

Wound sepsis in 10,000 surgical patients

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SUMMARY

A twelve year prospective wound audit was undertaken in an academic surgical unit. Data from 10,000 operations were analysed. Overall, wound infection rates decreased during this time. Infection rates in contaminated wounds in particular fell from 19.2% to 4.7%. This decrease in wound infection may be related in part to a change in the antibiotic prophylactic regimen and in part to the institution of the wound sepsis audit which provided regular information on the unit infection rates. This audit permitted early detection of adverse trends, and may have had a direct influence on surgical techniques.

INTRODUCTION

Since the late nineteenth century hospital-acquired surgical wound infection has presented a serious and continuing problem. Infection occurring as a post-operative complication in surgical patients increases discomfort, morbidity, debility and is occasionally life threatening. The side effects of using antimicrobial agents, and the increased cost associated with infection in terms of prolonging hospital stay must also be considered.¹

The true incidence of wound infection in surgical practice has been difficult to determine for many reasons. There is variation in the criteria for definition of wound infections and types of wounds studied; some reports have included all types of wounds or operations as one category whilst others have used separate and indefinite categories. Comparison between different hospitals is therefore difficult.

This study began as a prospective wound audit, and criteria were set for wound type and wound infection. During the 12 year period of the study two different therapeutic and prophylactic antibiotic regimens were in use, and some comparison between these regimens has been possible.

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METHODS

A prospective audit of wound sepsis in the professorial surgical unit at the Royal Victoria Hospital, Belfast, was commenced in January 1974. The unit covers a wide range of general surgery.

A wound was considered infected if it discharged pus. Wounds with serous or non-purulent discharge were considered infected only if a culture was positive. Even if no organisms were cultured or seen on gram staining of the discharge, the wound was considered to be infected when associated signs of increased local temperature, marked erythema or induration were present. Wounds with sepsis around a suture and wounds in which dehiscence occurred were considered to be infected. The number of individual patients rather than the number of individual wounds were counted. Thus, a patient with multiple wounds was considered as one event.

Surgical operations were classified according to the criteria of the American National Research Council,² except that contamination from perforated viscera due to disease or trauma was included in group 3.

Class 1. Clean wound. Non-traumatic wound, genitourinary or gastrointestinal tracts not entered.

Class 2. Potentially contaminated wound. Non-traumatic wound, entry into the respiratory, genitourinary and gastrointestinal tract has occurred but with no or minimal spillage of contents.

Class 3. Contaminated wound due to trauma or disease. Pus or spillage of viscous contents encountered.

Primary septic conditions, such as a pre-existing abscess requiring incision and drainage, were excluded from the survey as the open wounds through which pus continued to drain were inevitably infected.

Routine follow-up of patients was undertaken approximately six weeks after leaving hospital. Patients who gave a history of having had a wound discharge, or significant problems with the wound which could be attributed to infection, subsequent to leaving hospital were recorded as positive for wound infection within the study. Infections not related to the wound area were excluded.

For colonic surgery a regimen of low residue diet, laxatives, colonic washouts and peri-operative antibiotics was maintained throughout the study period. No stipulations were made regarding the method of wound closure. Wound surveillance in hospital was done on a daily basis by the senior house officer or surgical registrar under the supervision of the consultant surgeon. The four surgeons in charge remained the same throughout the duration of the study and no attempt was made to classify the results according to the grade of operator. At a monthly sepsis meeting infected cases were discussed which provided an opportunity to review individual cases, as well as the overall results which were subsequently collated on a yearly basis within the unit.

No prophylactic antibiotics were used for patients in the clean category. For some groups of patients in the potentially contaminated group, prophylactic antimicrobial regimens were used for three doses over a 24 hour period. For patients in the contaminated category a therapeutic regimen was generally maintained for five to seven days.

In the period 1974–1979 the two antimicrobial agents which were mainly used were co-trimoxazole and metronidazole separately or in combination. In the 1980–1985 period metronidazole continued to be used while cephalosporins (mostly cefuroxime) was substituted for co-trimoxazole. Metronidazole was given intravenously except in patients with appendicitis in whom it was given rectally by suppository. The co-trimoxazole and cephalosporins were given intravenously.

RESULTS

During the period of the study 10,000 operations were performed. There were 5,932 clean wounds of which 159 (2.7%) became infected. The infection rate was 8.7% in the 3,211 potentially contaminated cases, and 9.8% in the 857 contaminated patients.

The periods 1974–9 and 1980–5 were analysed separately. There was an increase in the total number of operations performed in the second period due primarily to an increase in the number of clean operations, from 51.0% to 66.5%. This represents an increasing interest in breast surgery in the unit during the period of the study. The percentage of potentially contaminated cases declined from 42% in the 1974–9 period to 23% in 1980–5.

TABLE

Analysis of wound infection in 10,000 patients from 1974 to 1985

	1974–1979		1980–1985		Total	
	Number	Infected (%)	Number	Infected (%)	Number	Infected (%)
Clean	2369	71 (3.0)	3563	88 (2.5)	5932	159 (2.7)
Potentially contaminated	1970	165 (8.4)	1241	115 (9.3)	3211	280 (8.7)
Contaminated	302	58 (19.2)	555	26 (4.7)	857	84 (9.8)

The incidence of infection within each class of operation is shown in the Table. The overall incidence of wound infection for the two periods was 6.3% (1974–9) and 4.3% (1980–5) but this difference was not statistically significant. In the clean group (Class 1) the infection rates of 3.0% (1974–9) and 2.5% (1980–5) were similar. In the potentially contaminated group (Class 2) the infection rate was 8.4% for the 1974–9 period and 9.3% during 1980–5. In the contaminated group (Class 3) there was a significant fall in the incidence of infection from 19.2% in 1974–9 to 4.7% (1980–5) ($p < 0.2$, chi squared test).

DISCUSSION

The main purpose of this prospective study was to function as a wound audit on a large number of patients undergoing a wide spectrum of operations. It was not a controlled study in the use of antibiotics but we do feel that it gives an overall view of the incidence of sepsis which may be expected in a general surgical unit. A clear definition of infection was established and agreed prior to commencing. Over the period of the study the patients were under the care of only four consultant surgeons, but there were a considerable number of registrars and senior house officers involved in patient management. A detailed analysis of the grade of operator was not undertaken, the choice of suture material was not defined, and subcuticular sutures were seldom used.

The overall wound infection rate of 5.3% compares well with the results of other large series. Overall infection rates in the range of 3.0% to 12.0% have been reported in many series. Olson et al³ from Minneapolis reported a low overall infection rate of 2.8%. The clean wound infection rate of 2.7% also compares favourably with results from other centres. Cruse and Foorde⁴ reported a rate of 1.5%, Burns and Dippe⁵ 2.5%, and Leigh⁶ 2.9% in clean wounds. When the two six-year periods are compared (1974–9 and 1980–5) the clean wound infection rates of 3.0% and 2.5% are not significantly different. We would not have anticipated any marked change in incidence but there was a gradual fall throughout the period of the study, and we feel that our figures are reasonably accurate in view of the late surveillance of wounds at six weeks after discharge. Rosendorf et al⁷ have emphasised the importance of post-discharge wound surveillance on reported infection rates.

In the potentially contaminated group various prophylactic antibiotic regimens were used, particularly in colorectal surgery. From 1974–9 metronidazole with or without co-trimoxazole was the main choice. The wound sepsis rates of 8.4% and 9.3% are at the lower range of that generally expected for a potentially contaminated group where rates of 8.0% to 29.0% have been reported.⁸ It has been consistently shown that prophylactic antibiotics are most useful in this group,⁹ but our investigations did not show any definite advantage for the use of a cephalosporin in comparison to co-trimoxazole.

In the group of contaminated wounds a therapeutic regimen of two drugs was used, the antibiotics being given at the time of surgery and continued for five to seven days. A considerable reduction in wound infection, from 19.2% in 1974–9 to 4.7% in 1980–5 would seem to indicate the superiority of cephalosporins used during the second six-year period. The infection rate of 19.2% in the first period was slightly higher than that reported elsewhere (8.8% to 28.4%).⁹ The rate of 4.7% for the second period is extremely low. There are two possible reasons for this marked reduction in infection rate — that the change from co-trimoxazole to cephalosporin was more effective in the therapeutic than in the prophylactic regimen, or that the very presence of the monthly wound audit has had some cumulative effect on the reduction of infection in all three categories, most significantly in the contaminated group. We have not recorded the frequency with which abdominal lavage was undertaken throughout the period of the study, nor the nature of the contamination.

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