

Prevalence of postoperative wound infection and its co relation with ASA score, duration of surgery and presence of organisms on bile culture in patients undergoing cholecystectomy; a hospital based study from a tertiary care hospital in Kashmir.

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Abstract:

Introduction and Background: Infection of the incised skin or soft tissue is a common but potentially avoidable complication of surgical procedures. Some bacterial contamination of surgical site infection is inevitable, from patients own flora or from the environment. Pre operative risk score based on presence of co-morbidities has been devised by American Society of Anaesthesiologists (ASA). Post operative wound infection has an enormous impact on patient's quality of life and contributes substantially to the financial cost of patient care.

Objective: To find out the prevalence of wound infection, its correlation with ASA score, duration of procedure and positive bile culture and also to find out the type of organisms commonly found in the bile aspirated from gall bladder in patients subjected to cholecystectomy in a tertiary care hospital in Kashmir.

Materials and Methods: After an institutional approval, the study was conducted by the Department of Pharmacology; Government Medical College Srinagar in collaboration with the Department of Surgery, SMHS Hospital (Associated hospital of Government Medical College, Srinagar). Patients with USG diagnosed cholelithiasis attending the surgical OPD of the SMHS hospital, planned for elective cholecystectomy were enlisted and those with no known drug allergy were eligible.

Results: Out of 200 patients studied, the number of females was twice the number of males with the mean age of study population being 41.4 ± 9.4 years. 66% of patients belonged to ASA score 1 and rest to ASA score 2. The prevalence of post operative wound infection amongst the study population was 18.5% with a higher rate amongst those belonging to ASA score 2 as compared to those belonging to score 1. Amongst the study population, 99% showed negative bile culture, in 0.5% aspiration was not done and only 9.5% of patients showed the growth of one or the other organisms that included Klebsiella and E. Coli (31.5% each), Pseudomonas and Non haemolytic streptococcus (10.5% each) and Citrobacter (16%). As such no co relation was found to exist between positive bile culture and duration of surgery with the subsequent development of post operative wound infection.

Conclusion: The overall prevalence of wound infection amongst the study group was 18.5% with a higher rate amongst those belonging to ASA score 2 as compared to those belonging to score 1 with statistically no significant association between the positive bile culture and duration of surgery with the development of postoperative wound infection.

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Key Word:

ASA Score, Cholecystectomy, Wound Infection

Introduction:

A United Kingdom survey of 157 hospitals in 1993-94 found that prevalence of wound infection was 2.6% amongst 12947 patients in eight surgical specialities varying from 15% in neurosurgeries to 6.2% in vascular surgeries.¹ Surgical site infections are common complications of care, occurring in 2-5% after clean extra abdominal surgeries and in upto 20% of patients undergoing intrabdominal procedures.² Studies following patients in post discharge period have reported even higher rates of post operative wound infections.³ Post operative wound infections have an enormous impact on patients quality of life and contributes substantially to the financial cost of patient care. The potential consequences for patient range from increased pain and care of an open wound sepsis and even death.⁴ Approximately one million patients have such wound infections each year in United States and extending the hospital stay by one week and increasing the cost of hospitalisation by 20%.⁵ Previous studies have indicated that 80% of post operative wound infections occur after operations which open the gastrointestinal or the pancreaticobiliary system.

The bacteria most often implicated in surgical site infections following cholecystectomy include *Escherichia coli*, *Klebsiella* species, *Enterococcus* species and other gram negative rods that colonize bile.^{6,7} Besides the endogenous flora, exogenous bacteria that colonize skin may be implicated e.g. Gram positive cocci in such clean contaminated surgery.⁸

Cholelithiasis is the most common disorder of adult life throughout the world. In our country well known experts have observed that cholelithiasis is more common in Kashmir than in any other part of India. This is more likely due to minor causes like cold climate, sedentary life and dietary habits, besides other well known causes. Although wound infections are not common after cholecystectomy but improvement is still a worthwhile aim because cholecystectomy is one of the most common operations performed on digestive system. Since no such study has so far been conducted or published from our state and the data available regarding this subject from rest of the parts of India are also scanty, the present study was carried out with the objective to find out the prevalence of wound infection following an elective cholecystectomy, look for any correlation of ASA score, a positive bile culture and duration of surgery to the occurrence of post operative wound infection. Also the most commonly organisms that could be grown out of a positive bile culture of these patients

were also found.

Aims and Objectives:

- To find out the prevalence of wound infection, its correlation with ASA score, duration of surgery and presence of organisms on bile culture and
- To find out the type of organisms commonly found in the aspirate from gall bladder in patients subjected to cholecystectomy.

Materials and Methods:

After an institutional approval, the study was conducted by the Department of Pharmacology; Government Medical College Srinagar in collaboration with the Department of Surgery, SMHS Hospital (an associated hospital of Government Medical College, Srinagar). Patients with USG diagnosed cholelithiasis attending the surgical OPD of the SMHS hospital, planned for elective cholecystectomy were enlisted out of which 200 were finally eligible for the study. All patients undergoing elective cholecystectomy for cholelithiasis without any known drug allergy were eligible. The following patients were excluded:

- Patients who had to undergo emergency cholecystectomy and where cholecystectomy was performed as a part of any other major operation.
- Patients with evidence of acute pancreatitis, acute cholecystitis, and those with the history of jaundice, stones and/or dilated common bile duct.
- Patients refusing to be the part of the study.

An informed consent was taken from the patients fit for the study. A detailed medical history and complete physical examination were sort. Before the surgical procedure, all the baseline investigations with an emphasis on USG documented cholelithiasis were done. Patients were subjected to the procedure and 5 ml of bile from the gall bladder was collected for culture from all the subjects during the operation. Each 5 ml aliquot was inoculated into a Mc-arteny bottle containing 50 ml of leuquoid broth and was sent for microbiological study for assessment of frequency of bile infection and commonly infecting organisms with their sensitivity to antibiotics.

Post-operative superficial or deep incisional soft tissue surgical site infection and intra-abdominal abscess were defined according to the published criteria.⁹

Results: A total of 200 patients were studied. The mean age of the studied population were 41.4 ± 9.4 years with females outnumbering males to the extent that females were twice the number of males of the studied population [Table 1]. As per the pre operative risk score based on presence of co-morbidities that has been

devised by American Society of Anaesthesiologists (ASA), majority (66%) of studied population belonged to ASA score 1 and only 34% belonged to ASA score 2. The overall infection rate amongst the study group was found to be 18.5% with a higher rate amongst those belonging to ASA score 2 as compared to those belonging to score 1 and the difference was statistically significant (p value= 0.01) [Table 2,3]. When the study population was grouped into two depending upon the presence or absence of infection and compared on the basis of duration of surgery, there existed no correlation between the duration and the subsequent development of wound

infection (Table 4). The bile collected from the study population at the time of cholecystectomy when subjected to culture, the percentage of positive cultures was 9.5% with percentage of Klebsiella and E Coli being 31.5% each, Pseudomonas and Non haemolytic streptococcus each being present in 10.5% and Citrobacter in 16% of positive bile culture (Table 5). Coming to whether there existed any association between the development of postoperative wound infection with the presence of growth on culture, it was found that the no such statistically significant association could be ascertained (Table 6).

Table 1: Demographic characteristics of the patients under study

Age	Male		Female		Total	
	N	%	N	%	N	%
20 to 29	4	6.0	19	14.3	23	11.5
30 to 39	9	13.4	40	30.1	49	24.5
40 to 49	35	52.2	53	39.8	88	44.0
50 to 59	15	22.4	21	15.8	36	18.0
60	4	6.0	0	0.0	4	2.0
Total	67	33.5	133	66.5	200	100.0
mean \pm SD	45.4 \pm 8.5 (25, 62)		39.4 \pm 9.3 (20, 59)		41.4 \pm 9.4 (20, 62)	

Table 2: ASA Score and Rate of Infection in the Study Population

ASA Score	Number (N)	Percent %
Score 1	132	66
Score 2	68	34
Overall Infection		
Yes	37	18.5
No	163	81.5

Table 3: Correlation of ASA and Overall Infection

	Infection	No Infection	Total (n)	Result
ASA-1	18	114	132	? $\chi^2=6.091$ $p=0.01$ (sig)
ASA-2	19	49	68	
Total	37	163		

Table 4: Comparison of Duration of Surgery (minute) as per Infection after Surgery

Infection	N	Min	Max	Mean	SD	Result
Yes	37	30	70	50.4	8.8	$t = 1.374,$ $p > 0.05$ (NS)
No	163	30	95	53.0	10.8	

Table 5: Commonly Cultured organisms from the Bile of the Study Population

Culture	N	%
Klebsiella	6	31.5
Pseudomonas	2	10.5
Non Haemolytic Streptococcus	2	10.5
E. Coli	6	31.5
Citrobacter	3	16

Note: 90% cultures were negative and in 0.5% patients, bile was not aspirated. Table only shows the description of positive bile culture.

Table 6: Correlation of Positive Bile Cultures and Wound Infections in studied population

Bile culture	Wound infection (n)	No infection (n)	Total	Result
Positive	3	16	19	FisherExact $\chi^2=0.01091$ $p=0.99$ (NS)
Negative	34	146	180	

Discussion:

Ever since our appreciation of the germ theory and realization of its determinant role in wound sepsis, surgeons have attempted to manipulate various components of host-parasite relationship so as to eliminate post operative wound infection

Progression from an antiseptic to aseptic technique has clearly minimized the bacterial challenge¹⁰. In AD 1600, wound infection was so common that redness, warmth and purulence were thought to be desirable features of wound healing. After the adoption of hand washing and use of sterile gowns and supplies, infection rates for cling procedures approached modern rates. However infection rates for procedures of the gastro intestinal tract remained high as a result of the endogenous origin of bacteria.⁴

Duration of surgery is positively associated with the risk of wound infection and this infection is additional to that of classification of operations.¹¹

Wound infections are not common after cholecystectomy (rates of 2-20% are reported in the literature), but improvement is still a worthwhile aim because cholecystectomy is one of the most common operations on the digestive system. In our study, the prevalence of post operative wound infection was found to be 18.5% which is comparable to the results of a study conducted in UK showing the prevalence of almost 20% in patients undergoing intra abdominal surgeries though the overall prevalence of postoperative wound infection among different specialities was found to be 2.6% only². Approximately one million patients have such wound infections each

year in United States and extending the hospital stay by one week and increasing the cost of hospitalisation by 20%.⁵

After the adoption of hand washing and use of sterile gowns and supplies, infection rates for cling procedures approached modern rates. However infection rates for procedures of the gastro intestinal tract remained high as a result of the endogenous origin of bacteria.⁴

Co-morbidities at the time of operation are the most significant predictor of wound infection. Pre operative risk score based on presence of co-morbidities has been devised by American Society of Anaesthesiologists (ASA). An ASA score greater than 2 is associated with increased risk of wound infection and this risk is additional to class of wound and duration of surgery.^{12,13} Besides these, we have very few studies available that have been conducted in different countries focussing on the rate of surgical site infections where it was found to range from 11% in Maharashtra (India)¹⁴ between year 2011-2013 to 22.2% in Israel¹⁵ between year 2005 to 2007. In these studies, various factors having an impact on the occurrence of surgical site infection have also been studied but most of such factors have not been included in our study but it is worthwhile if such studies are conducted in future keeping in view the role of such factors in causation of post operative wound infection^{14,15}.

Comparing our results with them, there also exists a statistically significant association between the ASA score and rate of infection ($p=0.001$) but coming to any correlation between duration of operation and the development of infections, the same has not been proved by our study.

The bile collected from the study population at the time of cholecystectomy was subjected to culture and the percentage of positive cultures was 9.5% with percentage of Klebsiella and E Coli being 31.5% each, Pseudomonas and Non haemolytic streptococcus each being present in 10.5% and Citrobacter in 16% of positive bile culture (Table 5) whereas we have the results available from a study revealing the percentage of common organism as E.coli (47%) followed by Klebsiella (25%), Pseudomonas (17%), Staphylococcus aureus (5.5%), Salmonella (3%) and Bacteroides fragilis (3%) of positive bile cultures¹⁶. From this bacteriological assessment, it seemed that both endogenous and exogenous contamination were the causes of wound sepsis.¹⁴ Coming to whether there existed any association between the development of postoperative wound

infection with the presence of growth on culture, it was found that there was no statistically significant association could be ascertained [Table 6]. The bacteria most often implicated in surgical site infections following cholecystectomy include Escherichia coli, Klebsiella species, Enterococcus species and other gram negative rods that colonize bile.^{6,7} Besides the endogenous flora, exogenous bacteria that colonize skin may be implicated e.g. Gram positive cocci in such clean contaminated surgery⁸ but unfortunately we didn't have the record available of the organisms present in the discharge coming out from the wound of those infected and thus it is pertinent to mention here that further research needs to be undertaken taking into consideration all the factors having an impact on the development of Surgical Site Infections.

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