

The relationship of bupivacaine and ropivacaine with the smoothness of breast milk in maternity patients

Relación de la bupivacaína y la ropivacaína con la suavidad de la leche materna en pacientes de la maternidad

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SUMMARY

Introduction: Breast milk is the most crucial source of nutrition containing essential substances for a child's immunity against diseases can digest solid food. The medical world always strives to find appropriate methods to reduce pain during labor, called Intrathecal Labor Analgesia (ILA) method. This study aims to analyze the relationship of bupivacaine and ropivacaine with the smoothness of breast milk in maternity patients. **Methods:** The patients were given analgesic drugs to determine the effect on their fluencies of breast milk within 24 hours. This research was conducted by doing medical record intervention toward the patients' identity, drugs, and ILA doses and observing them through giving questionnaires for the treatment of post-partum through the ILA method at a puerperal room of the hospital. **Results:** Ninety-six mothers were included in this study. Most mothers were at age 20-30 years (43.8%), master's degree (50.0%),

housewives (46.9%), and primiparous (68.8%) have fluency in breastmilk. Sixty-nine mothers with 2.5 mg of bupivacaine (71.8%) and twenty-seven mothers with 4.5 mg of ropivacaine (26.2%) analgesic through the ILA method had breastfeeding fluency. At the same time, 6 mothers with 2.5 mg of bupivacaine analgesia (8.7%) and 6 mothers with 4.5 mg of ropivacaine analgesia (22.2%) through the ILA method had no breastfeeding fluency. **Conclusion:** There is no relationship between bupivacaine and ropivacaine with the smoothness of breast milk in patients giving birth.

Keywords: Bupivacaine, Ropivacaine, ILA, Smoothness of breast milk.

RESUMEN

Introducción: La leche materna es la fuente de nutrición más importante que contiene sustancias esenciales para que la inmunidad de un niño contra las enfermedades pueda digerir los alimentos sólidos. El mundo médico siempre se esfuerza por encontrar

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métodos apropiados para reducir el dolor durante el trabajo de parto, llamado método de analgesia intratecal del trabajo de parto (ILA). Este estudio tiene como objetivo analizar la relación de bupivacaína y ropivacaína con la suavidad de la leche materna en pacientes de maternidad. **Métodos:** Las pacientes recibieron analgésicos para determinar el efecto sobre la fluidez de la leche materna dentro de las 24 horas. Esta investigación se realizó interviniendo en la historia clínica y la identidad de las pacientes, fármacos y dosis de ILA y analizando mediante la aplicación de cuestionarios para el tratamiento del posparto a través del método ILA en una sala puerperal del hospital. **Resultados:** Se incluyeron 96 madres en este estudio. La mayoría de las madres tenían entre 20 y 30 años (43,8 %), maestría (50,0 %), amas de casa (46,9 %) y primíparas (68,8 %) tenían fluidez en la leche materna. Noventa y tres madres recibieron analgésicos, 2,5 mg de bupivacaína (91,3 %) y 21 madres con 4,5 mg de ropivacaína (77,8 %) a través del método ILA tuvieron fluidez en la lactancia. Al mismo tiempo, 6 madres con 2,5 mg de analgesia con bupivacaína (8,7 %) y 6 madres con 4,5 mg de analgesia con ropivacaína (22,2 %) a través del método ILA no tuvieron fluidez en la lactancia. Sin embargo, no se encontró correlación entre bupivacaína y ropivacaína con la suavidad de la leche materna en la maternidad ($p = 0,298$). **Conclusión:** No existe relación entre bupivacaína y ropivacaína con la suavidad de la leche materna en pacientes que dan a luz.

Palabras clave: Bupivacaína, Ropivacaína, ILA, Suavidad de la leche materna.

INTRODUCTION

Children's health is a significant problem in Indonesia, where nutrition is a problem that affects the health of our society. The health status of children as successors greatly reflects the health of the nation and state. In addition, the baby's development and growth, which is mostly influenced by the amount of breast milk obtained from the mother and its nutritional content, still become a problem (1). Indicators that reflect conditions of mortality, nutritional status, and morbidity that affect the degree of public health in Indonesia are the second Maternal Mortality Rate (MMR) (2).

About 4 million of the 136 million babies under 28 days of age die every year worldwide, where early initiation of breastfeeding in the first 1 hour can save less than 1 million babies. On

the one hand, in Indonesia, people ignore the importance of breast milk to prevent allergies and infections. The Indonesian Demographic and Health Survey (IDHS) results show that breastfeeding in Indonesia decreased by 39.5 percent in 2006-2008 (3). Meanwhile, based on the 2012 IDHS, the MMR is 359/100,000 live births, where this figure has jumped from 2007 to 228/100,000 live births (2).

According to the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), children should be breastfed for approximately six months to reduce child mortality and morbidity. After 6 months of age, children are allowed to be given solid food, and during that period, they are still allowed to breastfeed until the child is 2 years old. A report showed that exclusive breastfeeding was significantly affected by nutritional status before pregnancy, family income, and early breastfeeding initiation (4). The promotion of exclusive breastfeeding in the first few months is because breast milk contains many nutrients needed. Because children have low immunity to various diseases caused by foreign organisms, children need early recognition with adequate nutrition, namely breast milk (5). A study stated that Breastmilk macronutrient levels correlate to infant growth in a unique pattern (6). According to Sherwood's book, 2014 "From a nutritional point of view, breast milk consists of water, fat, triglycerides, carbohydrates, lactose (milk sugar), several proteins, vitamins, and minerals calcium and phosphate", when reaching peak lactation a mother can produce 1.5 liters of milk every day. However, this energy flow is about 650 to 750 Cal/L (or 19 to 22 Cal/ounce) contained in breast milk, although the calorie content of breast milk depends on the mother's diet and breast size. Mothers must obtain 100 grams of lactose through the conversion of glucose to meet the needs of metabolic substances. Likewise, calcium phosphate is 2-3 grams that may be lost every day (7).

The medical world is always trying to find the proper method to reduce pain during labor, where there are many pharmacological and non-pharmacological methods. This method has several essential things, namely convenience, safety, and assurance of fetal homeostasis. Then known a method with almost no side effects to

the fetus or mother compared to other methods is called Intrathecal Labor analgesia (ILA). The ILA method is a method of spinal anesthesia in the subarachnoid space, and its action is by injecting regional anesthetic drugs into the mother's intrathecal space (lower back), which is given above a 4 cm opening (8). Bupivacaine is a local anesthetic amino amide group that is most widely used for spinal anesthesia. The potency of bupivacaine is 3-4 times stronger than mepivacaine and 8 times of procaine. The duration of action is 2-3 times longer than mepivacaine around 90-180 minutes (9). In addition to drugs, several things can affect the production of breast milk, namely the intake eaten by the mother must meet the number of calories, protein, fat, and vitamins and minerals that are sufficient; peace of mind and soul of the mother because stress can reduce the volume of breast milk and even breast milk production will not occur; pain; contraceptive use; breast care; breast anatomy; rest; baby suction factor; implementation of early breastfeeding initiation (10). This study aims to analyze the relationship of bupivacaine and ropivacaine with the smoothness of breast milk in maternity patients.

METHODS

This study was conducted to determine whether there is a relationship between administration of bupivacaine and ropivacaine for analgesia through the ILA method had breastfeeding fluency. The population of respondents in this study was all patients who gave birth using the ILA method who were given analgesic drugs. Then the patients were randomly selected to see their effect on the smoothness of breast milk within 24 hours. This research was conducted in 3 months. This research was conducted at the Gresik Muhammadiyah Hospital, Indonesia, employing medical record intervention in the form of patient identity, and drugs, and ILA dosage. Then, observations were made using a questionnaire for post-partum breastmilk through the ILA method in the post-partum room of Muhammadiyah Hospital, Gresik. Data on the smoothness of breast milk is obtained by conducting an assessment to get a score including the frequency of breastfeeding in a day, duration

of breastfeeding, breast condition, as well as the frequency of urination and defecation of the baby, including the color of the stool, as well as the condition of the baby after feeding.

In this study, the data collection procedure was carried out after obtaining an ethical permit from the Faculty of Medicine, Muhammadiyah University of Surabaya, Indonesia, and a research permit from the Muhammadiyah Gresik Hospital. The study was conducted on 69 post-partum mothers with bupivacaine 2.5 mg analgesic using the ILA method and 27 post-partum mothers with 4.5 mg ropivacaine in the ILA method. Each respondent measured the fluency score of breastfeeding using a questionnaire. The questionnaire includes questions about mothers breastfeeding babies ≥ 8 times in 24 hours, mothers breastfeeding babies ≥ 10 minutes, at each breast, before breastfeeding, whether the mother's breasts feel tense, the milk comes out of the mother's nipples, the baby pees the most at least 6 or more times in 24 hours, the baby has bowel movements 2 or more times in 24 hours, the color of the baby's bowel movements is golden yellow, not too watery, and not too thick and whether after breastfeeding the baby is sleeping peacefully for 2 hours or more.

The results of field observations and medical record data were processed by editing, coding, entry, and tabulating. Then, the data were analyzed using the Chi-square test using SPSS.

RESULTS

Table 1 displays the characteristic of respondents. Most respondents were at age 20-30 years (43.8 %), master's degree (50.0 %), housewives (46.9 %), and primiparous (68.8 %) had fluency in breastmilk.

In the respondent's characteristics, other factors affect breastfeeding, namely diet, nutrition, work, and environmental conditions. The food eaten by mothers who are breastfeeding affects the quality or amount of milk produced, although not directly. This is related to the reserves of various nutrients in the body that can be used when needed. Smooth milk production will be guaranteed if the food consumed by the mother every day contains sufficient nutrients in a regular

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Table 1
Characteristics of Respondents (n=96)

Variables	Smoothness Breastmilk			
	Yes	%	No	%
Age				
20 - 25 years old	21	21.9	3	3.1
26 - 30 years old	39	43.8	9	9.4
31 - 35 years old	15	15.6	0	0
>35 years old	9	9.4	0	0
Education Level				
Junior high school	0	0	3	3.1
Senior high school	27	28.1	3	3.1
Bachelor's degree	9	9.4	0	0
Master's degree	48	50.0	6	6.3
Occupation				
Housewife	45	46.9	9	9.4
Entrepreneur	18	18.8	0	0
General employees	9	9.4	3	3.1
Health workers	6	6.3	0	0
Teacher	6	6.3	0	0
Parity				
Nulliparous	6	6.3	12	12.5
Primiparous	66	68.8	0	0
Multiparous	12	12.5	0	0

pattern (11) portion and nutritional contents of the food consumed by the breastfeeding mother to meet the needs of breast milk sufficiency for babies. Diets in the form of nutrients will be converted into nutrients so that it becomes a metabolism that serves on producing the breast milk. The purpose of this study was to analyze the relationship of diet with breastfeeding adequacy in breastfeeding mother in Public Healthy Center of Ngadirojo, Pacitan, East Java. The design of this research is correlational research with cross sectional approach. The data as the population in this study were 21 breastfeeding mothers in the Public Health Center, Ngadirojo, Pacitan taken on January, using total sampling technique.

Independent variable studied was diet, while the dependent variable in this study was breastfeeding adequacy in reastfeeding mother. Data were obtained questionnaire instrument for diet and observation. The results were analyzed by using spearman rank test. The results of this study noted that almost all 90.5% maternal breastfeeding diet; belonged to enough categories, while 76.2% sufficiency of milk belonged to enough category too. The results of statistical tests known p-value = 0.002 at a significant level α . There are still many mothers who cannot give exclusive breastfeeding because mothers are busy working so they cannot give breast milk, this causes less milk production (12).

Post-partum mothers with 2.5 mg of bupivacaine analgesia through the ILA method had an average breastfeeding fluency score of 5.636 with a standard deviation of 1.989. Meanwhile, for post-partum mothers with 4.5 mg of ropivacaine through the ILA method, it is known that the average breastfeeding fluency score of 5.00 with a standard deviation of 1.581. Table 2 shows post-partum mothers with the analgesic bupivacaine 2.5 mg and ropivacaine 4.5 mg in the ILA method had the smoothness breastmilk. The measurement of the smoothness of breast milk is carried out by using a questionnaire containing questions related to conditions in the breastfeeding process that indicate the level of smoothness of breast milk. Chi-square test results obtained a significance value of 0.298. This shows that there is no statistical significance that shows the relationship between bupivacaine and ropivacaine with the smoothness of breast milk in patients giving birth in addition. A contingency coefficient of 0.181 was obtained, indicating that the analgesic effect through the ILA method has a very low relationship of bupivacaine and ropivacaine with the smoothness of breast milk in maternity.

Table 2
Relationship of analgesic effect through ILA method with the smoothness of breast milk

Treatment	Smoothness Breastmilk		p	Contingency Coefficient
	Yes n (%)	No n (%)		
Bupivacaine 2.5 mg	63 (91.3)	6 (8.7)	0.298	0.181
Ropivacaine 4.5 mg	21 (77.8)	6 (22.2)		

DISCUSSION

This study showed that the post-partum mothers with the analgesic both bupivacaine 2.5 mg and ropivacaine 4.5 mg in the ILA method had the smoothness breastmilk. Determination of the fluency of breastfeeding is obtained from the results of the questionnaire. From the questionnaire, a score of breastfeeding fluency was obtained. If the value is more than 4, it can be concluded that the mother's milk is smooth. The ILA method will provide minimal labor pain that is efficient, fast, easy, inexpensive, and practical to reduce stress (13). The dosage of ILA is considered appropriate according to a study that contains 25 μ g of fentanyl + a combination of 3.0 mg of ropivacaine and 75 μ g of clonidine (14). However, the ILA dosage used by anesthetists in the delivery room of this study was a combination of fentanyl 50 μ g + bupivacaine 2.5 mg or a combination of fentanyl 50 μ g + ropivacaine 4.5 mg. The analgesic effect of ropivacaine is comparable to bupivacaine when at a comparable dose, with a greater safety limit so that it can be used with a higher concentration and a larger dose when compared to bupivacaine (15). The motor block effect produced by ropivacaine is mild but has a good analgesic effect. At Muhammadiyah Hospital, Gresik, Indonesia the analgesic drug bupivacaine is more dominant than ropivacaine due to several factors, one of which is a more affordable price and a high working potential, namely 4-8. Meanwhile, ropivacaine has the potential to work, namely 4. According to this journal that single doses of 2-4 mL of 0.5 %-2 % solutions of ropivacaine are less potent than bupivacaine when administered intrathecally and is generally administered at a higher dose than bupivacaine. Ropivacaine is metabolized extensively in the liver, predominantly by aromatic hydroxylation to 3'-hydroxy-ropivacaine by cytochrome P450 (CYP) 1A2 and N-dealkylation to 2',6'-pipecoloxylidide by CYP3A4 (16). Ropivacaine rapidly crosses the placenta during epidural administration for caesarean section, resulting in the near-complete equilibrium of the free fraction of ropivacaine in the maternal and fetal circulation (16). Bupivacaine is highly protein-bound, which is consistent with its long duration and potential for cardiotoxicity. Indeed, the cardiotoxicity of bupivacaine

prompted the development of ropivacaine and L-bupivacaine. Chemical structure makes bupivacaine significantly more hydrophobic than mepivacaine and lidocaine, slower in onset but of longer duration (17). Bupivacaine is popular for use in a wide array of applications, including infiltration (0.25 %), peripheral nerve blocks (0.375-0.5 %), spinal (0.5 and 0.75 %), and epidural (0.5 and 0.75 %) anesthesia. Because of systemic toxicity, it is not used for IV regional anesthesia (17).

The two groups had not many different breastfeeding fluency scores. Mothers experienced breastfeeding inadequately in the study due to various factors, including some patients who had performed cesarean section surgery, then the early initiation of breastfeeding (IMD) was not carried out. Other factors that affect breastfeeding include diet, mental peace, use of contraception, breast care, breast anatomy, rest factors, and lack of baby suction (18). A study also showed that more than half of the postpartum mothers experienced stress, and their breastfeeding was not fluency, so there was a relationship between stress the fluency in breastfeeding (19).

This study is also following reproductive physiology that the age that can accelerate the onset of lactation is between 20-30 years (20). At that age, the reproductive organs develop completely and experience good maturity. According to a report, it shows that age > 30 years can significantly delay the onset of lactation (14). Older age has a risk factor for carbohydrate intolerance during pregnancy. Where carbohydrate intolerance during pregnancy can cause maternal sugar levels to increase the Body Mass Index (BMI) of overweight mothers, which will cause a decrease in progesterone levels immediately after the placenta is born, thereby inhibiting prolactin production.

The higher the mother's education level, the higher the access to seek information. This is in line with a report that there is a significant relationship between the level of a mother's education and the success of mothers in giving exclusive breastfeeding to babies (2,20,21). Mothers with high or good education levels can more easily receive all information about the importance of breastfeeding in meeting children's nutritional needs to ensure adequate nutrition of

children. On the other hand, mothers who lack education will hamper the development of a person's attitude towards the values introduced, so that it is difficult to receive information related to breastfeeding properly.

One of the efforts to increase breast milk is by breastfeeding children regularly (7). The more often the child sucks the mother's nipple, the more milk production, and *vice versa*. When the baby starts to suck on the nipple, it will produce the hormone prolactin, which regulates the cells in the alveoli to produce milk. The milk is collected into the milk ducts. The baby's suction also stimulates the production of the hormone oxytocin so that the muscle cells around the alveoli contract and are pushed towards the nipple. Thus, the more the baby sucks, the more milk it will produce. This is reinforced by a study that there is a significant relationship between maternal employment status and breastfeeding (22,23).

A study stated that mothers who give birth to children once (*Primipara*) or more than once (*Multipara*) could produce more breast milk than those who gave birth for the first time (*Nullipara*) so that it can affect the fluencies of breastfeeding (24). Mothers who give birth for the first time usually have less knowledge and experience in terms of breastfeeding, while mothers who have given birth more than once certainly have experience in breastfeeding so that lactation management will be carried out properly (25).

CONCLUSION

In the ILA method, postpartum mothers with analgesics, both bupivacaine 2.5 mg and ropivacaine 4.5 mg, had smooth breast milk. There is no relationship between bupivacaine and ropivacaine with the smoothness of breast milk in patients giving birth. In addition to drugs, several factors that affect breastfeeding smoothness include pain, food, peace of mind and mind, use of contraception, breast care, mother's rest factor, and baby's sucking factor.

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Conflicts of Interest

The authors declare no conflict of interest.

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