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ORIGINAL ARTICLE

Retrospective analysis of surgical site infections after cesarean section: Rates, microbiological profile, and clinical features

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ABSTRACT

Objective: Surgical site infection (SSI) accounts for 31% of healthcare-associated infections and is associated with a 3% mortality rate. It increases the frequency of transition to the intensive care unit, the length of hospital stay, and the rate of readmissions. According to the National Health Service-Related Infections Surveillance Network 2017 data, the rate of infection in the surgical field in our country is 0.72%, and this rate is 1.0% in 25 of 60 types of surgery. Obstetric–gynecologic surgeries are in this group. Information on SSI after cesarean section is limited in the international and national literature. Our research is aimed to define the features of C-section SSI and contribute to the solution of the problems observed with the data to be obtained.

Material and Methods: A retrospective evaluation of SSIs in patients who underwent C-sections between January 1, 2018, and December 31, 2020, at Zeynep Kamil Maternity and Children's Training and Research Hospital was conducted.

Results: During the study period, SSI was observed in 191 (2.3%) of 8370 C-section cases, and the mean age of these patients was 30.5±6.3 years. Body mass index was at the level of 32.8±5.2 kg/m^2 and body mass index value was >30 kg/m^2 in 88% of the SSI group. Emergency C-section was applied in 145 (75.9%) cases and elective C-section in 46 (24.1%) cases. The skin incisions were closed with multifilament in 174 (91.1%), monofilament in 14 (7.3%), and skin stapler in 3 (1.6%) patients. After the diagnosis of SSI, the povidone iodine dressing was sufficient for wound healing in 184 (96.3%) patients. Secondary healing method was applied to 4 (2.1%) patients and negative pressure wound closure technique was applied to 3 (1.6%) patients.

Conclusion: In terms of SSI, it is recommended to perform a preoperative risk assessment for pregnant women and to show appropriate approaches to risky people. Providing wound care training to patients at discharge, timely postpartum controls, and standardizing wound care products to be used will increase the success rate.

Keywords: Cesarean section, debridement, negative pressure wound therapy, postoperative complications, surgical wound infection, wound closure techniques.

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INTRODUCTION

Surgical site infections (SSIs) are defined as surgery-related infections that develop in the first 30 days after surgery or in the first 90 days if an implant is used.[1,2] The risk of death increased 2–11 times in patients who developed SSI. It develops at a rate of 2%–5% after surgery and causes an additional 7–11 days of hospitalization. It is considered to be preventable up to 60%.[3] It is in the first place in unplanned re-hospital admissions after surgery.[4,5] It is seen at a lower rate in outpatient procedures and in hospitals where a high number of surgical interventions are performed.[6,7] The occurrence of SSI depends on the complex relationship between the number and amount of microorganisms contaminating the surgical site, antimicrobial prophylaxis, patient's health status, and surgical technique. Patient factors include smoking, advanced age, obesity, malnutrition, diabetes, and immunosuppression therapy.[8,9] The presence of recent or old infection at the incision site, history of surgery, and history of hospitalization are other factors (Table 1).[10,11] Abdominal procedures have the highest incidence, and this rate is between 3.4% and 30% after cesarean section.[12,13]

Identifying the factors affecting SSI and reducing its incidence are the most important steps to reduce the morbidity and mortality rates that may be experienced. Thus, effective wound care, facilitation of complication management, improvement of surgical technique, and prevention of unnecessary antibiotic use will be ensured.

In our study, it was aimed to determine the rate of SSI observed in the C-section surgical site, its microbiological profile, and clinical features in our hospital serving a large pregnant group in Istanbul. It was thought that it would contribute to the development of the standard approach applied in wound care.

MATERIAL AND METHODS

The study was carried out retrospectively on patients who underwent C-sections between January 1, 2018, and December 31, 2020, at Zeynep Kamil Maternity and Children's Training and Research Hospital.

Patients who underwent C-sections in the operating room of Zeynep Kamil Maternity and Children's Training and Research Hospital and subsequently developed SSI on the incision site were included in the study. The definition of SSI was determined according to the Centers for Disease Control and Prevention (CDC) criteria. The presence of purulent discharge from the incision site after C-section, growth of microorganisms at the wound site in the culture sample, and findings such as disintegration, increased temperature, tenderness, and pain at the incision site were accepted as SSI. Wound culture samples were obtained with sterile swabs from all patients with SSI. Patients who had vaginal delivery were on immunosuppressive therapy, dialysis therapy, had an oncological diagnosis, had corticosteroid therapy for various reasons, and had a history of tuberculosis were excluded from the study. From 30 to 60 min before the C-section, antibiotic prophylaxis was administered to all patients in the clinic with intravenous cefazolin and intravenous clindamycin in those with penicillin allergy. In addition, additional doses of the same antibiotic were applied in interventions that lasted longer than 4 h. For the surgical wound care after C-section, the incision area was covered after cleaning with povidone iodine, and the wound was left open 1 day later. Clinical data were obtained after examining the retrospective files and health system records of the patients.

RESULTS

The incidence of SSI in the specified date range was calculated as 2.3% (191/8370). The mean duration of hospital stay was 5.5±4.4 days, and postpartum stay after C-section was 3.6±2.8 days. The mean age was 30.5±6.3 years. The mean gravida was 2.8±1.6, parity was 2.3±1.3, and abortion was 0.5±1. Body mass index was 32.8±5.2 kg/m^2, and 88% of the group with SSI had a body mass index value of >30 kg/m^2. There were 16 (8.4%) smokers and 1 (0.1%) alcohol user. A total of 21 (11%) subjects were receiving medical treatment under the diagnosis of autoimmune hypothyroidism. There were 66 (34.6%) anemic and 39 (20.4%) diabetic patients, and 11 (5.8%) were on insulin treatment. Ten (5.2%) patients had multiple pregnancies. Of the patients, 26.7% had hypertensive disorders of pregnancy and 23% had preterm delivery. While there were 113 patients with a history of abdominal surgery, 10 of them had undergone surgery except for C-section (Table 2).

A total of 84 (44%) C-section procedures were performed during the day shift hours between 8 a.m. and 4 p.m, and 107 (56.1%) were done in night shift hours between 4 p.m. and 8 a.m. Of the total 191 patients, 145 (75.9%) pregnant women got emergency C-section and 46 (24.1%) got elective C-section. When the relationship between the indication of C-section (emergency/elective) and the time periods of the operation (day shift hours/night shift hours) was examined, a statistically significant difference was found between the two groups (p=0.042). While 60.7% of emergency cases were out of working hours, only 41.3% of elective cases were out of working hours. Of the patients, 127 (66.5%) patients got the diagnosis during the summer and autumn seasons when the annual mean air temperature was high in the specified time period. Of the group, 109 (57.1%) were operated under general anesthesia and 82 (42.9%) under spinal/epidural anesthesia. The skin incision was repaired with multifilament in 174 (91.1%), monofilament in 14 (7.3%), and skin stapler in 3 (1.6%) of the pregnant women. Subcutaneous suture technique was preferred in 178 (93.2%) and separate suture technique in 13 (6.8%) patients.

The number of pregnant women who took preoperative antibiotics due to premature rupture of membranes was 19 (9.9%) (16 of them took ampicillin). The preoperative prophylactic cefazolin 2 g was administered to 167 (87.4%) and 3 g to 20 (10.5%) pregnant women. Clindamycin was used in 4 (2.1%) pregnant women due to penicillin allergy. Postoperatively, intravenous antibiotics were given to 44 (23%) patients and cefazolin was preferred in 29 (65.9%) patients. Oral antibiotic treatment was given to 111 (58.1%) patients when they were discharged, and in 66 (59.5%) patients, 1 g of cefazolin in the morning and evening for 7 days was approved.

The wound culture sample was collected in 13.9±9.7 days. In 24 (12.6%) patients, culture samples were taken during postpartum hospitalization. Pathological growth occurred in 118 (61.8%), normal bacterial flora grew in 2 (1%), and no growth occurred in 71 (37.2%) patients. Single pathogen growth was observed in 77 (40.3%) and mixed growth was observed in 41 (21.5%) of those with pathogen growth. The mean leukocyte level of the infected patients was 10.9±3.1×10^3 μL^{-1} at the time of diagnosis. In the surgical site of the patients, dehiscence was observed in 33 (17.3%), hyperemia in 61 (31.9%), and wound discharge in 122 (63.9%) patients.

Table 1: Risk factors for surgical site infection

Factors related to patient	Factors related to surgery
Age	Surgical site disinfection time
Nutritional status	Skin antisepsis
Diabetes mellitus	Preoperative shaving
Tobacco use	Preoperative skin preparation
Obesity	Duration of surgery
Distant site on current infection	Antimicrobial prophylaxis
Colonization with microorganisms	Ventilation in operating rooms
Degree of immune response	Inadequate sterilization of instruments
Preoperative hospitalization	Foreign body in the surgical site
	Surgical drains
	Surgical technique
	Poor hemostasis
	Dead space
	Tissue trauma

Table 2: Sociodemographic and health information of patients with SSI following C-section (n=191)

Variable	Mean±SD	Median (min–max)
Age (years)	30.5±6.3	30 (13–48)
Gravida	2.8±1.6	2 (1–11)
Parity	2.3±1.3	2 (1–9)
Abortion	0.5±1.0	0 (0–8)
Body mass index (kg/m²)	32.8±5.2	32.5 (20.7–55.7)
Hospitalization duration (days)	5.5±4.4	4 (2–27)
Postpartum hospitalization (days)	3.6±2.8	3 (1–26)
Postoperative culture obtainment (days)	13.9±9.7	12 (1–85)

Variable	n	%
Education		
Illiterate	6	3.10
Primary school	51	26.70
Secondary school	60	31.40
High school	49	25.70
University or higher education	25	13.10
Income		
Below minimum wage	111	58.10
Above minimum wage	80	41.90
Tobacco use		
Yes	16	8.40
No	160	83.80
Cessation due to pregnancy	15	7.90
Alcohol use	1	0.60
Hypothyroidism	21	11.00
Body mass index		
<30 kg/m²	42	22
30–34.9 kg/m²	111	58.10
35–39.9 kg/m²	24	12.60
≥40 kg/m²	14	7.30
Parity		
Nulliparity	55	28.80
Multiparity	136	71.20
Previous abdominal surgery (including C-section)	113	59.20
Previous abdominal surgery (excluding C-section)	10	5.20
Preoperative anemia	66	34.60
Hypertension		
No hypertensive disease	140	73.30
Preeclampsia	31	16.20
Gestational hypertension	8	4.20
Chronic hypertension	7	3.70
Superimposed preeclampsia	5	2.60
Diabetes mellitus during pregnancy	39	20.40
Preterm birth	44	23.00
Multiple pregnancy	10	5.20
Antenatal LMWH use	12	6.30
Postnatal LMWH use	110	57.60

LMWH: Low molecular weight heparin; SSI: Surgical site infection; SD: Standard deviation; Min: Minimum; Max: Maximum.

The hematoma was observed in 31 (16.2) patients and cellulitis was observed in 2 (1%) patients (Table 3). After SSI, the povidone iodine dressing was applied to 184 (96.3%) patients, the secondary healing method was applied to 4 (2.1%) patients, and the negative pressure wound closure technique was applied to 3 (1.6%) patients. None of the patients either developed sepsis or needed intensive care, and mortality rate was zero.

DISCUSSION

It is easier to prevent SSIs and solve developing complications with the help of standard diagnosis and treatment protocols developed in multidisciplinary hospitals with medical training clinics. Most studies on the subject have been done on multidisciplinary hospitals. There are not enough data about SSI in branch hospitals where every specialty is not available. In accordance with this fact, we conducted our study in the obstetrics clinic of the branch hospital we belong to. We evaluated the wound sites of the patients with C-section, which is frequently performed in our clinic. In a retrospective cohort study by Dias et al.,[13] the risk of developing SSI after C-section was given in a wide range as 3.4%–30% in obese patients who are at high risk for these infections.In different studies in the literature, it is between 3% and 15% in different groups.[14–20] In previous studies, independent risk factors for SSI were found to be comorbidities, history of surgery, prolonged operative duration, and use of antibiotics before surgery. In addition, the size of the sample studied, difference in the variety of comorbidities, choice of antibiotic, and accuracy of the data obtained are factors on the risk ratios stated in the literature for SSI. However, the relationship between age and SSI is not clear yet. Zejnullahu et al.[21] reported the rate of SSI as 9.85% in their study done in a multidisciplinary center.They found the risk of developing SSI significantly lower in the group under 35 years of age, in cases where the operative duration was shorter than 1 h, and in those who used preoperative antibiotics. It has been stated that having a history of C-section causes an eightfold increased risk (RR 8.428; 95% CI: 3.681–19.300; and p<0.001). In our clinic, the rate of SSI was calculated as 2.3%, and it is lower than the literature data. It is thought that frequency of the operation, its standardization, absence of significant practical difference between the practitioners, and application of certain algorithms after the procedure are considered to be factors on this rate. The effective and appropriate surgical technique reduces the rate of SSI. This can be achieved by gentle traction, effective he-

Table 3: Information regarding the procedure and surgical area, as well as the growth of microorganisms in the wound cultures (n=191)

Variable	n=191	%
Operation time		
During day shift hours (8 a.m.–4 p.m.)	84	44.00
During night shift hours (4 p.m.–8 p.m.)	107	66.00
C-section		
Emergency	145	75.90
Elective	46	24.10
Anesthetic technique		
General	109	57.10
Spinal	82	42.90
Preoperative antibiotic administration	19	9.90
Preoperative antibiotic selection		
Cefazol 2 g	167	87.40
Cefazol 3 g	20	10.50
Clindamycin 600 mg	4	2.10
Postoperative IV antibiotic administration	44	23.00
Antibiotics were prescribed following the time of discharge	111	58.10
Suture materials		
Multifilament	174	91.10
Monofilament	14	7.30
Stapler	3	1.60
Suture technique		
Subcuticular	178	93.20
Interrupted	13	6.80
Incision findings		
Dehiscence	33	17.30
Hyperemia	61	31.90
Serous discharge	60	31.40
Purulent discharge	62	32.50
Hematoma	31	16.20
Edema	33	17.30
Cellulitis	2	1.00
Presence of growth in the wound culture		
Pathological growth	118	61.80
No growth	71	37.20
Floral growth	2	1
Types of microorganisms		
Mix pathogen	41	21.50
Single pathogen	77	40.30
No growth	73	38.20
Isolated microorganisms in the wound culture	**n=118**	**%**
Staphylococcus spp.	68	57.60
Staphylococcus aureus	20	16.90
Staphylococcus epidermidis	36	30.50
Enterococcus (faecalis/cloacae)	13	11.00
Escherichia coli	16	13.60
Corynebacterium (striatum/ aurimucosum/amycolatum/xerosis)	27	22.90
Proteus mirabilis	3	2.50
Klebsiella (pneumoniae/oxytoca)	4	3.40
Pseudomonas aeruginosa	1	0.80

Table 4: SSIs can be superficial (skin) or deep (subcutaneous tissue) and localized within the organ or body cavity

	Surgical procedure day*	Extent of tissue involvement	Clinical features
Superficial incisional SSI	First 30 days†	Skin and subcutaneous tissue	• Peri-incisional pain or tenderness • Localized peri-incisional swelling • Peri-incisional erythema or heat
Superficial incisional SSI	Between 30 and 90 days†	Deep soft tissues of the incisional area, such as fascia and muscular layers	• Fever (>38°C) • Localized pain or tenderness
Organ/cavity SSI	Between 30 and 90 days†	Any part of the body that has been opened or manipulated deeper than the fascia/muscular layers throughout the process	Clinical features of specific organs or surgical spaces can be found on the CDC‡ website For instance, at least two of the following must be present in case of intraabdominal infection: • Fever (>38°C) • Hypotension • Nausea, vomiting • Abdominal pain or tenderness • Elevated transaminase levels • Jaundice

*: The day of surgery is accepted as the first day; †: According to NHSN (National Health Safety Network, USA); ‡: Clinical features of specific organs or surgical spaces can be found on the CDC website; SSI: Surgical site infection; CDC: Centers for disease control.

mostasis, effective removal of dead tissue, closure of dead spaces, cleaning the wound site with saline, tension-free wound closure, and removal of the drain as soon as possible.[22] Using the same suture material in 91.1% of the patients and the same surgical closure technique in 93.2% of the patients in our group supports the standardization of the practice. There is insufficient evidence that routine subcutaneous drain use effectively reduces the rate of SSI.[23] In patients with SSI, negative pressure closed drains can be used selectively, depending on the characteristics of the wound site. The risk of SSI can be reduced by the timing of prophylactic antibiotic administration, appropriate skin preparation, and maintaining sterilization conditions.[24] Antibiotic prophylaxis was administered at the appropriate dose and duration in all of our patients. Surgical site cleaning was provided with povidine iodine, and resterilizable wound dressings were used. As expected, the rate of SSI was found to be higher in night shift (56%) and emergency (75.9%) procedures. This shows the necessity of standardizing the surgical optimization conditions for 24 h.

Previously, it has been reported in the literature that some individual health characteristics are risk factors for SSI. These include other comorbidities such as anemia, obesity, hypertension, and diabetes mellitus. Zejnullahu et al.[21] showed that the probability of SSI is increased approximately 7.4-fold in the presence of comorbidities (RR 7.457; 95% CI: 3.392–16.3395, and p<0.001). Although no comparison was made with the healthy control group in our study, we would like to emphasize that in women with SSI, maternal health and obstetric problems such as anemia, gestational diabetes, obesity, hypertensive disease, and preterm labor are seen at a higher rate than the known frequency in our society.

SSI can be superficial (skin and subcutaneous), deep (subcutaneous tissue), or located in the organ or body cavity (Table 4). One of the important factors for surgical wounds is the degree of contamination. It is classified according to whether it occurs traumatically or not, whether the organ or space with specific endogenous flora is entered in a controlled manner at the time of surgical intervention, and whether misapplications are made in the principles of asepsis and antisepsis. In the guideline of the National Institute for Health and Care Excellence revised in 2019, surgical wounds are classified into four types according to the degree of contamination (Table 5). Our group consists of patients with one type of incision and is in the clean-contaminated wound group. According to the guideline, the risk of SSI in this group of wounds is 5%–10%.[25] SSI in the deep tissue and organ/body cavity was not detected in any of our patients. The predominant clinical finding observed was discharge from the wound site (63.9%). The dehiscence rate was 17.3%. The negative pressure wound closure technique was applied to 3 patients (1.6%) with wound dehiscence. The literature data of this application are promising in some high-risk surgeries and contaminated wounds. However, the evidence does not support its routine use. Outcomes may vary depending on the degree of contamination and features of the incision site.[26,27] As a matter of fact, the povidone iodine dressing was sufficient for wound care in 96.3% of the patients in our group. A meta-analysis of observational randomized trials failed to demonstrate

Table 5: According to the revised guideline of the NICE 2019, surgical wounds are classified into four categories based on the degree of contamination

Wound status	Definition
Clean (Class 1)	• They are nontraumatic and uninfected elective surgical wounds that are not drained and closed primarily without impairing asepsis techniques • These wounds do not enter hollow organs such as the genital system, urinary system, gastrointestinal tract, and respiratory system • No inflammation is present • These wounds are not formed as a result of penetration • The risk of developing SSI in this type of wound is less than 2%
Clean-contaminated (Class 2)	• Nonelective surgical wounds that are entered into the gastrointestinal system, urinary system, respiratory system, and genital system under controlled conditions and cause minor aseptic disturbances without contamination • In clean wounds, a new incision or explorative separate incision with negative results within 7–10 days postoperatively • Mechanical drainage is applied • No signs of infection are observed • The risk of developing SSI is between 5% and 10%
Contaminated (Class 3)	• These are fresh and open traumatic wounds • There is a significant gastrointestinal leakage into the wound • Uncontrolled entry into the infected genitourinary, gastrointestinal, and respiratory system • Grafted chronic open wounds and penetrating wounds within 4 h are in this group • Acute and nonpurulent wounds are considered in this group • The risk of developing SSI is over 15%
Dirty-infected (Class 4)	• Penetrating wounds that have been open for more than 4 h with traumatic, devitalized, foreign body and fecal contamination. There is serious contamination due to perforated organs • Acute bacterial infection or purulent discharge was encountered during the operation • The risk of developing SSI is over 30%

NICE: National Institute for Health and Care Excellence; SSI: Surgical site infection.

the benefit of using the delayed primary closure technique while leaving the infected wound open.[28] For wounds at risk of seroma, infrequent use of a skin stapler to close the wound and drain between daily stapler rings may be effective.[29] There is no evidence to suggest that the use of any particular dressing on a closed surgical wound reduces the rate of SSI.[30] However, wound protectors designed to protect wound edges from trauma and contamination can contribute to the prevention of SSI in clean-contaminated, contaminated, and dirty wounds.[31,32] In all patients in our group who were treated with negative pressure wound closure technique, a 10-mm Jackson Pratt drain was placed in the wound beds to prevent possible seroma, and primary closure was performed. The drain was taken off when the drain flow fell below 30 cc (Fig. 1). Two of the 3 patients in whom the technique was applied were diabetic and obese patients (Fig. 2). The method of leaving the wound to secondary healing without suturing was applied in 4 (2.1%) patients, and the intermittent suture technique was not preferred in any of the patients.

While antibiotics are not always necessary to treat superficial SSI, they are almost always necessary to treat deep and organ SSI. Antibiotic indications are cellulitis around the incision, presence of implanted material in the infected area, presence of systemic signs of infection, and signs of sepsis despite wound control.[33,34] Perioperative prophylactic antibiotics were given to all patients in our group. Of the patients, 58.1%, whose treatment was completed, were discharged with oral antibiotic treatment. It is a scientific fact, which is frequently applied in clinical practice but not based on evidence, that empirical antibiotic therapy at discharge by individual preferences without clinical findings or recommendations by microbiologist does not protect from wound infection, and it shows the necessity of reviewing existing practices. The choice of empirical antibiotic depends on the initial gram stain, wound class, site of the wound, previous exposure to antibiotics, history of colonization with antibiotic-resistant organisms, and use of local antimicrobial agents. Definitive antimicrobial therapy should be determined based on

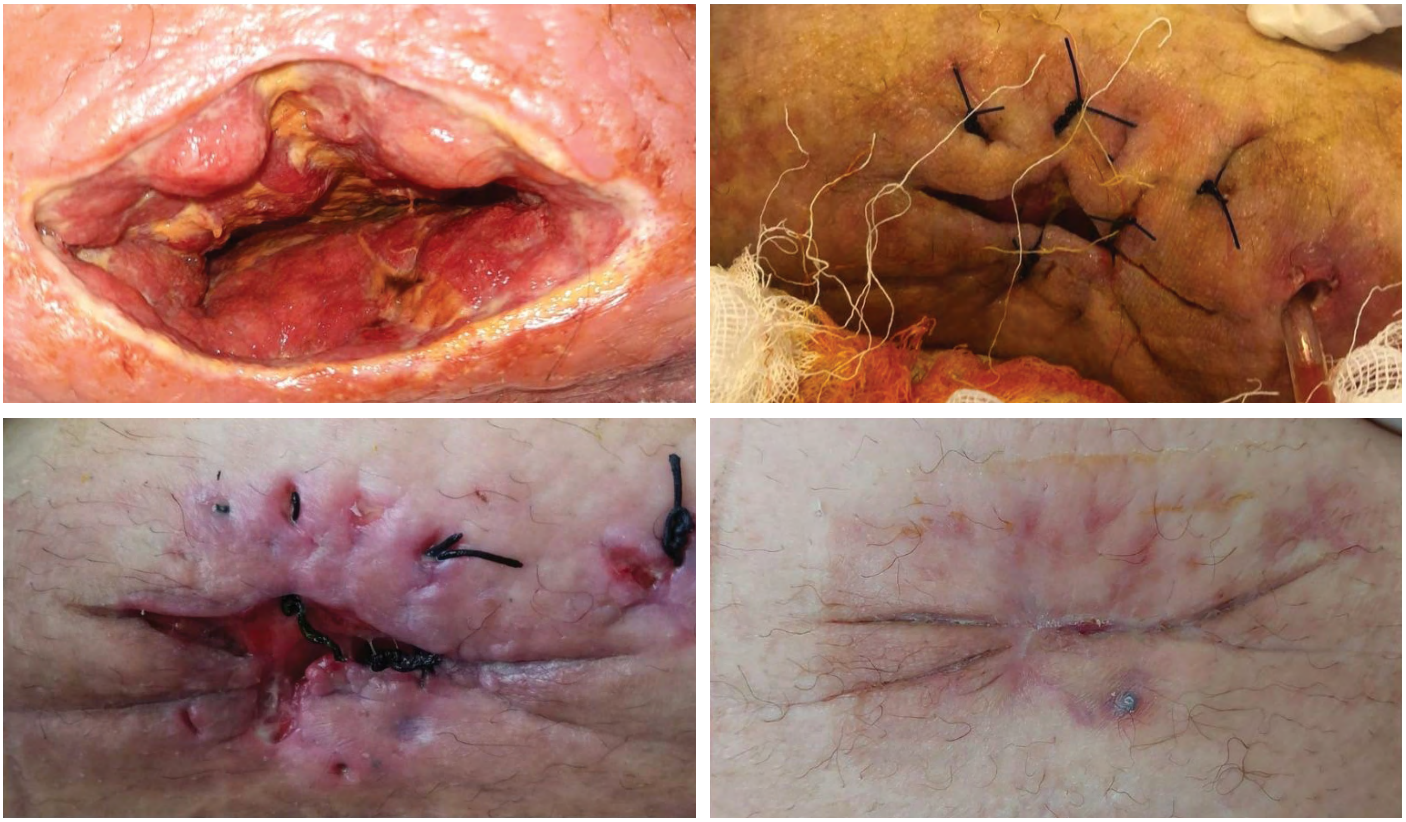

Figure 1: The appearance of the wound bed following treatment of a patient with the negative pressure wound closure technique. Demonstrating the application of primary repair using a 10-mm Jackson Pratt drain inserted on the wound bed after exudate is extracted and the tissue sample remains sterile. The monofilament suture material is preferred in primary repair. The drain is placed and maintained under negative pressure to prevent the formation of seroma.

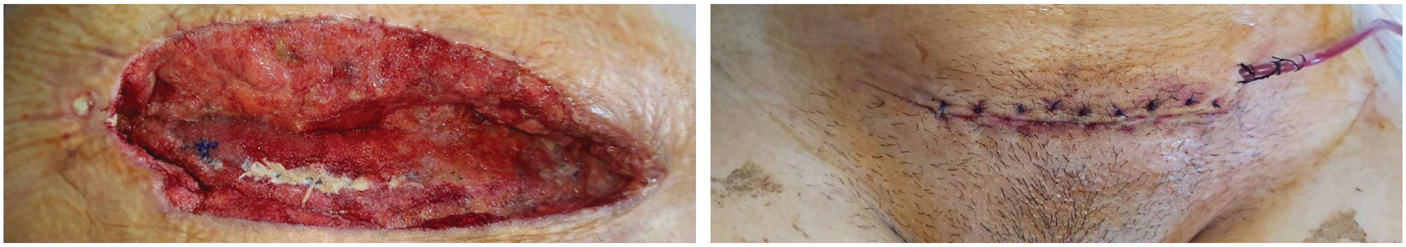

Figure 2: The wound appearance after 114 days of treatment in a 36-year-old female patient with a body mass index of 44.5 and type 2 diabetes mellitus. The patient was hospitalized for 26 days. The negative pressure closing technique was applied six times in total. The patient was examined eight times in the outpatient clinic and primary closure was applied to the wound site four times in different periods.

the patient's clinical response and susceptibility results of wound culture, if any. Antibiotics should be stopped when signs of wound infection regress and/or physiological parameters such as leukocytosis are normalized. The guidelines recommend a short course of antibiotics (24–48 h) for cellulitis that does not improve with wound dehiscence.[35,36] In the case of intraabdominal organ/space infection, antimicrobial therapy may be discontinued after source control has been established.[37] It should always be kept in mind that necrotizing soft tissue infection may develop, especially if the causative agents are *Streptococcus* or *Clostridium* spp. The clinical findings were detected during the clinical observation period in 12.6% and after discharge in an unplanned admission to the hospital in 87.4% of the patients with SSI in our group. Culture antibiogram samples were taken from all patients. The mean time of obtaining a culture was 13.9±9.7 days. Pathological microorganism growth was observed in 61.8% of the patients with culture sample. The most common pathogens isolated from infected surgical wounds were *Staphylococcus aureus*, coagulase-negative *Staphylococci*, *Streptococcus* spp., and *Enterococcus* spp. strains.[38] Similarly, *Staphylococcus* growth occurred in 57.6% of our group. No growth was observed in 37%. It is thought that the sociocultural levels, personal hygiene, and comorbidities of the patients affect the duration and distribution of organisms grown. Of the patients in the group, 58.1% lived on minimum wage or below. The education level of 38.8% was high school or higher. Type 2 diabetes mellitus was found in 20.4% of them, and 28.2% of them were on insulin (Table 2).

Improper wound dressing is an important risk factor in the development of SSI. Correct wound dressing during the care process determines the healing time. It is expected to be done in accordance with the rules, show the necessary care, and use the right products. Dressings that maintain moisture and temperature facilitate healing.[39] Moisture retention is highly important because wound fluids contain tissue growth factors that facilitate re-epithelialization and promote autolytic debridement. The ideal dressing should absorb exudate without leakage, be impermeable to water and bacteria, be free of particulate contaminants that may remain in the wound after removal, and should not cause trauma to the granulation tissue.[40] In our clinic, the wound dressing is applied by covering the wound with standard sterile gauze pads moistened with saline after cleaning the area with povidone iodine. Topical agents (e.g., povidone iodine, sodium hypochlorite, and hydrogen peroxide) are often used on heavily infected wounds. However, the benefit of these solutions in wound healing is unknown, as they may be toxic to fibroblasts and consequently inhibit wound healing.

Our study has several limitations. First, no comparison was made with the healthy control group without SSI, which is inherent in descriptive studies. Patients at high risk of SSI were not evaluated. Patient groups with systemic inflammatory and oncological diseases, chronic drug use that affect wound healing, and malnutrition could not be examined. Uncomplicated SSIs are easier to manage and SSI after C-section is in this group. In addition, there might be a group of patients who developed SSI after C-section and did not apply to our clinic. Since our research was conducted in a single center, the results we obtained cannot be generalized to the community. The contribution of frequently requested biochemical examinations on the decisions made, the effect of blood transfusion on the process, and cost-effectiveness evaluation have not been investigated. Prospective randomized controlled studies are needed to evaluate the efficacy of absorbable monofilament suture materials with a lower infection risk instead of multifilament absorbable material and also to examine the use of separate stitches instead of subcutaneous primary closure technique in patients with a high risk of SSI, diabetes, obesity, comorbidity, low self-care, and sociocultural levels. Long-term follow-up of our group with SSI should be done and the development of incisional hernia should be evaluated.

This study provides basic data for the rate of SSI, the high-risk group, and the clinical and microbial profile of SSI in patients who underwent C-section in Zeynep Kamil Maternity and Children's Training and Research Hospital, which includes a gynecology and obstetrics clinic. SSIs developing in a single type of surgical incision were investigated. Most of the cases (87.4%) developed SSI after discharge. This is important to emphasize the post-discharge wound care training and regular follow-ups. It also created an opportunity to review the surgical technique and materials used. In this context, we emphasize that pregnant women before C-section should be evaluated in terms of the risk of postoperative SSI development and the importance of preferring applications with a lower risk of SSI to the high-risk group. We believe that it would be beneficial to compare our study with the study results of multidisciplinary hospitals where similar surgeries are performed. Thus, the effect of the difference in approach on the results can be seen.

CONCLUSION

The wound healing process is quite complex. As the number of surgical interventions increases, the complication rate decreases. In terms of wound care, the process is similar. As standard, similar applications become routine; it will increase the success rate even more. The data from our study highlight the need for a review of national post-discharge wound surveillance programs. It also provides resource information for to-be-developed wound surveillance programs and postpartum care. Wound surveillance programs to be developed after C-section will contribute to the reduction of maternal morbidity by reducing SSI, thus reducing treatment costs.

Statement

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Ethics Committee Approval: The Zeynep Kamil Maternity and Children's Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 16.06.2021, number: 128).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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