

Improving Weight Gain in Premature Babies with Fat-rich Breastmilk

Ms Wong Ka Yin

APN, IBCLC, Trainer (WHO BF course)

Content Highlight

Bronchopulmonary Dysplasia (BPD), a chronic lung disease, is the most common complication in extremely preterm babies. Optimal nutritional support plays a critical role in managing BPD.^{1,8} In this article, we discuss how a mother builds up her confidence in meeting the nutritional need of her preterm baby by providing fat-rich breastmilk, using specific pumping techniques.



Case History

Lily was a 36-year-old mother with good past health. She was admitted at 24 weeks of gestation due to premature rupture of membrane. After one week, she gave birth to Anne, her second baby, by normal vaginal delivery. As an extremely preterm baby, Anne was admitted to the neonatal intensive care unit (NICU) immediately. Her birth weight was 700g. She had respiratory distress requiring a prolonged period of mechanical ventilation and oxygen supplementation. She subsequently developed BPD.

Lily was very keen on breastfeeding. She had breastfed her first girl who was then 2 years old. She started expressing her breastmilk soon after delivery and fed Anne with breastmilk exclusively after she had weaned off parenteral nutrition. Her daily feeding input was kept at no more than 150ml/Kg/day. The breastmilk was fortified with micro-nutrients and calories as recommended by the dietitian. However, her weight gain was not satisfactory. Lily became unconfident in continuing breastfeeding and considered switching to formula feeding.

I talked with Lily, listened to her concerns and accepted her feelings. Lily was worried that her breastmilk was not nutritious enough which had resulted in Anne's poor weight gain. I explored in detail how she expressed her breastmilk. Lily used a hospital-grade electric double breast pump. She expressed every 4 hours throughout the day with a daily production of around 600ml. She would save the breastmilk from the first three pumping sessions for Anne whose daily fluid requirement was only 264ml at the time. The subsequently expressed breastmilk would then be given to her elder daughter or stored. I suggested pumping regimes / techniques which would increase the fat content of her breastmilk.

1) Fractionating the Breastmilk into Foremilk and Hindmilk

Foremilk is the milk that flows out of the breast at the beginning of each milk removal while hindmilk is that flows near the end. The fat content is richer in the hindmilk which can be 1.6 times more than composite breastmilk.² This renders the hindmilk more energy dense.³ Studies have shown that preterm babies fed with hindmilk had a better weight gain when compared to those on composite milk.^{2,4}

Fractionating the breastmilk allows collection of the fat-rich hindmilk. Among several fractionating methods, "time" method is more commonly used.^{3,4} Breastmilk obtained 2-3 minutes after the let-down reflex when milk ejection becomes obvious is considered the hindmilk.^{3,4,5} As Lily's daily milk production almost doubled Anne's requirement, I suggested Lily to adopt the "time" method to fractionate her breastmilk into foremilk and hindmilk. The hindmilk from every pumping session would be reserved for Anne while the foremilk collected for her elder daughter or other purposes.

2) Using Hands-on Pumping Technique

It is a technique combining electric pumping with manual manoeuvers such as breast massage, compression, stripping and hand expression as necessary. It is hypothesized that hands-on pumping can increase the fat content of expressed breastmilk by removing the viscous hindmilk more efficiently than electric pumping alone.⁶ Through the hands-on pumping technique, the fat content of breastmilk can be more than 60g/L while that of composite breastmilk is typically 25-45g/L. This technique can increase the fat content by at least 33%. It is also a good technique to increase the breastmilk production in mothers of preterm babies as they are about 3 times more at risk of low milk production than mothers of term babies.⁷

I suggested Lily to use hands-on pumping technique to increase the fat content of her breastmilk according to the following steps:⁹

- 1. Wear a pumping bra to hold the breast shields so that both of her hands are free during pumping
- 2. Gently massage/compress the breasts, especially over areas of fullness which felt firmer, while watching the milk flow, and adjust where and how long the pressure is applied
- 3. Keep massaging while pumping until the milk flow slows down
- 4. Stop pumping and massage both breasts briefly for another 1-2 minutes
- 5. Choose one of the following methods to complete the expression session:
 - Resume double pumping
 - Switch to single pumping and use both hands to massage/compress the breast while pumping; complete one breast then the other



- Switch to hand expression

Lily followed the recommendations. She was delighted to see the increased thickness of the fat layer of the milk collected. She became more confident as she could do something valuable for her baby in NICU. After 2 weeks, Lily was happy to know that Anne's weight gain had improved.

Discussion

Milk producing cells produce the same kind of breastmilk throughout a feed. The exact mechanism of increasing fat content of breastmilk as the breast gets emptier remains unknown. Filtration is one of the theories based on animal studies.¹⁰ This theory proposes that fat globules cluster and adhere to the walls of alveoli and milk ducts. They are filtered out gradually as the breasts are progressively emptied.^{10,11}

Nutritional management of babies with BPD remains a big challenge. These babies usually need fluid restriction to no more than 150ml/kg/day to prevent pulmonary congestion and edema, while their ideal energy intake is 120-150kcal/kg/day.¹ They require an extra 15-25% more energy for breathing, assisting alveolarization of the lungs, and repairing damaged epithelial cells resulted from the disease process, etc. Inadequate nutrition can further worsen BPD as it may hinder lung development.^{1,8} Through specific pumping techniques such as fractionating the breastmilk and hands-on pumping, the mother can feed her baby with energy dense breastmilk. This is especially important for mothers whose babies are staying in NICU as it can strengthen their sense of control in caring for their babies in this unique way.

Key Messages:

- Nutritional management of babies with Bronchopulmonary Dysplasia (BPD) is a big challenge as they have higher energy requirement but need fluid restriction at the same time.
 支氣管肺發育不全嬰兒的營養管理是一項巨大的挑戰,因為他們有更高的能量需求,但同時需要 限制液體的輸入量。
- Higher fat content in breastmilk increases the caloric value.
 增加母乳的脂肪含量可增加其熱量。
- Fractionating breastmilk to collect hindmilk and using hands-on pumping can help increase the fat content of breastmilk.
 分段存取後奶和用手配合泵奶器擠奶有助增加母乳的脂肪含量。
- 4. Building mothers' confidence in breastfeeding babies with BPD is important as this can prevent them from switching to formula feeding.
 建立母親的信心以母乳餵哺支氣管肺發育不全的嬰兒是非常重要的,因為這樣可以避免她們轉用 配方奶餵哺嬰兒。

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