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Effects of Laparoscopic Surgery on Liver Enzyme Levels

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Abstract: Laparoscopic surgery, describes an area of surgery that crosses all traditional disciplines and has changed the face of general surgery. The aim of this study was to evaluate the presence and clinical importance of unknown liver enzymes abnormalities after multiple laparoscopic procedures. Serum bilirubin was found to be elevated following the laparoscopic surgery in the immediate post-operative duration which returned to pre-value within 1 week. These elevations were found to be transient as the levels of these enzymes returned to near pre-op values by 7 days post-operatively.

INTRODUCTION

Minimally invasive surgery, especially, laparoscopic surgery, describes an area of surgery that crosses all traditional disciplines and has changed the face of general surgery. The aim of laparoscopic surgery is to perform standard, traditional open surgical procedures via. the laparoscope in order to make the treatment more patient-friendly. The growth of this technique and its applications has developed exponentially and it currently accounts for a large proportion of all surgical procedures. Laparoscopy is gaining wide popularity among surgeons in India. There have been no studies in our setting to evaluate the potential deleterious effects of laparoscopic surgery on hepatic function.

Aim: To study effects of Laparoscopic surgery on liver enzymes.

Objectives: To assess the impact of laparoscopic surgery procedure enzymes on live (AST, ALT, Alkaline Phosphatase) and serum bilirubin and to relate the length of laparoscopic surgery procedure with the uptake of liver enzymes, assuming if any.

Literature review: in 1964, Kurt Semm in Keil, Germany has created an automated insufflation system which tracks abdominal pressure and gas flow. Development of rod lens system in 1966 was by British optical physicist Hopkins. His design resulted in improved image brightness and clarity. These same principles are still used in laparoscopes today. In 1986, there was a new development in which computer chip TV camera was attached to laparoscope. First laparoscopic procedure performed by general surgeons appears to have been liver biopsies under direct vision.

Several studies have reported elevated rates of aminotransferase as well as alcohol dehydrogenase and glutathione S-transferase but this indection is temporary as these enzymes returned to usual levels within 1-3 days (Anderi *et al*., 1998; Saber *et al*., 2000; Tan *et al*., 2003; Kotake *et al*., 2001). The laparoscopic instruments necessary to perform surgery are expensive. Some key factors should be considered when planning to purchase the instruments. Ensure that all instruments are compatible and fits in to the cannula and various cables will connect to one another. Back-up service and technical support should also be considered.

As laparoscopic surgery entails simultaneous vision via. a television camera on a monitor screen usually with recording of the operative procedure, either a Xenon light source or a 250 W Halogen lamp is required. A Storz light source which has a dual manual and video function with a self-adjusting light intensity can be used. The term 'cold' light is a mis snomer, since, the tip of the light conducting cable could easily ignite linen drapes. Modern light sources are equipped with thermal shield that reduces the amount of heat transmitted through the cable to minimize the risk of burns internally. The instruments used in laparoscopic surgery are modifications of standard open surgical instruments and are 30-40 cm in length with shaft diameter of 3-10 mm. The shafts may be insulated with non-conductive material and working tips are metal to allow use with electro cautery and to provide durability. Both reusable and disposable ones are available.

General anaesthesia is the preferred method for patients undergoing most therapeuticstic laparoscopic surgical procedures. It allows for complete control of patient's ventilation which might otherwise is com promised by systemic absorption of CO_2 and increased diaphragmatic pressure from pneumo peritoneum. It enables complete relaxation of abdominal wall muscles necessary for adequately maintaining pneumo peritoneum. Regional (epidural) anaesthesia has been used for selected cases in which general anaesthesia is contraindicated. CO_2 embolism is a potentially lethal complication of laparoscopic surgery that should be detected by careful intra operative monitoring. Gas embolism may occur as a result of trocar or needle penetration of a blood vessel or from gas embolism into venous channels cut during laparoscopic surgery.

In the period of pneumoperitoneum, the diaphragm is moved upwards and the abdominal portion of the chest wall is stiffened, leading in a decrease in the overall capacity of the lungs, a substantial decline in pulmonary conformity by up to 35-40% and a noticeable rise in the average strength of the respiratory system (Makinen *et al*., 1996; Pelosi *et al*., 1996; Rauh *et al*., 2001; Garcia-Perez *et al*., 2001).

The bile pigment bilirubin is a tetrapyrrole that is transported, conjugated, stored and excreted by the liver cells. It is derived from several sources, the majority of which are red cells destroyed by the reticuloendothelial system, either at the end of their natural life span or prematurely. To a lesser extent, bilirubin derives from myoglobin breakdown, the turnover of non-hemoglobin heme containing proteins in the liver, hemoglobin loss in the bone marrow during erythrocyte maturation and intra-medullary breakdown of newly developed erythrocytes. Measurements of serum bilirubin are helpful in separating diseases associated with unconjugated bilirubinaemia from those causing predominantly conjugated hyperbilirubinaemia but are of no value in differentiating jaundice resulting from hepatocellular disease from extra hepatic cholestasis. Serial documentations of serum bilirubin concentration provide a more accurate measure of the impairment of bilirubin excretion during the course of liver disease that can be gained by a clinical assessment of the degree of jaundice.

MATERIALS AND METHODS

The aim of this prospective study was to study the impact of laparoscopic procedures on the function of liver. All patients under study were selected for laparoscopic procedures with intake routine history, clinical assessment and evaluation in order to eliminate pre-existing liver disorder or generalized deficiency.

In all the patients selected for the study, the levels of Aspartate Amino transferase (AST or SGOT, normal range < 35 U L^{-1}), Alanine Aminotransferase (ALT or SGPT, normal range <40 U L^{-1}), Serum bilirubin (normal range <1 mg dL^{-1}) and Serum Alkaline Phosphatase (normal range 60-170 U L^{-1}) were measured pre-operatively once and then post-operatively on day 1 and 7. During the surgery, the Intra-Abdominal Pressure (IAP) was maintained at a range of 12-14 mm Hg. Serum bilirubin, AST, ALT and Serum alkaline phosphatase levels were measured by Erba XL system packs 360 automatic analyzer. Capable of accurate measurement.

RESULTS AND DISCUSSION

Figure 1 shows that of the 60 patients constituting the population of the people studied, the majority were female (55%) and 45% male patients.

In Fig. 2, the amount of serum bilirubin raise dramatically within 24-48 h of laproscopic surgery and decreased within one week.

In Fig. 3, after laparoscopic surgery the level of SGOT increased significantly within 24-48 h and declined in a week.

Figure 4 was indicated that almost double the pre-op values were found in post-op day 1 values in 20% cases in Sbilirubin values, 33.3% cases in SGPT values, 31.7% cases in SGOT values and 16.7% cases in S. Alkaline Phosphatase values.

Laparoscopic procedures has rapidly emerged as an established method for treatment of many common surgical diseases. Alterations in serum liver enzymes were reported in laparoscopic surgery rather than open surgery. Initial factor to consider here is CO_2 pneumoperitoneum (Tan *et al*., 2003). After the procedure, all the patients in our sample were subjected to CO_2 pneumoperitoneum and

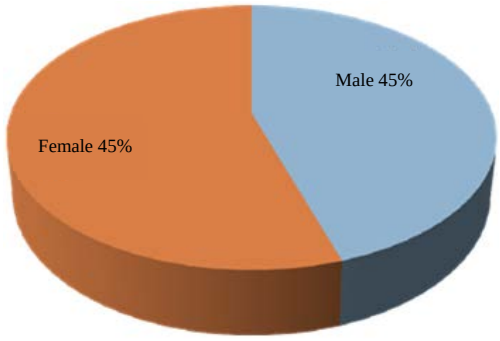

Fig. 1: Sex distribution of cases

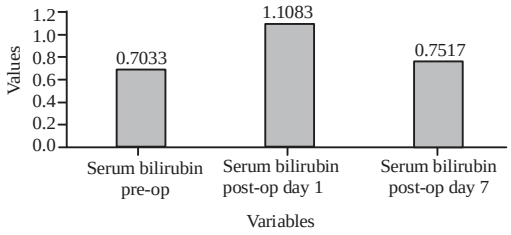

Fig. 2: Comparison of mean serum bilirubin value at different time interval

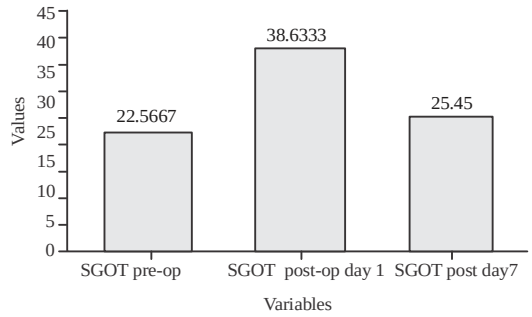

Fig. 3: Comparison of mean SGOT at different time interval

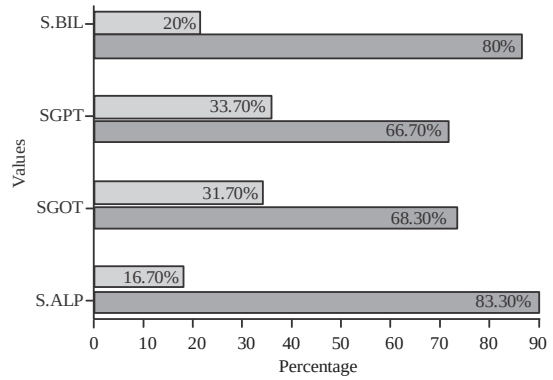

Fig. 4: Double change

demonstrated substantial improvements in the amount of post-operative serum liver enzymes. The observation is in line with other related studies (Sato *et al*., 2000; Takagi, 1998; Richter *et al*., 2001; Perner *et al*., 1999; Tunon *et al*., 1999; Schafer *et al*., 2001). However it remains to be explained why there is hepatic enzyme elevation in surgeries where the focus is far away from the liver. Another attributable cause may be hypercapnia seen in these procedures. In addition, to these findings, transient liver dysfunction was also found to occur in patients after some general anaesthesia (Scapa *et al*., 1998; Shimamoto *et al*., 1999; Zamparelii *et al*., 1999; Tanaka *et al*., 2000; Obata *et al*., 2000; Ichinose *et al*., 1999; Nishiyama *et al*., 1998; McEven *et al*., 2000; Darling *et al*., 2000; Feierman, 2000).

CONCLUSION

Results indicate something very important regarding laparoscopic procedures. As a matter of fact there are many types of laparoscopic processes and the study we concluded here that all forms of laparoscopic procedures can lead to transient up-regulation of liver enzyme elevation for which CO_2 pneumoperitoneum seemed to be the main causative factor. Though this change caused did not have any obvious clinical effect in patients with normal liver function, we suggest that laparoscopic surgery might not be the best option for patients with poor liver function.

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