

Original article

Epidemiological Surveillance of Surgical Site Infection and its Risk Factors in Cardiac Surgery: A Prospective Cohort Study

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ABSTRACT

Introduction and objectives: Surgical site infection in cardiac surgery is uncommon. The aim of the present study was to examine the incidence of this infection, compare it with national and international data, and evaluate its risk factors.**Methods:** This prospective cohort study included patients who underwent valve surgery or coronary revascularization during a 6-year period. The incidence of surgical site infection was studied. Associations between risk factors and infection were evaluated using odds ratios (OR). The infection rate was compared with Spanish and American data using the standardized infection ratio.**Results:** A total of 1557 patients were included. The overall cumulative incidence of infection was 4% (95% confidence interval [95%CI], 3.6%-5.6%), 3.6% in valve surgery (95%CI, 2.5%-4.7%) and 4.3% in coronary revascularization (95%CI, 2.3%-6.3%). Risk factors for surgical site infection in valve surgery were diabetes mellitus (OR = 2.8; $P < .05$) and obesity (OR = 6.6; $P < .05$). Risk factors for surgical site infection in coronary revascularization were diabetes mellitus (OR = 2.9; $P < .05$) and reoperation for bleeding (OR = 8.8; $P < .05$).**Conclusions:** Diabetes mellitus and obesity favor surgical site infection in valve surgery, whereas diabetes mellitus and reoperation for bleeding favor surgical site infection in coronary revascularization. Infection surveillance and control programs permit evaluation and comparison of infection rates in cardiac surgery.

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Vigilancia epidemiológica y factores de riesgo de infección de sitio quirúrgico en cirugía cardíaca: estudio de cohortes prospectivo

RESUMEN

Introducción y objetivos: La infección de sitio quirúrgico es poco frecuente en cirugía cardíaca. El objetivo es estudiar su incidencia, compararla con datos nacionales e internacionales y evaluar sus factores de riesgo.**Métodos:** Estudio de cohortes prospectivo que incluyó a pacientes intervenidos de cirugía cardíaca valvular y revascularización coronaria durante 6 años consecutivos. Se estudió la incidencia de infección de sitio quirúrgico. Se evaluó la asociación entre los factores de riesgo y la infección con la *odds ratio* (OR). Las tasas de infección se han comparado con las de España y Estados Unidos usando la razón estandarizada de infección.**Resultados:** Se incluyó a 1.557 pacientes. La incidencia de infecciones acumulada total fue del 4% (intervalo de confianza del 95% [IC95%], 3,6-5,6%), el 3,6% (IC95%, 2,5-4,7%) en cirugía valvular y el 4,3% (IC95%, 2,3-6,3%) en revascularización coronaria. La diabetes mellitus (OR = 2,8; $p < 0,05$) y la obesidad (OR = 6,6; $p < 0,05$) resultaron factores de riesgo de infección de sitio quirúrgico de la cirugía valvular. La diabetes mellitus (OR = 2,9; $p < 0,05$) y la reintervención por hemorragia (OR = 8,8; $p < 0,05$) son factores de riesgo de infección de sitio quirúrgico en revascularización coronaria.

Palabras clave:

Infección

Cirugía cardíaca

Epidemiología

Factores de riesgo

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Conclusiones: La diabetes mellitus y la obesidad favorecen la infección de sitio quirúrgico en cirugía valvular. La diabetes mellitus y la reintervención por hemorragia favorecen la infección de sitio quirúrgico en revascularización coronaria. Los sistemas de vigilancia y control de infección permiten evaluar y comparar las tasas de infección en cirugía cardíaca.

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Abbreviations

ASA: American Society of Anesthesiologists
 CDC: Centers for Disease Control and Prevention
 INCLIMECC: Clinical Indicators of Continuous Quality Improvement
 NNIS: National Nosocomial Infections Surveillance Index
 SSI: surgical site infection

INTRODUCTION

Surgical site infection (SSI) is an uncommon complication of cardiac surgery associated with high morbidity and mortality. It increases health care costs, mean hospital length of stay, and the rates of reoperation and intensive care unit admission.^{1–4} The profile of patients undergoing cardiac surgery has changed in recent years, with greater operative complexity (multiple valve or mixed valve and coronary artery surgeries), fewer patients

undergoing isolated coronary revascularization, and more comorbidities.^{5,6}

The incidence of SSI in cardiac surgery varies between 1.1% and 7.9% according to the surgical procedure analyzed (Table 1). Because this variation is due to differences in study design, patient profile, type of procedure analyzed, and the definitions used for infection classification, implementation of infection surveillance and control programs in hospitals is important. Such a program would permit evaluation of the incidence of infections and related risk factors, assessment of changes in epidemiological patterns, comparisons with other centers, and on-going determination of the effectiveness of any preventive measures introduced.^{7–14}

The National Nosocomial Infections Surveillance Index (NNIS) risk index is used to classify patients according to their risk of SSI and compare the adjusted rates among different surgeons, units, centers, and countries. The NNIS combines the degree of operative contamination (the factor most associated with SSI), the American Society of Anesthesiologists (ASA) physical status score (the intrinsic risk of the patient), and the operative time (an indicator of the complexity of the surgical procedure).¹⁵ Patients undergoing cardiac surgery are fairly homogeneous with respect to these

Table 1
 Studies of the Incidence of Surgical Site Infection after Cardiovascular Surgery

Author and year	Country	Study	Operation	Incidence	%
Cristofolini et al, 2012 ⁴	Germany	36 months	CABG	Superficial	1.3
				Deep	2.3
				Saphenous	1.0
Filsoufi et al, 2009 ⁵	United States	1998–2005	CARD	CARD	1.1
				CABG	1.8
				CARD + CABG	2.4
Faisal et al, 2012 ⁶	United States	1993–2008	CARD	Superficial	2.0
				CABG	1.5
				Saphenous	3.6
Berg et al, 2011 ⁷	Norway	2005–2009	CABG	Superficial	1.4
				Deep	5.1
				Saphenous	8.9
Monge et al, 2006 ⁸	Spain	1997–2003	CARD	CARD	5.6
				CABG	7.9
Sharma et al, 2009 ⁹	United States	2000–2004	CABG	Saphenous	2.4
Manniën et al, 2011 ¹⁰	The Netherlands	2002–2007	CARD	Superficial	5.6
				CABG	1.3
				Saphenous	3.2
Haley et al, 2012 ¹¹	United States	2008	CABG	All	2.2
Friedman et al, 2007 ¹²	Australia	2003–2005	CABG	Superficial	1.9
				Deep	1.3
				Saphenous	2.9
Cayci et al, 2008 ¹³	United States	1997–2003	CARD	All	1.5
				CABG	
Borer et al, 2011 ¹⁴	Israel	1998–1999	CARD	Deep	5.1
				CABG	

CABG, coronary artery bypass grafting; CARD, valve and cardiac structure surgery.

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