CLINICAL RESEARCH

Nosocomial transmission of group B streptococci

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Abstract

The acquisition of group B streptococci by babies in a special-care baby unit and two postnatal wards was investigated over a six-month period using serology and phage typing. Sixty-three culture-positive babies were identified in the postnatal wards, one-third of whom had been born to mothers who were not carrying the organism in the genital tract or anorectal area during labour. A non-maternal source was identified for 14 of these 21 infants: either colonised mothers and babies in the same ward or, on one occasion, a member of the hospital staff. In the special-care baby unit, however, only one instance of nosocomial acquisition of group B streptococci was recorded despite a high prevalence of colonisation in the staff on the unit and the presence of heavily colonised babies.

The results of this survey suggest that although sepsis caused by group B streptococci may be the result of nosocomial transmission, this may be prevented by careful attention to hygiene.

Introduction

Group B streptococci are an increasingly recognised cause of sepsis in the neonatal period.¹ In early-onset disease caused by group B streptococci the baby is thought to acquire the organism

from the mother's genital tract during labour.² Far less is known about late-onset disease and the acquisition of the organism by babies from non-maternal sources, as serotyping has not been able to provide the necessary degree of discrimination. A newly developed bacteriophage typing system consisting of 24 phages provides a far higher degree of discrimination³ and has been used to study the spread of group B streptococci within a nursery⁴ and a special-care baby unit.⁵ Aber *et al* suggested that nosocomial transmission of group B streptococci in the nursery is an important cause of neonatal colonisation.⁶ We studied babies in two postnatal wards and the special-care baby unit at this hospital over six months to assess the incidence of acquisition of group B streptococci in babies after birth, to study the epidemiology of colonisation of group B streptococci among both babies and staff in the special-care baby unit, to document specific instances of nosocomial transmission, and to assess the effectiveness of measures designed to prevent this mode of transmission.

Patients and methods

The special-care baby unit is divided into two "warm" rooms, where babies are usually nursed in cots, and an intensive care area, where all babies, generally of very low birth weight, are kept in incubators. Careful handwashing routines using chlorhexidine-based disinfectants (Hibiscrub and Hibisol) are part of the unit's policy, but gowns and masks are not worn routinely. Visiting by the immediate family is welcomed, and parents are encouraged to handle and feed their babies. Postnatal facilities consist of two large wards each divided into two eight-bedded rooms and several smaller rooms. Visiting is, in practice, unrestricted. Special handwashing procedures are not a feature of the nursery routines on these wards.

On the postnatal wards rectal, umbilical, nasal, and aural swabs were taken from babies at 6 to 24 hours of age and on discharge from hospital. Maternal rectal and vaginal swabs were taken at booking, 28 weeks, and 36 weeks and on admission to the labour ward. In the special-care baby unit babies were swabbed on admission and at weekly intervals from the same four sites. Throat and perianal swabs were taken at monthly intervals from the unit's staff. We could not swab all the staff on the postnatal wards regularly, but did swab them all on one occasion to gauge the general prevalence of carriage of group B streptococci.

Swabs were incubated at 37°C for 24 hours in Todd Hewitt broth

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(BBL) supplemented with sheep blood (5% v/v), nalidixic acid (15 mg/l), and gentamicin (4 mg/l).⁷ The broth was then subcultured on to Islam's serum starch agar⁸ and blood agar and the plates incubated anaerobically overnight at 37°C. Group B streptococci produce an orange-yellow pigment on serum starch agar. Lancefield group antigens were detected using the Phadebact coagglutination method (Pharmacia). Serotyping and phage typing were done at the division of hospital infection, Central Public Health Laboratory.

Results

POSTNATAL WARDS

Over the six-month study period a total of 600 mother-baby pairs were swabbed (table I). Group B streptococci were cultured from 151 mothers on at least one occasion during pregnancy. At the onset of

TABLE I—Prevalence of carriage of group B streptococci among mothers and babies

	No swabbed	No positive for group B streptococci	Prevalence of carriage (%)
Mothers { In pregnancy	600	151	25
In labour	600	88	15
Babies	600	63	10.5

labour 88 mothers were found to be culture positive. Of the 600 babies swabbed, 63 were colonised with group B streptococci. Of these, 31 had been born to mothers carrying the organism during labour. As 88 mothers were colonised at delivery this represents a 35% mother-to-baby transmission rate based on intrapartum swabbing. A further 11 culture-positive babies were born to mothers documented as carrying group B streptococci in pregnancy but culture negative during labour. The serotypes of these 11 pairs matched. The remaining 21 of the 63 colonised babies had been born to mothers consistently culture negative throughout pregnancy and labour. The organism was therefore assumed to have been acquired from non-maternal sources.

During the study there were six clusters of culture-positive babies in whom the acquisition of group B streptococci strongly suggested nosocomial transmission. Table II shows the details of the first of these. All four mothers were delivered by lower-segment caesarean

TABLE II—Nosocomial transmission of group B streptococci among babies on same ward

Case No	Date of delivery	Serotype identified in mother during:		Serotype identified in baby (time after birth):		
		Pregnancy	Labour	24 hours	10 days	6 weeks
1	24 Aug 1980	+ /III*	+ /III*	—	+ /III*	+ /III*
2	24 Aug 1980	—	—	—	+ /III*	—
3	25 Aug 1980	—	—	—	+ /III*	—
4	26 Aug 1980	—	—	—	+ /III*	—

*Phage type 8/12/19/31.

section during a 48-hour period and were roomed in together on a four-bedded side ward. One mother (case 1) had been positive for group B streptococci type III throughout pregnancy and before delivery. The three other mothers had been culture negative throughout pregnancy and labour. On initial swabbing at 24 hours of age the four babies were culture negative, but by discharge at 10 days all four were colonised with group B streptococci type III. The phage-type characteristics of the isolates in case 1 and in the four babies were identical (8/13/19/31). The second culture-positive cluster was of babies born to non-colonised mothers during the same week. The babies were not warded in together, but all grew group B streptococci of the same serotype (III) and phage type (11). During screening of the staff of the special-care baby unit a paediatric senior house officer known to have examined the babies was found to be colonised with this organism. In three of the four other clusters a source for the colonising organisms was traced to a colonised mother-baby pair. No index case was found for the sixth cluster.

SPECIAL-CARE BABY UNIT

Table III shows the prevalence of carriage of group B streptococci among the medical and nursing staff of the special-care baby unit. During September 12 out of 26 members of staff were culture positive.

TABLE III—Carriage of group B streptococci among staff of special-care baby unit

	No of staff swabbed	No positive for group B streptococci	Site	
			Perianal	Throat
August	15	1	1	
September	26	12	8	6
October	12	4	4	
November	22	6	6	
December	18	5	5	
February	22	7	7	2

Five of these 12 carriers were colonised with a type III strain of the same phage type 11, one of these five being the senior house officer mentioned above. Perineal carriage was far more common than throat carriage. A total of 451 sets of swabs were taken from 249 babies over the six months. Sixteen babies yielded cultures of group B streptococci. Serotyping and phage typing showed only one instance of nosocomial transmission, which affected two babies and one member of staff. This was despite a high prevalence of carriage among the medical and nursing staff and the presence in the unit for nearly half the study period of at least one baby who was culture positive. Three babies showed persistent carriage despite antibiotic treatment for unrelated clinical conditions.

FOLLOW-UP

Thirty-two babies were reswabbed at 6 weeks of age. Of 10 babies born to mothers who had been carriers of group B streptococci in hospital, six were still culture positive at follow-up, while eight colonised babies born to culture-negative mothers were all culture negative. A further 14 babies not colonised in hospital but born to carrier mothers were still culture negative at six weeks.

Discussion

This investigation was designed to assess the importance of the hospital environment as a source of group B streptococci in newborn infants. One-third (21) of the babies colonised with group B streptococci had been born to mothers who were not carrying the organism in either the vagina or the anorectal area during labour. Maternal upper respiratory carriage was not investigated, but other studies have shown this to be low.² We had good evidence from phage typing of a definite non-maternal source for the organisms in 14 of these 21 infants.

Our colonisation rate of 33% among babies born to culture-negative mothers was higher than the 12% found by Anthony *et al*¹ but lower than the 65% described by Paredes *et al*.⁹ These wide differences may reflect variations in practice on postnatal wards. Aber *et al*⁶ found that many babies born to culture-negative mothers became colonised later than those born to carrier mothers. Our results support this observation. Although the number of babies studied after discharge from hospital was small, our results suggest that the acquisition of group B streptococci from non-maternal sources in hospital is not a major factor in determining the pattern of carriage by babies once they have left hospital. This pattern may be important in understanding the epidemiology of late-onset infection due to group B streptococci.

With one exception the pattern of transmission of group B streptococci among babies on the postnatal ward appeared similar. In each cluster a mother-baby pair was colonised with

an identical serotype and phage type; the other infants found to be colonised with the same type had been born at about the same time to culture-negative mothers. These other babies had not been colonised at birth but had acquired the organism by the time they left hospital. Transmission might have been either via the hands of staff or direct from mother to baby. Mothers did, on occasion, handle each other's babies, although this was not encouraged. With our limited resources we could not swab all the staff on the postnatal wards at regular intervals as we did on the special-care baby unit. Given this limitation, 12 out of 21 cases of infant colonisation from non-maternal sources in these wards were linked by phage typing and serotyping to mother-baby index cases. In one cluster of culture-positive babies a member of staff was probably the source of transmission. The serotype III phage 11 strain colonised five of the staff of the special-care baby unit and then apparently disappeared. One of the staff carrying this strain had examined four babies on the postnatal wards who were later found to be colonised with an organism with the same characteristics. Possibly certain phage types of group B streptococci, as with other organisms such as *Staphylococcus aureus*, are associated with an increased capacity to spread. This possibility deserves further investigation. We cannot tell how many of the remaining babies acquired the organism from staff carriers. Anthony *et al*¹ also used phage typing to follow up the spread of group B streptococci among infant cohorts in a nursery. They did not, however, undertake a continuous survey of transmission of the organism, which is perhaps better done when the cohort system is not used.

Apart from during the first two months of the survey the prevalence of carriage of group B streptococci among the staff of the special-care baby unit was fairly constant (27-33%). During September, however, 12 of the 26 staff swabbed (48%) were found to be carriers, of whom six had positive throat cultures, which was unusual. As mentioned above, five of the 12 carriers were colonised with group B streptococci serotype III, phage 11. During the study period there was little evidence of baby to baby or staff to baby transmission, and on only one occasion were two babies on the special-care baby unit found

to be colonised with identical isolates. A similar organism was isolated at the same time from a member of staff.

Nosocomial transmission was slight in the special-care baby unit but considerable in the postnatal wards. This difference may be a reflection of the aseptic techniques possible in a small unit. The layout and fast turnover in the larger postnatal wards makes any aseptic regimen more difficult to enforce and procedures for baby-handling and handwashing often become compromised.

We thank the consultant obstetricians in the St Mary's Group for permission to study patients under their care, the medical and nursing staff whose co-operation made this study possible, and the Medical Research Council for financial support.

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(Accepted 9 June 1981)

Hypercalcaemia due to dihydrotachysterol treatment in patients with hypothyroidism after thyroidectomy

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Abstract

Hypercalcaemia is a recognised complication of hypothyroidism. We describe three patients who developed hypercalcaemia after thyroidectomy when thyroid supplements were discontinued. They were treated with thyroxine, dihydrotachysterol, and calcium after operation, and in all three cases serum calcium concentrations remained constant during combined treatment. Thyroxine treatment was discontinued several weeks before a radioiodine scan was performed; dihydrotachysterol and calcium were continued throughout. Serum calcium

concentrations rose to hypercalcaemic levels in all cases.

Elimination of dihydrotachysterol from plasma may be delayed in hypothyroidism, resulting in hypervitaminosis D. It is advisable to reduce the dose of dihydrotachysterol and to check serum calcium concentrations regularly in patients whose thyroid treatment is interrupted.

Introduction

Hypercalcaemia is a rare complication of hypothyroidism.¹ Our recent experience indicates that patients with postoperative hypoparathyroidism after total thyroidectomy for thyroid carcinoma are particularly likely to develop hypercalcaemia when vitamin D treatment is continued and thyroid treatment is interrupted for several weeks before radioiodine treatment. As this may be an important practical problem we describe our observations.

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