

ORIGINAL RESEARCH

Serum Cortisol Level In Enhanced Recovery After Surgery (ERAS) Pathway And Conventional Postoperative Care In Patients Undergoing Laparoscopic Cholecystectomy

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ABSTRACT

Background: Enhanced Recovery After Surgery (ERAS) is an evidence based multimodal perioperative protocol focused on stress reduction of patients and the early return to normal work by introducing multiple measures such as preoperative patient counseling to reduce patient anxiety and stress , nutrition optimization, standardizing analgesia with restricted use of opioids, minimizing electrolyte and fluid imbalance, using lesser invasive surgical approaches and promoting early ambulation and feeding so that the patient recovers faster, experience less physiological stress, has a shorter hospital stay and have fewer complications. Present study is undertaken to compare the changes in serum cortisol level, a stress hormone, in patients undergoing elective laparoscopic cholecystectomy with ERAS pathway and Conventional postoperative care, not following ERAS pathway.

Methods: 50 patients were randomised into 2 groups. 25 patients were in ERAS (group 1) and 25 patients were in Non ERAS, conventional postoperative care group (group 2). Samples for serum cortisol level were collected 1 hour and 6 hour after surgery.

Results: Statistically significant reduction in serum cortisol level at 1 hour and 6 hour after surgery was observed in both ERAS pathway group ($p=0.001$) and conventional postoperative, non ERAS pathway, care group ($p=0.000$) but between the two groups the difference in reduction of serum cortisol level at 1 hour and 6 hour after surgery is not statistically significant. No statistically significant difference was found in serum cortisol level at 1 hour in both the groups ($p = 0.727$) and at 6 hour in both the groups ($p= 0.352$).

Conclusion:

This study could not find any statistically significant difference in postoperative serum cortisol level in ERAS pathway group and conventional postoperative, non ERAS pathway, care group to support the fact that ERAS pathway may result in less postoperative stress. This study however shows that by following ERAS protocol in laparoscopic cholecystectomy, probably, the length of postoperative hospital stay can be reduced.

Keywords: ERAS. Serum Cortisol. Post operative Stress. Length Of Postoperative Hospital Stay

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INTRODUCTION

Laparoscopic cholecystectomy is a surgical procedure which is minimally invasive and is done for the removal of a diseased gallbladder. Laparoscopic cholecystectomy has largely replaced the open cholecystectomy since early 1990s. Laparoscopic cholecystectomy is currently the gold standard for the treatment of an array of benign gall bladder diseases such as acute or chronic cholecystitis, symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, gallbladder polyps etc.

In 1994, the concept of “Fast-track surgery” was described for the first time in the literature [1] and in the late nineties Henrik Kehlet and coworkers in Denmark presented a multimodal interventional approach in colorectal surgery aiming to reduce surgical stress and enhance postoperative recovery [2-4]. The foundation of the Enhanced Recovery After Surgery (ERAS) collaboration came to exist in 2000 among surgeons and anaesthetists of Europe, which in turn led to the formation of the ERAS Society in 2010.

Enhanced recovery after surgery (ERAS) is an initiative to improve patient surgical outcomes, and decrease lengths of hospital stay by decreasing the body's stress response to surgery. Enhanced recovery after surgery (ERAS) protocols consists of combination of various methods of perioperative patient care that integrates evidence-based interventions that reduce surgical stress, maintain postoperative physiological function, and enhance recovery in patients undergoing major surgery.[5-7]

Surgical intervention induces stress response that varies according to the nature and degree of tissue trauma. The effects of cortisol in the setting of surgical stress are complex. Various studies have been done to measure cortisol in the perioperative setting as a marker of surgical stress response [8-10]. Several studies are also done to compare stress response in laparoscopic vs open cholecystectomy [11-16]. Study to assess the stress response following ERAS protocol in laparoscopic cholecystectomy is not reported till date.

The aim of this study is to compare serum cortisol level postoperatively between Enhanced Recovery After Surgery (ERAS) Pathway and Conventional postoperative, not following the ERAS pathway, Care in Patients Undergoing Laparoscopic Cholecystectomy.

MATERIALS AND METHODS

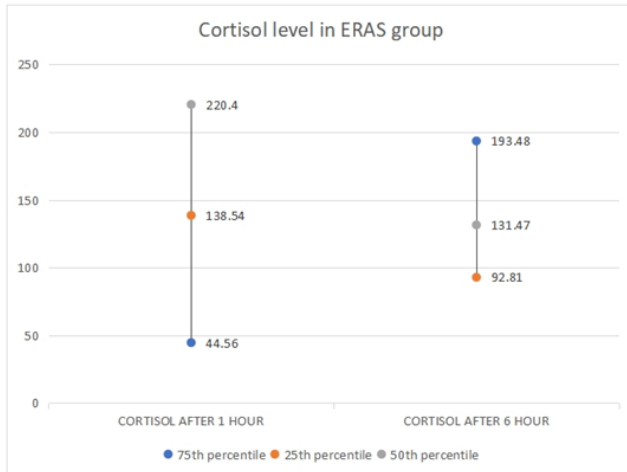
This study was a single centre based, prospective, analytical study conducted for a period of one year from June 2021 to May 2022, in department of general surgery, Jorhat Medical College And Hospital. The study was started after taking clearance from Institutional Ethics Committee. 50 patients presenting to the Department Of General Surgery with benign gall bladder diseases planned for laparoscopic cholecystectomy were included. The following patients were excluded from the study: age < 18 years, pregnant patients in first trimester, ASA grade 3 and above, acute cholecystitis presenting > 72 hour of onset of acute attack, refusal to participate in the study. Three teams were defined for the study. First team consisted of clinicians not related to operating team, allocated patients by randomisation in which each patient was allowed to independently choose a folded sheet where Group 1 or Group 2 was written. Group 1 was given ERAS pathway care and Group 2 was given conventional postoperative, non ERAS pathway, care. Second team consisted of surgical team. Third team collected data and was unaware of group allocation. Patients in ERAS pathway care (Group 1) were given preoperative education and detailed counselling and 250 ml oral carbohydrate loading dose 5-6 hour before surgery (diabetic patients were given 250

ml plain water) and solid diet allowed 10 hours before operation, mechanical bowel preparation was not done. Intraoperatively routine standard institutional anaesthesia protocol were followed, naso-gastric tube, intra-abdominal drain and foley's catheter were avoided in the ERAS pathway or minimally used (intraabdominal drain used in 9 patients, foley's catheter used in 1 patient out of 25 patients). Opioids were avoided as postoperative analgesic. IV antibiotic (injection ceftriaxone 1 gram IV twice daily After Negative Skin Test, infusion metronidazole 100 ml IV thrice daily), injection pantoprazole sodium 40mg IV once daily, injection diclofenac sodium 75mg IM twice daily or paracetamol infusion 100ml IV thrice daily as analgesic, Inj Pentazocin-Promethazine (1cc:1cc) IM at 10 pm on day of surgery and 2.5L/day IV crystalloid (maintainance fluid 25-30 ml/kg/day) were given postoperatively. Blood sample for serum cortisol level were collected at 1 hour and 6 hour after surgery. Early mobilisation and liquid diet were started on postoperative day 0 and solid diet started on postoperative day 1. Sips of water was allowed off table after recovery from anaesthesia and liquid diet was started immediately after appearance of bowel sound. Removal of drain and foley's catheter, if applied, was done on postoperative day 1. Patients were discharged when they tolerated pain, tolerated liquid and solid diet and mobilised with minimal discomfort and minimal support, irrespective of status of passage of flatus and stool. Patients in conventional post operative, non ERAS pathway, care (Group 2) were kept Nil Per Orally 10 hours prior to operation, mechanical bowel preparation was done. Intra operatively routine standard institutional anaesthesia protocol were followed and ryles tube, intra-abdominal drain and foley's catheter were used at operating surgeon's discretion (intraabdominal drain used in 20 patients, foley's catheter used in 8 patients out of 25 patients). IV antibiotic (injection ceftriaxone 1gram IV twice daily After Negative Skin Test, infusion metronidazole 100 ml IV thrice daily), injection pantoprazole sodium 40mg IV once daily , injection diclofenac sodium 75mg IM twice daily or injection tramadol hydrochloride 50mg IM twice daily as analgesic, Injection Ondansetron 4mg IV once daily and IV fluid (at surgeons discretion) were given postoperatively. Blood sample for serum cortisol level were collected at 1 hour and 6 hour after surgery. Mobilisation was done and liquid diet were given on post operative day 1 early morning and solid diet was started on post operative day 1 evening hours. Drain and foley's catheter, if used, were removed on or after post operative day 2 according to surgeon's discretion. Patients were discharged if they had no to minimal pain, tolerated liquid and solid diet, mobilised without any complaint and minimal support and after passage of flatus and stool. Patients in both the groups were followed up after 1 and 3 week of surgery for any surgical site infection, complications requiring readmission or any other complaint.

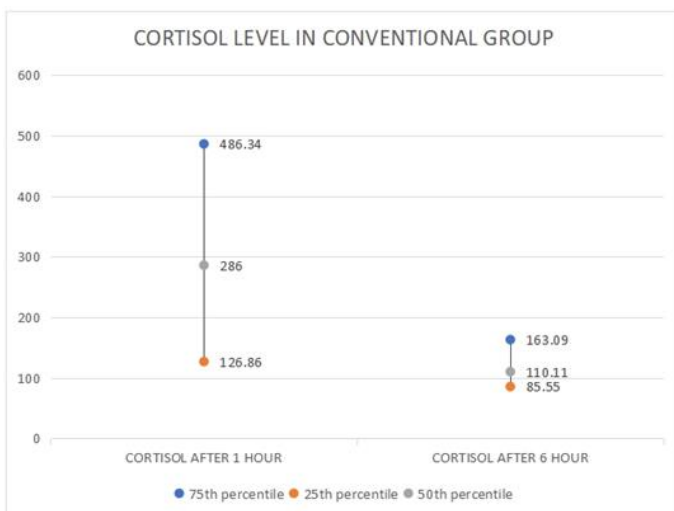
Statistical analysis was done using IBM SPSS Statistic version 26.0. Any p-value < 0.05 was considered to be statistically significant. Parametric data were expressed using mean and standard deviation. For related samples with 2 variables Wilcoxon Singed-rank test was used.

RESULT

The study was done on 50 patients.

**Figure 1**

In ERAS pathway group, the difference in serum cortisol level at 1 hour and 6 hour after surgery was found to be significant ($p = 0.001$). Median serum cortisol value at 1 hour was 138.54 ng/ml and at 6 hour was 131.47 ng/ml.

**Figure 2**

In Conventional Postoperative, non ERAS pathway, care group, the difference in serum cortisol level at 1 hour and 6 hour after surgery was found to be significant ($p = 0.000$). Median serum cortisol value at 1 hour was 286.00 ng/ml and at 6 hour was 110.11 ng/ml.

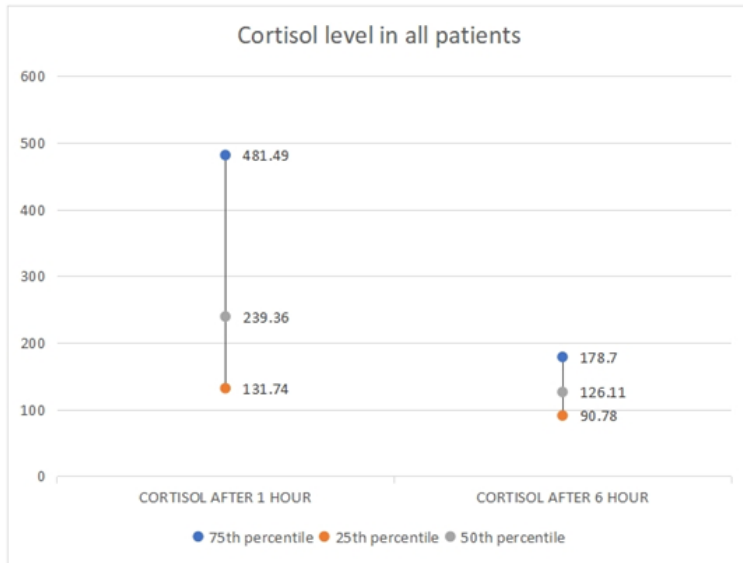


Figure 3

No statistically significant difference was found in serum cortisol level at 1 hour in both the groups ($p = 0.727$) and at 6 hour in both the groups ($p = 0.352$).

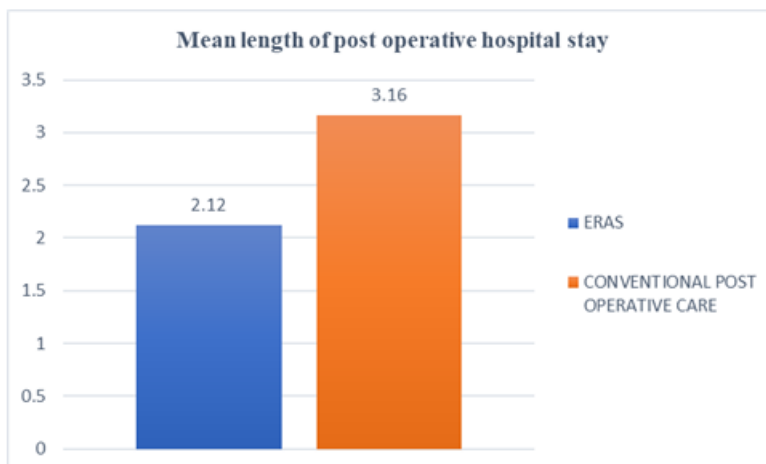


Figure 4

The mean length of postoperative hospital stay of the patients in the study was 2.74 ± 0.88 days. The mean length of postoperative hospital stay in the ERAS pathway group was 2.12 ± 0.44 days and mean length of postoperative hospital stay in Conventional Postoperative, non ERAS pathway, care group was 3.36 ± 0.76 days. There was significant difference in the mean length of postoperative hospital stay between the two groups ($p < 0.001$).

DISCUSSION

This study finds that at 1 hour after Laparoscopic cholecystectomy, the rise in the serum cortisol level reached higher in non ERAS pathway in isolated cases, however, which came down to the similar levels in both the groups at 6 hour.

Statistically significant difference in reduction of serum cortisol level was noted within each group at 1 hour and 6 hour after surgery. But no statistically significant difference was noted

in the serum cortisol level between the two groups. This study could not find any difference in the value of serum cortisol level postoperatively between ERAS pathway group and conventional postoperative, non ERAS pathway, care group.

One significant finding of course was found in this study that the postoperative length of hospital stay showed statistically significant shorter duration in patients getting ERAS pathway care as compared to conventional postoperative, non ERAS pathway, care.

A. J. Karayiannakis Et al in their study found mean serum cortisol value of 28 µg /dl at 4 hour after surgery and 22 µg /dl at 8 hour after surgery in patients undergoing laparoscopic cholecystectomy whereas in this study mean serum cortisol value at 1 hour after surgery was 29.65 µg/dl in ERAS group and 31.85 µg/dl conventional postoperative care group. Mean serum cortisol value at 6 hour was 17.82 µg/dl in ERAS group and 13.1 µg/dl in conventional postoperative care group. Mahdi Tavalae et al in their study showed significant difference, $p < 0.001$ (34.64 ± 15.28 vs 23.52 ± 10.94), in serum cortisol level postoperatively in patients of laparoscopic cholecystectomy without carbohydrate loading vs with carbohydrate loading.

Michal Pędziwiatr et al in 2015 did a randomised control trial in 40 patients that failed to show any difference in effect of oral preoperative carbohydrate loading vs placebo on serum cortisol level in patients undergoing laparoscopic cholecystectomy. H. Glerup et al in their study on 24 patients, showed that neither fasting nor amino acid-stimulated cortisol concentration increased after laparoscopic cholecystectomy, but the fasting cortisol value increased by 75% ($p < 0.05$) after open cholecystectomy.

CONCLUSION

The study of course found small evidence of rise of serum cortisol level in few individuals, which was higher in the non ERAS pathway group. But when analyzed it was found to be statistically not significant. The return of the serum cortisol level at six hour after surgery were equal in all patients irrespective of the postoperative care pathways. This study could not find any difference in postoperative serum cortisol level in ERAS group and conventional postoperative care group to support the fact that ERAS pathway may result in less postoperative stress. The difference in 1 hour and 6 hour serum cortisol value shows stress level falls at 6 hour postoperatively in both the groups but between the group the difference is statistically not significant. Several studies showed that stress in terms of serum cortisol level is reduced in laparoscopic cholecystectomy as compared to open cholecystectomy. Since laparoscopic cholecystectomy is a minimally invasive procedure, the stress response may have not been significantly different in the two groups taken in thus study. Further studies needs to be done with bigger sample size and other stress marker such as epinephrine and norepinephrine with proper adherence to ERAS protocols. This study shows that by following ERAS protocol in laparoscopic cholecystectomy, probably, the length of postoperative hospital stay can be reduced which was the primary aim of initiating the ERAS protocol.

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