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Post-operative wound infection in a developing country

A prospective survey at the Q.E.C.H., Blantyre, Malawi.

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Summary:

A prospective survey of post-operative wound infection rates was undertaken at the Queen Elizabeth Central Hospital, Blantyre, Malawi over a three-month period from April to June, 1985. The methods whereby wound sepsis data were obtained are presented. The results show an overall infection rate of 25.8% and that for clean wounds of 14.8%. These figures are relatively unfavourable and an attempt is made to explain this. The limitations of this study are discussed, as is the importance of continued sepsis surveillance with particular reference to the use of antibiotic prophylaxis.

Introduction:

The Queen Elizabeth Central Hospital in Blantyre is one of two central government teaching hospitals in Malawi and provides specialist services for over three million people. The surgical department is run by four general-surgical specialists, a government medical officer on rotation, one clinical officer and several trainee medical assistants. There are 220 beds, and as many floor-spaces, in four large "nightingale"-type wards; male and female general-, orthopaedic-, and paediatric-surgery. Here the pre-operative preparation and all the post-operative care is done. There is no recovery or intensive-care unit. There are two main theatres and a plaster-room (which is also used for minor infected cases). Patients are admitted through the Casualty department or Out-patient clinics, and many are referred from the various District Hospitals and Health centres. Although the health-services are free, the large distances and everpresent transport problems, together with the belief in traditional African healing result in a positive selection of the patients reaching the specialist.

The goals of this study were three-fold; first, to record accurately the post-operative wound infection rate during a consecutive three-month period; second, to uncover the determinants influencing wound sepsis in the situation encountered in a developing country; and third, as a pilot-study to examine the feasibility of such clinical research.

Methods and materials:

A standard form was designed on which the information could be recorded concerning patient characteristics at the time of operation, details of the operative procedure performed and the circumstances of wound healing during the post-operative follow-up period.

In the context of this audit, "operation" indicates a procedure in which a skin incision was made and sutured at the same session[1]; I+D's, debridements, skingrafts and secondary closures were thus excluded.

Operations were classified into four categories, based on the American National Research Council criteria[1]

CLEAN = no infection encountered, no hollow viscus opened.

CLEAN/CONTAMINATED = hollow muscular organ entered with minimal spillage.

CONTAMINATED = inflammation without pus formation, viscus opened with gross spillage of contents, fresh traumatic wound.

DIRTY = pus encountered or perforated viscus found, old traumatic wound.

Burns, oral-, genital-, and peri-anal incisions were excluded[2]. Unfortunately, it was not possible to include the gynaecological and obstetrical operations in this audit.

A wound was considered to be infected if it discharged pus[1] in which case it was opened and drained and where possible a pus swab taken for gramstain, culture and sensitivity.

I personally saw all patients before operation and inspected every wound daily until discharge from hospital and at outpatient review. A follow-up period of four weeks was endeavoured. (See Appendix form.)

Results: (See Tables I to V.)

Over a period of nine weeks in the months of April to June 1985, a total of 171 patients were registered in the survey. Of these 23 (14%) were excluded: 7 did not qualify in retrospect, 5 patients died within three days after operation, 11 had an inadequate follow-up of less than one week (they failed to attend for review or were transferred to a distant District hospital). The remaining 148 operations, of which 104 were elective and 44 urgent/emergency, provided 155 wounds for analysis.

Table I : Incidence of wound infection classified by degree of operative contamination.

Category	no. wounds	infected	%
CLEAN - major	76	10	13
- major	39	7	18
- total	115	17	14.8
CLEAN/CONTAMINATED	19	7	36.8
CONTAMINATED	14	9	64.3
DIRTY	7	7	100.0
OVERALL INFECTION RATE	155	40	25.8%

Infection occured in a total of 40 wounds yielding an overall infection rate of 25.8%. Table I shows the relation of wound infection to the degree of operative contamination. Infections were noted between 3 and 13 days post-operatively with an average of 6.5 days.

Table II lists the rates of wound infection in relation to the type of operative procedure. This detailed analysis is necessary to be able to pin-point specific problem areas responsible for significantly high rates. For example, all the (transvesical-) prostatectomies became seriously infected, almost certainly due to the long periods of pre-operative obstruction with inevitable urinary infection.

Table II : Operations classified by type of procedure with corresponding infections rates.

Operation procedure	no.	infected	%
HERNIA - inguinal	33	2	8
- other	7	1	20
APPENDECTOMY	5	1	20
LAPAROTOMY - bowel resection	13	4	
- gastric	4	2	33
- splenectomy	4	1	
- other	15	5	
UROLOGIC - (transvesical) prostatectomy	6	6	-
- nephrectomy	1	1	100
HEAD/NECK - (partial) thyroidectomy	5	1	25
- parotidectomy	1	1	
- thyroglossal cyst	2	0	
ORTHOPAEDIC - bone operations	13	4	21
- other	6	0	
PLASTIC (excluding skin-grafts)	7	3	43
MINOR OPERATIONS - tumors	29	6	23
- biopsy	6	2	

Bacteriological reports were obtained for 32 of the 40 infected wounds; 7 showed no growth, 25 had positive cultures of which 14 (44%) contained Staphylococcus aureus. Sensitivities done for 7 of these 14 gave resistance to Penicillins for all. Table III lists these results. This is, however, an incomplete picture as anaerobic cultures could not be done.

Table III : Bacteriological results.

Category	no. infected		Staph. aureus	E. coli	other	N.C.
CLEAN	15	(13)*	6	4	-	4
CLEAN CONTAMINATED	7	(5)	2	1	pseud. 2	1
CONTAMINATED	9	(8)	5	4	pseud. 2	-
DIRTY	7	(6)	1	3	proteus 2 pseud., proteus tbc.	2
Total	40	(32)	14	12	8	7

*= no. of results obtained.

The general condition of the patients was examined pre-operatively by assessing their nutritional state through measuring height, weight and skinfold-thickness. Serum protein analysis was not possible. The results, only obtained for 30 of the 110 adults, give an average height of 162 cm., weight of 50 kg. and skinfold-thickness of 6 mm. Blood haemoglobin values were also analysed, and give an average of 12.9 g/dl for males and 11.4 g/dl for females.

Patterns were sought for amongst the various determinants of infection by considering the clean operations[2]: infection rates for individual surgeons, which operating theatre was used, the duration of the operation, age of the patient, and pre-operative hospitalization. However, the number of wound infections (17 out of 115 clean operations) does not allow a valid analysis to be made.

An interesting result, shown in Table IV, concerns the use of antibiotic "prophylaxis". 70 patients (45%) received antibiotics perioperatively. Of these 42 (60%) were given them only post-operatively, which is currently accepted as ineffective prophylaxis. 24 of these 70 patients (34%) developed wound infections. When in stock, chloramphenicol, penicillin and tetracycline were prescribed.

Table IV : Antibiotic prophylaxis.

Category	Antibiotics given		% Infected with antibiotics
CLEAN	35/115	(30)	9
CLEAN CONTAMINATED	17/19	(89)	41
CONTAMINATED	11/14	(79)	64
DIRTY	7/7	(100)	100
Total	70/155	(45)	34%

Discussion:

These results were obtained from a busy general surgical department in a tropical deve-

Table V : Comparison of results with published reports.

Author (year)			No. wounds	Infection Rate (%) Overall	Clean wound
CRUSE & FOORD	(1980)	– N. America	62,939	4.7	1.5
N.R.C.	(1964)	– „	15,613	7.5	3.8
JONGSMA	(1982)	– Netherlands	2,544	2.9	1.2
OOSTVOGEL	(1984)	– „	390	5.0	3.5
LOEFLER	(1982)	– Kenya	5,527	2.8	1.8
„	(1983)	– „	592	11.9	9.4
MATHESON	(1984)	– U.K.	1,504	2.8	3.5
BORGSTEIN	(1985)	– Malawi	155	25.8	14.8

loping country. Despite the obvious limitations of this study due to the short period of audit and the small number of operations recorded, it can still be regarded as representative. A comparison with published reports (Table V) shows the remarkably high percentage obtained, but this is somewhat misleading as the circumstances cannot effectively be compared. Nevertheless, the clean wound infection rate of 14.8% is certainly a cause for concern and speculation.

In the Queen Elizabeth Central Hospital, the control of exogenous bacterial contamination through asepsis leaves much to be desired. Hygiene is generally poor, wards are overcrowded with patients lying on the floor and there is often no clean laundry. There is always a shortage of nursing staff. The two main theatres are used for all major and most minor operations including dental cases.

Due to inadequate maintainance the air-conditioning seldom works, doors will not close and the autoclave regularly runs out of steam. Disposable gloves are re-used as often as possible. There are no closed-suction drainage systems and even i.v. dripsets may be out of stock.

The condition of the patients operated upon, considering nutritional state and the blood haemoglobin, is generally good although too few results were obtained to do a valid comparison. The rather healthy section of the population catered for is a result of the positive selection due to patient delay, transportation difficulties and inadequate (life-support) facilities.

Any measures undertaken to reduce this high incidence of wound sepsis must begin with educating the surgeons and all other staff concerned in matters of infection and its control. A greater cleanliness could certainly be achieved. The role of endogenous bacterial contamination and that of surgical technique need to be stressed as they are equally, if not more, important than all exogenous factors combined[1,3,4]. The use of antibiotic prophylaxis must be strictly regulated to avoid a costly and harmful manipulation of the microbial ecology. Simple and cheap measures, such as per-operative wound lavage with an antiseptic (eg. hibitane) should be considered.

In conclusion, the results of this pilot-study illustrate that there is a need for continued surveillance and collection of data, so that a high standard of performance may be attained and maintained to the benefit, not only of the patients, but of the medical services as a whole.

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APPENDIX : Data collection form used in this study

Name ..... Date of admission ..... '85
Age ..... M/F Ward ..... / outpatient.
Hosp. No. .....

PRE-OPERATIVE
PRE-EXISTING DISEASE .....
MEDICATION .....
NUTRITIONAL STATE: malnourished normal obese
WEIGHT ..... cm, WEIGHT Kg. ...SKIN FOLDS
Hb ..... g/l.
HYGIENE: poor adequate good (shoes)
SKIN PREPARATION: washing shaving disinfection

OPERATION Surgeon ..... Op.Theater 1/2
DATE ..... '85 DURATION ..... hrs. ..... min.
URGENT: elective urgent emergency
ANAESTHESIA .....
OPERATION PROCEDURE .....
.....
.....
SKIN CLOSURE: non/incomplete primary secondary
other .....
SKIN SUTURE MATERIAL .....
DRAIN .....
BREAK IN STERILE TECHNIQUE .....
PROPHYLACTIC ANTIBIOTICS: systemic topical
(specify) .....
CLASSIFICATION: 1) clean,
2) clean-contaminated,
3) contaminated,
4) dirty.

REVISED DATA COLLECTION FORM:
NAME ..... Date Admission .....
AGE ..... yrs M/F Ward ..... / OPD
Hosp. No. .....

PRE. OP. DIAGNOSIS ..... WEIGHT ..... cm
..... WEIGHT ..... kg
..... Hb ..... g/l

OPERATION Date .....
Surgeon ..... Op. Theatre 1/2
URGENCY: elective / urgent / emergency
ANAESTHESIA .....
OP. PROCEDURE .....
.....
.....
Skin Closure: ..... Drain .....
DURATION: ..... hrs ..... Mins.
PROHYACTIC ANTIBIOTICS pre-op / per-op / post-op
(specify) .....

CLASSIFICATION
I Clean
II Clean Contaminated
III Contaminated
IV Dirty

POST-OPERATIVE COURSE Ward .....

POLICY-UP: DATE OF DISCHARGE ..... '85
Outpatient clinic .....

WOUND CLASSIFICATION:
1) no infection,
2) stitch abbocess only,
3) possible infection,
4) definite infection,
5) unknown

BACTERIOLOGICAL CULTURE: P.O. day .....
Site: .....
Organism: .....
POST - OP COURSE:

WOUND CLASSIFICATION
1) No Infection
2) Stitch Abscess only
3) Possible Infection
4) Definite Infection
5) Unknown

Final evaluation P.O. day .....

First noted P.O. day .....

BACT. CULTURE: P.O. day: .....
Organism: .....