The African Journal of Medicine and Medical Sciences

Volume 17
1988

BLACKWELL SCIENTIFIC PUBLICATIONS
Oxford London Edinburgh Boston Palo Alto Melbourne

Afr. J. Med. med. Sci. (1988) **17**, 145–148.

Post-operative wound infection in thoracic patients: a preliminary report

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Summary

A retrospective study of 37 patients undergoing pulmonary resection, between 1975 and 1980, was performed to establish the incidence of wound infection and to determine contributory factors. Sixteen patients had suppurative lung disease while 11 had pulmonary tuberculosis. The majority of the patients received prophylactic antibiotic (Ampicillin and Cloxacillin) given intramuscularly or intravenously, prior to thoracotomy, and continued for several days post-operatively.

Twenty of the 37 cases (54%) developed wound infection, defined as any purulent wound drainage in the post-operative period. The patients with infection (group A) did not differ from those without (group B) as regards presence of pyorrhoea or haemoptysis, the duration of operation or the quantity of blood infused during surgery. A significant difference in the duration of chest intubation was identified between group A (6 ± 1.3 days) and group B (3 ± 1.5 days) ($P < 0.001$). The implication of the results towards the modification of post-operative management of patients is discussed.

Résumé

On a entrepris une étude rétrospective de 37 patients ayant fait l'objet d'une résection pulmonaire entre 1975 et 1980, afin d'établir l'apparition d'une infection chirurgicale et de déterminer les facteurs qui en sont responsables. Seize patients souffraient d'une affection pulmonaire suppurative et onze avaient une tuberculose pulmonaire. La majorité des patients avaient reçu, à titre prophylactique et avant la thoracotomie, des antibiotiques (Ampicilline et Cloxacilline) par voie intramusculaire ou intraveineuse; ce traitement a été prolongé pendant plusieurs jours après l'opération.

Vingt des 37 cas (54%) ont développé une infection chirurgicale, définie comme tout drainage d'une plaie purulente au stade post-opératoire. Les patients avec infection (groupe A) ne différaient pas de ceux sans infection (groupe B) en ce qui concerne la présence de pyorrhosie ou d'hémoptysie, la durée de l'operation et la quantité de sang transfusé pendant celle-ci. Toutefois, on a observé une différence significative dans la durée du tubage de la cavité thoracique entre le groupe A (6 ± 1.3 jours) et le groupe B (3 ± 1.5 jours) ($P < 0.001$). On examine ici les implications de ces résultats afin d'établir les modifications à apporter dans le traitement post-opératoire des patients.

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Introduction

At the University College Hospital, Ibadan, 70% of thoracic diseases requiring surgery are due to infections [1]. Surgical wounds in such patients would fall within the categories of 'clean-contaminated' 'contaminated' or 'dirty' according to the U.S. National Research Council [2]. These categories depict patients at a high risk of post-operative wound infection.

A previous report from our medical centre [3] indicated that the infection rate on the surgical service was 7.5%, well within the range of 4.8–17% reported from developed countries [2]. Nevertheless, we believe that our current infection rate far exceeds the previously reported level. We have, therefore, carried out a retrospective study of all our patients who had pulmonary resection, to document the wound infection rate and to determine the predisposing factors.

Patients and methods

The records of all patients undergoing pulmonary resection between April 1975 and December 1980 were reviewed. We only included patients with adequate documentation of case history sufficient for analysis. The examined data included the clinical diagnosis, presence or absence of pyorrhoea and haemoptysis, pre-operative antibiotic received, operation performed, quantity of infused blood, duration of chest intubation, condition of operative wound and post-operative course until discharged. Swabs were taken from all infected wounds and submitted for microscopical examination, aerobic cultures and antibacterial sensitivities. It should be noted that the majority of patients received prophylactic antibiotics in the form of intravenous or intramuscular Ampicillin and Cloxacillin. Antiseptic soap washes to the chest wall using chloroxylenol (Dettol® Reckitt and Coleman) or similar agent was applied for several days before surgery. Posterolateral thoracotomy with pleural entry via the periosteal bed of the fifth rib was routinely used for all cases. Chest closure technique consisted of pericostal No. 2 chromic catgut and layered approximation of muscles with continuous zero chromic catgut sutures.

Statistical analysis of results was performed using Student's *t*-test to determine the significance of differences obtained between the infected (group A) and non-infected (group B) patients. Standard errors of difference between percentages were calculated.

Results

Thirty-seven patients were available for study. Twenty-eight had lobectomy, while nine underwent pneumonectomy. The majority suffered from suppurative lung disease (Table 1). We defined wound infection as any purulent discharge from the wound in the post-operative period. The infected wounds were categorized as minor, if confined to less than 25% of the incision line and above the muscle layer; or major, for any involvement beyond this range.

The operative mortality rate was 22% and the overall wound infection rate was 54%. Positive culture was obtained in nine patients of which two were mixed organisms. The organisms were Klebsiella species in four cases, *Escherichia coli* in three, *Pseudomonas* in two, *Staphylococcus aureus* in one and *Streptococcus faecalis* in one. All, apart from the *Pseudomonas*, species were sensitive to Ampicillin and Cloxacillin. Nine of the 20 infected cases were in the minor category (major infection rate, 30%). Infection was more frequent amongst the pneumonectomy patients (67%) than in the lobectomy cases (50%); although the difference was not statistically significant ($P < 0.317$). Pre-operatively, pyorrhoea and haemoptysis were present in 62% and 70% of cases, respectively. Paradoxically, the infection rate was significantly greater in patients without, than in patients with, pyorrhoea ($P < 0.01$) (Table 2). Amongst the intra-operative and post-operative factors examined (Table 3), only the duration of post-thoracotomy drainage showed a positive correlation with the infection rate. Duration of chest intubation averaged 6 ± 1.3 days for group A in contrast to 3 ± 1.5 days for group B ($P < 0.001$). A total of eight patients succumbed in the post-operative period, six from respiratory failure and two from intrathor-

Table 1. Primary diagnosis in 37 patients

Pulmonary TB	
Destroyed lung syndrome	6
Bronchiectasis/cavitation	5
Non-tuberculous infection	
Bronchiectasis/lung abscess	16
Pulmonary Neoplasm	4
Miscellaneous	6

Table 2. Analysis of pre-operative factors*

Factors	Infection rate (%)	Significance
Aetiology		
TB	54	n.s.
Non-TB	44	
Pyorrhoea		
Present	40	$P < 0.01$
Absent	79	
Haemoptysis		
Present	57	n.s.
Absent	45	

*n.s. = Not significant. Note overall infection rate 54% (20/37).

Table 3. Analysis of intra- and post-operative factors*

Factors	Infected (group A) (20)	Uninfected (group B) (13)	Significance
Operating time (h)	3.5 ± 1.7	3.4 ± 1.6	n.s.
Infused blood (ml)	4.8 ± 3.1	3.2 ± 1.4	n.s.
Chest intubation (days)	6 ± 1.3	3 ± 1.5	$P < 0.001$

*Data shown are mean ± s.d.
n.s. = Not significant.

acic infection. The post-operative period of hospitalization averaged 16 days in group B patients, compared with 38 days in group A (infected patients).

Discussion

Comparisons between studies on the incidence of nosocomial infection are hindered by lack of agreement on terminology [4]. Any inquiry into the rate of occurrence of surgical wound infection must begin by defining the operational terminology. We selected the criteria of 'purulent discharge' as our index of infection to ensure the inclusion of 'stitch abscesses' and wounds with sterile pus in our statistics. The use of microbiological evidence of bacteria as sole determinant of wound infection invariably underestimates the true incidence, as negative cultures are not contradictory to the presence of infection [5]. Nevertheless, bacteriological studies are essential adjuncts for the effective therapy of established wound infections.

Predisposition to wound infection is determined by the dose of bacterial inoculum and the inherent resistance of the patient [2]. As the type of operative procedure performed greatly influences the bacterial 'dosage', categorization of wounds provides a measure of the risk involved. The U.S. National Academy of Science [2] classified wounds into 'clean', 'clean-contaminated', 'contaminated' and 'dirty'. Currently, such wounds carry a relative risk of infection of 1.8%, 8.9%, 21.5% and 38.3%, respectively [6]. The majority of our patients fell into the high-risk ('contaminated') category.

The presence of severe pulmonary pathology, indicated by the high incidence of pyorrhoea and haemoptysis in our patients, as well as the high prevalence of malnutrition, would combine to reduce patients' resistance to infection. Malnutrition and remote infections are amongst the patients' factors known to have an adverse effect on nosocomial infection [7], while a true correlation has been demonstrated between the latter and the severity of the underlying disease [4]. The effect of our attempts at antibiotic prophylaxis were not determinable in the present study, as its use was neither consistent nor standardized. However, others [6,8] have substantiated its benefit in all categories of wound infection. The few cases of positive wound cultures obtained in our patients confirms [9] that despite prophylactic antibiotics, wound infection occurring in such cases is due to sensitive organisms. We found no relationship between infection rate and the duration of the operative procedure, in contrast to the study of Cruse *et al.* [2] where a direct relationship was reported. The degree of surgical trauma to tissues, assessed by determining the amount of blood transfused intra-operatively, was unrelated to the infection rate. An identical wound closure technique excluded this as a contributory factor in the infected cases.

The finding of a statistically significant difference in the duration of chest drainage between the infected and non-infected patients illustrates the inherent risk of any drainage system. It is well established that the use of drains increase infection rates [3,7]. The period of chest drainage is usually dictated by the quantity of the effluent obtained over a 24-h period. Our pneumonectomy patients also received chest tubes for rapid evacuation of modest bleeding usually occurring during the initial 48-h after operation.

In conclusion, the present study has confirmed our fears that the wound infection rate after pulmonary resection is unacceptably high.

A real correlation between the period of chest intubation and infection rate has been identified. It is our intention to modify our protocol accordingly by earlier extubation of patients and possibly avoiding chest tubes altogether in pneumonectomy patients. We also plan to establish a strict regimen of systemic prophylactic antibiotics.

References

1. Adebonojo SA, Adebo OA, Osinowo O. Pattern of thoracic surgical diseases in Nigeria: experience at the University College Hospital, Ibadan. J Natl Med Assoc 1978;70:651–7.
2. Cruse JE, Foord R. A five-year prospective study of 23,649 surgical wounds. Arch Surg 1973;107:206–10.
3. Montefiore D, Alausa KO, Cooke AR *et al*. Epidemiological surveillance of hospital-acquired wound infections. Nig Med J 1979; 9:289–93.
4. Laufman H. How to keep valid statistics on surgical infection rates. J Surg Pract 1978;7:4–9
5. Laufman H. Surgical infection control: basic definitions and current status. J Surg Pract 1978;7:61–4.
6. Skinner D, Myerowitz D. Recent advances in the management of thoracic surgical infections. Ann Thorac Surg 1981;31:191–8.
7. Polk HC. Operating room acquired infection: a review of pathogenesis. Ann Thorac Surg 1979;45:349–59.
8. Bryant LR, Dillon ML, Mobin-Uddin K. Prophylactic antibiotics in noncardiac thoracic operations. Ann Thorac Surg 1975;19:670–6.
9. Ilves R, Cooper JD, Todd TRJ, Pearson FG. Prospective randomized, double-blind study using prophylactic cephalothin for major elective, general thoracic operations. J Thorac Cardiovasc Surg 1981;81:813–7.

(*Accepted* 19 *March* 1987)