calcium demands exist, as a result of which the deleterious effect of heparin may be specifically augmented. A recent article on thromboembolism in pregnancy¹⁰ did not refer to the risk of osteopenia. Until the precise risks of this complication have been established the decision to use heparin must clearly be made with great care.

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Antibiotics in surgical treatment of acute abscesses

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Summary and conclusions

A four-way, double-blind, prospective trial of treatment of abscesses by incision, curettage, and primary closure with and without antibiotic cover (clindamycin injection before operation or capsules after operation, or both) was conducted. There was no appreciable difference in mean healing time between the patients given both the antibiotic injection and the antibiotic capsules and those given the injection and placebo capsules, whereas healing times in those given the placebo injection and antibiotic capsules or placebo only were appreciably longer. Four of the patients who were not given the antibiotic injection developed bacteraemia; one patient who was given the antibiotic injection also developed a bacteraemia, but this was caused by clindamycin-resistant bacteria.

These results show that a single injection of an effective antibiotic before operation is sufficient to protect the patient against bacteraemia and permit optimum healing.

Introduction

Before the discovery of antibiotics an acute abscess was usually treated by applying a poultice to draw the pus to the surface. Once the abscess was "ripe" or "pointing" it was incised and the cavity packed with a cotton wick to encourage healing from the depth of the cavity outwards. After the introduction of antibiotics Ellis¹ showed that pus could be released safely and the abscess wall removed by curettage as soon as the diagnosis was made, provided that antibiotic was combined with the surgical treatment. Subsequently he showed that the antibiotic was so effective in combating the infection that the abscess cavity could

be closed by primary suture. The antibiotic regimen he used complied with the current dogma that if an antibiotic has been prescribed treatment must continue for five days to discourage development of resistant strains of micro-organisms. He gave an intramuscular injection of antibiotic one hour before operation and a five-day course of treatment by mouth after operation. The hypothesis behind the use of antibiotics was that the blood that filled the freshly evacuated and curetted abscess cavity would be laden with antibiotic and would sterilise the contents, thus permitting safe suture. This attractive idea has never been proved to be true and is still regarded with scepticism even though the results of this method of treatment have established its efficacy.²⁻⁶

Recently Rutherford *et al*⁷ suggested that primary closure after curettage of an abscess is safe and effective without the use of an antibiotic, even though many surgeons object to curettage because of the danger of causing a bacteraemia. We decided, therefore, to test the theoretical basis of this method and determine the necessity or otherwise of antibiotics by a four-way, double-blind, prospective trial using evidence of postoperative bacteraemia or septicaemia and prolonged healing times to show unsatisfactory results.

Patients and methods

Phials of antibiotic or placebo were prepared with only their serial numbers to distinguish them. Similarly, capsules of antibiotic or placebo were prepared with an identical appearance. The antibiotic used was clindamycin. The intramuscular injection contained 300 mg clindamycin phosphate and the capsules 150 mg clindamycin hydrochloride. Patients who had been given lincomycin or clindamycin in the past week were excluded from the trial. Packs were prepared and labelled with serial numbers; each pack contained a phial and 16 capsules, one capsule to be taken six-hourly for four days after operation. Neither the doctor nor the patient was aware of the true nature of the contents of each pack. After 80 patients had completed their treatment the code was broken, and the patients were then found to have been randomly divided into the following groups.

Group 1—Antibiotic injection one hour before operation; antibiotic capsules for four days after operation.

Group 2—Antibiotic injection one hour before operation; placebo capsules for four days after operation.

Group 3—Placebo injection one hour before operation; antibiotic capsules for four days after operation.

Group 4—Placebo injection one hour before operation; placebo capsules for four days after operation.

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SURGICAL PROTOCOL

Consent was obtained from adult patients who had an abscess that was considered likely to contain at least 3 ml of pus. Patients with congenital or other valvular diseases of the heart were excluded. One hour before operation venous blood was taken as a standard for subsequent estimations of antibiotic concentration and the injection given. The operations were performed under general anaesthesia. The area of the abscess was cleaned and isolated by sterile towels. The abscess was incised and a specimen of pus taken for both aerobic and anaerobic cultures. The wall of the abscess was then removed by thorough curettage, and, after evacuation of pus and debris, a sample of the blood filling the cavity was taken for estimation of antibiotic concentration. The cavity was occluded by deep, encircling mattress sutures. A sample of venous blood was then taken for aerobic and anaerobic blood cultures.

The patients recovered from the anaesthetic in the short-stay ward. After three hours a further sample of venous blood was taken for blood cultures. The patients were then able to leave hospital, about four hours after operation. They were instructed to return at any time if they felt unwell or if the dressing became soiled. A definite appointment was made for the fifth day after operation, at which the wound was inspected and usually the sutures removed. If the wound was not fully healed by the fifth day patients were seen at intervals of one or two days. Healing was judged to have occurred when the skin edges were closed and flat, pain and induration had resolved, and there was no discharge on the dressing.

Results

Eighty-six patients were initially included in the trial but three failed to attend for follow-up examinations and two (who had been operated on for anorectal abscesses) were subsequently found to have an anorectal fistula that required further operations, while one patient's records were lost. Our results refer to the remaining 80 patients (19 in groups 1 and 3 and 21 in groups 2 and 4).

Table I lists the types of abscess included in the trial and shows a satisfactory distribution among the four groups. The mean healing time was 9.63 days for patients in group 1, 9.66 days for those in group 2, 12.95 days for those in group 3, and 16.05 days for those in group 4.

Table II gives the details of the five patients from whom a positive blood culture was obtained. Four were in group 3 and one was in group 2, the infecting organism in this last patient being *Escherichia coli* resistant to clindamycin. In all but one patient the bacteraemia had cleared within three hours so that the second blood culture was

TABLE I—Types of abscess and distribution among treatment groups

Type of abscess	Treatment group				Total
	1	2	3	4	
Axillary	7	7	7	7	28
Puerperal breast		1	1	1	3
Non-puerperal breast	1	1	1	3	6
Perianal	2	2	4	2	10
Ischiorectal	1	3	1	1	6
Pilonidal	2	2	2	2	8
Infected sebaceous cyst	2	2		4	8
Other	4	3	3	1	11
Total	19	21	19	21	80

TABLE II—Details of patients with positive blood cultures

Case No	Treatment group	Type of abscess	Culture of pus	Blood culture	
				At operation	3 h after operation
4	3	Postpartum breast	<i>Staph aureus</i>	<i>Staph aureus</i>	Negative
10	3	Thigh	<i>Staph aureus</i>	<i>Staph aureus</i>	<i>Staph aureus</i>
23	2	Ischiorectal	<i>Bacteroides</i> , <i>E coli</i>	<i>E coli</i>	Negative
75	3	Axillary	<i>Staph aureus</i>	<i>Staph aureus</i> Haemolytic streptococcus	Negative
	3	Axillary	<i>Staph aureus</i>	<i>Staph aureus</i>	Negative

negative. The patient in whom the bacteraemia persisted later developed septicaemia, and two days after operation he was admitted with malaise, fever, and persisting pain and erythema around the abscess site. We had to break the code for this patient. He was then treated with 600 mg lincomycin by intramuscular injection, and his symptoms quickly resolved. Two days later he was discharged, but his abscess took 21 days to heal completely.

Discussion

The fear of curettage of an abscess in a patient unprotected by the cover of an appropriate circulating antibiotic seems to be justified. The blood filling the abscess cavity after curettage had the same concentrations of antibiotic as the circulating venous blood. In those patients who were unprotected there were five proved cases of bacteraemia, and one patient later developed septicaemia. Our results seem to confirm that our policy of giving a preoperative loading dose of an effective antibiotic allows thorough curettage without risk to the patient. The question of which antibiotic to use depends on the causal organism, which can usually be predicted from the site of infection.

The customary postoperative course of antibiotic appears, however, to be unnecessary. Our results show no difference between the patients given such a course and those given placebo, provided that the antibiotic given before operation was effective. The rate of healing was the same, and the only complication was a bacteraemia caused by the inappropriateness of the antibiotic and not by the lack of subsequent treatment.

We have therefore adopted the policy of incision, curettage, and primary suture of soft-tissue abscesses under cover of a single antibiotic injection given before operation.

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ONE HUNDRED YEARS AGO From time to time, considerable doubts have been expressed as to the perfect wholesomeness of American bacon and ham. There would seem to be some ground for the distrust of these imports which has sprung up; since, in a report by Mr Law, one of the first authorities on the diseases of domestic animals in America, to the American National Board of Health, we find such a statement as the following. "Our pork hams have, rightly or wrongly, acquired a most undesirable reputation. Dr Belfield and Mr Atwood of Chicago pronounce eight per cent of the hogs killed in that city to be trichinous, and several European countries have forbidden the importation of American hams. In Germany, on the other hand, where all pork is subjected to microscopic examination, the statistics show that trichinae have been found in but one of two thousand hogs examined." (*British Medical Journal*, 1880.)