DOCTORS ACADEMY

BETTER EDUCATION. BETTER HEALTH.

ISSN 2052-1715

Clinical Research
DAUIN 20180125

World Journal of Medical Education and Research:
An Official Publication of the Education and Research Division of Doctors Academy

Predictive Markers for Surgical Site Infection in Laparoscopic Appendicectomy

Darwin O

Institution
University of Nottingham
Nottingham NG7 2RD,
United Kingdom

WJMER, Vol 16: Issue 1, 2018

Abstract

Background: The risk of surgical site infection (SSI) is considered one of the most serious issues following laparoscopic appendicectomy (LA). This study seeks to analyse the predictive value of commonly ordered routine admissions laboratory tests for SSI in LA.

Methods: This retrospective study was conducted among patients at least 18 years of age with acute nonperforated appendicitis who underwent LA at a tertiary care hospital in Sydney, Australia between 1 July 2015 and 30 June 2016. Utilising patients' records, results of routine admissions laboratory tests were collected. The collected preoperative lab results included white blood cell count (WBC), red blood cell count (RBC), and serum albumin (S. alb) levels. The patients were then divided into two groups based on the occurrence of an SSI.

Results: A total of 166 laparoscopic appendicectomies were performed during the study period. Of these, 148 were for non perforated appendicitis, and 144 had patient records suitable for statistical analysis. The mean WBC was 8.17 x10^3 cells/mm^3 (range = 5.8-12.1). The mean RBC was 4.99 x10^3 cells/mm^3 (range = 3.8-6.2). S. alb showed a mean of 3.79 g/dL (range = 2.8-5.1). Only a minority of patients (n=7, 4.9%) suffered from a SSI. 6 patients had superficial incisional infections, and 1 patient had an organ/space infection.

Conclusion: Among the laboratory tests investigated, only preoperative serum albumin was identified as a significant predictor for SSI (P = 0.008). As SSI can be a serious postoperative morbidity, the possible use of preoperative S. alb as a screening tool for preventable SSI should be further investigated.

Key Words

Surgical Site Infection; Appendicectomy; Predictive Markers; General Surgery; Nosocomial Infection

Corresponding Author:
Mr Oliver Darwin; E-mail: mzyod2@nottingham.ac.uk

Introduction

Postoperative surgical site infections (SSI) remain a major cause of morbidity among surgical patients. A study by Graves (2009)[1] estimated that over 21,000 cases of SSI occur annually in Australia, and other studies show an overall SSI incidence of 2-12%[2,3,4]. A similar study in the United States determined that approximately 500,000 cases occur annually, among 27 million surgical procedures[5]. SSI accounts for approximately one quarter of nosocomial infections[6], and is known to impose serious burdens on patients, increasing morbidity and mortality rates, as well as lengthening hospitalisation and increasing costs[7,8].

As such, any predictive markers that have a potential to identify and prevent the risks for this situation would be hugely beneficial, but are rarely utilised on a clinical basis[9]. This study seeks to analyse the value of commonly ordered routine admissions laboratory tests in predicting SSI risk in patients undergoing laparoscopic appendicectomy (LA) for nonperforated appendicitis.

Method

The pathologic state of the appendix has been shown to be the most important determinant of postoperative infection[10,11]. Incidence of SSI is four to five times higher following appendicectomy for perforative or gangrenous appendicitis. Hence, this study analysed only appendicectomies for nonperforated appendicitis. In addition, since its introduction in 1983, LA has been conducted much more frequently than open appendicectomy due to its minimal invasiveness[12]. As such, only procedures performed by LA were considered.

The study was conducted retrospectively, with patients of at least 18 years of age with acute nonperforated appendicitis who underwent LA at a tertiary care centre in Sydney, Australia between 1 July 2015 and 30 June 2016. The results of routine

2

admissions laboratory tests were collected utilising the patients' medical records, and the results for white blood cell count (WBC), red blood cell count (RBC), and serum albumin levels (S. alb) were extracted. Any patients that did not have results for these laboratory tests in their medical records were not included.

The LA procedures were carried out using three ports, as per Society of American Gastrointestinal and Endoscopic Surgeons guidelines[13]: one 10 mm camera port at the umbilicus, and two 5 mm secondary ports placed at the left lower quadrant and suprapubic regions respectively.

The state of nonperforated appendicitis, and the presence of SSI, was determined through the final pathologic reports. SSI classifications were defined according to Centre for Disease Control guidelines[14]. Statistical analyses were performed using IBM SPSS Statistics for Macintosh, Version 23.0.0 (IBM Corp., Armonk, NY, USA), and logistic regression analysis was applied. A P-value of <0.05 was deemed to be statistically significant.

Results

A total of 166 laparoscopic appendicectomies were performed during the study period, with 148 performed for nonperforated appendicitis. Of these, 144 had records suitable for statistical analysis.

The average age of the patients was 27.4 (range = 6-67), with 54.2% (n=78) of the patients being male. The mean preoperative WBC was 8.17 $x10^3$ cells/mm^3 (range = 5.8-12.1). The mean preoperative RBC was 4.99 $x10^3$ cells/mm^3 (range = 3.8-6.2). Preoperative S. alb showed a mean of 3.79 g/dL (range = 2.8-5.1). Only a minority of patients (n=7, 4.9%) suffered from a SSI. 6 patients had superficial incisional infections, and 1 patient had an organ/space infection.

Of the measured parameters, only preoperative S. alb was significantly different between the SSI group and the non-SSI group (P = 0.008). WBC (P = 0.433), RBC (P = 0.534), and age (P = 0.374) showed no statistical significance (Table 1).

	Mean	SD	P-value
Preoperative WBC			
SSI	7.96	1.78	0.433
Non-SSI	8.18	1.27	
Total	8.17	1.29	
Preoperative RBC			
SSI	4.87	0.57	0.534
Non-SSI	5.00	0.65	
Total	4.99	0.64	
Preoperative S. alb			
SSI	3.20	0.51	0.008
Non-SSI	3.83	0.55	
Total	3.80	0.54	
Age			
SSI	27.3	8.42	0.374
Non-SSI	27.4	12.3	
Total	27.4	12.1	

Table 1: Parameters predicting surgical site infection.

3

Clinical Research
DAUIN 20180125

World Journal of Medical Education and Research:
An Official Publication of the Education and Research Division of Doctors Academy

Discussion

This study focussed on identifying a routine admission laboratory test that could be used for predicting susceptibility to postoperative surgical site infection. The only statistically significant predictor of SSI in laparoscopic appendicectomies was preoperative serum albumin (P = 0.008). This finding is in keeping with previous literature[15,16,17,18,19], and in contrast to a previous study that reported that preoperative total lymphocyte count was the only predictor of delayed wound healing[20].

It has previously been shown that serum albumin is a reliable indicator of nutritional status, and low serum albumin can be indicative of preoperative nutritional depletion. Matar et al have suggested the use of nutritional biomarkers as screening tests for preventing surgical site infection[21], and measures taken to counteract nutritional deficiency have been shown to successfully decrease the incidence of SSI from 12.9% to 1.9%[9]. This study has shown that serum albumin is an effective biomarker for SSI, and could potentially play a role in identifying patients for the implementation of nutritional support protocols to reduce infection rates.

Conclusion

The results of routine laboratory admissions were retrospectively examined to determine if any results could be used as a predictive biomarker for susceptibility to postoperative surgical site infection. Preoperative serum albumin level was identified as the only statistically significant predictor of surgical site infection (P = 0.008). As surgical site infection is a serious and preventable cause of postoperative morbidity, this study indicates that using preoperative serum albumin as a screening measure to identify patients at risk of SSI could be beneficial, and should be investigated further.

References:

1. Graves N, Halton K, Paterson D, Whitby M. 'Economic rationale for infection control in Australian hospitals'. Healthcare Infection (2009). 14(3):81-8.
2. De Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn B. 'Surgical site infection: Incidence and impact on hospital utilisation and treatment costs'. American Journal of Infection Control (2009). 37(5):387-97.
3. Leaper DJ, Van Goor H, Reilly J, Petrosillo N, Geiss H, Torres A, Berger A. 'Surgical site infection - a European perspective of incidence and economic burden'. International Wound Journal (2004). 1(4):247-73.
4. Fiorio M, Marvaso A, Vigano F, Marchetti F. 'Incidence of surgical site infections in general surgery in Italy'. Infection (2006). 34:310.
5. Horan T, Culver D, Gaynes R, Jarvis W. 'Nosocomial infections in surgical patients in the United States, January 1986-June 1992'. Infection control & Hospital Epidemiology (2015). 14(2):73-80.
6. Klevens RM, Edwards JR, Richards CL. 'Estimating health care-associated infections and deaths in U.S. hospitals, 2002'. Public Health Reports (2007). 122(2):160-6.
7. Stone PW. 'Economic burden of healthcare-associated infections: an American perspective'. Expert Rev Pharmacoecon Outcomes Res (2009). 9(5):417-22.
8. De Angelis G, Murthy A, Beyersmann J, Harbarth S. 'Estimating the impact of healthcare-associated infections on length of stay and costs'. Clinical Microbiology and Infection (2010). 16(12):1729-35.
9. Gottschalk MB, Johnson JP, Sadlack CK, Mitchell PM. 'Decreased infection rates following total joint arthroplasty in a large country run teaching hospital: A single surgeon's experience and possible solution'. J Arthroplasty (2014). 29:1610-6.
10. Garcell HG, Arias AV, Sandoval CAP, Garcia EG, Gamboa MEV, Sado AB, Serrano RAN. 'Incidence and ethology of surgical site infections in appendectomies: a 3-year prospective study'. Oman Med J (2017). 32 (1):31-5.
11. Xiao Y, Shi G, Zhang J, Cao JG, Liu LJ, Chen TH, et al. 'Surgical site infection after laparoscopic and open appendectomy: a multicenter large consecutive cohort study'. Surg Endosc (2015). 29(6):1384-93.
12. Kathkouda N, Mason R, Towfigh S, Gevorgyan A, Essani R. 'Laparoscopic versus open appendectomy: a prospective randomised double-blind study'. Annals of Surgery (2005). 242(3):439-50.
13. Korndorffer J, Haggerty S, Stefanidis D, Earle D, Lobe T, et al. 'Guidelines for Laparoscopic Appendectomy'. SAGES (2009).
14. Berrios-Torres A, Umscheid C, Bratzler D. 'Centers for Disease Control and Prevention guideline for the prevention of surgical site infection'. JAMA Surg (2017). 152(8):784-91.
15. Gibbs J, Cull W, Henderson W, Daley J, Hur K. Kurie SF. 'Preoperative serum albumin level as a predictor of operative mortality and morbidity: results from the national VA surgical risk study'. Arch Surg (1999). 134:36-42.
16. Greene KA, Wilde AH, Stulberg BN. 'Preoperative nutritional status of total joint patients: relationship to postoperative wound complications'. J Arthroplasty (1991). 6:321-5.
17. Gunningberg L, Persson C, Akerfeldt T. 'Pre- and post-operative nutritional status and predictors for surgical-wound infections in

elective orthopaedic and thoracic patients'. E Spen Eur E J Clin Nutr Metab (2008). 3:e93-101.

18. Zhu Y, Zhang F, Chen W, Liu S, Zhang Q, Zhang Y. 'Risk factors for periprosthetic joint infection after total joint arthroplasty: a systematic review and meta-analysis'. J Hosp Infect (2015). 89:82-9.

19. Alfargieny R, Bodalal Z, Bendardaf R, El-Fadli M, Langhi S. 'Nutritional status as a predictive marker for surgical site infection in total joint arthroplasty'. Avicenna J Med (2015). 5(4):117-22.

20. Marin LA, Salido JA, Lopez A, Silva A. 'Preoperative nutritional evaluation as a prognostic tool for wound healing'. Acta Orthop Scand (2002). 73:2-5.

21. Matar WY, Jafari SM, Restrepo C, Austin M, Purtill JJ, Parvizi J. 'Preventing infection in total joint arthroplasty'. J Bone Joint Surg Am (2010). 92(Suppl 2):36-46.

5

The World Journal of Medical Education & Research (WJMER) is the online publication of the Doctors Academy Group of Educational Establishments. It aims to promote academia and research amongst all members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from all parts of the world. The journal intends to encourage the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting-edge technology and those who need to innovate within their resource constraints. It is our hope that this interaction will help develop medical knowledge & enhance the possibility of providing optimal clinical care in different settings all over the world.
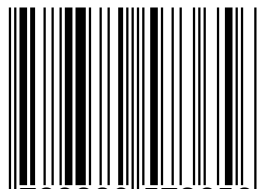
WJMER

World Journal of Medical Education and Research

An Official Publication of the Education and Research Division of Doctors Academy