GENERAL GYNECOLOGY

Surgical site infections and cellulitis after abdominal hysterectomy

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OBJECTIVES: To identify risk factors for and outcomes of surgical site infections and cellulitis after abdominal hysterectomies.

STUDY DESIGN: We used logistic regression analysis to analyze data from a case-control study of 1104 patients undergoing abdominal hysterectomies at a university hospital between Jan. 1, 2007 and Dec. 30, 2010.

RESULTS: Factors significantly associated with surgical site infections and with cellulitis were: pulmonary disease, operations done in Main Operating Room East, and seroma. Body mass index >35, no private insurance, and fluid and electrolyte disorders were risk factors for surgical site infections. The mean prophylactic dose of cefazolin was significantly higher for controls than for patients with surgical site infections. Preoperative showers with Hibiclens (Molnlycke Health Care US, LLC, Norcross, GA) and cefazolin prophylaxis were associated with a significantly decreased cellulitis risk. Surgical site infections and cellulitis were significantly associated with readmissions and return visits and surgical site infections were associated with reoperations.

CONCLUSION: Preoperative showers, antimicrobial prophylaxis, surgical techniques preventing seromas, and the operating room environment may affect the risk of surgical site infections and cellulitis after abdominal hysterectomies.

Key words: abdominal hysterectomy, cellulitis, surgical site infections

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Surgical site infections (SSIs) are the second most common healthcare-associated infection (HAI) reported to the Centers for Disease Control and Prevention's National Health Safety Network (NHSN) and these infections adversely affect patient outcomes.[1] Patient-related risk factors for SSIs after hysterectomies have included: diabetes, obesity, weight, a thick subcutaneous tissue layer, neoplasm, low preoperative serum albumin, and proliferative endometrium.[2-8] Age <40 years[4,9] and advanced age[8,10] have been associated with increased risk of SSIs. Procedure-related risk factors have included: abdominal procedures,[2,11] total hysterectomies compared with subtotal hysterectomies,[4] procedure duration,[5] preoperative hospital stay greater than 2 days,[8] hematoma,[8] nongynecological procedures done with the hysterectomy,[8] excessive intraoperative bleeding,[5,10,12] transfusions,[6,13] and low postoperative hemoglobin.[9] Perioperative antimicrobial prophylaxis has been associated with decreased risk of SSIs.[14]

The mean rate of SSIs after hysterectomies done at the University of Iowa Hospitals and Clinics (UIHC) was above the NHSN 75th percentile. A preliminary assessment suggested that obesity, diabetes, and asthma were common among patients with SSIs. In addition, rates of cellulitis after these procedures seemed to be high. Thus, we conducted a case-control study to identify potentially modifiable risk factors for SSIs and for cellulitis. We also sought to identify outcomes of these infections. During the study, the surgeons became concerned that SSI rates were higher among patients whose operations were done in Main Operating Room (MOR) East than among patients whose operations were done in MOR. To address this concern, we extended the study period 18 months and we collected data on the rooms in which procedures were done.

Materials and Methods

We defined an SSI case as any patient who had an abdominal hysterectomy (*International Classification of Diseases*, Ninth Revision Clinical Modification procedure codes: 68.31, 68.39, 68.41, 68.49, 68.61, 68.69) at the UIHC between Jan. 1, 2007 and Dec. 31, 2010, and who was identified by the UIHC's Program of Hospital Epidemiology as meeting the NHSN definition of SSI, including superficial incisional, deep incisional, and organ/space infections.[1] We defined a cellulitis case as any patient who had an abdominal hysterectomy at the UIHC between Jan. 1, 2007

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The study was conducted in Iowa City, IA.

The authors report no conflict of interest.

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TABLE 1
Bivariable analyses: patients with cellulitis, SSIs, and controls[a]

Variable		Control (n = 240)	SSI (n = 66)	Cellulitis (n = 60)	Cellulitis vs control	SSI vs cellulitis
Preoperative factor						
Age, y	(Mean ± SD)	54.9 ± 14.1	53.2 ± 11.9	57.6 ± 12.9	$P = .19$	$P = .05$
	(Median)	54.0	53.0	60.0	$P = .06$	$P = .18$
Weight, kg	(Mean ± SD)	86.9 ± 24.8	101.7 ± 33.5	100.3 ± 28.3	$P = .0003$	$P = .80$
	(Median)	82.8	97.2	98.1	$P = .02$	$P = .10$
BMI	(Mean ± SD)	32.8 ± 9.0	38.2 ± 11.5	38.5 ± 10.7	$P < .0001$	$P = .89$
	(Median)	31.3	36.0	36.4	$P = .004$	$P = .72$
	BMI <18.5	3 (1.3)	0 (0)	0 (0)	$P = .03$	$P = .44$
	≤18.5 BMI <25	47 (19.6)	10 (15.2)	5 (8.3)		
	≤25 BMI <30	55 (22.9)	7 (10.6)	9 (15.0)		
	BMI ≥30	135 (56.3)	49 (74.2)	46 (76.7)		
No private insurance		57 (23.8)	27 (40.9)	22 (36.7)	$P = .05$ OR, 1.9 (95% CI, 1.0–3.4)	$P = .72$ OR, 1.2 (95% CI, 0.6–2.5)
Comorbidities	Peripheral vascular disease	1 (0.4)	0 (0)	3 (5.0)	$P = .03$ OR, 12.6 (95% CI, 1.3–123)	$P = .11$
	Chronic pulmonary disease	20 (8.3)	17 (25.8)	11 (18.3)	$P = .03$ OR, 2.5 (95% CI, 1.1–5.5)	$P = .39$ OR, 1.5 (95% CI, 0.7–3.6)
	Hypertension	96 (40.0)	27 (40.9)	35 (58.3)	$P = .01$ OR, 2.1 (95% CI, 1.2–3.7)	$P = .07$ OR, 0.5 (95% CI, 0.2–1.0)
	Obesity	66 (27.5)	28 (42.4)	28 (46.7)	$P = .005$ OR, 2.3 (95% CI, 1.3–4.1)	$P = .72$ OR, 0.8 (95% CI, 0.4–1.7)
Preoperative oral hypoglycemic agent		33 (13.8)	14 (21.2)	5 (8.3)	$P = .38$ OR, 0.6 (95% CI, 0.2–1.5)	$P = .05$ OR, 3.0 (95% CI, 1.0–8.8)
Operative or immediate postoperative factor						
Reason for hysterectomy: cancer		150 (62.5)	51 (77.3)	45 (75.0)	$P = .07$ OR, 1.8 (95% CI, 0.9–3.4)	$P = .84$ OR, 1.1 (95% CI, 0.5–2.6)
MOR East		25 (10.4)	19 (28.8)	12 (20.0)	$P = .05$ OR, 2.2 (95% CI, 1.0–4.6)	$P = .30$ OR, 1.6 (95% CI, 0.7–3.7)
Preoperative shower with Hibiclens		40 (16.7)	17 (27.0)	4 (6.7)	$P = 0.06$ OR, 0.4 (95% CI, 0.1–1.0)	$P = .004$ OR, 5.2 (95% CI, 1.6–16.5)
Procedure	Total	99 (41.3)	20 (30.3)	24 (40.0)	$P = .61$	$P = .24$
	Subtotal	12 (5.0)	5 (7.6)	1 (1.7)		
	Radical	129 (53.7)	41 (62.1)	35 (58.3)		

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