Case Report

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Prevention of Maternal to Infant Transmission of CMV via Breast Milk in a Full-Term Infant by Pasteurization of Maternal Breast Milk: A Case Study

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Introduction

The beneficial effects of natural mother's breast milk [MBM] are well established [1]. The American Academy of Pediatrics recommends exclusive breastfeeding until at least six months of age [2]. However, MBM is not always safe [1]. Viruses like HIV or CMV are shed in MBM and transferred to her newborn infant [1]. While MBM acquired CMV infection is particularly problematic in premature neonates, full-term infants are not totally immune [1,3,4-9]. Maternal to infant transmission of CMV via MBM during infancy can lead to hepatitis, pneumonia and occasional mortality [4]. Therefore, removal of CMV from MBM without reducing the beneficial effects is desirable [4]. Pasteurization of MBM completely removes CMV [1]. With the availability of a point of care portable human milk pasteurizer, it has become easier to pasteurize MBM [10-12]. We encountered a full-term baby who was born to a mother who was seropositive for CMV-IgG and IgM antibodies. She was treated with Acyclovir during pregnancy. The baby was considered at risk of developing CMV disease from maternal to infant transmission of CMV via BM during infancy. Therefore, we chose to pasteurize MBM before administration to her baby.

Case Presentation

A female baby was born to a twenty-fouryears old, Gravida 1 Para 0 mother by spontaneous onset vaginal delivery at thirty-nine weeks of gestational age [GA] at Centinela Hospital [CH, Inglewood, California]. CH serves patients of low socioeconomic class. It has ~ 650 deliveries and ~ one hundred NICU admissions per year. The mother had good prenatal care. She was in very good health before, during and after pregnancy. However, she was diagnosed to have CMV infection around 29 weeks of GA: Serum CMV IgG and IgM were 8.6 (Negative < 0.6, equivocal 0.6 to 0.7, positive > 0.7) and 41. 4 (negative <30, 30-35 equivocal, Positive > 35) respectively. Therefore, the mother was treated with oral Acyclovir for three weeks as an out-patient. She had normal CBC, liver and thyroid function tests prior to treatment with Acyclovir. At CH her serum CMV-IgG antibody concentration before and soon after delivery were 6.8 and 4.8 U/ml respectively [13]. Baby had Apgar scores of 9 and 9 at 1 and 5 minutes of age. She was appropriate for GA: B.W.:2840 grams, length 48 CM, head circumference 31 cm. Baby's vital signs and physical examination were appropriate for a female baby of 39 weeks GA. At the time of birth, the baby had a normal C.B.C., manual differential, platelet count, total and direct serum bilirubin concentrations. She had normal serum AST, ALT, alkaline phosphatase, total protein, albumin and globulin at two and five days of age. Urine for CMV-DNA was negative at two days of age [13]. Cranial ultrasound was normal. It was concluded that the baby was not born with CMV infection. Hearing screening prior to discharge from the NICU was normal. In view of the maternal history of CMV during pregnancy, and persistence of abnormal maternal serum CMVIgG antibodies, maternal to infant transmission of CMV via MBM during infancy was considered as a real possibility [4-9].

After discussion with the mother, it was decided to pasteurize MBM to eliminate CMV prior to feeding her baby [1]. The use of human BM pasteurizer named Kimie [Shreyas Medicals, Pune, India] was previously approved by the CH Medical Hospital Board (Identifier: NICU-PO13) and the IRB of University of California at Los Angeles (Identifier: 22-000107). Kimie 500 or 3000 was used based on the available volume of the MBM to be pasteurized [12]. The mother was educated regarding collection, storage and transportation of expressed BM [EBM] and the use of pasteurized BM [PBM] [14]. Manufacturer's recommendations were strictly followed to pasteurize MBM [10-12]. We did not perform bacterial culture of the MBM before or after pasteurization. Baby continued to receive PBM until three months of age. Infant formula was used if PBM was insufficient. Mother was allowed to continue breast feeding by latching on her breast after three months of age. She continued breast feeding until six months of age. Urine for CMV was negative at birth and two and a half months of age, positive at six and a half months age. She had normal Hb/HCT, WBC count [including differential], reticulocyte and platelet count and liver function tests (Albumin, total and direct bilirubin, alkaline phosphatase, AST, ALT) at seven months of age. She had normal hearing screening, growth and development at six months of age. She had no signs of respiratory or any other illness at any time until nine months of age.

Discussion

While Hayes and Reynolds observed presence of CMV in the BM of ~ 30 % of CMV seropositive women [8,7], the range is 32 to 96% [1,3]. An increase in CMV infection depends on many factors like ethnicity, low socioeconomic status, social habits or customs, geography [country or a region within a country] [1,13]. The prevalence of CMV seropositive women in reproductive age is 40-60 % in the USA and Western Europe, while in Asia and Africa it can be up to 90% [1,13]. The rate of CMV seropositive women at CH was ~ 80% [13]. This may be because of the low socioeconomic status of patient population. It is also known that seronegative mothers do not shed CMV in the BM [1,2-8]. CMV transmission via infected MBM generally happens during infancy. Between 10 to 60 % among different countries are affected [4]. As many as 58 percent of infants who were breast-fed with BM that contained CMV were infected with CMV [6]. It can lead to serious acute illness, especially in very preterm babies [1,3]. However, full term infants are not totally immune [4-9]. It has been reported that neonates negative for CMV at birth acquired CMV during infancy [4-9]. MBM acquired CMV infection in healthy infants usually manifest when the child is between four and sixteen weeks of age [4-9]. As many as one third of infants exposed to CMV perinatally may have signs and symptoms of CMV which include fever, vomiting, diarrhea, abdominal distension, lymphadenopathy, hepatosplenomegaly, hepatitis, pneumonitis and abnormal blood counts [4-6]. However, exactly how often such illnesses may occur is still not determined, but is an important issue [4].

Differential diagnosis of CMV infection during infancy include: Chlamydia, hepatitis B, HIV, enteroviruses, adenoviruses and bacterial infections [4]. Therefore, it is likely that MBM acquired CMV infection during infancy frequently remains undiagnosed. All infected infants continue to shed CMV, therefore these infections may have pathogenic potential for late appearing sequalae [4]. In a study by Stango et al rates [%] of urinary excretion of CMV at 6 months of age were 56 (Japan), 55 (Thailand), 42 (Guatemala), 35 (Finland), 10 (USA and England) respectively [6]. None of the nine formula fed infants but 11 out of 19 [58%] BM fed infants acquired CMV infections between four weeks and four months of age [7]. Therefore, BM has been considered the most likely source of CMV that occurred within the first six months of life [7]. It was proposed that means to render the milk non-infectious without destroying its valuable properties should become available [7]. The pattern of CMV expression in MBM is unimodal, with low levels in the first week postpartum increasing to a maximum between four to eight weeks and declining through 10 to 12 weeks or much longer [1]. Therefore, we decided to administer PBM until three months of age. The mother continued to do nipple feed her baby until six months of age. Baby's urine was negative for CMV at two and a half months of age, however it became positive at five and a half months of age. Therefore, maternal to infant transmission of CMV must have happened after three months of age. Despite the presence of CMV in the urine, baby did not develop signs or symptoms of CMV disease.

Until recently, it has not been easy to pasteurize natural mother's EBM since the existing pasteurizers are not readily available. With the availability of Kimie 500 or 3000 it has become easier to pasteurize natural mother's EBM before it is given to her infant [10-12]. Details about the genesis and the evolution of Kimie have been described [12]. In the USA, FDA approval is not necessary for the use of MBM pasteurizer since it is considered a catering device. Kimie was imported from India under a commodity code 84198008. In a similar study, to prevent maternal to infant transmission of CMV in a full-term baby with SCID, we pasteurized MBM until fourteen months of age [10]. Pasteurization of MBM did not adversely affect growth and development [10]. Similarly, in the present study, pasteurization of MBM until three months of age did not influence growth and development studied at six and nine months of age. While holder pasteurization reduces the amount of few beneficial biological compounds in BM, these losses do not seem to be clinically relevant [10,15]. In summary, in a full-term baby, we attempted to prevent maternal to infant transmission of CMV via MBM by pasteurizing MBM before administering it to her baby. This strategy has not been attempted before. More studies are necessary to establish the efficacy and safety of this approach. With the availability of point of care pasteurizer like Kimie it should be easy to do so.

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