COMPARISON OF FREQUENCY OF WOUND INFECTION: OPEN VS LAPAROSCOPIC CHOLECYSTECTOMY

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Background: The objective of this quasi experimental study was to compare the frequency of wound infection between open cholecystectomy (OC) and laparoscopic cholecystectomy (LC) conducted in Surgical Unit IV, Jinnah Hospital Lahore from June 2005 to January 2006. **Methods:** 100 patients undergoing elective cholecystectomy for symptomatic gallstones were studied. The patients were allocated in the two groups of 50 each by simple random technique. Group-I underwent OC and Group-II underwent LC. The patients were then followed up for four weeks to pick up signs of wound infection. In case of infection, the degree of infection and the remedial measures done were documented and the results analysed. **Results:** In LC group there was only one case of Class- II wound infection i.e. 2%. In case of OC there were three cases of wound infection i.e. 6%. Out of these, two were of Class-III and one of Class-II. **Conclusion:** While there was no wound infection in cases of chronic Cholecystitis in both groups, the frequency of wound infection was three times as common in OC as compared to LC in Acute Cholecystitis / Empyema.

Key words: Open cholecystectomy (OC), Laparoscopic Cholecystectomy (LC), Wound infection.

INTRODUCTION

Cholecystectomy is one of the most frequently performed operations[1]. For over a hundred years open cholecystectomy (OC) established itself as gold standard for symptomatic cholelithiasis[2]. However in the last two decades laparoscopic cholecystectomy (LC) has challenged its place. Although both of these procedures are fairly well tolerated, wound infection remains the commonest postoperative complication[1, 2.] which not only prolongs the hospital stay of the patient, increases cost of treatment but can also lead to septicemia and long term complications like incisional hernia.[1-4] Therefore in order to decrease the morbidity and mortality of the postoperative patients new surgical innovations must be explored and developed.

The effect of laparoscopic surgery on wound infection has not been given much attention in the surgical literature even though it may have the potential to decrease the frequency of infectious complications [6, 7] and modify their characteristics [8] Certain aspects of Laparoscopic Surgery that may reduce the occurrence of surgical infections are: a minimal impact on immune system, minimal exposure to external environment, carbon dioxide penumoperitoneum, better visulasation of tissues for dissection and hemostasis. The reusable LC instruments on the other hand increase the risk of infection.

Thus the aim of this project was to study the impact of all these factors in causing infectious complications by comparing the frequency of wound infection between OC and LC and in the light of our results suggest measures to improve this aspect of patient care.

MATERIAL AND METHODS

This study was conducted in Surgical Unit IV, Jinnah Hospital Lahore from June 2005 to October 2005. The patients suffering from symptomatic gallstones with age upto sixty years were admitted in the ward both from emergency and out patient department. The investigations done to establish the diagnosis were; abdominal ultrasound, serum bilirubin, alklaine phosphatase, alanine aminotransferase (ALT), aspartate aminotransferase (AST). Once diagnosed, the patients were prepared for surgery if they were fit for general anesthesia. 100 patients undergoing elective cholecystectomy were studied. Out of these fifty cases were of open and fifty cases were of LC.

The patient's profile was entered in the Proforma and they were randomly categorized into those undergoing open or laparoscopic Cholecystectomy by using table of random numbers. Patients found suffering from jaundice, pregnancy, coagulopathy, choledocholithiasis, portal hypertension, diabetes mellitus or any other immunosuppressive disorder were excluded from the study. The patients allocated to both groups had more or less similar clinical features.

All operations were performed by consultant surgeons or senior residents under their direct supervision, all having sufficient skill and experience in both types of procedures.

Postoperatively the patients were followed for upto four weeks and complications specifically Wound infection, Jaundice, Biloma formation, Intra-abdominal abscess and Port site hernia were looked for.

The classification of degree of wound infection and its subsequent management[16] was done as shown in table 1.

In case of infection, the degree of infection and its treatment done was documented. The two groups were then compared and studied for the factors responsible for causing wound infection and the results compiled.

All the patients undergoing cholecystectomy were given a prophylactic dose of third generation cephalosporin at the time of induction of anesthesia and further two doses by I/V route postoperatively. Same policy was adopted for Class II infections but for Class III infections pus was sent for culture and sensitivity and the antibiotics were started empirically and then continued for 5 – 7 days per orally.

RESULTS

Out of a total of 100 patients studied, 50 underwent OC and 50 LC. Both groups were comparable in age and sex distribution as well as percentage of difficult cases like acute cholecytitis, empyema and mucocele. The age of the patients ranged from 21-80 years with the maximum number in the 4th decade i.e. 30 patients. (Table 2). The mean age for LC was 44.68±15.16 years and OC was 42.34±13.29 years.
The male to female ratio for LC was 1:5.2 and for OC 1:4.

The commonest presentation was chronic cholecystitis in both groups. (Table 3), i.e. 25 patients (50%) in laparoscopic and 22 (44%) patients in OC group.

The hospital stay for LC was 1- 3days and for OC 4-7days.

While there was no wound infection in any case of chronic cholecystitis i.e. zero out of 54case, all 4 instances of wound infection in this series occured in acute cholecystitis / empyema. (4 out of 46 such cases i.e. 8.7%)

In case of LC group there was only one of Class-II wound infection in the infra umbilical incision of a 38years female suffering from empyema (Table 4). The wound infection resolved on dressings on OPD basis. In case of OC there were 3 cases of wound infection i.e. 6%. Out of these, one was of class-II and two of Class –III. (Table 4). Both Class-II infections resolved on wound dressings on OPD basis while class III wounds required removal of stitches, drainage of pus and oral antibiotics. In one case wound debridement was required as well.
The patients characteristics are shown in Table 4
There was no case of extra hepatic biliary injury and no mortality in this series.

The P value was statistically insignificant (P value = 0.414)

Table-1: Classification of wound infection and treatment

Class-I	No infection	No Treatment
Class-II	Skin and Superficial subcutaneous tissue infection only	Removal of stitches / wound dressing
Class-III	Deep subcutaneous tissue infection requiring antibiotics and prolonged hospital stay	Removal of stitches / drainage of pus / oral antibiotics / C&S of discharge.
Class-IV	Widespread or systemic infection.	Hospitalization / IV antibiotics

Table- 2: Age distributation of LC & OC patients.

Age in yrs	Total No of Patients n=100	OC n=50	LC n=50
21-30	20	12 (6%)	08(4%)
31-40	30	14(7%)	16(8%)
41-50	20	12(6%)	08(4%)
51-60	12	05(2.5%)	07(3.5%)
61-70	16	07(3.5%)	09(4.5%)
71-80	02	00(0%)	02(1%)

Table 3: Clinical Presentation

Clinical Presentation	Laparoscopic Cholecystectomy n=50	Open Cholecystectomy n=50
Chronic Cholecystitis	25 (50%)	22 (44%)
Acute Cholecystitis	15 (30%)	18(36%)
Empyema	06 (12%)	07(14%)
Mucocele	04(08%)	03(06%)

Table-4: Characteristics of Patients developing wound infection in OC & LC group

S.No	Group	Sex	Age Yrs	Clinical presentation	Class of wound infections
1	LC	F	38	Acute Cholecystitis	II
2	OC	F	50	Empyema	III
3	OC	M	40	Acute Cholecystitis	II
4	OC	F	38	Empyema	II

DISCUSSION

Certain aspects of laparoscopic surgery that may influence surgical infection are;

- Impact on the immune system

- Influence of pneumoperitoneum and gas on peritoneal inflammatory response
- Use of antibiotic prophylaxis
- Pneumoperitoneum as a catalyst of infection.
- Technical aspects related to sterilization of instruments

Surgical intervention triggers a series of alterations in the immune system and therefore in the inflammatory response.[5] Any immune suppression occurring after trauma is related to an increase in the incidence of septic complications.[5] It is now broadly accepted that the immune system is better preserved following laparoscopic than open surgery; this is demonstrated by the diminished release of various markers including Interleukin (IL) 6 and C-reactive protein (CRP). This decreased immune response results from a significantly smaller tissue injury.[6] Recent studies have analyzed this topic thoroughly,[7-9] describing the effect that laparoscopic surgery has on different components of the immune system, such as T-cell lymphocytes and delayed hypersensitivity[7], mononuclear phagocytic neutrophils[10], polymorphonuclear elastase[11] and anion superoxide[12]. All exhibit greater alterations following open surgery. Apart from the above, it is also important to analyse the peritoneal response to infection because surgical infection initially develops in the peritoneal cavity[9].

Pneumoperitoneum directly affects the peritoneal defence system. Iwanaka etal[13] Observed increased number and greater viability of peritoneal macrophages in carbon dioxide penumoperitoneum as opposed to conventional open surgery. They also found that the amount of cytokines and nitrous oxide released was less in the laparoscopy group[14], interpreting their results to be a consequence of greater cellular stress during open surgery. Watson etal[15] evaluated the effect of different factors in ambient air on inflammatory response during surgery. They observed a decrease in phagocyte activity with open surgery in comparison to laparoscopy. Thus the peritoneal cell mechanisms display better preservation during laparoscopic than open surgery. This preservation of immune system is a major cause for a lower frequency of wound infection.

The other possible factors responsible for the decreased frequency of infectious complications in LC group are minimal exposure to external environment, greater precision in tissue handling and dissection as well as more meticulous hemostasis due to better visualization of structures as compared to open surgery.

In our study in which the two groups i.e. LC and OC were almost similar in their biological characteristics (Table 4) yet only one patient (2%) in the laparoscopic group developed wound infection while in OC group three patients (6%) developed infectious complications. Out of these, two cases had a deep-seated infection requiring prolongation of treatment as well as increasing the hospital stay. An analysis of different clinical studies has shown a similar low occurrence of infectious complications in laparoscopic procedures as compared to open surgery. In 1518 patients undergoing LC the frequency of wound infection was 1.1% and there were only two intraabdominal abscesses. (0.1%)[16]. Gold-Deutch et al [17] studied the incidence of septic complications in a series of 247 LCs. They obtained samples of bile for micro-biological analysis and in 13% of cases cultures were positive, yet only two patients developed umbilical port infections (0.8%). These results differed from those observed during OC, in which the frequency of wound infection was between 2 and 7%. [18]

In the present study infection was limited to the cases of empyema or acute cholecystitis, occurring in the infra umbilical incision. This could be most probably due to the contamination of wound from spillage of gall bladder contents or excessive tissue trauma incurred during gall bladder extraction. Therefore to decrease the occurrence of wound infection in LC gallbladder should be extracted in a pouch and irrigation of wound done by normal saline. Excessive manipulation at the infaraumblical port during gallbladder extraction should be avoided by enlarging the incision to deliver edematous / thick walled gall bladder.

Antibiotic prophylaxis is generally well established in clinical practice. [19] However the low occurrence of abdominal wall infection after laparoscopic surgery suggests that its role in such procedures needs to be re-evaluated. Frantzides and Sykes [20] compared 164 patients treated laparoscopeically, who received preoperative antibiotic prophylaxis, with 78 patients who were not administered antibiotics; the differences in infection rate were not significant (nine of 164 versus none of 78 respectively). Antibiotic prophylaxis can therefore be omitted, in cases of chronic cholecytitis.

Knowledge about how infection can be transmitted by way of instruments is an important factor in its prevention. For open surgery, instruments are easily sterilized by conventional methods (gas or autoclave). However, for laparoscopic work the kit is mechanically more complex and so its complete sterilization is difficult; disposable instruments are therefore preferred. Nevertheless, because of cost, reusable instruments are still in use. Fortunately, the incidence of postoperative infection despite repetitive use remains quite low. Several studies have demonstrated that, despite the difficulty in cleaning, such equipment is infection proof[21-23]. This is not,

however, an argument for reuse, since solid residue exists in higher quantity following sterilization of instruments used for laparoscopic work than open surgery. It is therefore suggested that the maintenance of laparoscopic instruments should be governed by the same guidelines as those used in open surgery.

CONCLUSION

Because of low frequency of infection in cases of chronic cholelithiasis prophylactic antibiotic use should be reviewed.

The occurrence of infection in LC group was limited only to the cases of Empyema and acute cholecytitis. In such cases the gall bladder should be extracted in a pouch and irrigation of wound done by normal saline.

Excessive manipulation at the infra umbilical port during gall bladder extraction should be avoided by enlarging the incision to deliver edematous / thick walled gall bladder.

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