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"STUDY OF CHANGES IN COAGULATION PROFILE OF PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY USING CARBON DI OXIDE PNEUMOPERITONEUM IN A TERTIARY MEDICAL CENTRE"

General Surgery

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ABSTRACT

BACKGROUND: Laparoscopic cholecystectomy is a common surgical procedure and carbon dioxide pneumoperitoneum created for this purpose may alter the coagulation profile of these patients. This study aims to find the effects of carbon dioxide pneumoperitoneum on coagulation profile and assess if there is an increased risk of thrombosis.

MATERIALS AND METHODS: A clinical observational study was conducted with 50 patients who underwent laparoscopic cholecystectomy using carbon di oxide pneumoperitoneum. The prothrombin time and D-dimer values were calculated before and after surgery .using the paired t test data was analyzed.

RESULTS: The study showed a decrease in the prothrombin time and increase in the D- dimer value post operatively. The mean of prothrombin time after surgery was 0.13 seconds lower than the preoperative value and D-dimer was found to be elevated three times the pre operative values. The p value calculated for both were highly significant.

CONCLUSION: Laparoscopic cholecystectomy using carbon dioxide pneumoperitoneum leads to hypercoagulable states. Hence stringent measures need to be taken to put the patient on prophylaxis for deep vein thrombosis to avoid dire consequences.

KEYWORDS

Laparoscopic Cholecystectomy, Pneumoperitoneum, Prothrombin Time, Hypercoagulation

INTRODUCTION

Laparoscopy is one of the widely used tools for diagnostic and therapeutic purposes in recent times which offers the advantage of better cosmesis, lesser post-operative pain, shorter hospital stay, early return to normal life and work. With advancements in technology and instrumentation, laparoscopy has entered into every array of surgical field. A working cavity is one of the requisites for laparoscopy. This cavity is commonly created by positive pressure pneumoperitoneum using carbon di oxide.

Carbon di-oxide pneumoperitoneum affects normal physiology. It is easily absorbed from the peritoneal cavity into circulation. It may affect the cardiovascular, respiratory and coagulation system.

Laparoscopy has its complications due to increased intraabdominal pressure, carbon di-oxide absorption from peritoneum during insufflation and reverse Trendelenburg position adopted during surgery.

The first laparoscopic cholecystectomy was performed in 1986 in Germany. The duration of surgery, complications have reduced over time. Laparoscopic cholecystectomy is now the gold standard procedure. And with over 5,00,000 procedures being done annually, laparoscopic cholecystectomy assumes a great significance in general surgical specialty.

Effects of carbon di oxide pneumoperitoneum need to be studied in detail with respect to individual systems. This study aims to study the effects of carbon di oxide pneumoperitoneum on the coagulation system of patients undergoing laparoscopic cholecystectomy , and make the surgeon aware of the detrimental effects, if any.

AIM OF THE STUDY

1. To determine the changes in coagulation profile of patients undergoing laparoscopic cholecystectomy using carbon di oxide pneumoperitoneum.
2. Assess if there is an increased risk of thrombosis post-operatively.
3. To determine if patients undergoing laparoscopic cholecystectomy have to be started on prophylaxis for deep vein thrombosis to prevent complications.

Review Of Literature

Cholecystectomy is the surgical removal of gall bladder. Indications[2] include symptomatic gall stones, gall bladder polyps greater than 1 cm, acute and chronic cholecystitis, acalculous cholecystitis, empyema gall bladder, mucocele of gall bladder, typhoid carriers and gallstone pancreatitis.

Laparoscopy is the endoscopic visualization of peritoneal cavity. It usually assisted by pneumoperitoneum that helps to distend the peritoneal cavity and separate the abdominal wall from the contents. This pneumoperitoneum helps in visual clarity of visualized abdominal organs. It provides the necessary space to perform diagnostic and therapeutic procedures. It reduces the chances of injury to the adjacent organs. It helps maintain normal physiological state which is required for safe effective surgery. The optimal pressure for pneumoperitoneum is 12-15mmHg. Carbon di oxide is the "Gas of choice".

The coagulation of blood[5] depends on the balance between two groups, procoagulants and anticoagulants that is present in blood. Prothrombin is a plasma protein formed by the liver. It is involved in the process of coagulation. Normal time is around 12 seconds. D-dimer is the product of degradation of crosslinked fibrin (XII Factor)[6]. It is an indicator of ongoing process of activation of hemostatic system. The reference value is less than 250 ng/ml or 0.5 ug/ml fibrinogen equivalent units.

Sages { Society of American Gastro and Endoscopic Surgeons } [7]

All laparoscopic procedures carry a risk of hypercoagulability. Short and less complicated or less complex procedures like laparoscopic appendectomy and laparoscopic cholecystectomy carry a low risk of venous thromboembolism."

"Deep vein thrombosis prophylaxis can be given by one of the following methods. Pneumatic compression devices are calf length pneumatic devices which increase lower extremity venous blood flow they also cause fibrinolysis. Unfractionated heparin is given subcutaneously or through intravenous route.. A combination of the above is frequently used for Deep vein thrombosis prophylaxis.

The following studies look into the relation between Carbon dioxide pneumoperitoneum –reverse Trendelenburg position on the cardiovascular and coagulation system. Kehlet [10] also mentioned that "There is not much difference in the coagulation system in laparoscopic and open procedure and changes could mainly be attributed to the position of patient in laparoscopic surgery (Reverse Trendelenburg)."

Laparoscopic cholecystectomy was reported to have no effects on the coagulation system in various studies. Dexter et al [15] studied 26 patients and he analyzed clotting factors. "Stress response, cytokine release and neuro-humeral response during surgery were stated as the major factors that caused thromboembolic phenomenon.

Multiple studies have been conducted to assess the risk of thrombosis post laparoscopic cholecystectomy. The following studies inferred that the risk of thromboembolism increased post-surgery. Trifilleti et al [23] noticed that "There was a significant increase in the fibrinogen levels 8 hours after surgery. This, he noted, may be due to the decreased response against stress. This decreased response to stress may be due to pneumoperitoneum, anesthetic that act on liver, decreased blood flow through the portal vein, fluids infused during surgery."

On the contrary some studies found that hypo-coagulable states were common after laparoscopic surgery. Schietroma et al[28] studied the cytokine levels in patients undergoing laparoscopic and open procedure and found that "Hypercoagulation was seen almost after every surgery. This was attributed by him to the increased cytokine level.

The timing of highest risk for thrombosis were reported at various time intervals following laparoscopic cholecystectomy. Custendil et al[31] reported "Higher incidence of thrombosis on the first post operative day following surgery The incidence of thrombosis too varied from 0.02% to as high as 55% depending on the technique used for diagnosing thrombosis.

Studies were done to assess the risk benefit ratio of uncontrollable bleeding in patients receiving thromboprophylaxis

MATERIALS AND METHODS:

This study will be a **CLINICAL OBSERVATIONAL** done at Hi-tech Medical College and Hospital between January 2021 to September 2021.

Size Of The Study:

50 patients

STUDY METHODOLOGY

Patients who were diagnosed to have a gall bladder pathology and underwent laparoscopic cholecystectomy were included in the study. Consent was obtained from the patient regarding inclusion in study. History and clinical examination were done. Patient`s age sex, symptoms and their duration of surgery were recorded.

Basic routine investigations will be done for all patients Complete hemogram, Urine routine, Blood sugar, Blood urea, Serum creatinine, Serum electrolytes, USG abdomen & pelvis. Coagulation profile: Prothrombin Time, D - dimer, Duplex scan. 3cc of blood will be drawn under strict aseptic precautions; one sample prior to surgery, one sample 6 hours after onset of pneumoperitoneum. Samples will be processed for prothrombin time and D-dimer. Duplex scan will be done to look for deep vein thrombosis.

Inclusion Criteria

All patients operated for cholecystectomy laparoscopically, of both sexes, age from 18-60 yrs, surgery time between 90- 180 minutes

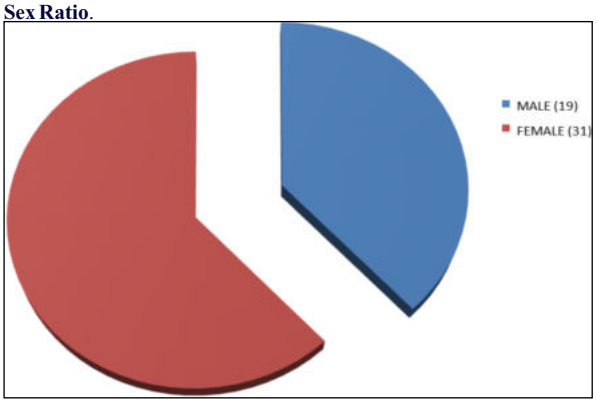
Exclusion Criteria

Patients <18yr and >60yr, surgery time >3 hours, procedures converted to open surgery, associated hypertension ,patients on anticoagulant therapy, known malignancies, known history of bleeding and clotting disorders, deep venous thrombosis, pregnancy are excluded.

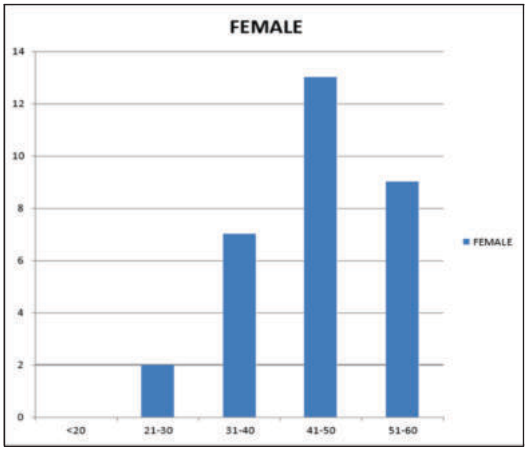
Data Analysis :

The Paired student T –test was used to analyze the values collected before and after the surgery. The mean of the two groups , the standard deviation, standard error of mean and the P- value were calculated. The results were again converted into pie charts, bar diagrams and scatter map for the sake of easy understanding , and are presented as follows.

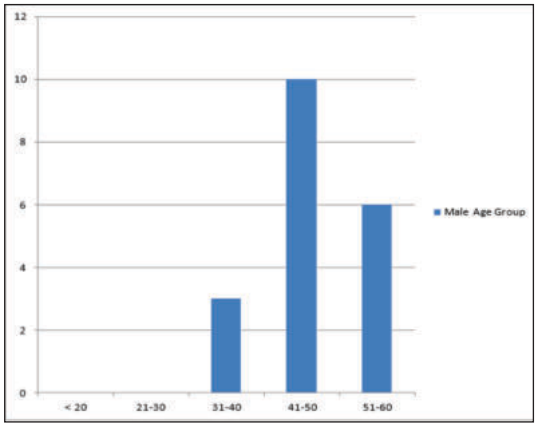
Sex Ratio.



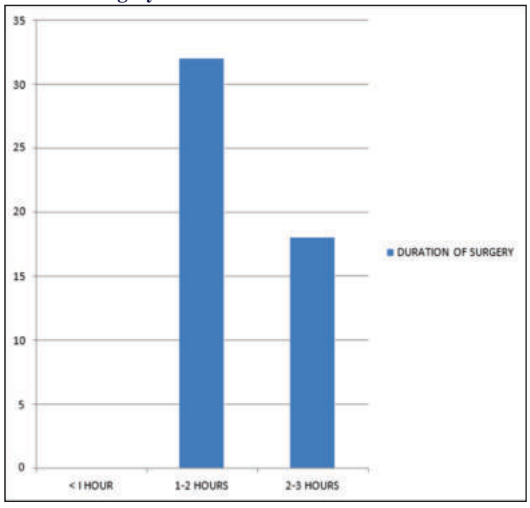
Age Distribution In Females



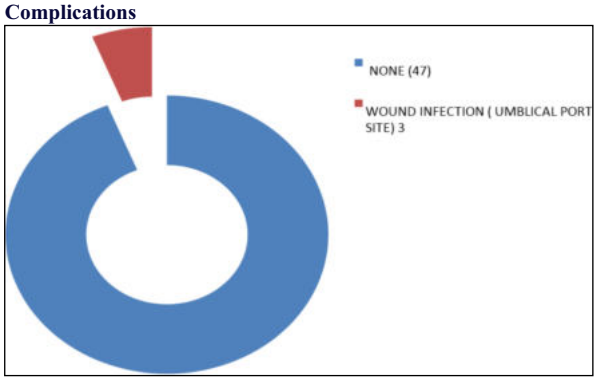
Age Distribution In Males



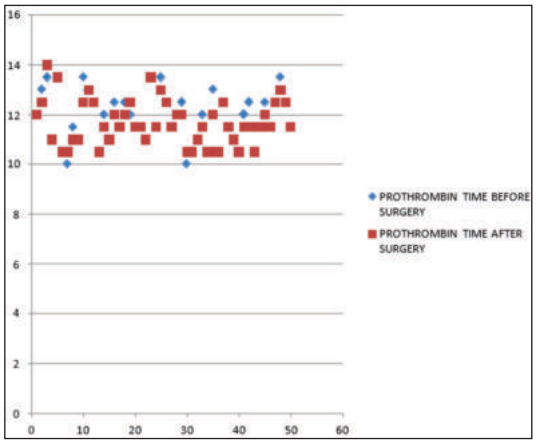
Duration Of Surgery



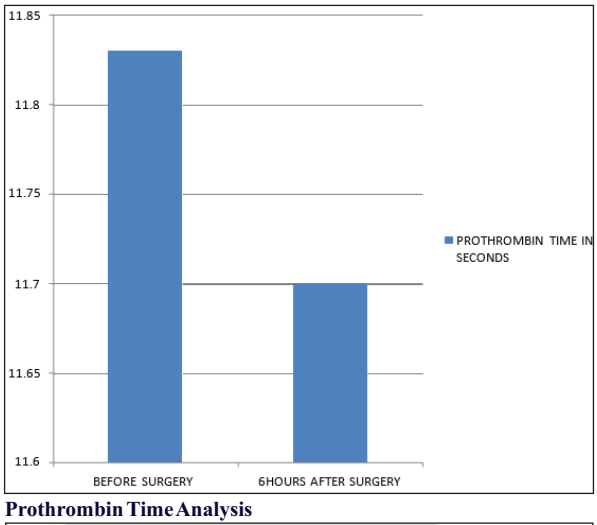
Complications



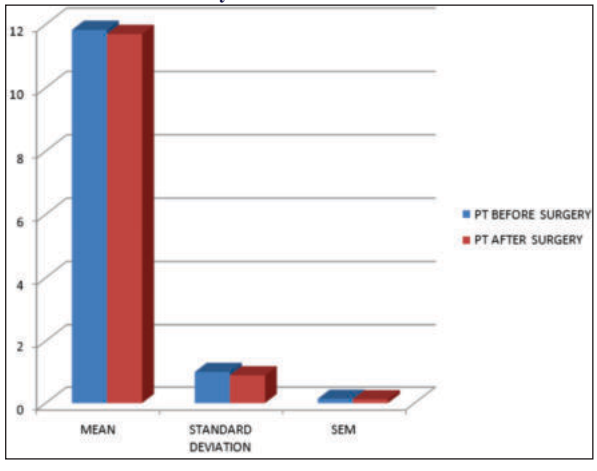
Prothrombin Time Of 50 Patients



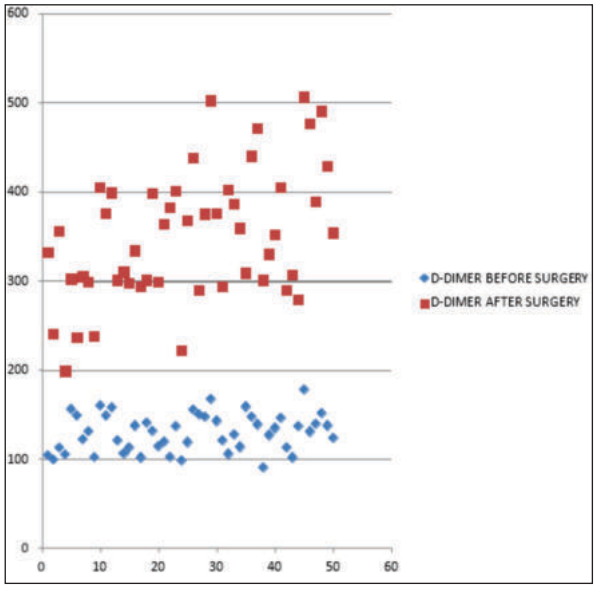
Prothrombin Time In Seconds



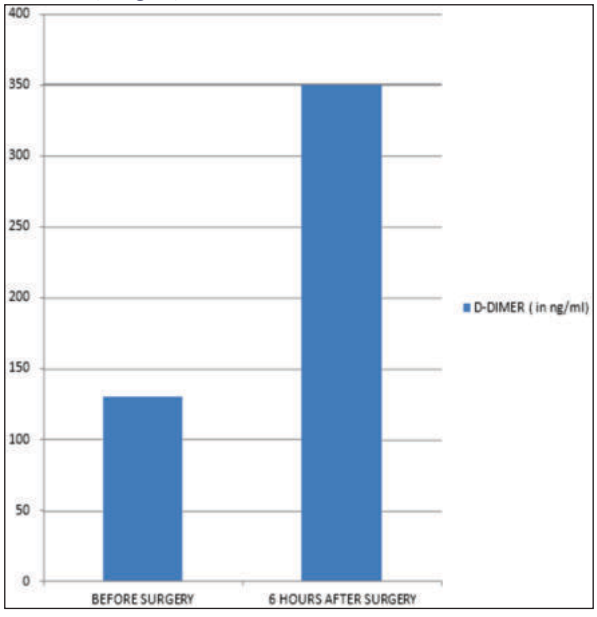
Prothrombin Time Analysis



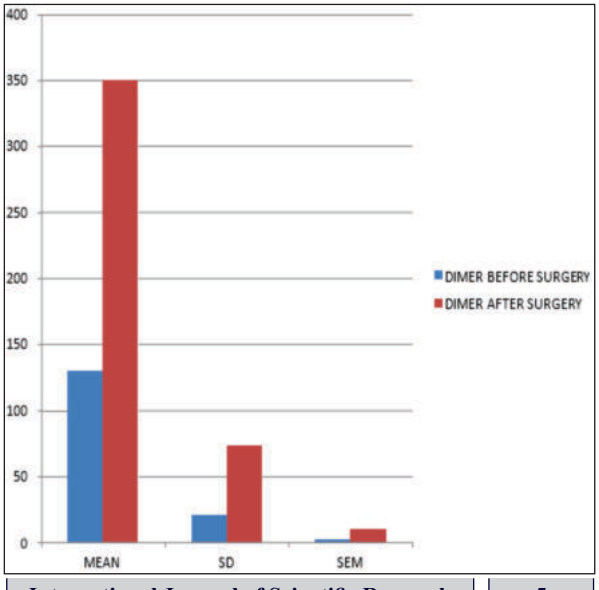
D-DIMER OF 50 PATIENTS



D- Dimer (in Ng/ml)



D- Dimer Analysis



PROTHROMBIN TIME		
	BEFORE SURGERY	AFTER SURGERY
MEAN	11.83	11.7
STANDARD DEVIATION	1.008	0.898
STANDARD ERROR OF MEAN	0.143	0.127

D DIMER		
	BEFORE SURGERY	AFTER SURGERY
MEAN	129.78	350.22
STANDARD DEVIATION	21.01	73,21
STANDARD ERROR OF MEAN	2.97	10.35

RESULTS:

The duration of the surgery ranged from 1 hour 25 minutes to 2 hours 50 minutes. There was wound infection at the umbilical. The mean hospital stay was 4 days.

The difference in the mean between the two groups was 0.130. The confidence interval at 95% was between 0.031 to 0.229. The p- value was 0.0109 (<0.05).

The difference in mean of the two groups was 220.44 and the confidence interval of 95 % lay between 240 to 200.83. The p-value of the D-dimer analysis was at 0.001 was meant it was extremely significant statistically.

On follow up none of the patients developed signs of deep vein thrombosis clinically when they turned up for follow up to 2 weeks post-surgery.

DISCUSSION:

There was a higher incidence of female patients undergoing cholecystectomy 62%, compared to male 32%.

The majority of the patients who underwent surgery were in the age group of 41-50 years in both the sexes. The second highest was seen in the age group of 51-60 years. These two groups constituted 76% of the cases. Showing that the disease incidence increased after the age of 40 years.

The duration of surgery varied between 1 hour 25 minutes to 2 hours 50 minutes. This shows the unpredictability of the duration of the surgery the longest taking twice the time for the shortest procedure.The prothrombin time was not altered in most of the patients 62% (31 out of 50).

The mean of the prothrombin time before surgery was 11.83 and the one after surgery was 11.7. The standard error of mean was 0.143 and 0.127.

The study goes in line with other studies by Hans et al [25], Garg et al[26] and Schietroma et al[28] who also support the fact that there is a state of hypercoagulabilty.

When the D-dimer values are analyzed, all the patients are seen to have an increase in the d-dimer values. With many showing a two fold increase in the d-dimer values before and after surgery.

The mean of the D-dimer before and after surgery where calculated to be 129.78 and 350.22 and the standard error of mean was 2.97 and 10.35. The difference in the mean was 220.44 .This increase clearly indicates the undergoing fibrinolytic process.

Statistically too the values were found to be extremely significant with a p value of 0.001. thus this increase in d-dimer suggests the high risk of thrombosis leading to activation of fibrinolytic systems.

These changes in coagulation factors cannot be attributed to the position of patient alone. All the patients being put on reverse trendenlenberg position with a 30 degree tilt with a right up tilt given. Not all patients showed a similar change in coagulation profile.

The effect of position can only be studies if studies are done comparing laparoscopic procedures that adopt a trendenlenberg position to procedures that employ reverse trendenlenberg position.

The effect of increased abdominal pressure may have a role to play in the alteration of coagulation profile.

Stasis of blood is a component of Virchow's triad[5] and could trigger the coagulation pathway.

On the contrary to many studies that reported the incidence of thrombosis postoperatively, there were no cases who developed signs of thrombosis though the patients showed increased coagulation profile. This was probably due to the small size of the population under study. The incidence of post operative thrombosis was placed at 0.02% (1 in 5,000) in the larger studies done elsewhere.

CONCLUSION :

The study shows a marked increase in the d-dimer values and a significant decrease in the prothrombin time. This goes to prove that there is activation of both coagulation and fibrinolytic systems post laparoscopic cholecystectomy.

This activation of coagulation system could spell a disaster if the patients were to face a thromboembolic phenomenon post cholecystectomy. But none of the 50 patients operated by us had any thromboembolic problems postoperatively. This could mean that the body has effective counter mechanisms to deal with this change in coagulation profile.

When assessed if there is a need for prophylaxis against thrombosis, the study shows change in the coagulation profile resulting in a hypercoagulable state.

Hence it is better that for patients undergoing laparoscopic cholecystectomy stringent measures are taken and patients are put on some form of stringent deep vein thrombosis prophylaxis, preferably Low molecular weight Heparin.

The surgeon is hence left with a daunting task of looking into the cost-risk- benefit ratio for individual patients with respect to deep vein thrombosis prophylaxis. The presence of even a single risk factor should necessitate the surgeon to start the patient on prophylaxis to avoid dire consequences.

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