Original Article

Postoperative Wound Infection in A University Hospital

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Abstract

Two thousands four hundreds and forty-one postoperative wounds were studied during 15 month-period from January 1987 to March 1988 at Songklanagarind Hospital to determine the postoperative wound infection rate. There were 159 wounds that became infected, yielding an overall infection rate of 6.5%. When categorized operation by traditional wound classification, infection occurred in 3.6% of clean wound 8.4% of clean-contaminated wound 11.8% of contaminated wound and 31.0% of dirty or infected wound.

เรื่องย่อ

การติดเชื้อแผลผ่าตัดในโรงพยาบาลมหาวิทยาลัยแห่งหนึ่ง

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วารสารโรคติดเชื้อและยาต้านจุลชีพ 2532; 6:1-3.

คณะผู้วิจัยได้ศึกษาถึงอัตราการติดเชื้อแผลผ่าตัดในโรงพยาบาลสงขลานครินทร์ โดยทำการศึกษาในช่วงเวลา 15 เดือน ตั้งแต่เดือนมกราคม พ.ศ. 2530 ถึงเดือนมีนาคม พ.ศ. 2531 ผลการศึกษาพบว่ามีการผ่าตัด 159 ครั้งที่มีการติดเชื้อหรือคิดเป็นการติดเชื้อร้อยละ 6.5 ของการผ่าตัดทั้งหมด เมื่อแบ่งการผ่าตัดออกเป็นแผลสะอาด, แผลปนเปื้อน-สะอาด, แผลปนเปื้อน และแผลสกปรกแล้ว ก็พบว่ามีการติดเชื้อร้อยละ 3.6, 8.4, 11.8 และ 31.0 ตามลำดับ.

INTRODUCTION

Postoperative wound infections have been recognized to be the serious problem throughout the entire history of surgery. The great revolution on practice of surgery were the introduction of antiseptic, aseptic techniques, and antibiotic. These made it possible for us to operate upon many patients on whom we would not able to do at 20 years ago because of risk of infection. Despite of these evolution and elucidation of new techniques that led to better control of surgical infection, postoperative wound infection still remains the problem of major importance.

There is considerable variation in rates of wound infection from hospital to hospital. This may partly due to the differences of patients' susceptibilities and differences of type of operation. In order to get more valid comparison of postoperative wound infections, the classical method[1] that classified surgical wound into one of the three categories according to degree of contamination has been in generally used. And recently, the introduction of simplified risk index[2] for classification the risk of developing wound infection.

This study was undertaken to describe the rate of postoperative wound infection in Songklanagarind Hospital. The methods utilized for classification patients by the risk of developing wound infection were both traditional wound classification[1] and simplified risk score.[2]

MATERIALS AND METHODS

Songklanagarind is a university hospital of 570 beds. It serves as medical school and referral center

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for the southern part of Thailand. The study was undertaken from January 1987 through March 1988. The services included in this study were general, cardiopulmonary, urology, neurology, pediatric, plastic, and orthopedic surgery.

Three infection control nurses (S.T., U.N., and P.V.) visited each surgical unit, and ICU once to twice weekly and collected all the pertinent data. The informations were recorded on the preprinted work sheets. After discussion with hospital epidemiologist (S.J.) they classified the wounds according to degree of contamination and risk score. The charts of all discharged patients were reviewed to assure that no relevant data missing. No attempt was made to follow up the patients after discharge unless the patient was readmitted. Excluded from this study were skin graft, anal surgery, burns, and minor surgery that required no general nor regional anesthesia.

Postoperative wound infection included incisional surgical wound infection and deep surgical wound infection. The following criteria were used for diagnosing infection. Incisional surgical wound infection may be diagnosed in any of the following ways: (1) Physician's definite diagnosis of incisional surgical wound infection and no previous diagnosis of incisional surgical wound infection at the same anatomic site. (2) Purulent drainage from operative wound site and no previous diagnosis of incisional surgical wound infection at the same site. (3) Physician's diagnosis of stitch abscess and incision not healed within three days after suture removal. Deep surgical wound infection may be diagnosed in any of the following three ways: (1) Physician's definite diagnosis of any of the following conditions: (a) Meningitis following neuro-surgery. (b) Pleural empyema following thoracic surgery. (c) Abdominal abscess or subphrenic abscess following abdominal surgery. (d) Endocarditis following cardiac surgery. (e) Septic arthritis or osteomyelitis after bone or joint surgery. (2) Purulent drainage from a drain, fistula or natural body opening and no previous diagnosis of deep surgical wound infection at the same site. (3) Pus encountered at re-operation at or near the surgical field of a previous operation and no previous diagnosis of deep surgical wound infection at the same site.

Postoperative wounds were categorized by traditional wound classification[1] and by simplified multivariate risk score.[2] The traditional wound classification classified operation wound into clean, clean-contaminated, contaminated, and dirty or infected wound. Simplified multivariate risk score[2] can be calculated by adding one point for the presence of each of the following four variables: (1) abdominal operation; (2) operation lasting > 2 hours; (3) contaminated or dirty-infected operation by the traditional wound classification system; (4) having ⩾ 3 diagnoses.

RESULTS

During the 15 month-period, there were 159 wound infections in 2,441 postoperative wounds, yielding an overall infection rate of 6.5%. When the operations were classified by degree of contamination,[1] there were 1,552 clean wounds, 557 clean-contaminated wounds, 245 contaminated wounds, and 87 dirty or infected wounds. And in each of these categories there were 56, 47, 29, and 27 wounds that became infected respectively. The infection rates in each traditional wound classification are listed together with other studies in Table 1. When the operations were categorized by multivariate risk score,[2] there were 909, 1021, 453, 50 and 8 wounds that had 0, 1, 2, 3, and 4 scores respectively. And in

Table 1 Incidence of postoperative wound infection from various reports in relation to wound classification.

Authors	Year	Type of hospital	Wounds	Percentage of infection				
				Wound classification				Overall
				I	II	III	IV	
NAS-NRC[3]	1964	Five university hospitals	15,613	5.1	10.8	16.3	28.0	7.4
Cruse[4]	1968 – 1972	University hospital	23,649	1.8	8.9	21.5	38.0	4.8
Cruse[5]	1968 – 1977	University hospital	62,939	1.5	7.7	15.2	40.0	4.7
Haley[2]	1975 – 1976	Mixed types	69,352	2.9	3.9	8.5	12.6	4.1
Edwards[6]	1969 – 1972	Medical college	40,923	4.2	4.6	6.0	10.1	4.8
Olson[7]	1977 – 1981	Veteran administration	20,193	1.8	2.9	9.9	–	2.8
Hulton[8]	1977 – 1981	District general hosp.	15,199	4.5	15.8	–	–	8.8
Collier[9]	1982 – 1984	Two community hospitals	2,733	1.5	2.1	3.9	9.3	5.1
Ortona[10]	1985	University hospital	1,505	7.5	9.9	6.9	39.9	8.4
This study	1987 – 1988	University hospital	2,441	3.6	8.4	11.8	31.0	6.5

I = Clean, II = Clean-contaminated, III = Contaminated, IV = Dirty or infected

Table 2 Surgical wound infection rates categorized by simplified multivariated risk index.

Authors	Simplified risk score					Overall
	0	1	2	3	4	
Haley[2]	1.0	3.6	8.9	17.2	27.0	4.1
This study	2.9	5.4	13.0	28.0	62.5	6.5

Table 3 Common pathogens isolated from infected postoperative wounds.

Pathogens	No.
Staphylococcus aureus	36
Pseudomonas aeruginosa	24
Escherichia coli	16
Klebsiella pneumoniae	11
Proteus mirabilis	5

each of these categories there were 26, 55, 59, 14, and 5 wounds that became infected respectively. The infection rates in each risk score category are listed in Table 2 together with the infection rates yielding from SENIC project.[2]

Pathogens could be isolated from 119 infected wounds or 74.8% of the total infected wounds. The common pathogens responded for postoperative wound infections are illustrated in Table 3.

DISCUSSION

There is considerable variation among infection rates reported from different studies (Table 1). This discrepancy may be due to many factors such as patient and hospital characteristic, surgical subspecialty and type of operation, criteria used for diagnosing infection, and method of survey. The factors that influence wound infection include host factors and agent factors. Host factors are the resistance of host to infection. These include local and systemic resistance of host. Agent factors include dose of bacterial contamination and pathogenicity. Traditional wound classification[1] can control only dose of bacterial contamination and ignore the other host and agent factors. In the university hospital, we always operate upon the highly susceptible and debilitate patients. So the infection rate in the university hospital may be higher than general hospital or secondary care hospital. Regarding to this reason, the infection rate obtained from our study may be rather high. And the another reason is that we included in our study only the major operation. This probably produced the large figures of clean wound infection.

Simplified multivariate risk score is the attempt to get more valid comparison by concerning the factors other than degree of contamination. Although includes the duration of operation that may reflect the surgical volume; includes the anatomic site of operation that may reflect the local resistance; and includes number of diagnosis. But these may not directly reflect the host susceptibility. This probably can explain the higher infection rate in all risk score categories when compare with infection rates resulting from SENIC project.[2]

Before we have the valid comparison method, every hospitals should obtain their own postoperative wound infection rates for monitoring and evaluating their infection control measures.

The common pathogens that caused postoperative wound infection were not strikingly different from the general.[11]

REFERENCES

1. Altemeier WA, Burke JF, Pruitt BA Jr, Sandusky WR. eds. Manual on control of infection in surgical patients. Philadelphia: Lippicott, 1984:28-9.
2. Haley RW, Culver DH, Morgan WM. Identifying patients at high risk of surgical wound infection: a simple multivariate index of patient susceptibility and wound contamination. Am J Epidemiol 1985; 121:206-15.
3. Ad Hoc Committee of the Committee on Trauma, Division of Medical Sciences, National Academy of Sciences-National Research Council: Postoperative wound infections: the influence of ultraviolet irradiation of operating room and various other factors. Ann Surg 1964; 160 (Suppl 2):1-132.
4. Cruse PJE, Foord R. A five-year prospective study of 23,649 surgical wounds. Arch Surg 1973; 107:206-10.
5. Cruse PJ, Foord R. The epidemiology of wound infection: a 10-year prospective study of 62, 939 wounds. Surg Clin North Am 1980; 60:27-40.
6. Edwards LD. The epidemiology of 2,056 remote site infections and 1966 surgical wound infections occurring in 1865 patients: a four year study of 40,923 operations at Rush-Presbyterian-St. Luke's hospital Chicago. Ann Surg 1976; 184:758-66.
7. Olson M, O'Connor M, Schwartz ML. Surgical wound infections: a 5-year prospective study of 20,193 wounds at the Minneapolis VA medical center. Ann Surg 1984; 199:253-9.
8. Hulton NR, Kiff ES, Brogan TD. Surgical sepsis at a district general hospital. J Hosp Infect 1985; 6:140-6.
9. Collier C, Miller DP, Borst M. Community hospital surgeon-specific infection rates. Infect Control 1987; 6:249-54.
10. Ortana L, Federico G, Fantoni M. A study on the incidence of postoperative infections and surgical sepsis in a university hospital. Infect Control 1987; 8:320-4.
11. Mayhall CG. Surgical infections including burns. In: Wenzel RP, ed. Prevention and control of nosocomial infections. Baltimore: Williams & Wilkins, 1987:344.