What cord care – if any?

I G Verber, F S Pagan

Abstract

The use of antiseptic treatment during cord care varies from unit to unit. Although it may reduce bacterial colonisation it may also delay cord separation. Where antiseptic treatment is used there is uncertainty as to the best agent.

Hexachlorophane powder (0.3%) and 4% chlorhexidine detergent were each compared with dry cord care as a control on a two ward maternity unit in a six month open study.

Of 133 infants treated with hexachlorophane 44 (33%) became heavily colonised with *Staphylococcus aureus* compared with 80 (47%) of 171 controls; a reduction of one third. Chlorhexidine reduced colonisation by more than half; 17 (16%) of 104 compared with 41 (42%) of 98 controls. Chlorhexidine was associated with cord attachment at 10 days in 29 (28%) infants compared with 31 of 515 (6%) infants when it was not used. Hexachlorophane was more acceptable to the nursing staff. The reduction in colonisation with the two compounds was largely due to the suppression of cross infection.

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The umbilicus has long been recognised as a site of colonisation with *Staphylococcus aureus*¹ whence it can spread from infant to infant causing skin infections and from infant to mother causing breast abscesses.² The use of hexachlorophane as an umbilical antiseptic treatment prevents colonisation and cross infection,^{3,4} whereas barrier nursing does not.⁵

Doubts about the safety of hexachlorophane^{6,7} led to its withdrawal from use with a subsequent increase in staphylococcal infection.⁸ Chlorhexidine was introduced as an alternative and found to be effective⁹ and safe.¹⁰ It is now accepted that hexachlorophane, used properly, is also safe¹¹ and it has been reintroduced, though there has been little in the way of comparison between it and chlorhexidine. In the interim, doubts have been cast on the need for antiseptic treatment of the cord and its use has been described as illogical, ineffective, and unnecessary.¹²

In this district general hospital maternity unit, which uses dry cord care and has historically a high colonisation rate with *S aureus* and intermittent outbreaks of pemphigus neonatorum, a study by Stark and Harrison showed a colonisation rate at 48 hours after birth of 68% and a strong association between heavy colonisation and later infection.¹³ The purpose of the study reported here was to compare the colonisation rate with dry cord care

with that in cords treated with chlorhexidine or hexachlorophane.

Patients and methods

There are two postnatal wards within the maternity unit and for three months ward A applied hexachlorophane 0.3% powder (Sterzac; Hough Hoseasons Ltd) to the umbilicus, axilla, and groins during routine morning care and to the umbilicus only at other nappy changes, whereas ward B acted as a control. After a five day wash out period, ward A reverted to dry cord care and ward B began treatment with 4% chlorhexidine detergent liquid (Hibiscrub; ICI). This was gently rubbed into and around the cord each morning and after two minutes washed off in the bath. The two treatments were begun on the first morning of life and continued daily until discharge. Infants on ward B were therefore bathed from day 1 during the treatment period whereas all other infants were not bathed until day 4, as is the normal unit practice. It was intended to continue the second treatment period for three months but it was discontinued after two months, and for the third month early bathing only was carried out with no chlorhexidine treatment.

The umbilicus is recognised as the first site of colonisation and this usually occurs by 48 hours after birth.¹⁴ Swabs were therefore taken from the base of the umbilicus on the morning of the third day of life. Infants staying longer than three days were swabbed a second time on discharge.

Swabs were cultured on blood agar and mannitol salt agar and incubated for 48 hours. Levels of *S aureus* colonisation were recorded as: 0, no growth; 1, less than 100 colonies; 2, greater than 100 colonies; and 3, confluent growth. All positive swabs were sent to the public health laboratory services for phage typing.

As the previous study had shown marked variation in *S aureus* incidence with time but not between the two wards the study was designed so that treatment and control periods were contemporaneous. The relative risk with 95% confidence intervals was calculated for an incidence study and p values by the χ^2 test with Yates's correction.

All staff working on either ward had nasal swabs taken at the midpoint of the trial. After the end of each treatment period the nurses administering the treatment were asked to fill in a questionnaire on its acceptability.

Results

Six hundred and thirty infants including five pairs of twins were admitted to the postnatal

Departments of Paediatrics and Bacteriology, Memorial Hospital, Darlington
I G Verber
F S Pagan

Correspondence to:
Dr I G Verber,
Department of Paediatrics,
North Tees General
Hospital, Hardwick,
Stockton, Cleveland
TS19 8PE.

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Table 1 Cord colonisation with differing care

Day No	Ward	Treatment	No of infants treated	No of positive swabs (grade 3)	Relative risk (95% confidence interval)	p Value (χ^2)
1-90	A	Hexachlorophane	133	60 (44)	0.66 (0.49 to 0.88)	p<0.025
1-90	B	Dry cord	171	102 (80)	1	
95-150	A	Dry cord	98	52 (41)	1	p<0.001
95-150	B	Chlorhexidine	104	24 (17)	0.39 (0.24 to 0.64)	
151-182	A	Dry cord	54	23 (18)	1	p=0.9
151-182	B	Early baths	59	25 (20)	0.99 (0.47 to 2.09)	

Table 2 Variation of colonisation with age at swabbing

Age (hours)	No of infants swabbed (n=630)	No (%) positive swabs (n=291)
0-12	8	0
13-24	26	8 (26)
25-36	30	10 (34)
37-48	143	67 (47)
49-60	241	120 (50)
61-72	148	68 (46)
>72	34	18 (53)

Table 3 Cord separation after day 10

Treatment	No of infants	No (%) of infants with delayed separation of cord
Dry care	323	23 (7.1)
Hexachlorophane	133	5 (3.7)
Early bath	59	3 (5.1)
Chlorhexidine	104	29 (27.9)*

*Relative risk 3.92 (95% confidence interval 2.37 to 6.46); p<0.001 (χ^2).

wards during the trial. Eleven infants were born during the washout period and their results are not included in the comparisons between the treated and non-treated groups. Two hundred and thirty nine infants who were discharged after the third day of life had a second swab performed.

SWAB RESULTS

Table 1 gives the number of infants in each treatment group and the results of the first swab. Compared with dry cord care there was a modest but significant reduction in infants with a heavy growth of *S aureus* colonisation with hexachlorophane, a marked reduction with chlorhexidine and early bathing, but no reduction with early bathing alone.

Table 2 shows the effect of the age of the infant when the first swab was taken on the

percentage of swabs that were positive. This confirms that most infants who are colonised become so by 48 hours after birth. The proportion of early discharges is equal in all groups and does not account for the differences in colonisation rate observed.

There was no difference in the colonisation of boys (149 of 325 (46%)) compared with girls (139 of 305 (46%); relative risk 1.01; 95% confidence intervals, 0.85 to 1.2).

CORD SEPARATION TIMES

During the use of chlorhexidine, community midwives began to report an excessive workload as they were having to visit infants at home for longer than the standard 10 day period because of delayed cord separation. Because of this, the use of chlorhexidine was discontinued after two months and the community midwives continued to record the occurrence of delayed separation of the cord and identified retrospectively any that had occurred since the trial began. Table 3 shows that there was a marked increase in delayed separation of the cord when using chlorhexidine and early bathing, but not with hexachlorophane or early bathing alone.

CROSS INFECTION

Infants remaining on the ward for longer than three days were swabbed again at discharge so that the prevalence of *S aureus* and its phage types on each ward could be established.

There was little change in the colonisation between 48 hours and discharge: only 23 infants had a positive swab after a negative swab and only 11 infants had a negative swab after a positive swab. It was therefore possible to identify occasions when new infants acquired the same phage type as an infant already colonised on the same ward. Table 4 shows those occasions where more than two infants carried the same phage type. It is likely that these runs of infants being colonised with an identical phage type were due to cross infection between infants. This cross infection was principally seen when no antiseptic treatment was in use. The reduction in cross infection largely accounts for the overall reduction in colonisation seen during treatment. The only time when cross infection with the same phage type was seen on the two wards simultaneously was when neither ward was using antiseptic treatment.

Eighty one members of staff were identified as having worked on the two wards and 71 of these returned nasal swabs. Fifteen (21%) were positive for *S aureus* of which two (3%) came from staff working on ward A, nine (13%) on ward B, and four (6%) from staff who had worked on the two wards. Of 136 colonised infants on ward A, only 29 (21%) matched with phage types isolated from staff working on that ward compared with 104 (68%) of 152 on ward B. The phage types seen in cross infection episodes were not isolated any more often from the attending staff than other phage types.

Table 4 Occurrence of cross infection

Day No	Phage types	No of infants affected	Day No	Phage types	Infants affected
Ward A (hexachlorophane)			Ward B (dry cord care)		
			3-11	95	5
			6-26	3a/3c/71	6
			36-46	3a	7
			39-46	3a/3c/71	7
57-65	95	5			
69-89	3a/55/71	4	67-76	95	3
87-93	94	3	87-92	95	6
Ward A (dry cord care)			Ward B (chlorhexidine)		
105-109	95	4			
106-119	3a/3c/55/71	8	131-136	95	3
141-148	3a/3c/55/71	4			
Ward A (dry cord care)			Ward B (dry cord care (early bathing))		
147-158	95	5	150-159	95	6
143-164	71/95	4			
161-177	3a/3c/55/71	4	160-178	3a/3c/55/71	4
			168-176	55	5

ACCEPTABILITY

Treatment with hexachlorophane seemed acceptable to the nurses, although three of nine commented that the powder clogged around the base of the cord when it was wet. The other six nurses commented that it seemed to dry up moist cords quickly. In contrast, all 10 nurses using chlorhexidine expressed dissatisfaction with the treatment as they felt it was messy and difficult, and the cords remained moist for a longer period.

Discussion

Uncertainty as to the need for antiseptic treatment of cords and the best compound to use has led to a wide variety of practice throughout the Northern region. At the beginning of the trial, eight of 18 units (delivering 48% of the infants born in the region) used dry cord care, four units (19% of infants) used hexachlorophane powder, three (11.4%) used hexachlorophane and alcohol wipes, two (9.6%) used alcohol wipes alone, and one (11%) used chlorhexidine (personal communications). This study confirms the findings of a study from Birmingham¹⁵ that the use of dry cord care alone will lead to an unacceptably high colonisation rate with *S aureus*. The relation between cord colonisation and infection is now well established, though it may be that midwives working in hospital are not aware of the occurrence of the infection as it often occurs after the infant has been discharged.⁹

There has been a previous comparison between hexachlorophane and chlorhexidine, though this involved the use of a chlorhexidine powder which is not commercially available.¹⁶ This showed that the two powders were equally effective. Our study shows that chlorhexidine 4% solution is more effective in reducing colonisation than hexachlorophane powder, but is associated with delay in cord separation resulting in an increased workload for community midwives. As the data on cord separation during the use of hexachlorophane was collected retrospectively, some cases could have been missed, but it is extremely unlikely that these would be enough to account for the observed difference.

The delay in cord separation with chlorhexidine may have been due to the eradication of non-pathogenic commensal organisms, which does occur with liquid chlorhexidine but not with the chlorhexidine powder,^{9 16} or it may be due to the detergent base delaying drying of the cord. Whatever the reason, the delay in cord separation and the unhappiness of the midwives in using this treatment makes it difficult to recommend. Further, it is much more likely that mothers would be happy to continue treatment at home with hexachlorophane powder than they would with chlorhexidine liquid.

This study also attempted to look at the epidemiology of staphylococcal infection in neonates. This has been investigated on a number of occasions since Allison and Hobb's seminal paper from Cardiff in 1947.¹⁷ It is thought that *S aureus* is introduced from the attending staff, but then the umbilicus of the infant acts as

a reservoir from which the bacterium is spread from infant to infant.²⁻⁴ This process was certainly seen in our study (table 4) and its occurrence was greatly reduced by the use of antiseptic treatment of the cord. In addition to the phage types listed in table 4, however, there was a large number of other phage types occurring sporadically throughout the trial period with no particular pattern. Using the proposed model of infection, it is difficult to account for occasions where four infants in one four bedded ward were colonised with four different phage types. We have to agree with Seeberg and Brinkhoff that 'the epidemiological situation in cohort nurseries is very complex'.⁹

The apparent differences between the phage types on the infants and on the attending staff on ward A is interesting, but might be accounted for by those staff who did not submit swabs and by the fact that staff who were nominally attached only to ward B did help out on the other ward from time to time.

This study, unlike the previous study from this unit,¹³ did not attempt to determine the occurrence of staphylococcal disease after the infant had been discharged from the hospital. The two studies taken together, however, are highly suggestive that use of antiseptic treatment of the cord reduces the amount of staphylococcal skin infection and should be encouraged.

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