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Surgical Site Infection after Gastrointestinal and Hepatobiliary Surgeries - A Retrospective Evaluation from a Single Center of Western India

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Abstract: ***Aim of study**: Aim of our study to evaluate various factors responsible for surgical site infection after gastrointestinal and hepatobiliary surgeries. **Material and methods**: Patient who underwent gastrointestinal and hepatobiliary surgery in our department were evaluated retrospectively. Various factors associated with surgical site infection were evaluated using univariate and multivariate analysis. Surgical site infection was defined as any culture positive discharge from the wound within 30 days of surgery. **Results**: We evaluated total 331 patients operated between April 2018 to March 2020. 14 patients were lost to follow up after discharge and before completing post operative day 30. Eighteen patients expired before 30 days without developing SSI and were excluded from the study as per exclusion criteria. 299 patient included in the study. Total 20 patients developed surgical site infection. It showed SSI rate in our study population was 6.68%. On univariate analysis prolonged hospital stay, more blood product used, higher cdc grade of surgery, higher ASA grade, more operative time, open surgeries, colorectal and HPB surgeries were associated with surgical site infections. On multivariate analysis only prolonged hospital stay independently predicted Surgical Site Infectins. (p=0.014, 0dds ratio 1.223, 95% confidence interal 1.042-1.435.). **Conclusion**: Prolonged hospital stay independently predicts surgical site infections after gastrointestinal and hepatobiliary surgery.***

Keywords: Surgical Site Infections (SSI), Hospital stay, morbidity, mortality, HPB surgery

1. Background

According to world health organisation (WHO) health care associated infections is the emerging health care problem. [1] Surgical site infections are one of the most common healthcare associated infection. [2] Surgical site infections increases hospital stay, cost and also some times they are associated with increase mortality. [3]

Various studies have evaluated epidemiology of surgical site infections India. [4, 5], however very few studies evaluated SSI after gastrointestinal and hepatobiliary surgeries in India.

2. Aim of Study

Aim of our study to evaluate various factors responsible for surgical site infection after gastrointestinal and hepatobiliary surgery.

3. Material and methods

Patient who underwent gastrointestinal and hepatobiliary surgery in our department were evaluated retrospectively. Various factors associated with surgical site infection were evaluated using univariate and multivariate analysis.

Surgical site infection definition

Surgical site infection was defined as any culture positive discharge from the wound within 30 days of surgery. [6,7] We did not use CDC criteria as it described all kind of surgeries and non-specific for abdominal surgeries. If we use CDC criteria complication like asymptomatic biloma or collections would also come in definition of surgical site infection.

Inclusion Criteria

- All patients who underwent gastrointestinal and hepatobiliary surgery.
- All the patient with preexisting abdominal infections were included in the study

Exclusion criteria

- Patients lost to follow up before 30 days
- Patient expired before 30 days without developing SSI

Antibiotic protocol

We give single dose pre operative antibiotic (preferably third generation cephalosporin with extended spectrum beta lactum coverage as per our hospital sensitivity data, at the time of induction all patient without pre existing sepsis and septic shock. [8]. We give antibiotics according to survival sepsis guidelines in patient with established sepsis using pre calcitonin level as the guide. [9]

Factors Evaluated

We evaluated various factors associated with Surgical site infections:

- Age
- Sex
- Open or Laparoscopic Surgeries
- Emergency Surgeries
- Type of surgeries (Upper gastrointestinal, HPB, Small bowel, Colorectal ,Hernia andothers.
- Benign or malignant surgeries

- CDC grade of surgeries [10]
- American society of anesthesiology classification [11]
- Hospital stay
- Blood product requirement
- Operative Time

We also evaluated weather SSI is associated with other complications and mortality.

4. Statistical Analysis

Analysis of means or medians were selected according to skewness and standard error of skewness and kurtosis and standard error of kurtosis analysis. Categorical variants were analysed using chi square test or fisher t test where ever appropriate. Continuous variable were analysed using Mann whitney u test.

P value less than 0.05 was considered significant. Multivariate analysis was done using logistic regression method. SPSS (IBM) version 23 was used for statistical analysis. Ethical clearance obtained from hospital ethical committee. IRB 345/Shalby/2020

5. Results

Study population:
We evaluated total 331 patients operated between April 2018 to March 2020. 14 patients were lost to follow up after discharge and before completing post operative day 30. Eighteen patients expired before 30 days without developing SSI and were excluded from the study as per exclusion criteria. 299 patient included in the study .Twenty (6.68%) patients developed surgical site infection. Twelve patients had superficial SSI, 4 had deep SSI and 4 had organ space infection. [Figure 1].

Number of Patients according to type of surgeries is described in Table 1 and Grade of surgeries in Table 2

Univariate analysis:
On univariate analysis prolonged hospital stay, more blood product used, higher cdc grade of surgery, higher ASA grade, more operative time, open surgeries, colorectal and HPB surgeries were associated with surgical site infections. (table 3) (Table 1)

Multivariate analysis:
On multivariate analysis only prolonged hospital stay independently predicted Surgical Site Infections. (p=0.014,0dds ratio 1.223, 95% confidence interal 1.042-1.435.) Here prolonged hospital stay is defined as perioperative hospital stay before diagnosis of surgical site infection. and not after that or readmissions.

Relationship with other complications and mortality:
SSI was associated with other complications (p=0.002) but not associated with mortality. (p=1.0) 14 patients who expired in our study population mostly due to non surgical procedure related complications.

6. Discussion

Surgical science has progressed to a great extent in last century. Despite such a great progress Surgical site infection remains a major challenge and its incidence rates still remains high due to prevalnce of wide range of protocols and practices [12] Causes of Surgical site infection can be multifactorial and include variety of patient related, hospital related and procedural related factors and it includes use of variery of protocols and procedures to prevent them. [13]

This retrospective study evaluated risk factors and their association with surgical site infections. Over all SSI rates were 6.76 percent in our data. Multicenter study published showed over SSI rates after gastrointestinal surgeries were of 12.3 % which is significantly higher than our data. It showed SSI rates in middle and lower countries are much higher.(14 and 23.2% respectively). Although India is one of the middle to lower income countries, our SSI rates are significantly lower than published results world-wide.[1] Lee et al in their systemic review of korean experience showed SSI rates of around 9.4%, which is almost identical to our data.[14]. Reason for lower SSI rates in our data may be due to short course single dose antibiotic protocols and evidence based management of preexisting abdominal infections by survival sepsis protocols.

On univariate analysis Higher ASA grade, Higher CDC grade of surgery, prolonged surgical time ,higher blood products use, Open surgeries and prolong hospital stay were associated with Surgical site Infections. Karol et al in their systemic review also showed that prolong duration of surgery and complexity of surgery were associated with Surgical Site Infections.[15] Carvalho et al showed that higher ASA grades, Higher grade of surgery, and prolonged surgical duration were associated with SSI rates, which was also shown in our data.[16] Varelo et al [17] also showed surgical site infections after laproscopic surgeries was minimal and which is the key benefit of laproscopic surgeries.

In our study multivariate analysis showed that prolonged hospital stay independently predicted surgical site infection. Mujagic et al [18] also showed similar findings.

In our series surgical site infections were also significantly associated with other complications but was not significantly associated with 90 day mortality. (p=0.338). INSISO study group also showed that surgical site infections were signifcantly associated with increased mortality and morbidity [19].

There are certain limitations of our study being retrospective study inherent limitations of retrospective study also applies to our study.

7. Conclusion

Prolonged hospital stay independently predicts surgical site infections after gastrointestinal and hepatobiliary surgery.

Ethical clearance: Obtained from hospital ethical committee

Conflict of interest: none

Abbreviations: SSI (surgical site infections), HPB (hepato pancreaticobiliary)

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Table 1: Type of surgery (Surgical Site Infection group had significantly higher number of Hepato pancreatico biliary and colorectal surgeries compared to patients who did not develop Surgical Site Infections)

Type of surgery	Number of patients	P value
Upper GI (stomach and esophagus)	13	0.056
Small bowel	35	0.082
Hepato pancreatico biliary Surgery	177	0.001
Colorectal Surgery	42	0.016
Hernia and other surgeries	32	0.123

Table 2: CDC grade of surgeries

Grade of surgeries	Total Number of Patients
Clean (grade 1)	3
Clean contaminated (Grade 2)	158
Contaminated (Grade 3)	110
Dirty (Grade 4)	28

Table 3: Univariate analysis for SSI

Factors	No SSI (n=279)	SSI (n= 20)	P Value
Age (median/range)	54 (7-83)	50 (34-65)	0.486
Sex (M/F)	180/99	12/8	0.156
Hospital stay(median/range)	2 (1-15)	5.5 (1-20)	P<0.0001
Blood products used(median/range)	0 (0-8)	0.5 (0-4)	P=0.001
Cdc grade of surgery(median/range)	2 (1-4)	3 (2-4)	P<0.0001
ASA score(median/range)	2 (1-4)	3 (2-4)	P<0.0001
Operative time (median/range) (minutes)	90 (15-600)	120 (45-420)	P=0.004
Emergency Surgery (n=45)	3	42	P=1.000
Open Surgeries (n=154)	19	135	P<0.0001
HPB (n=177)	173	4	P=0.001
Colorectal (n=42)	7	35	P=0.016
90 days Mortality	14	2	P=0.338

Table 4: Multivariate analysis

Factors	P value	Odds ratio	95% confidence interval
Open surgery	0.996	4.83	0.48-48.48
Blood products	0.135	0.683	0.42-1.12
Asa grade	0.590	1.30	0.494-3.46
Operative time	0.342	1.004	0.996-1.012
Grade of surgery	0.200	2.095	0.677-6.48
Colorectal surgery	0.260	2.075	0.583-7.38
HPB surgery	0.466	0.563	0.120-2.64
Hospital stay	0.014	1.223	1.042-1.435

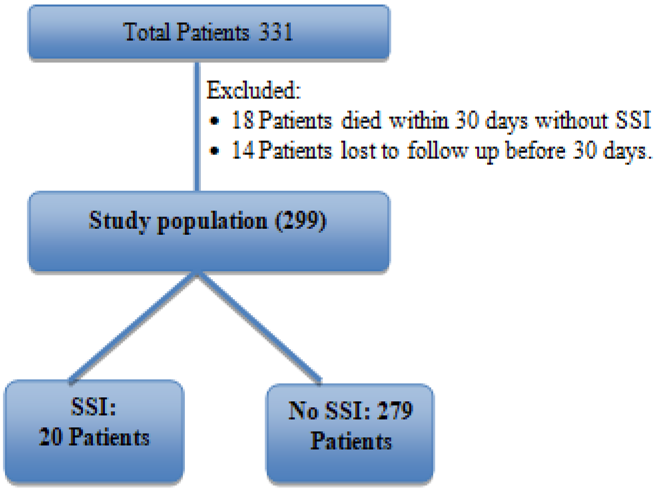

Figure 1: Study Population