



A PROSPECTIVE STUDY OF INFLAMMATORY RESPONSE FOLLOWING LAPAROSCOPIC AND OPEN CHOLECYSTECTOMY

Dr Mrityunjai kumar

Associate Professor, Department of Surgery, Jawaharlal Nehru Medical College & Hospital, Bhagalpur, Bihar 812001

Dr Ankur*

Tutor, Department of Pathology, Jawaharlal Nehru Medical College & Hospital, Bhagalpur, Bihar 812001 *Corresponding Author

ABSTRACT

Background: Surgical trauma induces immediate neuroendocrine, metabolic, and immunologic responses in the body, aimed at controlling tissue damage, combatting infection, and promoting processes to repair and restore damaged tissues through inflammatory and anti-inflammatory factors.

Aim: The aim of the study was to evaluate the inflammatory response to surgical trauma open and laparoscopic cholecystectomy.

Materials and Methods: The study was done from June 2017 to May 2018 in department of general surgery Jawaharlal Nehru medical college, Bhagalpur, Bihar. The study included 60 cases, divided into 2 groups. Group 1- 30 laparoscopic and Group 2- 30 open cholecystectomies. Blood samples were collected 2 hours preoperatively and at 4 and 24 hours post surgery. Blood was evaluated for the levels of interleukin-1 β , interleukin-10, and tumor necrosis factor-alpha. Two groups were compared.

Results: The levels of interleukin-1 β , interleukin-10, and tumor necrosis factor-alpha was significantly more in the open cholecystectomy group at 4 hours. At the 24th postoperative hour, the levels of all 3 cytokines were also higher in the open cholecystectomy group.

Conclusion: The result of the present study confirms that open cholecystectomy causes more significant stress response in the form of raised ILs and TNF levels as compared to laparoscopic cholecystectomy at 4 and 24 hours after the surgery. Hence the post-operative pain was lesser in laparoscopic cholecystectomy group patients.

KEYWORDS : Laparoscopic Cholecystectomy, Open cholecystectomy, inflammatory response, interleukin.

Introduction:

Gallstone disease is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors like age, gender, and ethnic background. The prevalence of gallstone varies widely from place to place. Laparoscopic cholecystectomy is an operative procedure that has spread widely and rapidly through the surgical community. In large part this has been driven by patient demand. Several recent studies have demonstrated the safety of this procedure and it is now believed by many to be the treatment of choice for symptomatic cholelithiasis. Over the past 30 years, a major challenge in every surgical field has been how to achieve a balance between minimizing surgical trauma and ensuring operative feasibility. Minimally invasive surgery (MIS) was one of the most important surgical developments in the 20th century. Laparoscopic surgery broke paradigms and revolutionized the world of surgery, becoming the gold standard for the surgical treatment of digestive system diseases. Comparisons of open abdominal surgery procedures and MIS techniques have revealed that laparoscopic surgeries are generally associated with less trauma, less pain, shorter hospital stays, better postoperative recovery, and better aesthetic results for patients. For these reasons, there has been growing interest in this procedure, as evidenced by the increasing publication of articles related to minimally invasive laparoscopy. Laparoscopic cholecystectomy offers advantages of decreased post operative pain, decreased hospital stay and an earlier return to normal activity. Improved pulmonary functions in immediate postoperative period with laparoscopic cholecystectomy compared to conventional cholecystectomy have been well demonstrated.

Inflammatory response following surgical trauma has long been a matter of study. Results, however, have been varied. We sought to assess changes in the levels of proinflammatory and anti-inflammatory cytokines in patients undergoing laparoscopic and open cholecystectomy and their impact on the clinical outcome of patients concerning the postoperative pain score.

In our study, the systemic stress responses after laparoscopic and conventional open cholecystectomy were compared as a non-randomized prospective trial. The hypothesis is that laparoscopic cholecystectomy causes significantly less stress response as compared to open cholecystectomy.

Materials and methods:

The study was done from June 2017 to May 2018 in department of general surgery Jawaharlal Nehru medical college, Bhagalpur, Bihar.

The study included 60 cases, divided into 2 groups. Group 1- 30 laparoscopic and Group 2- 30 open cholecystectomies.

Inclusion criteria:

Patients with symptomatic cholelithiasis, Age: 20 to 60 years. Both sex

Exclusion Criteria

Uncomplicated gall stone disease (empyema, associated CBD stones, Mirizzi's syndrome, biliary fistulas, gall bladder mass were not included).

Patients with illness like hypertension, diabetes, pregnancy, chronic pulmonary disease, cardiac disease, and other associated abdominal disease.

The intensity of pain was assessed with the help of a visual rating scale (VRS). The amount of pain described by the patient as-

| Intensity of pain | Score |
|-------------------|-------|
| No Pain | 0 |
| Mild Pain | 1 |
| Moderate Pain | 2 |
| Severe Pain | 3 |
| Very Severe Pain | 4 |

The enteral and parenteral analgesics were provided to the patient accordingly.

Blood samples were collected 2 hours preoperatively and at 4 and 24 hours post surgery. Blood was evaluated for the levels of interleukin-1 β , interleukin-10, and tumor necrosis factor-alpha in both group patients. Plasma levels of TNF- α , IL-1 β and IL-10 were quantified by ELISA.

Results:

Changes in the level of serum IL-1 β levels-

| | Pre-op | 4hours post-op | 24 hours post-op |
|------------------------------|------------------------|------------------------|-------------------------|
| Open Cholecystectomy | 14.02 \pm 7.43 pg/ml | 21.40 \pm 9.6 pg/ml | 27.40 \pm 10.11 pg/ml |
| Laparoscopic cholecystectomy | 9.8 \pm 6.7 pg/ml | 11.60 \pm 5.16 pg/ml | 16.33 \pm 8.54 pg/ml |

IL-1 β levels increased from 14.02 \pm 7.43 pg/ml before surgery to 21.40 \pm 9.6 pg/ml after 4 hours and 27.40 \pm 10.11 pg/ml after 24 hours of surgery in the Open Cholecystectomy group.

In the Laparoscopic cholecystectomy group, mean serum IL-1 β levels increased from 9.8 \pm 6.7 pg/ml before surgery to 11.60 \pm 5.16 pg/ml after 4 hours and 16.33 \pm 8.54 pg/ml after 24 hours of surgery

Changes in the level of serum IL-10 levels-

| | Pre-op | 4hours post-op | 24 hours post-op |
|------------------------------|------------------------|------------------------|------------------------|
| Open Cholecystectomy | 28.11 \pm 5.22 pg/mL | 36.24 \pm 5.32 pg/mL | 54.98 \pm 6.37 pg/mL |
| Laparoscopic cholecystectomy | 23.62 \pm 4.43 pg/mL | 30.24 \pm 5.36 pg/mL | 44.74 \pm 7.32 pg/mL |

In the Open Cholecystectomy group IL-10 levels increased from 28.11 \pm 5.22 pg/mL before surgery to 36.24 \pm 5.32 pg/mL after 4 hours and 54.98 \pm 6.37 pg/mL after 24 hours of surgery.

In the Laparoscopic cholecystectomy group, mean serum IL-10 levels increased from 23.62 \pm 4.43 pg/mL before surgery to 30.24 \pm 5.36 pg/mL after 4 hours and 44.74 \pm 7.32 pg/mL after 24 hours of surgery.

Changes in the level of serum TNF- α levels-

| | Pre-op | 4hours post-op | 24 hours post-op |
|------------------------------|------------------------|------------------------|------------------------|
| Open Cholecystectomy | 42.71 \pm 5.54 pg/mL | 59.02 \pm 6.0 pg/mL | 87.86 \pm 6.70 pg/mL |
| Laparoscopic cholecystectomy | 41.74 \pm 6.33 pg/mL | 50.39 \pm 6.15 pg/mL | 66.22 \pm 5.17 pg/mL |

In the Open Cholecystectomy group TNF- α levels increased from 42.71 \pm 5.54 pg/mL before surgery to 59.02 \pm 6.0 pg/mL after 4 hours and 87.86 \pm 6.70 pg/mL after 24 hours of surgery.

In the Laparoscopic cholecystectomy group, mean serum TNF- α levels increased from 41.74 \pm 6.33 pg/mL before surgery to 50.39 \pm 6.15 pg/mL after 4 hours and 66.22 \pm 5.17 pg/mL after 24 hours of surgery

The levels of interleukin-1 β , interleukin-10, and tumor necrosis factor-alpha was significantly more in the open cholecystectomy group at 4 hours and at 24th postoperative hour.

Post-operative pain score-

| | 4hours post-op (Average) | 24 hours post-op (Average) |
|------------------------------|--------------------------|----------------------------|
| Open Cholecystectomy | 3.2 | 2.3 |
| Laparoscopic cholecystectomy | 2.1 | 1.6 |

In the Open Cholecystectomy group pain score was 3.2(severe) after 4 hours and 2.3(moderate) after 24 hours of surgery.

In the Laparoscopic cholecystectomy group pain score was 2.1(moderate) after 4 hours and 1.6(mild) after 24 hours of surgery.

Discussion:

Minimally invasive surgery has presented an alternative approach to diminishing metabolic responses by avoidance of a substantial abdominal incision, reduced tissue manipulation and faster patient recovery. Tissue injury triggers a systemic inflammatory response, which is influenced by several factors, such as tissue injury volume and trauma intensity. This has already been described when comparing open cholecystectomy with laparoscopic one, the latter with an attenuated inflammatory response, probably due to less associated tissue damage. Tissue injury from surgical trauma activates different cellular elements responsible for the immune response, like macrophages, neutrophils and natural killer (NK). Once activated, these cells initiate the production of cytokines, such as interleukins, which directly participates in the systemic inflammatory response. Riese et al. demonstrated that during abdominal surgeries the peritoneum reacts rapidly increasing the production of interleukins. It has been clearly demonstrated in several studies that ILs can be used as an inflammatory marker, since its levels are elevated early in the face of tissue damage. In an animal model study, Douglas et al. and later on, Bessler and associates have observed greater elevations in ILs after laparoscopic colectomy in comparison to open colectomy. However, higher percentage increases in TNF levels in the OC group on the 4th postoperative day suggest that LC and OC are equally stressful intraoperatively but subsist less in the postoperative period.

Conclusion:

The result of the present study confirms that open cholecystectomy causes more significant stress response in the form of raised ILs and

TNF levels as compared to laparoscopic cholecystectomy at 4 and 24 hours after the surgery. Hence the post-operative pain was lesser in laparoscopic cholecystectomy group patients.

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