted & analysed statistically from recorded data.

RESULTS AND ANALYSIS

Of the 65 patients, 58 patients were of ASA grade I, 7 patients were of ASA grade II. Of the ASA II patients, 4 were on antihypertensive therapy, 2 were on antihypertensive & eltroxin therapy, 1 was on inhalation therapy for bronchial asthma. All patients were normotensive, euthyroid and with normal SpO_2 at the time of surgery. There was no instance of conversion to open surgery in any of the above mentioned cases.

Analysis of the recorded data shows significant rise (>10mmHg) in systolic BP in 78% cases, diastolic BP in 80% cases & rise in both systolic & diastolic BP in 69% cases. Excessive rise in BP (>20% of baseline systolic/diastolic) occurred in 27% cases. Of the 7 ASA grade II patients, 5 patients exhibited excessive rise in BP and were aged > 45 years.

The mean $ETCO_2$ 10 minutes after CO_2 insufflation ($ET1CO_2$) was 22.5mm while the mean $ETCO_2$ just before desufflation ($ET2CO_2$) was27.5m. $ET1CO_2$ and $ET2CO_2$ are differing sifnificantly by paired t test & $p<0.001$. However as both the readings were within acceptable limits, it can be assumed that hypercapnea did not occur in any of the cases.

Comparison of systolic & diastolic BP rise over time by repeated measure ANOVA shows $p<0.001$, hence significant. Dunnett's Multiple Comparison Test reveals significant rise of both systolic & diastolic BP throughout surgery. Bivariate correlation of rise in BP to factors like age, duration of surgery by Pearsons product moment correlation coefficient gamma reveals that the mean age of the study group was 33 years; it had no significant correlation with BP rise. The mean duration of operation was 67.30 minutes & the mean requirement of propofol during surgery was 63.93mg, both parameters had significant correlation to BP rise.

DISCUSSION

Laparoscopy has now become the standard technique for cholecystectomy. However the pneumoperitoneum required for laparoscopy results in pathophysiological changes, specially affecting the cardiovascular function as mentioned by J.L. Joris et al.[7] As laparoscopic techniques are applied to a broader spectrum of population, the impact of small but significant decrements in cardiac function become increasingly important.[11] The extent of cardiovascular changes associated with creation of pneumoperitonium will depend on the interaction of factors include positioning of patient, the intra abdominal pressures obtained during insufflations and the neurohumoral effects of absorbed CO_2.[1] As laparoscopic cholecystectomy is being regularly practiced, whether baseline factors such as age, sex, ASA grade or duration of operation bears any correlation to extent of haemodynamic changes needs to be studied to prevent morbidity as well as mortatility.

CONCLUSION

As laparoscopic cholecystectomy is gaining huge popularity irrespective of age, sex, cardiovascular status or other co-morbidities, more studies regarding effects of pneumoperitonium or patient positioning should always be welcome. This study shows that there is significant rise in systolic BP in 78% cases, significant rise in diastolic BP in 80% cases and significant rise of both systolic & diastolic BP in 69% cases, irrespective of age or sex. Excessive rise in BP, either systolic or diastolic (20% > than baseline), was noted in 27% patients; all of these patients were aged > 45 years & females (32%) showed a slightly greater preponderance compared to males (30%). ASA grade II patients & operations of duration > 60 minutes had significant correlation to BP rise.

Table 1: Mean Demographic Descriptives.

Descriptive	Mean	Standard Deviation	Standrad Error
Age	33.09 years	±10.47	1.29
Duration	67.30 minutes	±16.59	2.0
Pulse	91.73/minute	±16.79	2-22
Systolic BP	126.44mmHg	±10.71	1.32
Diastolic BP	79.44mmHg	±7.12	0.88

Table 2: Analysis of Recorded Data.

Data	Mean	Standard Deviation	Standard Error
ET 1 CO_2 ET 2 CO_2	22.54mm 27.58mm	2.97 3.38	0.36 0.42
PULSE(initial) PULSE(end)	95.73/minute 81.96/minute	14.24 13.93	2.0 1.93
SYSTOLIC BP (maximum rise)	19.48mmHg	13.40	1.67
DIASTOLIC BP (maximum rise)	21.68mmHg	`12.26	1.53

Table 3.

	Pearson correlation	Age	Duration	Propofol	SBP max↑	DBP max↑
Age	significant	1 65	316* 010 65	376** 003 60	217 084 64	154 224 64
Duration	significant	316* 010 65	1 65	407** 001 60	060 640 64	185 144 64
Propofol	significant	376** 003 60	407** 001 60	1 60	088 507 59	153 246 59
SBP Maximum rise	significant	217 084 64	060 640 64	088 507 59	1 64	761** 000 63
DBP Maximum rise	significant	154 224 64	185 144 64	153 246 59	761** 000 63	1 64

*Correlation is significant at the 0.05 level(2-tailed)

** Correlation is significant at the 0.01 level(2-tailed)

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