RESEARCH ARTICLE

Timing of Circumcision and Breastfeeding Initiation Among Newborn Boys

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ABSTRACT

BACKGROUND AND OBJECTIVES: Newborn circumcision, particularly in the first 24 hours of life, has been thought to adversely affect breastfeeding initiation. However, no studies specifically support an association between early circumcision and difficulty with breastfeeding initiation or maintenance. This study was designed to determine whether timing of newborn circumcision affects rates of exclusive breastfeeding during the first 2 weeks of life.

METHODS: A retrospective study of 797 newborn boys and their mothers was conducted at a large military hospital. Exclusion criteria included gestational age <38 weeks, multiple delivery, NICU admission, and absence of maternal intention to breastfeed. Multivariable logistic regression models examined the relationship between time of elective circumcision and exclusive breastfeeding at 3 time points: hospital discharge and the newborn and 2-week outpatient visits.

RESULTS: Mean infant age at circumcision was 29.7 hours. Thirty-one percent were circumcised at <24 hours of age. Rates of exclusive breastfeeding were 66.8%, 64.1%, and 63.7% at hospital discharge and the newborn and 2-week outpatient visits, respectively. In the multivariable model, time of circumcision was not significantly associated with exclusive breastfeeding at hospital discharge (odds ratio [OR], 1.01; 95% confidence interval [CI], 0.99–1.00; $P = .54$), the newborn outpatient visit (OR, 1.00; 95% CI, 0.99–1.02; $P = .84$), or the 2-week outpatient visit (OR, 0.99; 95% CI 0.98–1.01; $P = .44$).

CONCLUSIONS: There was no significant association between timing of elective newborn circumcision and exclusive breastfeeding in the first 2 weeks of life. In this setting, early circumcision of otherwise healthy, term boys had no deleterious effects on breastfeeding initiation or maintenance.

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Exclusive breastfeeding at the time of hospital discharge is specifically important for several reasons. It has been demonstrated that mothers who are exclusively breastfeeding their infants when they leave the hospital are more likely to be breastfeeding exclusively at the 2-month well visit.[1] A Healthy People 2020 goal is that <10% of infants receive formula supplementation in the first 2 days of life.[2] In 2014, exclusive breastfeeding at the time of hospital discharge became a core measure for Joint Commission accreditation for all hospitals with >1100 deliveries annually.[3] Given the benefits of breastfeeding, it is reasonable to provide as much institutional support as possible for its initiation and limit any factors that might interfere with this important health behavior. However, few studies have explored whether factors such as circumcision in the newborn period have significant impact on breastfeeding. As such, hospital policies that limit access to elective procedures, such as circumcision (supported by the American Academy of Pediatrics [AAP][4]), should be closely examined before they are widely implemented.

The relationship between circumcision and infant feeding is important, because elective circumcision is the most common surgical procedure among boys in the United States. From 1999 through 2010, the Centers for Disease Control and Prevention reported that 55% to 60% of newborn boys were circumcised before hospital discharge.[5,6] In 2012, the AAP released a policy statement on circumcision that concluded "evaluation of current evidence indicates that the health benefits of newborn boy circumcision outweigh the risks, and justify access to this procedure for families who choose it".[4] This was the AAP's strongest stance to date in support of circumcision.

The question of whether breastfeeding initiation and establishment is adversely affected by early newborn circumcision is widely debated. Some experts discourage neonatal circumcision in the first days of life, based on reports that circumcision is painful and stressful to the newborn and can interfere with sleep cycles and maternal–infant bonding.[7] Anecdotally, many physicians believe that avoiding circumcision in the early newborn period improves establishment of breastfeeding.[8,9] However, no studies to date have demonstrated an association between the timing of an infant circumcision and breastfeeding initiation or maintenance. The purpose of this study was to examine whether timing of newborn circumcision within the first 72 hours affects exclusive breastfeeding rates in the first few weeks of life.

METHODS

Study Design and Subjects

We conducted a retrospective medical record review of circumcised infant boys born between January 1, 2008 and December 31, 2011 at the Naval Medical Center (San Diego, CA). Entrance criteria for this study included infant boys who were circumcised before hospital discharge, had a gestational age ≥38 weeks and were the product of a singleton pregnancy, and whose mothers endorsed an intention to breastfeed. Infants admitted to the NICU were excluded. For all infants included, circumcisions were performed according to the following protocol: anesthesia was performed with a dorsal penile nerve block using 1cc of 1% lidocaine without epinephrine. All circumcisions were completed using a Gomco clamp, and 1 dose of oral Tylenol (15mg/kg) was given immediately after the procedure. Potential study patients were identified using *Current Procedural Terminology* code 54150 for circumcision, which generated lists of circumcised infant boys born at our institution during the defined study period. Three trained research assistants then reviewed hard copies of these medical records and extracted information using a standardized data collection form developed by the principle investigator. The principal investigator checked the data for discrepancies and potential outliers and coded all data for statistical analysis. All of the data points included in the analysis were collected by manual chart review. The institutional review boards of the Naval Medical Center, the University of California, San Diego, and San Diego State University approved this study protocol.

Measures

The primary outcome measure was exclusive breastfeeding at 3 time points: hospital discharge and the newborn and the 2-week outpatient visits. Exclusive breastfeeding was defined as no infant formula feeding at each specific time point. During hospitalization, nursing staff documented (in the inpatient record) whether formula was provided and consumed by the infant. Those who consumed any amount of formula were not considered to be exclusive breastfeeders at the time of nursery discharge. At the newborn visit (~1–2 days postdischarge) and 2-week outpatient visit, parents reported on feeding method and frequency. The primary care physician recorded this information in a standardized field within the newborn outpatient clinical note. If parents reported using any formula supplementation, infants were not categorized as exclusive breastfeeders. Infants who had been supplemented with formula in the hospital, but were exclusively breastfeeding in the outpatient setting, were considered to be exclusive breastfeeders at the time of the outpatient visits.

The primary independent variable of interest was infant age (in hours) at the time of circumcision. Infant age in hours at the time of circumcision was calculated as the difference between the date and time of birth and the date and time of circumcision. Age at circumcision was analyzed as a continuous variable from birth to 72 hours. It was also dichotomized as <24 hours vs ≥24 hours.

Covariates in the analysis included birth weight, length of hospital stay, delivery method, any medical complications not requiring a NICU admission, maternal age, race, and parity. Birth weight (grams), length of hospital stay (days), and maternal age (years) were used as continuous variables in the analysis. Because the majority of the sample was white (57%), race was dichotomized as "white" versus "other." Delivery method was dichotomized as "vaginal" versus "cesarean delivery." Vacuum- or forceps-assisted vaginal deliveries were included in the "vaginal delivery" category. Parity was dichotomized

as "first-time mothers" or "mothers who have had at least 1 previous live birth." Infants with a medical complication, such as jaundice or requiring a sepsis evaluation, were categorized as having a nursery complication.

Additional covariates included military rank, active duty status, and mother's marital status. We categorized military sponsor rank as enlisted service members versus officers because all military officers are college graduates and have a significantly higher salary than enlisted personnel. This provided a proxy variable for socioeconomic status. Mother's active duty status was obtained from the chart; mothers were either on active duty at the time of delivery, or were the dependent spouse of an active duty husband who served as her sponsor for medical benefits through the naval health system. Presence of a spouse at the time of birth was also recorded. Single active duty mothers and those whose husbands were deployed were categorized as "not having a spouse present" (single mother or married, spouse deployed). Married active duty mothers and civilian-dependent mothers whose spouse was not deployed were categorized as "having a spouse present" (married, spouse present).

Data Analysis

Descriptive statistics included means and frequencies. The dependent variable was exclusive breastfeeding measured at 3 time points: hospital discharge and the newborn and 2-week outpatient visits. The independent variable of interest was infant age (in hours) at the time of elective circumcision. Bivariate comparisons between time of circumcision and exclusive breastfeeding status at the 3 time points were performed using t tests and χ^2 tests. These associations were also assessed in 3 separate multivariable logistic regression models for exclusive breastfeeding at each of the 3 time points, taking into account all covariates significant in bivariate analyses. We also performed multivariable logistic regression at all 3 time points using the dichotomized variable for timing of circumcision, defined as circumcision completed before 24 hours of life versus at 24 hours or later but before hospital discharge. P values <0.05 were used to determine statistical significance. All analyses were conducted by using SAS, version 9.3 (SAS Institute, Inc, Cary, NC).

RESULTS

Our sample included 797 infants at discharge, 747 at the newborn visit, and 496 at the 2-week visit. Descriptive statistics are summarized in Table 1. Mean infant age at circumcision was 29.7 hours (range 5–71 hours). Thirty-one percent were circumcised at <24 hours. Overall rates of exclusive breastfeeding were 66.8%, 64.1%, and 63.7% at time of discharge, newborn outpatient visit, and 2-week outpatient visit, respectively.

In bivariate analyses (Table 2), exclusive breastfeeders were circumcised earlier than those not exclusively breastfeeding at the time of discharge (29 [10.7] hours vs 31.2 (12.1) hours; $P = .01$). Length of hospital stay among exclusive breastfeeders was significantly shorter than length of stay for those who had been supplemented with formula (1.61 [0.68] days vs 1.98 [0.74] days; $P < .01$). Lower birth weight, higher parity, maternal white race, vaginal delivery, officer status, and the presence of a spouse were significantly associated with exclusivity of breastfeeding at the time of hospital discharge. No significant relationship was found between the timing of newborn circumcision and feeding method at the newborn ($P = .25$) or 2-week outpatient visits ($P = .30$). White race and presence of a spouse remained significantly associated with exclusive breastfeeding at both outpatient visits.

Unadjusted logistic regression models revealed that newborns circumcised earlier were more likely to be exclusively breastfeeding at the time of discharge (odds ratio [OR], 0.98; 95% confidence interval [CI], 0.97–0.99; $P = .01$; Table 3). In the multivariable logistic regression models, there was no association between timing of circumcision and exclusive breastfeeding at the time of discharge or at the newborn or 2-week outpatient visits. We found no association between timing of circumcision and exclusive breastfeeding at the newborn or 2-week outpatient visits in either the unadjusted or multivariable models. Covariates associated with increased odds for exclusive breastfeeding on the multivariable model at the time of discharge included white race (OR, 1.82; 95% CI, 1.28–2.56; $P < .01$) and vaginal delivery (OR, 1.56; 95% CI, 1.04–2.34; $P < .05$). Those who were discharged later had lower odds of exclusive breastfeeding (OR, 0.54; 95% CI, 0.41–0.72; $P < .01$). Covariates

TABLE 1 Maternal and Infant Characteristics ($n = 797$)

	Mean (SD) or Frequency
Birth weight (g)	3545 (432.2)
Maternal age (y)	27.2 (5.6)
Gestational age (wk)	39.6 (0.9)
Length of stay (h)	40.8 (16.8)
Age at circumcision	
<24 h	30.8
24–72 h	69.2
Race	
White	57.1
African-American	9.3
Asian	9.1
Other	24.5
Delivery method	
Vaginal birth	76.3
Cesarean delivery	23.7
Parity	
First child	49.1
≥2 children	50.9
Active duty mother	
Yes	26.9
No	73.1
Presence of spouse	
Married, spouse present	88.9
Married, spouse deployed	2.9
Single, active duty	8.2
Sponsor rank	
Enlisted	87
Officer	13
Non-NICU complications	
None	72.2
Sepsis evaluation	15.3
Phototherapy	4.4
Other	8.1

TABLE 2 Descriptive Statistics of Exclusively and Nonexclusively Breastfeeding Infants

	Time of Hospital Discharge (n = 797)		Newborn Visit (n = 747)		2-week Visit (n = 496)	
Exclusively breastfed	Yes	No	Yes	No	Yes	No
Mean						
Time of circumcision (hours of life)	29.0	31.2*	29.4	30.4	29.6	30.7
Birth weight (g)	3524	3588*	3546	3527	3515	3558
Maternal age (y)	27.3	27.1	27.4	27.2	27.8	27.0
Hospital stay (h)	38.4	48.0**	40.8	43.2*	40.8	43.2
Frequency (%)						
Parity						
First child	63.7	36.3**	60.6	39.4*	60.9	39.1
≥2 children	69.9	30.1**	67.5	32.6*	66.3	33.7
Race						
White	73.1	26.9**	71.6	28.4**	69.0	31.0**
Other	58.5	41.5**	53.9	46.1**	56.4	33.6**
Delivery method						
Vaginal delivery	71.5	28.5**	66.1	33.9*	64.2	35.8
Cesarean delivery	51.9	48.1**	57.9	42.1*	62.4	37.6
Military rank						
Officer	70.9	29.1	66.3	33.7	77.6	22.4**
Enlisted	66.2	33.8	63.8	36.2	61.2	38.8**
Active duty mother						
Yes	60.8	39.2*	57.1	42.9*	57.3	42.7
No	69.1	30.9*	66.6	33.4*	66.0	34.0
Presence of spouse						
Married, spouse present	69.2	30.8*	66.5	33.5*	64.6	35.4**
Single or spouse deployed	55.8	44.2*	51.4	48.6*	41.3	58.7**
Nursery complications						
None	68.1	31.9	65.7	34.3	65.9	34.1
Sepsis evaluation	62.3	37.7	56.0	44.0	59.7	40.3
Phototherapy	54.3	45.7	61.8	38.2	38.1	61.9

* $P < .05$; ** $P < .01$.

associated with increased odds for exclusive breastfeeding at the newborn and 2-week outpatient visits in the multivariable models included white race, presence of a spouse, and higher military sponsor rank (Table 3).

Multivariable regression analyses were performed using the dichotomized variable for timing of circumcision defined as <24 hours and ≥24 hours. These analyses demonstrated no significant difference in breastfeeding rates (69% vs 66% at discharge [$P = .60$], 64% vs 64% at the newborn visit [$P = .60$], and 66% vs 63% at the 2-week visit [$P = .49$]).

DISCUSSION

In our retrospective medical record review of nearly 800 mothers and babies born at a large military hospital in California, we found no significant associations between the timing of elective newborn circumcision and rates of exclusive breastfeeding over the first 2 weeks of life. Thirty-one percent of babies in our sample were circumcised at <24 hours of life. This practice is discouraged at many hospitals due to concerns about interference with breastfeeding initiation and establishment in the first days of life. Our analyses do not support an association between early circumcision and a decreased frequency of exclusive breastfeeding in the first weeks of life.

There has been little research to date on the association between circumcision and breastfeeding, including what effect timing of this procedure may have on neonatal breastfeeding establishment. Previous research has examined whether feeding practices differ among circumcised boys compared with their uncircumcised counterparts. Fergusson et al[10] used a longitudinal birth cohort to assess the effect of neonatal circumcision on breastfeeding and found that there was no association between circumcision and breastfeeding success. Notably, this study looked solely at circumcised infant boys as compared with an uncircumcised control group; although the newborn boys were described as being circumcised in the hospital "immediately following birth," the timing of the procedure was not clearly delineated. In 1982, Marshall et al[11] conducted an observational study that suggested circumcision was to blame for a "brief and transitory" effect on couplet bonding, especially during feeding sessions. However, this study included only bottle-fed babies who were not rooming in with their mothers, and the findings were not statistically significant. More recent literature on bottle-feeding behavior after circumcision, which looked at volumetric comparisons of feedings both preprocedure and postprocedure, found no significant difference between baseline and the first or second feedings after circumcision.[12] To our knowledge, this is the first study to examine the effect of the timing of neonatal circumcision and breastfeeding behavior in the early newborn period.

To increase breastfeeding rates overall, this study also highlights factors other than circumcision that may be important to investigate further, including delivery method, race, and spousal presence, as contributors to breastfeeding success. Mothers who had a vaginal delivery were significantly more likely to breastfeed at the time of discharge compared with mothers who had a cesarean delivery. White mothers in our study were exclusively breastfeeding

TABLE 3 Multivariable Analysis: Odds of Exclusive Breastfeeding at 3 Time Points: Discharge and Newborn and 2-Week Outpatient Visits

	Odds of Exclusive Breastfeeding at Time of Discharge (n = 797)	Odds of Exclusive Breastfeeding at Newborn Outpatient Visit (≈1–2 d) (n = 747)	Odds of Exclusive Breastfeeding at 2-week Outpatient Visit (n = 496)
	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Time of circumcision	1.01 (0.99–1.00)	1.00 (0.99–1.02)	0.99 (0.98–1.01)
Birth weight	1.00 (0.99–1.00)	NA	NA
Length of hospital stay	0.54 (0.41–0.72)**	0.90 (0.68–1.20)	NA
Parity (first child versus >1 child)	1.19 (0.83–1.70)	1.13 (0.80–1.60)	NA
Race (white versus other)	1.82 (1.28–2.56)**	2.00 (1.45–2.78)**	1.64 (1.09–2.44)*
Delivery method (vaginal versus cesarean delivery)	1.56 (1.04–2.34)*	1.35 (0.89–2.01)	NA
Active duty mother	0.92 (0.6–1.39)	0.85 (0.56–1.29)	NA
Presence of father/spouse	1.70 (0.95–3.01)	1.61 (0.91–2.90)	2.30 (1.22–4.34)**
Sponsor rank (officer versus enlisted)	NA	NA	1.87 (1.03–3.39)*

Adjusted OR controls for other characteristics in the model. Three separate multivariable logistic regression models were developed for each of the 3 time points above (discharge, the newborn visit, and the 2-week visit). NA, not applicable.
* $P < .05$; ** $P < .01$.

at significantly higher rates than African-Americans, Asians, and other racial minorities. Our study indicates that in our military population, single, active duty mothers and those women who have husbands that are deployed are less likely to breastfeed exclusively compared with married mothers whose husbands are home with them in the first weeks after delivery. In addition, mothers from enlisted military families demonstrated significantly lower rates of exclusive breastfeeding than mothers from officer families. All of these factors are important targets for breastfeeding support initiatives.

In addition to the demographic factors associated with breastfeeding initiation, we found that infants with shorter hospital stays were more likely to be exclusively breastfeeding at the time of discharge. These findings are consistent with previously reported results in the literature, which describe that the odds of formula supplementation for newborns double with each additional inpatient nursery day, as compared with those mother–infant dyads that were discharged just after 24 hours of life.[13] This may be because infants are frequently more alert and wakeful on the second day of life and tend to want to feed more by this time. Mothers are also more commonly fatigued on the second night after delivery, and often perceive their milk supply to be inadequate. The combination of these factors often lead to increased requests for formula after 24 hours of life.[14] Night nurses have also been shown to be more likely to offer formula supplementation to mothers who complain of fatigue during their shift, a time that is often considered natural sleeping hours.[15] However, we also acknowledge that the significant relationship between shorter length of hospital stay and increased rates of exclusive breastfeeding at the time of discharge may be due to the inherent success of these mothers at breastfeeding. Physicians often feel more comfortable sending home a mother and baby if the baby is latching well and the mother is successfully breastfeeding. Unfortunately, given the retrospective nature of our study, we cannot say for sure why women were more likely to be breastfeeding at the time of discharge if they had shorter lengths of stay. Prospective and qualitative studies are needed to more fully examine the relationship between circumcisions, formula supplementation, and timing of discharge in the first 48 hours of life. Nevertheless, with earlier circumcisions, we may be able to decrease the delay in discharges that occur because of the postprocedure observation period.

Strengths and Limitations

There were several limitations to this study. The families studied were in the military (mother, father, or both were active duty service members), potentially limiting the generalizability of our results to other populations. There is inherent mobility in a military population such that even within our relatively self-contained hospital system, we lost 38% to follow-up at the 2-week outpatient visit. In addition, this was a retrospective study relying on chart review and not a prospective study designed to answer the question. We chose to study only mothers who intended to breastfeed at the time of delivery. We do not know how timing of circumcision might have influenced the small number who had not initially decided to breastfeed but changed their minds. There is also an element of recall bias inherent in our methods because our information was dependent on mothers reporting accurate information at outpatient follow-up visits. Another limitation is that the presence of a spouse does not equate to breastfeeding support. Many mothers have good breastfeeding support from extended family or friends when the husband is deployed or not involved. It would be interesting to further study the finding that the presence of a spouse during the first 2 weeks of life is related to exclusive breastfeeding success. Finally, our results demonstrate no association between our primary independent (age at circumcision) and dependent (exclusive breastfeeding)

variables of interest. Although this is an important finding, we recognize that there is publication bias in favor of positive or negative findings, and that it is statistically very difficult to prove an absence of association. We hope that our results will be a stimulus for future prospective, randomized studies, which might add to the paucity of data concerning the effects of circumcision on breastfeeding.

This study has important strengths, including the large sample with excellent continuity through the first outpatient visit. Even at the 2-week visit, we had retained 62% of the sample. As such, we were able to review a large number of records of mothers and babies from birth until the 2-week well child visit. In addition, our military population represents a diverse "cross-section" of the United States, with representation from many different racial and ethnic groups, as well as varying socioeconomic classes and education levels.

CONCLUSIONS

The timing of elective newborn circumcision before hospital discharge was not associated with a decrease in exclusive breastfeeding among military mothers and babies in the first 2 weeks of life. Furthermore, rates of breastfeeding initiation were not different among those who were circumcised within the first 24 hours of life versus later, suggesting that breastfeeding should not be cited as a reason to delay inpatient circumcisions for parents that elect for this procedure. More research is needed to determine if this relationship is similar in other nonmilitary and ethnic/racial populations, and prospective studies are necessary to confirm these findings.

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