The Egyptian Journal of Hospital Medicine (January 2023) Vol. 90, Page 775-779

The Effect of Surgical Wound Infection on Postoperative Hospital Stay

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ABSTRACT

Background: Patients who experience any postoperative complication have longer hospital stays. Infection at the surgical site is the major cause of postoperative problems and lengthening of hospital stays. However, numerous variables contribute to the development of surgical site infections.

Objective: The present study is aimed to investigate the effect of surgical wound infection on postoperative hospital stay. **Patients and methods:** This study was conducted in Al Hussein and Al Mokatam General Hospital from February to August 2022 on 20 cases. Complete history and demographic data were obtained along with complete physical examination from all participants. All data regarding characters of the surgical wound and time of discharge was recorded. **Results:** Mean age in the included patients was 42.22 (SD 10.94) years. Mean weight was 87.72 (SD 13.5) kg. Mean height was 166.56 (SD 5.88) cm. Postoperative Hb reached 11.36 (SD 0.54) g/dl. Among 20 patients included in the study lower segment cesarean section (LSCS) was reported in 4 (20%) of cases, myomectomy was in 3 (15%) and total abdominal hysterectomy (TAH) was in 13 (65%) cases. Mean time to discharge in gapped wound was 2.5 (SD 2.1) days. Time to discharge was significantly increased in cases with gapped wound. There was significant negative correlation between hospital stay and good wound.

Conclusion: Depending on the surgical category, the length of hospital stays and wound characteristics related to surgical site infection (SSI) vary greatly by identifying the surgical techniques that have a SSI unfavourable effect that is more severe. A strong inverse relationship exists between hospitalisation and healing wounds.

Keywords: Surgical site infection; Length of hospital stay, Time to discharge, Case series, Al-Azhar University.

INTRODUCTION

Patients who encounter any postoperative difficulties often stay in the hospital for 3 to 11 more days than those who do not. According to a recent study, regardless of preoperative patient risk, complications that lasted 30 days or more decreased median patient survival by 69% [(1)].

The third most common type of infection connected with healthcare is surgical site infection (SSI), which makes about 14%–16% of all such illnesses. According to reports, patients who experience SSIs have a 2- to 11-fold increased chance of dying, making them one of the clinically significant post-operative consequences. An average of 2 to 5 percent of surgery patients is predicted to experience SSI [(2)].

According to estimates, SSI was directly responsible for 0.64% of hospital mortality in the USA. According to a recent study from Europe, the infection was to blame for 38% of patient deaths with SSI, translating to an attributable mortality of 0.9%. Furthermore, patients with SSI spend longer in the hospital, which increases the overall cost of hospitalisation. The severity of these negative effects varies depending on the type of surgery, the country of investigation, and the methods employed [(3)].

Case contamination, obesity, stoma development, medical co-morbidities, and preoperative antibiotic selection are only a few of the many factors that affect SSIs. Despite being a well-established practise, prophylactic intravenous antibiotic administration during elective colorectal surgeries has recently changed due to changes in drug availability and the release of new medications [(4)]. The prevention of SSIs has received more attention since the U.S. Centres for Disease Control and Prevention (CDC) released the Guidelines for Prevention of Surgical Site Infection in 1999.There have been several reports released about how to prevent SSIs and how common they are [(5)].

The present study is aimed to investigate the effect of surgical wound infection on postoperative hospital stay.

PATIENTS AND METHODS

This was a study conducted in Al Hussein and Al Mokatam General Hospital from February to August 2022. The study was conducted on 20 cases. All were followed at the Obstetrics and Gynecology Units.

The study population consisted of female patients >20 years. Patients underwent one of the following 3 categories of surgery: Lower segment cesarean section (LSCS), Myomectomy, and Total Abdominal Hysterectomy (TAH) were enrolled in the study. Emergency cases in all categories were excluded.

The following data were collected from all participants:

Complete history taking: Personal history, any complaint, Obstetric history, menstrual history, past medical and past surgical history, and family history.

Complete physical examination including General examination: Vital signs (Blood pressure, Temperature, Heart rate, Respiratory rate).

Every patient receiving surgery in any of the selected surgical categories, information on their demographics, discharge, and potential risk factors were recorded.

Received:23/07/2022
Accepted:25/09/2022

Surgery site wounds were divided into 3 categories based on their characteristics: excellent wounds, gapped wounds, and inflammatory wounds.
Patients that experienced SSI had further infection information gathered. The SSI diagnosis was made by the doctor in accordance with the CDC Guidelines for Prevention of Surgical Site Infection's criteria for defining SSI [6].

Ethical Approval:

Following approval of the study by Al-Azhar University Ethical Committee, each participant in the study signed an informed consent. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical Analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 26 for windows. Qualitative data were defined as numbers and percentages. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as means and standard deviation (SD). The Spearman's rank-order correlation is used to determine the strength and direction of a linear relationship between two non-normally distributed continuous variables and/or ordinal variables. P value ≤ 0.05 was considered significant.

RESULTS

Table 1 summarizes age, weight, height and post-operative Hb of the participants.

Table 1: Patients' basic characteristics.

Parameter	Value (N = 20)
Age (Year)	42.22 ± 10.94
Weight (Kg)	87.72 ± 13.5
Height (Cm)	166.56 ± 5.88
Post-operative Hb (g/dl)	11.36 ± 0.54

Table 2 summarizes the type of operations.

Table 2: Type of Operations which were conducted on the participants of the study.

Operation	N	%
LSCS	4	20
Myomectomy	3	15
TAH	13	65

Table 3 summarizes age, weight, height and post-operative Hb of LSCS patients.

Table 3: Basal characteristics of LSCS patients

Parameter	Value
Age (Year)	29.75 ± 6.85
Weight (Kg)	90 ± 7.02
Height (Cm)	168.5 ± 2.65
Post-operative Hb (g/dl)	11.41 ± 0.49

Table 4 summarizes pregnancy data of LSCS of the participants.

Table 4: Pregnancy data of LSCS patients

Parameter	Value
Parity	2.25 ± 1.71
Number	9 (100%)
Female	7 (77.78%)
Male	1 (11.11%)
Abortion	1 (11.11%)
Fetus number in current pregnancy	1.25 ± 0.5
Total number	5 (100%)
Female	1 (20%)
Male	4 (80%)
Gestational Age (Week)	37.5 ± 0.58
Viability (Yes)	5 (100%)
Placenta previa	3 (75%)
Average Liquor	4 (100%)
Medical History	
Previous surgical removal of renal stone	2 (50%)
Previous E&C after abortion	1 (25%)
Time to discharge (Days)	2.5 ± 1.29

Table 5 summarizes demographic and clinical data of patients subjected to myomectomy.

Table 5: Demographic and clinical data of Myomectomy patients

Parameter	Value
Age (Year)	36.67 ± 2.08
Weight (Kg)	84.33 ± 18.15
Height (Cm)	166.67 ± 6.11
Myoma Size	
Diameter 1 (mm)	54 ± 5.57
Diameter 2 (mm)	50 ± 6
Post-operative Hb (g/dl)	11.7 ± 0.39
Clinical Picture (Menorrhagia)	3 (100%)
Medical History	
DM	2 (66.67%)
HTN	2 (66.67%)
Wound status through follow up	
Good wound	3 (100%)
Gapped wound	0
Inflamed wound	0

Table 6 summarizes demographic and clinical data of patients subjected to TAH.

Table 6: Demographic and clinical data of TAH patients.

Parameter	Value
Age (Year)	48.64 ± 8.23
Weight (Kg)	89.09 ± 15.46
Height (Cm)	166.18 ± 7.1
Myoma Size	
Diameter 1 (mm)	48.18 ± 19.54
Diameter 2 (mm)	42.73 ± 22.89
Post-operative Hb (g/dl)	11.27 ± 0.6
Clinical Picture	
Bleeding	7 (53.85%)
Abdominal Pain	6 (46.15%)
Medical History	
DM	2 (15.38%)
HTN	2 (15.38%)
OLC	3 (23.08%)
HCV	1 (7.69%)
Wound status through follow up	
Good wound	10 (76.92%)
Gapped wound	2 (15.38%)
Inflamed wound	1 (7.69%)

DM: Diabetes mellitus, HTN: Hypertension, HCV: Hepatitis C virus.

Table 7 summarizes time to discharge with each wound outcome of the participants.

Table 7: Time to discharge with each wound outcome.

Parameter	Value
Good wound	1 ± 0
Gapped wound	3 ± 1.41
Inflamed wound	3

There was significant negative correlation between hospital stay and good wound (**Table 8**).

Table 8: Correlation between hospital stay and good wound.

Parameter	**Pearson Correlation**	**P. Value**
Hospital Stay	-0.911**	<0.0001

DISCUSSION

Postoperative complications increase hospital stays by 3 to 11 days. Regardless of prior risk, a 30-day complication in a recent trial decreased patient survival by 69% [7].

SSIs are thought to affect more than 500,000 Americans annually, or 2.8 per 100 procedures. Between one-fourth and one-third of all nosocomial infections are these SSIs. Numerous studies have attempted to calculate the effect of SSI on hospitalisation duration and expenses [8].

The primary outcome in these investigations was the duration of hospitalisation, which SSI increased by 7 to 19.5 days. One of these studies' authors calculated that for patients hospitalised in the early 1990s, the average additional cost per patient hospitalisation was $4,500. Authors of a more recent investigation discovered comparable outcomes [9].

In the US, 0.64 percent of hospital mortality was due to SSI. In a recent European investigation, 38% of SSI-related deaths were attributable to the infection (0.9%). SSI patients experience longer hospital stays and higher healthcare costs. The severity of adverse effects varies with surgery, country, and technique [10].

Since the CDC published Guidelines for Preventing Surgical Site Infection in 1999, SSI prevention has gained attention. Numerous reports on SSI prevention and occurrence have been published [5].

This study examines how surgical wound infection affects postoperative hospital stay.

Mean age of included patients was 42.22 years. Mean weight was 87.72 kg. Mean height was 166.56 cm. Post-operative Hb reached 11.36 g/dl.

Totty *et al.* [11] males: 79.3% vs 63.6% (P= 0.168), BMI (mean 27.33 vs 28.71; P= 0.248), and age (mean 63.6 vs 62.6 years; P= 0.698) do not significantly differ between groups (SSI vs non-SSI). Tobacco use and diabetes, however, differ statistically significantly. In the SSI group, there are substantially more current smokers (P= 0.002) than there are patients with diabetes (P= 0.035). The type of surgical technique shows significant differences as well (P= 0.031).

LSCS was operated in 4 (20%) of cases. Myomectomy was in 3 (15%). TAH was in 13 (65%) cases. In a study by **Taylor *et al.*** [12] the group 89 wound infections were found, 73 of which were associated with the techniques used for the investigation. Due to data limitations, five individuals were eliminated from the study, leaving 68 patients who underwent 15 distinct procedures. These were compared to 136 control patients who underwent the same risk-indexed surgery in the same surgical division and were chosen by stratified random selection. In the study of **Whitehouse *et al.*** [13] each of the 59 case-patients who experienced SSIs after orthopaedic surgery was matched with an appropriate control. The study group included 28 matched pairs of patients with SSIs from DRH and 31 matched pairs of patients from DUMC. Of the 59 patient pairs, 11 (19%) had joint replacements done; the remainder pairs had a wide range of orthopaedic treatments done. In matched pairs, surgery was performed by the same surgeon 81% of the time, using the same technique 92% of the time, and 95% of the time, within six months of one another. Among all surgical operations, appendectomy, laparotomy, open cholecystectomy, and pyelolithotomy itself accounted for 71.4% of the overall infection, according to research by **Goyal *et al.*** [14] for LSCS patients, mean age was 29.75 years. Mean weight was 90 kg. Mean height was 168.5 cm. Post-operative Hb mean was 11.41 g/dl. For

LSCS patients mean parity was 2.25. Previous pregnancies 7 were females and one was male and one apportion occurred. Mean gestational age was 37.5 weeks. All fetuses were viable, but placenta previa was diagnosed in 3 (75%) cases. Mean time to discharge was 2.5 days. **Roshini *et al.*** [15] showed that 1410 caesarean sections were done in total over the study period. A total of 50 of them (4.2%) had an infection at the site. In the cases, 36 (72%) of the caesarean sections were emergency, whereas 14 (28%) were elective.

In the study group, the average age of the LSCS patients was 27.06 years, while it was 26.72 years in the control group. Age and parity were not shown to be major risk variables in the study for wound infection. **Jido *et al.*** [16] observed that overall wound problems with SSI following CS in the UK were 13.6% and 8.9%, respectively. They prospectively investigated CS wound infection, taking post-discharge observation into account. SSI might not be discovered for a number of weeks after discharge, and it might not go to the operating hospital [17]. In a prior study, the additional hospital stay was 16.06 days. This will lead to a lengthy hospital stay with direct financial costs and negative health effects [18]. In this investigation, SSI was discovered on 6 out of 3 days. According to a Scottish research, the majority of inpatient SSIs occurred between days 2 and 7 [8].

In myomectomy cases mean age was 36.67 years. Mean weight was 84.33 kg. Mean height was 166.67 cm. Regarding myoma size, first diameter was 54 mm; second diameter was 50 mm. Post-operative Hb mean was 11.7g/dl. Menorrhagia was observed in 3 (100%) cases. DM was observed in 2 (66.67%) and HTN in 2 (66.67%) cases. Good wound was observed in 3 (100%) cases. **Kim *et al.*** [19] showed that baseline characteristics of the two subgroups (the group that received and that group that did not receive antibiotics) were similar. Mean age was 38.3 in first group, 39.8 in second groups. BMI was 27.2 in first group, 28.1 in second groups.

In TAH cases mean age was 48.64 years. Mean weight was 89.09 kg. Mean height was 166.18 cm. Regarding myoma size first diameter was 48.18 mm; second diameter was 42.73 mm. Mean post-operative Hb was 11.27 g/dl. Bleeding was observed in 7 (53.85%) and abdominal pain was observed in 6 (46.15%) cases. Good wound was observed in 10 (76.92%) cases, Gapped wound was observed in 2 (15.38%) cases and inflamed wound was observed in 1 (7.69%) case.

Kandula *et al.* [20] performed historical cohort study of cases and matched controls were performed in a tertiary care university hospital. Women undergoing total abdominal hysterectomy in which a postoperative wound infection developed had a mean postoperative stay of 10.7 days, compared with 7.15 in uninfected and matched control patients. The infected case patients stayed 3.55 days longer in the hospital than did the uninfected patients (P= 0.0025). Mean time to discharge in gapped wound was 2.5. Time to discharge was significantly increased in cases with gapped wound.

Taylor *et al.* [12] demonstrated that neither the length of the surgery nor the anaesthetic risk score varied between wound infection patients and controls. Hospital stays for patients with infections were 19.5 days longer than those for controls (95% confidence interval, range, 11.0 to 27.9 days). More time was spent in the hospital because of deep infections than because of superficial incisional infections (24.3 versus 13.2 days).

In a research by **Whitehouse *et al.*** [13], the median first hospital stay for infected patients was 6 days, as opposed to 5 days for control patients who were not infected. One day was the median additional day of the initial hospitalisation related to SSI. Patients with SSI required more surgical procedures and total hospital stays. As a result, orthopaedic patients with SSI spent an extra 14 days in the hospital overall. In their overview of recent significant clinical trials looking at preoperative, intraoperative, and postoperative procedures to lower the incidence of SSI, **Zuarez *et al.*** [21] address the biological mechanism of SSI and risk factors for its occurrence. A crucial aspect of the postoperative assessment is the daily examination of the caesarean incision. An infection should be suspected if there is a fever, discomfort, erythema, purulent discharge, or induration. When most women have already been released from the hospital and it is postoperative days 4–7, the majority of wound infections do not become clinically evident. Because of this, it's crucial to educate young women about the symptoms and signs that call for further investigation because prompt treatment can significantly reduce the likelihood of serious effects.In our study there was significant negative correlation between hospital stay and good wound. Along with our results, **Mahmoud *et al.*** [22] reported that SSI increase length of hospital stay. The more the severity the longer the duration patient stays at hospital. Also**, Bohl *et al.*** [23] reported increase length of hospital stay in cases diagnosed with SSI.

In conclusion, this study gives information regarding the prevalence of SSI and the negative effects of these infections. It demonstrates that the additional length of hospital stays, and SSI-related wound features vary greatly depending on the type of operation. By determining whether surgical techniques have a more severe SSI detrimental effect, it was found that patients who received TAH and who had a higher incidence of gapped wounds spent more time in the hospital. Overall, there was significant negative correlation between hospital stay and good wound

Conflict of interest: The authors declare no conflict of interest.

Sources of funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contribution: Authors contributed equally to the study.

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