

# The Comparison of Four Different Regimens Used for Neonatal Umbilical Cord Care

Nermin TANSUĞ<sup>1</sup>, Şükran KESKİN<sup>1</sup>, Ali A. GÜVEN<sup>1</sup>, Zehra KARAKOÇ<sup>1</sup>,  
Süheyla SÜRÜCÜOĞLU<sup>2</sup>, Semra ORUÇ<sup>3</sup>, Ali ONAĞ<sup>1</sup>  
Manisa-Turkey

**OBJECTIVE:** There is no consensus on the regimens used for umbilical cord care. The purpose of this study is to compare the effectiveness of different regimens used for umbilical cord care.

**STUDY DESIGN:** Dry cord care, alcohol, povidone-iodine, or eosine were applied to 173 healthy full-term neonates. Periumbilical swab samples were taken on the first, third and the tenth days after delivery. Chi square and frequency analysis were applied.

**RESULTS:** There was no difference between the effectiveness of the four different regimens. The differences between the groups for percentage of colonization and the colonized species, and the separation times of umbilical cord were not significant.

**CONCLUSIONS:** Dry care is a suitable method for umbilical cord care as antimicrobial agents have no superiority in healthy fullterm babies.

(*Gynecol Obstet Reprod Med* 2006; 12:112-115)

**Key Words:** Newborn, Umbilical cord care, Omphalitis

The umbilical cord (UC) is an important bacterial colonization site.<sup>1,2</sup> Bacterial colonization of the cord causes omphalitis characterized by swelling, pus and erythema on the abdominal wall or sepsis without any of these signs.<sup>3</sup> Although the incidence of the UC infections is not actually known, we know that it is more common in undeveloped or developing countries compared with the developed ones.<sup>4,5</sup>

The UC care is important to prevent the infections caused by the bacterial colonization of the cord in the neonatal period.<sup>6</sup> However, there is no consensus on the regimens used for UC care. The results obtained from different studies are all different. WHO promotes dry cord care for developing countries, although notes that antiseptics might benefit infants in settings where harmful substances are traditionally applied.<sup>7</sup> Another important point at this view is not to forget that every delivery is not hygienic and UC may be a potential risk for sepsis in regions with high omphalitis rates.

There are many regimens used for UC care. The most commons are; alcohol, triple dye, chlorhexidine, mupirocin and polybactrine.<sup>8,9,10</sup> On the other hand, there is no method supported by experimental findings.

The purpose of this study is to compare the effectiveness

<sup>1</sup>Department of Pediatrics, <sup>2</sup>Department of Microbiology <sup>3</sup>Department of Obstetrics and Gynecology, Celal Bayar University Medical School, Manisa, Turkey

Address of Correspondence

Nermin Tansuğ  
Celal Bayar Üniversitesi Tıp  
Fakültesi, Çocuk Sağlığı ve  
Hastalıkları Anabilim Dalı,  
Neonatoloji Bilim Dalı,  
Manisa, Turkey

Submitted for Publication: 19.06.2006

Accepted for Publication: 29.06.2006

of different regimens (povidone-iodine, alcohol, eosine versus dry care) used for UC care.

## Material and Methods

### Study group

One hundred seventy-three healthy full-term neonates who were born in Celal Bayar University Hospital were included in the study. The neonates who were premature, small for gestational age, or admitted in the neonatal intensive care unit were excluded from the study.

Four different regimens; dry cord care, alcohol, povidone-iodine, and eosine, changing monthly, were applied to neonates. UC care was applied on the whole length of the UC once daily both in hospital and at home after discharge, until the UC was separated. The neonates did not have a bath during this period and contact of the UC with diapers was not permitted. Information was given to the families about omphalitis and UC care. All the infants were breast fed during the study. Any swelling with erythema and/or local heat on the abdominal wall within 5 mm from umbilicus to periphery was recognized as omphalitis.

### Bacteriological Study

Periumbilical swab samples taken with synthetic tipped swabs on the first, third and the tenth days after delivery were immediately introduced in Stuart transport medium (Oxoid Limited, Hampshire, England) and sent to the Bacteriology Laboratory of Celal Bayar University Hospital. The specimens were seeded on sheep blood agar and EMB agar media (Oxoid Limited, Hampshire, England). After incubation in a CO<sub>2</sub> enriched atmosphere at 37°C, plates were inspected for growth of bacteria. All isolates were identified by standard microbiological methods. Confirmation of species identification was performed using commercial kits (BBL Crystal GP; E/NF; ID-Becton Dickinson, USA).

Table 1. The main properties of four groups (NS: not significant -  $p > 0.05$ )

	Povidone-iodine	Alcohol	Eosine	Dry care	p
N (%)	40 (23.1)	43 (24.9)	51 (29.5)	39 (22.5)	
UC separation time (day)	7.7±1	8±0.9	7.9±1.2	8.1±0.8	NS
Hospitalization period (day)	4.2±0.9	4.1±1	3.9±1.2	4±0.8	NS
Maternal age (year)	26±0.8	27±1.1	26±1.2	26±0.9	NS
Gestational age (week)	39±1	39±1	39±1	39±1	NS
Birth weight (gram)	3200±150	3150±125	3220±130	3180±120	NS
Apgar scores	9±1	9±1	9±1	9±1	NS

Table 2. The percentages of colonization of UC (CNS assumed to be pathogen)

	1 <sup>st</sup> day (n/%)	3 <sup>rd</sup> day (n/%)	10 <sup>th</sup> day (n/%)
Colonization (+)	35 / 20.2	114 / 65.9	107 / 61.8
Colonization (-)	138 / 79.6	59 / 34.1	66 / 38.2

Table 3. The percentages of the colonized microorganisms (Other: *Enterobacter*, *Acinetobacter*, *pseudomonas*, *enterococcus*, *klebsiella*)

	1 <sup>st</sup> day (n/%)	3 <sup>rd</sup> day (n/%)	10 <sup>th</sup> day (n/%)
CNS*	27 / 15.6	82 / 47.4	78 / 45.1
S. Aureus	3 / 1.7	18 / 10.4	16 / 9.2
E.coli	3 / 1.7	3 / 1.7	2 / 1.2
Other	2 / 1.2	11 / 6.4	11 / 6.4

\*Coagulase Negative Staphylococcus

## Statistics

SPSS 10.0 (SPSS incorporated, Chicago) was used for the statistical analysis. Chi square and frequency analysis were applied.  $P < 0.05$  was considered significant.

## Results

One hundred seventy-three healthy full-term neonates were admitted to the study. Seventy-five of them were females (43.3%), and 98 were males (56.7%). The number of neonates in each group of UC care was as follows: Dry cord care: 39 neonates, alcohol: 43, povidone-iodine: 40, eosine: 51. Maternal age, the period for hospital stay, gestational age, birth weight, gender, apgar scores and the separation time of UC were all similar in each group (Table I). There was no sign of omphalitis during the study.

The colonization percentage of the UC with at least one microorganism was 18.5% (n=40). If Coagulase Negative Staphylococci (CNS), the component of normal flora of the skin, assumed to be a pathogen, the colonization percentage of the UC with at least one microorganism was 65.9% (n=114). We found no significant difference between four groups for the colonization percentages according to the samples taken on the first day after delivery. CNS was the

most determined microorganism (15.6%). The colonization percentages increased on the third and tenth days compared with the first day. But there was no difference between groups for the percentage of colonization and the colonized species. The most common pathogens colonized other than CNS were *Staphylococcus aureus* and *Esherichia coli* (Table 2 and 3).

Between the four study groups, we did not find significant differences in the cord colonization percentages, the species of the microorganism colonized and the application method on the third and tenth days.

The colonization percentage of UC of the neonates born with vaginal delivery was higher in each group compared with the cesarian section delivery group ( $p < 0.05$ ).

## Discussion

UC is a suitable place for bacterial colonization and plays a role for sepsis.<sup>1,2</sup> According to the data in the study of Fairchild et al, the colonization percentage was found to be 83% on the first day of life and increased on the other days.<sup>11</sup> In our study, we got similar results although with smaller percentages. The colonization percentages increased on the third and the tenth days compared with the first day.

So, higher colonization percentages on the following days indicate a powerful role of environment on colonization of UC. When evaluated according to the colonized microorganisms, the higher percentage of the CNS supports this theory. In this study, the newborns were all healthy fullterm and were all given to the same room after delivery with their mothers according to the rooming-in process. So, this contact between the baby and the mother helped the colonization of CNS, component of the skin flora. If CNS assumed to be non pathogen, the most common microorganism colonized is *S. Aureus*.<sup>12</sup> This finding is consistent with the literature. The high percentage of colonization with vaginal delivery compared with the cesarian delivery indicates a second factor affecting the colonization of the UC.

WHO promotes dry cord care for developing countries, although notes that antiseptics might benefit infants in settings where harmful substances are traditionally applied.<sup>7</sup> But there is no consensus on this view. There are many different studies using different regimens on UC care with different consequences. Since alcohol which is used to prevent colonization of staphylococci is volatile, its antimicrobial effect as a single agent is very weak. However it has been shown in several studies that alcohol has advantages for shortening the drying time and separation time of UC. There are also many studies reporting that a disinfectant including alcohol but not rapidly vaporizes is a good choice for UC care. Combined use of 80% Ethanol and 0.5% chlorhexidine is reported to decrease rates of omphalitis and late onset sepsis.<sup>13</sup> In another study there was no difference between application of alcohol alone and alcohol after triple dye in terms of risk of infection. Medves et al. reported that alcohol does not prevent colonization in their study comparing alcohol with dry care, and that there is not any difference with regard to infection between the two methods.<sup>14</sup> On the contrary Janssen et al reported that rates of pus and unpleasant odor from the UC was higher in the group of dry care in their study comparing triple dye and dry care.<sup>15</sup> There are also studies reporting that none of the antimicrobial agent is effective on preventing colonization. In this study any difference or benefits of the three regimens compared with dry care could not be shown.

Another important point is the relationship between colonization and omphalitis. There is no study showing a good relation between these. Colonization always does not mean omphalitis.<sup>16,17</sup> There can be no signs of omphalitis despite the colonization of UC. In this study we found similar results. Despite the high percentage of colonization of UC, we found no newborn with signs of omphalitis. So, there can be another factor influencing the occurrence of omphalitis other than colonization which can be the immune system of the newborn. We have limited knowledge about this and this must be evaluated with further studies.

In this study, we found no difference for the separation times of UC between four groups. There is also controversy

about the influence of antimicrobials on separation of UC. Yigit et al. found shorter time for separation with dry care compared with povidone-iodine, chlorhexidine and mercurrom.<sup>18</sup> However another study showed longer time period for separation with dry care compared with triple dye.

As a result, in this study, we found no difference between the effectiveness of four different regimens (povidone-iodine, alcohol, eosine versus dry care) used for UC care.

### Conclusion

Dry care is a suitable method for UC care as antimicrobial agents have no superiority, but in this study, the participants were all fullterm and healthy newborns and had a hygienic delivery. So, it can be preferable to use antimicrobial agents instead of dry care for the prematures and the neonates needing intensive care and the fullterm newborns who especially live in regions with high omphalitis rates and low socioeconomic status.

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