HHS Public Access

Author manuscript

Arch Dis Child Fetal Neonatal Ed. Author manuscript; available in PMC 2017 March 01.

Published in final edited form as:

Arch Dis Child Fetal Neonatal Ed. 2012 January ; 97(1): F18–F23. doi:10.1136/adc.2010.209213.

Randomised trial comparing hand expression with breast pumping for mothers of term newborns feeding poorly

Valerie J Flaherman[1], **Barbara Gay**[2], **Cheryl Scott**[3], **Andrew Avins**[4], **Kathryn A Lee**[5], and **Thomas B Newman**[1,6]

[1]Department of Pediatrics, University of California School of Medicine, San Francisco, California, USA

[2]University of California San Francisco Medical Center, San Francisco, California, USA

[3]Kaiser Permanente South Sacramento Medical Center, Sacramento, California, USA

[4]Division of Research, Northern California Kaiser Permanente, Oakland, California, USA

[5]Department of Family Health Care Nursing, University of California School of Nursing, San Francisco, California, USA

[6]Department of Epidemiology and Biostatistics, University of California School of Medicine, San Francisco, California, USA

Abstract

Objective—Breast pumping or hand expression may be recommended when newborns latch or suck poorly. A recent trial found worse outcomes among mothers who used a breast pump in the early postpartum period. The objective of this study was to compare bilateral electric breast pumping to hand expression among mothers of healthy term infants feeding poorly at 12–36 h after birth.

Design—Randomised controlled trial.

Setting—Well-baby nursery and postpartum unit.

Patients—68 mothers of newborns 12–36 h old who were latching or sucking poorly were randomly assigned to either 15 min of bilateral electric pumping or 15 min of hand expression.

Mainoutcome measures—Milk transfer, maternal pain, breastfeeding confidence and breast milk expression experience (BMEE) immediately after the intervention, and breastfeeding rates at 2 months after birth.

Results—The median volume of expressed milk (range) was 0.5 (0–5) ml for hand expressing mothers and 1 (0–40) ml for pumping mothers (p=0.07). Maternal pain, breastfeeding confidence

Correspondence to Valerie J Flaherman, Department of Pediatrics, University of California San Francisco, 3333 California Street, Box 0503, San Francisco, CA 94143, USA; flahermanv@peds.ucsf.edu.

Competing interests None.

Ethics approval This study was conducted with the approval of the UCSF Committee on Human Research, the Kaiser Permanente Institutional Review Board and the Stanford University Administrative Panel on Human Subjects in Medical Research.

Provenance and peer review Not commissioned; externally peer reviewed.

and BMEE did not differ by intervention. At 2 months, mothers assigned to hand expression were more likely to be breastfeeding (96.1%) than mothers assigned to breast pumping (72.7%) (p=0.02).

Conclusions—Hand expression in the early postpartum period appears to improve eventual breastfeeding rates at 2 months after birth compared with breast pumping, but further research is needed to confirm this. However, in circumstances where either pumping or hand expression would be appropriate for healthy term infants 12–36 h old feeding poorly, providers should consider recommending hand expression.

INTRODUCTION

The many benefits of breastfeeding[1–8] have encouraged the establishment of Healthy People breastfeeding goals.[9,10] Although rates of initiation have risen and are now close to target, rates of breastfeeding at time points after initiation are still well below target.[8,9] Paediatricians, obstetricians, lactation consultants, nurses and peer counsellors have all been shown to promote breastfeeding.[11–19] However, few specific provider recommendations have been examined in clinical trials for their effect on eventual breastfeeding duration.

One common provider recommendation is early milk expression, either using a breast pump or using hand expression.[20,21] Chapman *et al*[22] conducted a randomised trial comparing breast pumping to no intervention for mothers after Caesarean delivery and found a trend toward decreased breastfeeding duration in the pumping group. Other investigators, including Schwartz *et al*,[23] Morton *et al*[24] and Win *et al*,[25] have conducted observational studies on the association between breast pumping and/or hand expression and eventual breastfeeding duration. The results of these studies have been mixed, and due to their observational design, they may have some confounding by varying reasons for early expression practices. Milk expression may provide additional breast stimulation to increase milk production, but the hormonal response to expression is not identical to infant sucking,[26] and expression may have other important differences from sucking as well. Nevertheless, because the degree to which an infant empties a breast influences the future rate of milk synthesis (at least during mature milk production),[27] experts often recommend milk expression for mothers with breastfeeding challenges.[21,28] Because some studies have shown that breast pumping removes more milk than hand expression,[26,29,30] breast pumping may be seen as superior to hand expression. However, some experts have observed that hand expression may result in larger milk volumes immediately after birth.[24,31] The difference between the effect of early breast pumping and the effect of early hand expression on eventual breastfeeding prevalence is unknown.

Infants who are not latching well or not sucking well when latched are at increased risk of early breastfeeding discontinuation.[32] Excessive newborn weight loss, initiation of formula, maternal pain, maternal frustration and lower milk production due to inadequate breast stimulation may all contribute to breastfeeding discontinuation in this group, and milk expression is often recommended to improve breast stimulation and milk production. However, no studies have examined the effect of the method of early milk expression on breastfeeding outcomes for such newborns. We conducted a randomised controlled trial

comparing the effect of breast pumping to that of hand expression for mothers of healthy term infants 12–36 h old who were not latching well or not sucking well when latched.

PATIENTS AND METHODS

We enrolled mother–infant pairs 12–36 h after birth where the infants were not latching well or not sucking well when latched. Pairs were excluded if mothers were <18 years old, did not speak English or had a history of low milk supply or breast surgery other than cyst removal, or if infants were <37 weeks gestation, <2000 g birth weight or received level II or III care. Poor latch and/or poor suck was determined by a study doctor or nurse by maternal interview and review of any lactation consultation at the time of recruitment. The study sample was drawn in 2007–2009 from the population of the well-baby nurseries and postpartum units at the University of California San Francisco (UCSF) Medical Center, Kaiser Permanente South Sacramento Medical Center and Stanford University Medical Center. Informed consent was obtained from all subjects by the study doctor or nurse. This study was approved by the UCSF Committee on Human Research, the Kaiser Permanente Institutional Review Board and the Stanford University Administrative Panel on Human Subjects in Medical Research.

We randomly assigned 68 mother–infant pairs to either breast pumping or hand expression using blocked randomisation, stratified by site and delivery method. Sample size was determined to allow 80% power to detect a 5 ml difference in expressed milk volume between the two study groups with an α of 0.05. The allocation sequence for randomisation was generated by an independent biostatistician; assignments were placed into sealed opaque envelopes by an independent administrative assistant. Immediately following enrolment, the study investigator opened sequential envelopes in the presence of a second clinician and revealed the randomisation arm. Thus we had complete allocation concealment, although no blinding was possible. Infants were then weighed on a Babyweigh scale (Medela, McHenry, Illinois, USA) using the test weighing technique, in which the infant is weighed prior to feeding on a scale with an accuracy of 2 g and then reweighed after feeding on the same scale. After initial weighing, mothers attempted to breastfeed their infants with advice and support from a study doctor or nurse. Following the breastfeeding attempt, mothers randomly assigned to breast pumping were taught breast pumping by the study doctor or nurse and then used a bilateral electric breast pump (Ameda Elite Hospital Grade Breast Pump; Ameda, Lincolnshire, Illinois, USA) for 15 min in a single session under supervision of the study doctor or nurse. The breast pump vacuum setting was initially begun at the lowest level (30 mm Hg) and then gradually increased as tolerated by the mother. Mothers assigned to hand expression were taught hand expression by a study doctor or nurse and then performed hand expression for 15 min in a single session under supervision of the study doctor or nurse. After milk expression, the entire expressed milk volume was measured by syringe and mothers in both groups fed their babies any expressed milk using a syringe, cup or spoon. Infants were subsequently reweighed on the same scale.

Immediately following these procedures, the study investigator verbally administered three questionnaires. First, in order to measure breastfeeding confidence, mothers were asked questions from a slightly modified version of the Breastfeeding Self-Efficacy Scale–Short

Form (BSES-SF),[33] rating each item on a scale from 1 ('strongly disagree') to 5 ('strongly agree'). Second, mothers were asked questions from a modified Holdcroft scale[34] of breastfeeding-related pain, which assessed pain in the breast, lower abdomen, back and perineum on a scale of 0–10. Third, mothers were asked questions from a newly developed breast milk expression experience (BMEE) measure, which included questions about social support for milk expression and personal and learning experience of milk expression. Mothers were then reminded that they could continue to use their method of milk expression if desired but were not under an obligation to do so. Phone follow-up by various investigators at 1 week, 1 month and 2 months assessed breastfeeding, milk expression and formula use. See box 1 for survey questions used to assess breast-feeding, milk expression and formula use. After 3 months of enrolment, due to low follow-up rates, study procedures were revised to include the collection of at least two phone numbers for follow-up, and were further revised after 9 months to include the collection of at least three phone numbers for follow-up. Completion rate rose from 30% to 81.6% following these changes.

Box 1

Survey questions on breastfeeding, milk expression and formula use at 1 week, 1 month and 2 months

1. Within the past 24 h, since yesterday at this time, has the infant received any breast milk?
2. Within the past 24 h, has the infant received any breast milk directly from nursing?
3. Within the past 24 h, has the infant received any expressed breast milk?
4. Within the past 24 h, has the infant received any formula?
5. In the past 24 h, has the infant received any water, juice or tea?
6. Are you expressing breast milk?

We compared the effect of method of expression on the dichotomous outcomes of breastfeeding and breast pumping using χ^2 tests. We compared the effect of method of expression on our primary outcome of expressed milk volume and maternal pain using the Mann–Whitney test. We compared the effect of method of expression on continuous outcomes of BSES-SF scores and BMEE scores using the Student t test. All analyses were conducted using Stata 9.2 (Stata, College Station, Texas, USA).

RESULTS

Overall, 35 (51.5%) mothers were assigned to the hand expression group and 33 (48.5%) to the pumping group. The two study groups were similar at baseline (table 1).

The median volume of expressed milk (25th–75th percentile) was 0.5 ml (0–1) for hand expressing mothers (range 0–5 ml), and 1 ml (0–3) for pumping mothers (range 0–40 ml) (p=0.07). The median change in weight of infants before and after all feeding (including

breastfeeding and feeding of expressed milk) was 0 g (−3 to 5) for the pumping group (range −8 to 98 g), and 0 g (−1 to 2) for the hand expression group (range −4 to 14 g) (p=0.72).

There were no significant differences between the groups for any of the individual items in the BSES-SF or for the full scale (table 2). The BMEE differed for two questions whose wordings necessarily varied with treatment group. Mothers assigned to pumping had more agreement with the statement ‘I don’t want anyone to see me pumping’ (3.0±1.2) than mothers who hand expressed did with the statement ‘I don’t want anyone to see me hand expressing’ (2.3±1.1) ($p<0.05$). Mothers who were assigned to pumping had lower agreement with the statement ‘The instructions for using the pump are clear’ (4.1±0.9) than mothers who hand expressed did with the statement ‘The instructions for hand expressing are clear’ (4.5±0.5) ($p<0.05$). In our cohort, 33 (48.5%) mothers reported a pain score of 5 (of 10) or greater in one or more areas (either breast, lower abdomen, back or perineum). Pain scores during and after the milk expression intervention differed little by study group. However, breast pain scores measured during the feeding before the intervention were significantly higher in the hand expression group than in the breast pump group (22.9% vs 6.1% with breast pain scores ≥5), so it is possible that this pre-existing difference between the groups masked an effect of the intervention. For additional results on pain, see table 3.

At 1 week, 35 (57.4%) babies had received formula, including 17 (58.6%) in the pump group and 18 (56.3%) in the hand expression group. The 37 (62.7%) mothers expressing milk at 1 week included 18 (66.7%) from the group originally assigned to pumping and 19 (59.4%) from the group originally assigned to hand expression; one mother from each group reported using hand expression at 1 week. The 40 (78.4%) mothers expressing milk at 1 month included 16 (72.7%) from the group originally assigned to pumping and 24 (82.8%) from the group originally assigned to hand expression; two mothers from each group reported using hand expression at 1 month.

Final outcome assessment at 2 months was obtained for 48 mothers (70.6%). Absence of outcome ascertainment at 2 months did not differ by study group, with nine mothers in the hand expression group and 11 mothers in the pump group lost to follow-up for 2-month outcomes (p=0.49). Mothers assigned to the hand expression group were more likely to be breastfeeding at 2 months (97.1%) than mothers assigned to the breast pump group (72.7%) (p=0.02). The relative risk for breastfeeding at 2 months was 1.32 (1.01–1.73) for the hand expression group compared to the breast pump group.

At 2 months, 41 (85.4%) mothers were still breastfeeding and seven had stopped breastfeeding. Mothers who stopped breast-feeding by 2 months had lower scores in the immediate post-partum period for the modified BSES-SF, with a mean score of 2.7±0.74 compared with mothers who continued breastfeeding at 2 months, with a mean BSES-SF score of 3.5±0.66 immediately after birth (p=0.02). See table 4 for additional differences between mothers who eventually breastfed through 2 months and mothers who did not. At 2 months, 36 (75%) mothers were expressing milk, including 15 (68.2%) from the group originally assigned to breast pumping and 21 (80.8%) from the group originally assigned to hand expression (p=0.31). All study mothers who were expressing breast milk at 2 months were using a pump and none was using hand expression. The majority of mothers who were

expressing milk at 2 months (53.1%) stated that they did so to store milk for times of maternal–infant separation. Few (15.6%) of the mothers at 2 months stated that they expressed milk in order to improve their milk supply, and the proportion of mothers expressing milk at 2 months in order to improve their milk supply did not differ by randomisation arm.

DISCUSSION

Our randomised study found that mothers of healthy, term, poorly feeding infants randomly assigned to hand expression at 12–36 h were more likely to be breastfeeding at 2 months than mothers randomly assigned to breast pumping. Our results could not be explained by milk volume, breastfeeding self-efficacy, pain or BMEE, which all differed little between the groups. However, the hand expression group reported increased comfort expressing milk with others present compared to the breast pump group, and the hand expression group also showed a trend towards increased comfort breast-feeding with others present. It is possible that hand expressing made mothers feel more comfortable breastfeeding and/or expressing with others present, or that pumping made mothers feel less comfortable breastfeeding and/or expressing with others present. This trend may have contributed to the success of the intervention, since we also found a trend towards increased rates of breastfeeding at 2 months among mothers who reported increased comfort breastfeeding with others present during the birth hospitalisation.

Since few mothers in our study used hand expression after the first week, we believe our results may be potentially attributable to two important differences between pumping and hand expression that are specific to the immediate post-partum period. First, mothers in the hand expression group reported greater comfort expressing milk with others present than mothers in the breast pump group. Feeling awkward or embarrassed in the presence of others might be an important barrier to continued successful breastfeeding in the immediate postpartum period. Second, milk volumes in this study cohort were very small, with median volumes of 1 ml in both groups. It is possible that the small volume of colostrum expressed by both groups appeared ‘normal’ in the hand expression group but appeared ‘insufficient’ for the mothers in the pump group, who used the large collecting system of the pump.

Potential additional causes for our results include bias or chance. A potential source of bias for this study could be that follow-up at 2 months was completed for 70.6% of subjects. If mothers in the hand expression group had lower rates of follow-up than those in the pump group, and if mothers who were not breastfeeding at 2 months were more likely to be lost to follow-up than mothers who were breastfeeding at 2 months, this might introduce bias to account for our results. However, there was no difference between the study arms in loss to follow-up. Furthermore, most loss to follow-up occurred in the early study participants, prior to establishment of improved follow-up procedures. Since our randomisation occurred in randomly permuted blocks of two and four, we had an even distribution to both randomisation arms throughout the time period of our study, and therefore loss to follow-up from early subjects due to suboptimal follow-up procedures is unlikely to account for any difference found between study groups.

Our study has several important limitations. First, we included only mothers of healthy term infants 12–36 h old who were not latching well or not sucking well when latched. While this is a large and important group, our findings may not apply to mothers of younger or older infants, or to mothers expressing milk for other reasons, such as engorgement or maternal–infant separation. Second, our study did not include a group randomised to receive no intervention. Therefore, we cannot report how either hand expression or breast pumping would compare to no intervention for our study population. Third, our study attempted to identify potential reasons for an effect of method of expression on eventual breastfeeding prevalence, including breastfeeding confidence as measured by breastfeeding self-efficacy, expression experience and pain. However, few differences in these measures reached statistical significance when we compared the two groups. It is possible that a larger sample size would have provided the statistical power to better identify the factors contributing to the effect of method of milk expression, but it is also possible that other, unmeasured factors were significant contributors to or mediators of the effect. The indication of no significant difference between the two groups on enrolment (table 1), however, suggests that the randomisation procedure was effective in controlling for confounders. Fourth, we do not have data on LATCH score, incidence of ankyloglossia, maternal body mass index or other predictors of breastfeeding rates. However, we would expect these factors to have been approximately evenly distributed by the randomisation, so bias from this source appears to be unlikely.

Our results need to be confirmed by other studies. If confirmed, further research is needed to determine how method of expression affects eventual breastfeeding rates, for example, by impacting maternal embarrassment, by impacting maternal perception of milk supply, or by some other mechanism. A recent systematic review found that the literature on maternal experience associated with milk expression is limited.[30] Our study revealed overall low volumes of expressed milk, high background levels of postpartum pain, and high overall concern about expressing and/or breastfeeding in front of others. The impact of these factors on maternal experience requires further study.

Although breast pumping is a fast and efficient method of milk expression once mature milk supply is established, there has been little previous study of breast pumping in the immediate postpartum period. One previous trial suggested that breast pumping in the immediate postpartum period may have a negative effect on breastfeeding duration, and no previous research has demonstrated either that pumping is beneficial for mothers at 12–36 h or that hand expression is harmful. Therefore, based on the previous literature and our results, we believe that in circumstances where either pumping or hand expression would be appropriate for healthy term infants 12–36 h old feeding poorly, teaching hand expression rather than breast pumping might improve breastfeeding rates at 2 months.

CONCLUSION

Mothers who were randomly assigned to hand expression shortly after birth were more likely to be breastfeeding at 2 months than those assigned to breast pumping shortly after birth. The mechanism for the association between early method of expression and later breastfeeding prevalence is unknown, and further research is needed to confirm our results

and explore the reasons for an association between early expression practice and later breastfeeding outcomes. However, given the lack of previous evidence to support breast pumping in this population and the results of our study, providers should consider teaching hand expression instead of pumping to mothers of healthy term newborns feeding poorly after birth in cases where either method of expression might be appropriate.

Acknowledgments

The authors thank Anthony Burgos, MD, Assistant Professor of Pediatrics at Stanford University, and Janelle Aby, MD, Assistant Professor of Pediatrics at Stanford University, for subject recruitment and enrollment at Stanford.

Funding This project was supported by grant number KL2 RR024130 from the National Center for Research Resources and grants number 5 K12 HD052 and 1K23HD059818-01A1 from the National Institute of Children Health and Human Development.

References

1. Kramer MS, Guo T, Platt RW, et al. Infant growth and health outcomes associated with 3 compared with 6 mo of exclusive breastfeeding. Am J Clin Nutr. 2003; 78:291–5. [PubMed: 12885711]
2. Quigley MA, Kelly YJ, Sacker A. Breastfeeding and hospitalization for diarrheal and respiratory infection in the United Kingdom Millennium Cohort Study. Pediatrics. 2007; 119:e837–42. [PubMed: 17403827]
3. Beaudry M, Dufour R, Marcoux S. Relation between infant feeding and infections during the first six months of life. J Pediatr. 1995; 126:191–7. [PubMed: 7844664]
4. Sadeharju K, Knip M, Virtanen SM, et al. Finnish TRIGR Study Group. Maternal antibodies in breast milk protect the child from enterovirus infections. Pediatrics. 2007; 119:941–6. [PubMed: 17473095]
5. Ip, S., Chung, M., Raman, G., et al. Breastfeeding and Maternal and Infant Outcomes in Developed Countries. Rockville, MD: Agency for Healthcare Research and Quality; 2007.
6. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50302 women with breast cancer and 96973 women without the disease. Lancet. 2002; 360:187–95. [PubMed: 12133652]
7. Danforth KN, Tworoger SS, Hecht JL, et al. Breastfeeding and risk of ovarian cancer in two prospective cohorts. Cancer Causes Control. 2007; 18:517–23. [PubMed: 17450440]
8. Centers for Disease Control and Prevention (CDC). Breastfeeding trends and updated national health objectives for exclusive breastfeeding – United States, birth years 2000–2004. MMWR Morb Mortal Wkly Rep. 2007; 56:760–3. [PubMed: 17673896]
9. US Department of Health and Human Services. [accessed 3 January 2008] Healthy People 2010 Midcourse Review. 2007. http://www.healthypeople.gov/data/midcourse/pdf/fa16.pdf
10. US Department of Health and Human Services. [accessed 6 April 2010] Developing Healthy People 2020 – Maternal, Infant and Child Health. 2010. http://www.healthypeople.gov/hp2020/Objectives/ViewObjective.aspx?Id=177&TopicArea=Maternal%2c+Infant+and+Child+Health&Objective=MICH+HP2020%e2%80%9312&TopicAreaId=32
11. Escobar GJ, Braveman PA, Ackerson L, et al. A randomized comparison of home visits and hospital-based group follow-up visits after early postpartum discharge. Pediatrics. 2001; 108:719–27. [PubMed: 11533342]
12. Lieu TA, Braveman PA, Escobar GJ, et al. A randomized comparison of home and clinic follow-up visits after early postpartum hospital discharge. Pediatrics. 2000; 105:1058–65. [PubMed: 10790463]
13. Coutinho SB, de Lira PI, de Carvalho Lima M, et al. Comparison of the effect of two systems for the promotion of exclusive breastfeeding. Lancet. 2005; 366:1094–100. [PubMed: 16182897]

14. Bonuck KA, Trombley M, Freeman K, et al. Randomized, controlled trial of a prenatal and postnatal lactation consultant intervention on duration and intensity of breastfeeding up to 12 months. Pediatrics. 2005; 116:1413–26. [PubMed: 16322166]
15. Labarere J, Gelbert-Baudino N, Ayral AS, et al. Efficacy of breastfeeding support provided by trained clinicians during an early, routine, preventive visit: a prospective, randomized, open trial of 226 mother-infant pairs. Pediatrics. 2005; 115:e139–46. [PubMed: 15687421]
16. Taveras EM, Capra AM, Braveman PA, et al. Clinician support and psychosocial risk factors associated with breastfeeding discontinuation. Pediatrics. 2003; 112:108–15. [PubMed: 12837875]
17. Anderson AK, Damio G, Young S, et al. A randomized trial assessing the efficacy of peer counseling on exclusive breastfeeding in a predominantly Latina low-income community. Arch Pediatr Adolesc Med. 2005; 159:836–41. [PubMed: 16143742]
18. Chapman DJ, Damio G, Young S, et al. Effectiveness of breastfeeding peer counseling in a low-income, predominantly Latina population: a randomized controlled trial. Arch Pediatr Adolesc Med. 2004; 158:897–902. [PubMed: 15351756]
19. Graffy J, Taylor J, Williams A, et al. Randomised controlled trial of support from volunteer counsellors for mothers considering breast feeding. BMJ. 2004; 328:26. [PubMed: 14703543]
20. Labiner-Wolfe J, Fein SB, Shealy KR, et al. Prevalence of breast milk expression and associated factors. Pediatrics. 2008; 122(Suppl 2):S63–8. [PubMed: 18829833]
21. Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #5: peripartum breastfeeding management for the healthy mother and infant at term revision, June 2008. Breastfeed Med. 2008; 3:129–32. [PubMed: 18578059]
22. Chapman DJ, Young S, Ferris AM, et al. Impact of breast pumping on lactogenesis stage II after cesarean delivery: a randomized clinical trial. Pediatrics. 2001; 107:E94. [PubMed: 11389292]
23. Schwartz K, D'Arcy HJ, Gillespie B, et al. Factors associated with weaning in the first 3 months postpartum. J Fam Pract. 2002; 51:439–44. [PubMed: 12019051]
24. Morton J, Hall JY, Wong RJ, et al. Combining hand techniques with electric pumping increases milk production in mothers of preterm infants. J Perinatol. 2009; 29:757–64. [PubMed: 19571815]
25. Win NN, Binns CW, Zhao Y, et al. Breastfeeding duration in mothers who express breast milk: a cohort study. Int Breastfeed J. 2006; 1:28. [PubMed: 17184553]
26. Zinaman MJ, Hughes V, Queenan JT, et al. Acute prolactin and oxytocin responses and milk yield to infant suckling and artificial methods of expression in lactating women. Pediatrics. 1992; 89:437–40. [PubMed: 1741218]
27. Daly SE, Kent JC, Owens RA, et al. Frequency and degree of milk removal and the short-term control of human milk synthesis. Exp Physiol. 1996; 81:861–75. [PubMed: 8889483]
28. Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #22: guidelines for management of jaundice in the breastfeeding infant equal to or greater than 35 weeks' gestation. Breastfeed Med. 2010; 5:87–93. [PubMed: 20387269]
29. Slusher T, Slusher IL, Biomdo M, et al. Electric breast pump use increases maternal milk volume in African nurseries. J Trop Pediatr. 2007; 53:125–30. [PubMed: 17409102]
30. Becker GE, McCormick FM, Renfrew MJ. Methods of milk expression for lactating women. Cochrane Database Syst Rev. 2008; 4:CD006170.
31. Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #3: hospital guidelines for the use of supplementary feedings in the healthy term breastfed neonate, revised 2009. Breastfeed Med. 2009; 4:175–82. [PubMed: 19739952]
32. Dewey KG, Nommsen-Rivers LA, Heinig MJ, et al. Risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss. Pediatrics. 2003; 112:607–19. [PubMed: 12949292]
33. Dennis CL. The breastfeeding self-efficacy scale: psychometric assessment of the short form. J Obstet Gynecol Neonatal Nurs. 2003; 32:734–44.
34. Holdcroft A, Snidvongs S, Cason A, et al. Pain and uterine contractions during breast feeding in the immediate post-partum period increase with parity. Pain. 2003; 104:589–96. [PubMed: 12927631]

What is already known on this topic

- Poor infant suck and latch are common in the newborn period.
- Breast milk expression using either hand expression or a pump is often recommended for mothers of newborns latching or sucking poorly.
- No previous studies have reported the effect of type of milk expression on breastfeeding outcomes.

What this study adds

- Expressed milk volume at 12–36 h did not differ by method of expression.
- Mothers randomly assigned to hand expression at 12–36 h were more comfortable being seen expressing than mothers randomly assigned to pumping.
- Mothers randomly assigned to hand expression were more likely to be breastfeeding at 2 months than mothers randomly assigned to pumping.

Table 1

Cohort characteristics

Characteristic	Breast pump group (N=33)	Hand expression group (N=35)	p Value
Infant age (h), mean±SD	20.8±7.8	20.9±6.7	0.95
Male gender	23 (69.7%)	17 (48.6%)	0.08
Birth weight (kg), mean±SD	3.31±0.5	3.50±0.5	0.23
Gestational age (weeks)	39.1±1.3	39.4±1.1	0.27
Vaginal delivery	27 (77%)	24 (72.7%)	0.67
Maternal age (years)	30.2±6.6	30.2±6.3	0.98

Table 2

Outcomes immediately following intervention: item scores * for items differing by group

	Randomised comparison		
	Breast pump group	**Hand expression group**	**p Value**
BSES items and scale			
I can always comfortably breastfeed with my family members present	3.2±1.3	3.8±1.2	0.058
I can always know when to switch from one breast to the other	3.2±1.2	2.6±1.3	0.080
Total BSES	3.4±0.8	3.4±0.7	0.994
BMEE items and scale			
I don't want anyone to see me (pumping/hand expressing)	3.0±1.2	2.3±1.1	0.021
The instructions for (using the pump/hand expressing) are clear	4.1±0.9	4.5±0.5	0.036
Total score, 11-item BMEE	3.4±0.4	3.4±0.6	0.901
Expressed milk volume (ml)	2.9±7.7	0.8±1.4	0.136
Weight change before feed to after feed (g)	0.8±3.5	4.2±19.4	0.334

* Items scored on a 1–5 scale, from 1, strongly disagree to 5, strongly agree. p Values are for randomised assignment to breast pump compared to hand expression.

BMEE, breast milk expression experience; BSES, Breastfeeding Self-Efficacy Scale.

Table 3

Number of subjects with a pain score ≥5 (out of 10) in the hand expression (n=35) and pumping (n=33) groups

	During feeding, prior to the expression intervention		During the expression intervention		After expression intervention	
	Hand	**Pump**	**Hand**	**Pump**	**Hand**	**Pump**
Breast	8 (22.9) **	2 (6.1) **	2 (5.7)	2 (6.1)	1 (2.9)	2 (6.1)
Abdomen	10 (34.5) *	4 (15.4) *	4 (11.4)	2 (6.1)	8 (22.9)	3 (9.1)
Back	3 (8.6)	3 (9.1)	2 (5.7)	3 (9.1)	6 (17.1)	3 (9.1)
Perineum	5 (14.3)	5 (15.2)	5 (14.3)	5 (15.2)	12 (34.3)	13 (39.4)
Any location	18 (51.4)	13 (39.4)	11 (31.4)	11 (33.3)	17 (48.6)	17 (1.5)

Values are N (%).

* $p<0.10$,

** $p<0.05$.

Arch Dis Child Fetal Neonatal Ed. Author manuscript; available in PMC 2017 March 01.

Table 4

Outcomes immediately following intervention: item scores * for items differing by study group

	Breastfeeding at 2 months	No breastfeeding at 2 months	p Value
BSES items and scale			
I can always comfortably breastfeed with my family members present	3.7±1.2	2.7±1.4	0.055
I can always know when to switch from one breast to the other	3.0±1.3	2.9±0.9	0.859
Total BSES	3.5±0.7	2.7±0.7	0.019
BMEE items and scale			
I don't want anyone to see me (pumping/hand expressing)	2.5±1.1	3.4±1.1	0.062
I had no problems figuring out how to (use the pump/hand express colostrum/milk)	3.8±1.0	3.0±0.6	0.048
The instructions for (using the pump/hand expressing) are clear	4.3±0.6	3.4±1.	0.002
Total score, 11-item BMEE	3.5±0.5	3.2±0.3	0.134

* Items scored on a 1–5 scale, from 1, strongly disagree to 5, strongly agree.

p Values are for eventual outcome of breastfeeding at 2 months compared to no breastfeeding at 2 months.

BMEE, breast milk expression experience; BSES, Breastfeeding Self-Efficacy Scale.