BACTERIOLOGICAL FINDINGS AND CLINICAL SYMPTOMS IN RELATION TO CLINICAL OUTCOME IN PUERPERAL MASTITIS

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Abstract. Clinical symptoms, bacterial content in breast milk and treatment were recorded in 43 women in Oslo with puerperal mastitis. Patients with a favorable (n=35) and unfavorable outcome (n=8) (defined as abscess formation and/or symptom relief after more than 7 days) were compared. The group with unfavorable outcome was characterized by increased delay between symptoms and time for consultation, higher score of clinical symptoms and higher frequency of Staphylococcus aureus. A higher frequency of S. aureus was found in the affected breasts than in the unaffected breasts. There was no difference concerning the frequency of coagulase-negative staphylococci and overall bacterial counts, either between milk from affected and non-affected breasts, or between milk from non-affected breasts and milk from healthy donors. The present investigation indicates that penicillin treatment is questionable when considering that untreated cases healed almost as quickly as treated ones, and that 70% of the S. aureus strains were resistant to phenoxymethylpenicillin. It is concluded that present bacterial examinations in breast milk are of limited help in deciding who needs antibiotic treatment.

Key words: breast feeding, mastitis, phenoxymethylpenicillin, staphylococcal infections

INTRODUCTION

Puerperal mastitis is a common disorder for which suggestions for treatment have differed. Early as well as restricted antibiotic intervention have been proposed (1), the former in order to prevent abscess formation (2,3). A recent approach advocated that the decision whether to treat with antibiotics or not, should be based on the concentration of pathogenic bacteria (and leukocytes) in the milk from the infected breasts (4).

We have tested whether the diagnosis infectious mastitis can be based on results from bacterial cultures by comparing bacterial counts in milk from both breasts in mothers with symptoms of unilateral mastitis.

Our observations were made in primary health care where most cases of mastitis are seen. Antibiotic treatment, if considered necessary, was in the present series instituted at once, before bacteriological findings were at hand. The clinical course was followed and could be related to laboratory data and clinical findings at the first consultation. Particular emphasis was placed on the individuals who showed an unfavorable outcome.

The data were therefore analysed with the aim of establishing whether these patients could be identified from the outset.

MATERIALS AND METHODS

Patients

Women (19—38 years old) leaving the maternity wards in Oslo were asked to contact 1 of 8 selected general practitioners if they got symptoms indicating acute unilateral mastitis. During the inclusion period (from October 1986 to August 1987) a total of 43 patients completed both the initial examination and the follow up period. During the same period, milk samples from 100 healthy nursing mothers supplying the milk bank at Ullevål Hospital were also obtained.

The intensity of skin erythema, swelling, heat and tenderness in the breasts were scored from 0 to 3. A total score was calculated for each breast. The patients were asked about the duration of symptoms, time since delivery and whether the milk production was decreased during the illness.

All the women were asked to continue breast feeding and ensure thorough emptying by frequent nursing and oxytocin nasal spray, if necessary, before each feed. The decision to give peroral phenoxymethylpenicillin 4 mill. U daily for 7
days was left with the individual physician and based on clinical findings. They were free to change to other treatments including surgical intervention if symptoms did not subside. The patients reported back after one week at the latest and gave an account of changes that had occurred concerning pain and swelling in the breast. They were also asked about milk production from the affected breast and whether the infant had shown any signs of rash or changes in fecal evacuations.

Sampling and bacteriology
Samples (2ml, avoiding the first ml) for bacteriological examinations were obtained from both breasts by squeezing out milk directly into sterile vials after the nipples and aerolae mammae had been washed with sterile 0.9% NaCl solution. Rectal or axillary (plus 0.5°C) temperature was recorded. The milk samples were stored at 4°C for a maximum of 24 hours. They were inoculated on blood agar plates and incubated at 37°C overnight. The isolated bacteria were identified by routine methods and their concentrations in milk, colony forming units (c.f.u.) per ml, were calculated. Pathogenic bacteria were tested for antibiotic resistance.

Grouping of patients and statistics
The patients were grouped according to clinical outcome. Recurrence of symptoms, abscess formation and/or delayed recovery beyond 7 days were notified as "unfavorable outcome". The differences between the two groups were tested with Student's t-test.

RESULTS
S. aureus was isolated from 40% of the samples from affected breasts. There was a definite increase in the proportion of affected breasts containing S. aureus compared with the contralateral breasts (Table I). Other pathogenic bacteria (beta-haemolytic streptococcus, pneumococcus) were infrequently observed. Presumed apathogenic bacteria were almost similarly distributed in affected and unaffected breasts. The bacterial counts of both pathogenic and apathogenic bacteria were undistinguishable on the two sides. In the group of healthy milk donors the samples contained 86% coagulase-negative staphylococci, 4% S. aureus and 8% Streptococcus viridans. The median concentration for each of these bacteria was 10^3 c.f.u./ml milk, and mixed cultures were a frequent finding.

The group of 8 patients with an unfavorable outcome included 3 with breast abscesses (two of which were incised) and 5 with clinical symptoms lasting for more than 7 days including 2 relapses. Reinfection with S. aureus from the baby’s skin and nostrils was demonstrated in one of these. A slightly higher frequency of pathogens was seen in this group.

Table I shows that the group with unfavorable outcome had definitely higher symptom score at first visit. Analysis of the 4 components of the score showed that this was due to more pronounced skin erythema (score 2.3 ±0.7, mean ±SD, against 1.1 ±0.8, p=0.001) and heat (score 1.9 ±0.8 against 1.1 ±0.8,p=0.03), while tenderness and swelling were similar in the two groups. There were higher symptom scores in breasts with than in breasts without pathogenic bacteria (Table I). Other variables are shown in Table II.

Analysis of the subset of 10 patients who did not receive an antibiotic at the first consultation, showed that 2 patients recovered after more than 7 days. In comparison 6 out of a total of 33 who were treated with

Table I. Symptom scores in subgroups of patients and numbers of patients with various bacteriological findings.

<table>
<thead>
<tr>
<th>Symptom score (Mean±SD)</th>
<th>Patients with unfavorable outcome (n=8)</th>
<th>Patients with favorable outcome (n=35)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected breast</td>
<td>Unaffected breast</td>
</tr>
<tr>
<td>With S. aureus^a</td>
<td>7.2±2.4</td>
<td>0.4±1.0</td>
</tr>
<tr>
<td></td>
<td>(10^3.5)</td>
<td>(10^4.0)</td>
</tr>
<tr>
<td>With other pathogenic bacteria^a</td>
<td>1</td>
<td>(10^3.0)</td>
</tr>
<tr>
<td>With coag.-negative Staphylococci^a</td>
<td>4</td>
<td>(10^3.5)</td>
</tr>
<tr>
<td>With Streptococcus viridans^a</td>
<td>1</td>
<td>(10^2.0)</td>
</tr>
</tbody>
</table>

^a Mean c.f.u. per liter milk.

an antibiotic nevertheless showed a protracted course. The rest of the untreated patients recovered within the average of 3.3 days, which is not significantly different from the average (2.0 days) of the total patients grouped as having a favorable outcome. The symptom scores of the affected breasts in untreated patients were, however, somewhat lower than the group as a whole (3.1 against 4.9).

70% of the strains of the S. aureus grown from breast milk were beta-lactamase producing and thus resistant to phenoxymethylpenicillin. Four of the 8 patients with unfavorable outcome belonged to this group, while no pathogens were found in the milk from the other 4. 2 patients were given erythromycin because of suspected penicillin allergy, one with S. aureus and one with Streptococcus viridans. They recovered after 3 and 2 days respectively.

Three lactating infants with looser fecal evacuations were observed, but probably none was related to the feeding with infected milk and ingestion of penicillin. The milk production in the affected breast was initially decreased in 22 of the 43 patients, and persisted for more than a week in 11 patients.

DISCUSSION

The present findings emphasize the importance of staphylococcal infections in mastitis. There was a high recovery rate of staphylococci and a dominant proportion of penicillin-resistant bacteria. The coagulase-negative staphylococci in the present series could include pathogenic strains of S. saprophyticus and S. epidermidis (6), as specific identification was not included by the laboratory. Both these strains are considered as possible etiologic agents in puerperal mastitis (7).

The main impression from the present study is that mastitis is usually a benign affection, self-limiting, with few consequences for the suckling infant. The present practice with encouraged emptying of the breast by frequent feeding seems appropriate. It is possible that penicillin therapy shortens the course of the disease, but this cannot be inferred from the present data. Anyway, phenoxymethylpenicillin was unable to prevent prolonged illness and sometimes abscess formation in one out of five patients.

Although in the present patients bilateral mastitis was seen on only one occasion, slight symptoms were occasionally found in the contralateral breast, and it has been observed that passage of penicillin into human milk is increased bilaterally in apparently unilateral mastitis (8). Pathogens were, however, in the present series often recovered only from the breast with definite clinical symptoms.

Although observer variation in symptom scores may be considerable, there was a clearly positive relationship between high scores for local erythema and heat, and protracted clinical outcome. Bacterial counts and fever on the other hand had, contrary to previous claims (9), no discriminating ability between patients with short-lived and protracted symptoms (Table II). It is known that milk contains both growth promoting and inhibiting factors which might disturb the prognostic value of bacterial counts (10). The frequency by which the most common bacteria (coagulase-negative staphylococci) were recovered from the contralateral breast in patients with favorable outcome was very similar to the frequency in milk samples from our healthy donors and in accordance with findings in normal breast milk by others (11,12). Studies in animals have suggested that these staphylococci are able to induce mastitis, but this infection is generally mild. The presence of this microorganism may also interfere with colonization with more pathogenic bacteria such as S. aureus (13).

Mastitis caused by S. aureus has been regarded to be due to bacteria harbored in infants' nostrils after contamination on the maternity wards and therefore liable to give clinical symptoms during the first weeks after discharge (2,3,14). The median time of onset (4 weeks after delivery) in our series indicated that this mode of infection might be the case in 50% of the patients. Moreover, both the finding that symptoms early after delivery were linked with an unfavorable outcome and that penicillin-resistant S. aureus were frequent in our

| Table II. Characterization of subgroups of patients according to clinical outcomes. |
|---------------------------------|---------------------------------|
|                                | Patients with unfavorable outcome (n=8) | Patients with favorable outcome (n=35) |
| Temp. °C                        | Mean ± SD                          | Mean ± SD                          |
| Mean                           | 38.4 ± 1.0                         | 38.6 ± 0.8                         |
| Time since delivery (days)      | Mean ± SD                          | Mean ± SD                          |
| Mean                           | 32 ± 22                            | 62 ± 70                            |
| Range                          | (9-68)                             | (10-255)                           |
| Delay before consultation (days)| Mean ± SD                          | Mean ± SD                          |
| Mean                           | 4.1 ± 3.6                          | 2.0 ± 2.6                          |
| Range                          | (1-11)                             | (0-14)                             |
| Duration of symptoms (days)     | Mean ± SD                          | Mean ± SD                          |
| Mean                           | 11.1 ± 8.2                         | 3.1 ± 1.4                          |

patients indicate that hospital acquired infection remains a problem.

The finding that 6 out of 8 patients recovered quickly without antibiotics may indicate that host defence mechanisms are effective. On the other hand, many patients were infected with penicillin resistant bacteria, which suggests that other drugs should be used as therapy. Early consultation and instructions about thorough emptying, if necessary with oxytocin, seem to be of major importance, in accordance with findings by others (9). Erythromycin is of limited value because staphylococci rapidly develop resistance against this drug. It should therefore be reserved for cases with penicillin allergy. The best overall choice might be penicillinase resistant penicillins. These could in our opinion be restricted to patients who show no improvement after 2 days of conservative treatment, and to those presenting with excessive symptoms from the beginning (15).

In conclusion, both the proposition that phenoxymethylpenicillin treatment is appropriate and that it should be given when bacterial milk counts exceed a certain number, seem unwarranted. A specific and immediate diagnostic test for beta-lactamase producing S. aureus in breast milk would be helpful in deciding who needs antibiotics. It also remains to be seen whether penicillinase-resistant penicillins are more beneficial than alternative treatments in infectious mastitis.

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REFERENCES


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