Original Article

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Effect of Immediate Postpartum Skin-to-Skin Contact Between Mothers and Newborns on Episiotomy Pain: A Randomized Controlled Trial

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Abstract:

Objective: To determine the effect of immediate skin-to-skin contact (SSC) between mothers and their newborns on episiotomy pain.

Material and Methods: This randomized controlled trial enrolled 60 participants who underwent vaginal delivery. The participants were divided into two groups: an immediate SSC group and a no SSC group (n=30 for each group). SSC was initiated within 10 minutes after birth with a contact duration of at least 30 minutes. Episiotomy pain severity was evaluated using a visual analog scale (VAS) at one hour after birth in both groups. The pain scores were analyzed using the Mann-Whitney U test and the optimum contact time for reducing episiotomy wound pain was evaluated by a receiver operating characteristic (ROC) curve.

Results: The median VAS of episiotomy pain at one hour after delivery in the SSC group was statistically significantly lower than the no SSC group (1.9 (0.8-3.1) vs. 3.4 (2-5.2) cm, p-value<0.001). The contact time for optimal pain reduction was at least 30 minutes of SSC.

Conclusion: Immediate SSC contact between a mother and her neonate after delivery can effectively reduce episiotomy pain.

Keywords: episiotomy pain after delivery, skin-to-skin contact, vaginal delivery

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Introduction

Vaginal delivery is the preferred method of birth for obstetricians in their routine work. Vaginal delivery is the ideal route of delivery for most fetuses in uncomplicated clinical settings and it carries the lowest risk to most pregnant women with comorbidities[1]. Episiotomy is a common obstetric procedure often performed during vaginal delivery to allow adequate vaginal opening during the second stage of labor. The rates of episiotomy vary globally between 9.7% and 100%[2]. In 2019, the annual report of pregnant women giving birth at our institute reported that 1,018 pregnant women delivered by vaginal birth of the 1,747 pregnant women who gave birth and the rate of episiotomy in these women was 98%.

Previous studies have found that Asian women have a small and narrow birth canal[3]. An episiotomy is a procedure that helps reduce severe pain in the birth canal area[4], In addition, there are several advantages of episiotomy: it is a simple incision to repair, it heals more rapidly than a spontaneous perineal tear, it reduces the chance of a severe perineal and vaginal trauma, easy prevention of fetal brain injury, and it helps shorten the second stage of labor[5,6]. However, perineal pain after an episiotomy is a complication that is common after this procedure, even with adequate local anesthesia. Currently, in addition to pharmacological methods for pain relief in perineal repairs, there is an increasing trend toward non-pharmacological methods, such as music therapy, prayer, application of cold packing, and skin-to-skin contact (SSC) with the neonate[5-12].

SSC is defined by the WHO as placing the infant in the prone position on the mother's abdomen or chest in a direct ventral-to-ventral position with bare skin contact between the mother and infant. Immediate SSC is contact that begins less than 10 minutes after birth. Immediate and uninterrupted SSC has been shown to be beneficial for both the mother and the newborn[13]. For example, for the mother, it promotes the release of oxytocin which initiates uterine contraction, reduces the rate of postpartum hemorrhage, reduces depressive symptoms and physiological maternal stress, and relieves pain during the postpartum period after delivery. In terms of the neonatal benefits, SSC has been found to effectively transfer beneficial parts of the microbiome from the mother to the baby, which helps prevent neonatal infections with a positive influence on the baby's cardiovascular, respiratory, and thermoregulation systems[14-17].

Many recent studies have shown that SSC between a mother and baby has an analgesic effect from the secretion of oxytocin and the activation of endogenous opioid neurotransmitters. The strongest endogenous opioids are beta-endorphins, and together with oxytocin release, help suppress inflammatory pain, pain nociception, and emotional stress[18,19]. Another proposed mechanism of the analgesic effect of SSC is the distraction mechanism[20]. The main objective of this study was to investigate the effect of immediate postpartum SSC between mothers and newborns on episiotomy pain. Due to the varying duration of SSC reported in previous studies[11,13,21,22], the secondary objective was to determine the optimal cut-off duration of SSC and identify factors associated with the optimal reduction of episiotomy pain.

Material and Methods

Participants

This study was a randomized controlled trail conducted at the Department of Obstetrics and Gynecology, HRH Princess Maha Chakri Sirindhorn Medical Center (MSMC), Srinakharinwirot University Hospital, during the period July 2020 to March 2021.

Ethical approval

The study was approved by the Human Research Ethics Committee of the Faculty of Medicine, Srinakharinwirot

University (COA. No. SWUEC-030/2563F, on June 12, 2020) and registered in the Thai Clinical Trial Registry (TCTR20210916001).

Study design

The participants for this study were selected through convenience sampling. The reason for choosing this sampling method was that it made it more convenient for the staff members to participate in this study during their working hours only. The research group selected mothers who had been admitted to the hospital and were due to having vaginal delivery. The total number of participants was 60. The inclusion criterial were a singleton term pregnancy (gestational age ≥37 weeks) with adequate pelvimetry, vertex presentation, planned episiotomy, estimated fetal weight between 2500-3500 grams, and active phase of labor. The exclusion criteria were inability to communicate in Thai, history of lidocaine allergies or previous operative vaginal delivery, high blood pressure more than 140/90 mmHg, abnormal fetal tracing and/or use of analgesic techniques or drugs during the peripartum or intrapartum periods.

At the time of admission to the study, we gave details to the participants regarding the study protocol, such as the aim of study, participant group assignment, and steps involved in the data collection. All the participants gave written informed consent before the start of the study and were then randomly divided into a group with immediate SSC and a group without SSC (standard group), using a block randomization (block of four) method.

Intrapartum management was performed as usual. At the MSMC, painless labor is not a standard care due to limitations in healthcare resources, therefore no participants received epidural anesthesia. All obstetricians who delivered the babies used the same protocol, which was 2% lidocaine with adrenaline for anesthesia until reaching 10 ml, followed by mediolateral episiotomy, which was similar in both groups. After that, the doctor repaired the episiotomy with polyglycolide-co-L-lactide braided fast, with absorbable sutures in both groups. Also, the continuous locking technique was used to suture the vaginal walls and skin suturing was done using the subcuticular technique. After delivery, all the participants received standard care in the delivery room. Before repairing the episiotomy, the participants were asked to estimate the pain around the episiotomy wound by using a numerical rating scale (NRS), which had scores between 0 and 10, with 0 for no pain and 10 for maximum pain. Warm sterile towels were placed on all newborns, and their heads were covered with cloth or a knitted cap to maintain a proper temperature. In the standard group, the newborns were given routine neonatal care (e.g., keeping them warm and suctioning any secretions), shown to the participant, identified by the mother's name, and placed under a radiant warmer with a brief physical examination performed. In the SSC group, after being shown to the mother, the newborns with bare skin were placed in the prone position on the mother's chest, with direct skin-to-skin contact. The SSC began 10 minutes after birth while the perineal wound was being repaired and the contact time between the mother and her infant was at least 30 minutes, aiming for the maximum effect of the practices. Throughout each SSC, a certified nurse closely monitored the baby and looked out for any unexpected events. After the end of SSC process, the newborn was placed under the radiant warmer for subsequent newborn care. The steps after this were the same as in the standard group.

The participants' general demographic and operative information were collected by the physician who performed the procedure. At one hour after delivery, all the participants were transferred to the recovery room and were asked to complete a pain assessment for the area of the episiotomy wound using a visual analog scale (VAS). The pain quantification involved a 10-cm long straight line on a paper and the participants were asked to put a mark across the

line corresponding to the pain intensity. The scale was a straight line drawn from the left to the right side of the paper, in which the left-side represented zero pain and the right-side maximum pain. The data were collected by another qualified physician who was blinded to the status of the mother.

The VAS is one of the most reliable and valid measurement tools for self-reporting of pain in adults and children aged above 8 years[23]. The reason why we evaluated episiotomy pain at one hour after delivery was because 1) we needed to evaluate the precise effect of SSC. If pain evaluation was performed concurrently during the episiotomy repair and SSC process or immediately after, the pain reduction might be due to distraction. 2) The median half-life and range of lidocaine for subcutaneous injections are 28.2 (17.4–36.6) minutes[24], so performing the evaluation one hour following the local anesthesia we could be sure the effect of the lidocaine was washed out before the pain evaluation, and 3) This time period was the most convenient period for patient preparation and recovery.

The methods of pain assessment were different before and after the repair of the episiotomy wound (NRS and VAS, respectively), because SSC should start as soon as possible after delivery, and the NRS is a simple verbal assessment, which was most convenient in this situation. We also felt that assessment bias might occur if the both pain assessments were evaluated by the same method.

Sample size calculation

The sample size was estimated using the formula for comparing means between two unrelated groups from STATA software version 13. We conducted a pilot study to calculate the required sample size. The sample size was calculated using a two-sided alpha error of 0.5 and 80% power. The minimum total sample size was calculated to be 50 (allocation ratio=1:1, 25 in the SSC group and 25 in the no SSC group). Under the assumption that there would be 20% lost to follow-up, we decided to include a total of 60 participants (n=30 for each group). A p-value of<0.05 was considered significant for the differences between groups.

Statistical analysis

This study was an intention-to-treat analysis. Statistical analysis was performed using STATA version 13. (StataCorp. version 13. College Station, TX: StataCorp LP; 2013). The demographic data was represented using descriptive statistics, including percentages, mean±standard deviation (S.D.), and median (interquartile range; IQR). The homogeneity between the SSC and standard groups was tested using chi-square test, t-test, and Mann–Whitney U test.

The association between immediate SSC and lower perception of episiotomy pain was calculated using the Mann-Whitney U test, requiring a two-sided p-value<0.05 and 80% of power to be statistically significant. For the secondary objective, first, the receiver operating characteristic (ROC) curve and the point closest to (0, 1) corner in the ROC curve (Euclidean's index) to find the optimal contact time for the maximum reduction of episiotomy pain with the aim of VAS=3 cm, and second, we determined the factors that affected the VAS of episiotomy pain ≤3 cm by using a multivariable logistic regression model.

Results

The number of pregnant women who fulfilled the inclusion criteria was 103. Of these, 43 participants were excluded: 30 who could not communicate in Thai language, 8 who had high blood pressure on admission, and 2 and 3 participants who had a history of previous operative vaginal delivery and abnormal fetal tracing, respectively. The remaining 60 participants were randomly divided into an SSC group of 30 patients and a standard group of 30

patients. The randomized SSC group had 2 infants who were unable to follow the protocol, one due to low Apgar score, requiring immediate close neonatal management, and the other with thick meconium amniotic fluid who also needed an intensive care after birth. In the standard group, there was one patient for whom it was not possible to collect the data because the participant underwent an emergency cesarean section due to a non-reassuring fetal status during the second stage of labor (Figure 1). Consequently, we used multiple imputations by linear regression to handle the missing data. All the participants were included in the outcome analysis (intention-to-treat analysis). The patients' characteristics, including general demographic characteristics and operative information, are shown in Table 1, with no statistically significant differences between the two groups. The mean (S.D.) of SSC duration was 31.33 (9.45) minutes. Except for the one participant who had the emergency cesarean section, as noted above, all participants delivered successfully via the vaginal route without the need for operative vaginal delivery. The risks identified in antenatal care in our study, such as anemia, gestational diabetes mellitus, maternal obesity, poor/excessive maternal weight gain during pregnancy, asthma, hyperthyroidism, and advanced maternal age, were not significantly different between the study groups, when they were classified as a high-risk or low-risk (no identified risk) group.

The primary results indicated that SSC showed

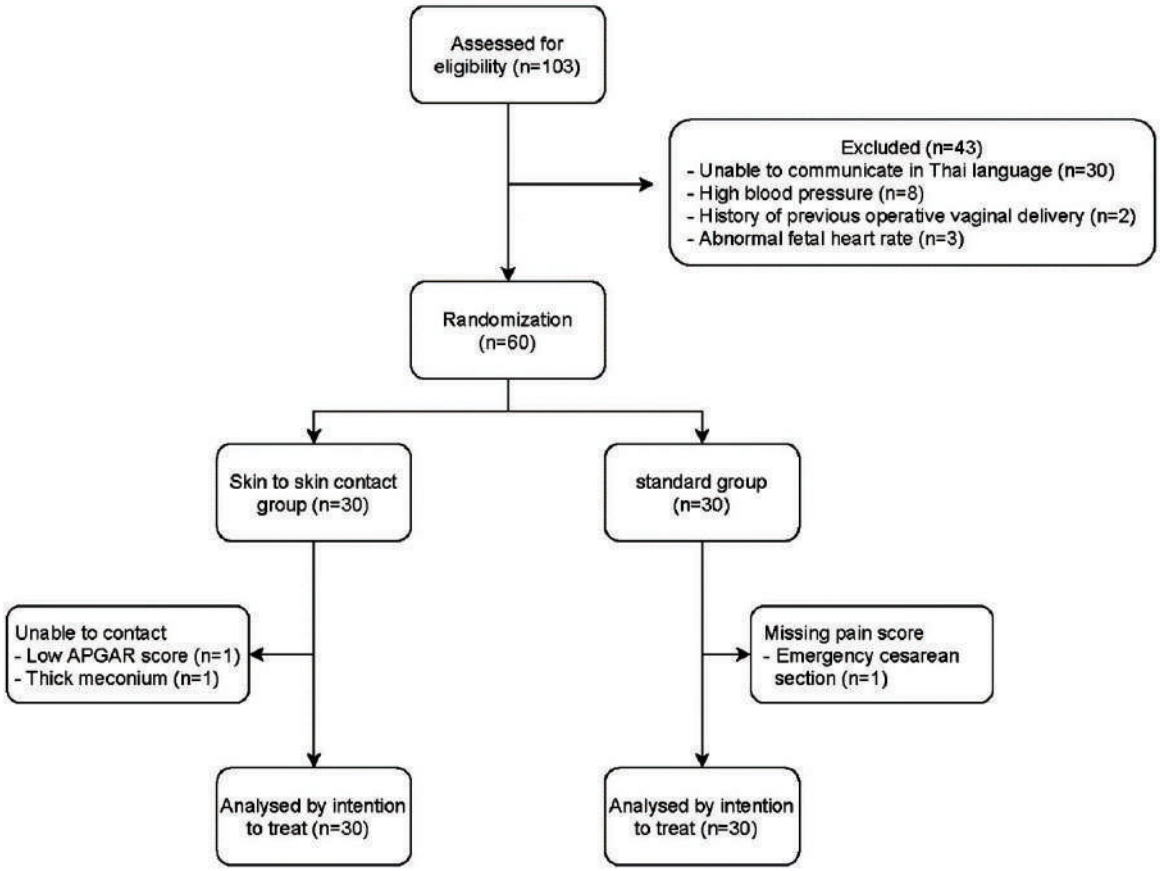

Figure 1 Study flow of participant recruitment

statistical significance in lower pain severity compared to the standard group. The median VAS (interquartile range) was 1.9 (0.8–3.1) cm in the SSC group versus 3.4 (2.0–5.2) cm in the standard group, a median difference of 1.5 cm (95% confidence interval, 0.07–2.93, p–value<0.001). All patients were discharged on day 2 postpartum with no complications of the episiotomy wounds. One neonate had meconium aspiration syndrome and 8 neonates had neonatal jaundice.

Regarding the secondary findings, the ROC curve demonstrated a correlation between the duration of SSC and the VAS of episiotomy pain at a cut–off point of 3 cm. The area under the curve (AUC) was 0.6657, as shown in Figure 2. The Youden index was utilized to find the optimum duration of SSC that resulted in the best pain improvement (VAS≤3 cm). This yielded the conclusion that at least 30–minute duration gave the optimal pain reduction, with a sensitivity of 64.7%, specificity of 76.9%, positive predictive value (PPV) of 78.6%, and negative predictive value (NPV) of 62.5% with an AUC of 0.71 (Table 2).

A multivariable logistic regression model was created including the factors of maternal age, previous vaginal delivery, duration of second stage of labor, size of episiotomy wound, estimated blood loss, fetal birth body weight, pain score before repair episiotomy wound, risk during antenatal care, attending doctor, race, SSC duration, and maternal BMI at delivery date. The SSC duration was the only statistically significant factor for VAS of episiotomy pain less than 3 cm with an adjusted odds ratio of 1.04, 95% CI 1.01–1.08, and p–value=0.01

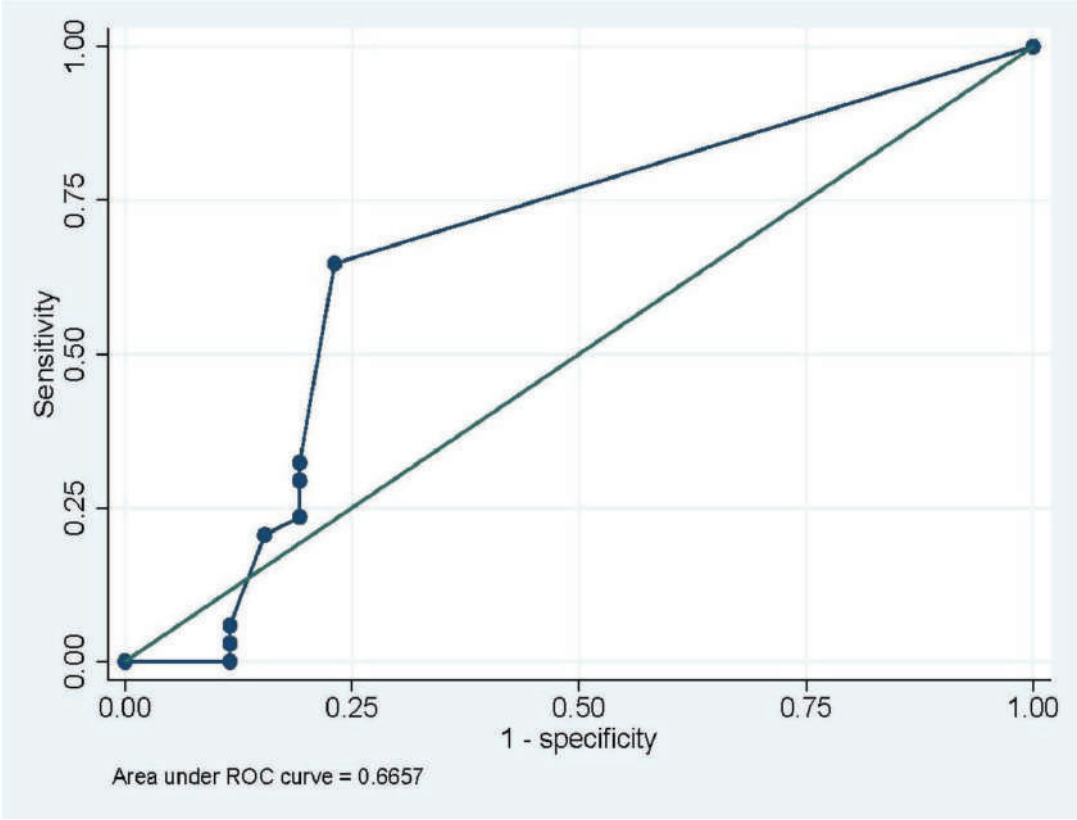

Figure 2 Association between duration of SCC and episiotomy wound pain (ROC curve)

Table 1 General demographic characteristics

Characteristic	No. (%)		p-value
	Skin-to-skin contact group (n=30)	Standard group (n=30)	
Maternal age, mean (S.D.), years	25.20 (4.95)	26.03 (5.57)	0.54*
BMI at delivery date, mean (S.D.), kg/m^2	25.99 (2.64)	24.97(4.02)	0.25*
Race			0.55**
Thai	28 (93.33)	29 (96.67)	
Other	2 (6.67)	1 (3.33)	
Risk during antenatal care			1**
low risk	18 (60)	18 (60)	
high risk	12 (40)	12 (40)	
Previous vaginal delivery			0.59**
≥1	13 (43.33)	11 (36.67)	
Never	17 (56.67)	19 (63.33)	
Operative information			0.47*
Size of episiotomy wound, mean (S.D.), cm	3.65 (0.57)	3.53 (0.83)	
Degree of perineal laceration			1**
First degree	0 (0)	0 (0)	
Second degree	30 (100)	30 (100)	
Third degree	0 (0)	0 (0)	
Fourth degree	0 (0)	0 (0)	
Lidocaine volume, mean (S.D.), ml	10 (0)	10 (0)	1*
NRS before operation, mean (S.D.)	5.57 (0.89)	5.73 (0.94)	0.48*
Score ≤6 (mild to moderate pain)	26 (86.67)	23 (76.67)	0.32**
Score ≥7 (severe pain)	4 (13.33)	7 (23.33)	
Attending doctor			0.78**
Resident	21 (70.00)	23 (76.67)	
Intern	3 (10.00)	3 (10.00)	
Extern (under supervision)	6 (20.00)	4 (13.33)	
Second stage of labor, median (IQR), min	13.5 (8-19)	12.5 (8-16)	0.89***
Neonatal body weight, mean (S.D.), grams	3,083 (249.72)	2,988.33 (295.36)	0.18*
Estimated blood loss, median (IQR), ml	150 (100-350)	200 (100-300)	0.74***

S.D.=standard deviation, IQR=interquartile range, NRS=numerical rating scale

*Independent t-test, **chi-square test, ***Mann-Whitney U test

Table 2 Efficacy of the contact time at a different cut-off times

Duration (minuets)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
0	100	0	40.35	0
≥30	64.7	76.9	78.6	62.5
≥31	32.3	80.8	68.8	47.7
≥32	29.4	80.8	66.7	46.7
≥33	23.5	80.8	61.5	44.7
≥35	20.6	84.6	63.6	44.9
≥36	5.9	88.5	40	41.8
≥38	2.9	88.5	25	41.1
≥45	0	88.5	0	40.4
>45	0	100	0	56.7

NPV=negative predictive value, PPV=positive predictive value

Discussion

One of the well-known adverse effects of an episiotomy is wound pain. This randomized controlled trial aimed to examine whether early SSC could have a positive effect on episiotomy pain during the immediate postpartum period. SSC is a non-invasive method, has no side effects, and has been found in the early studies to provide beneficial outcomes in terms of reducing immediate postpartum pain.

A total of 60 people participated in the study divided into two groups, with no statistically significant differences in NRS of pain and all other characteristics. The study found significantly lower episiotomy pain in the SSC group (median difference of VAS 1.5 cm, p-value<0.001) with at least 30 minutes duration of SSC for maximum effect to reduce pain.

Many pain management methods have been developed to reduce the pain of vaginal birth in the setting of non-epidural analgesia. There are still many women who suffer from perineal pain after childbirth, even if they have been given adequate local analgesia during repair episiotomy wound. It would thus be interesting and desirable to find an additional, simple, and economical method to reduce perineal pain. At present, there is limited evidence to explain how SSC reduces pain, and the mechanism is not entirely clear. Many earlier studies have supported the assumption that SSC between a mother and baby has an analgesic effect from the secretion of oxytocin and the activation of endogenous opioid neurotransmitters. The strongest endogenous opioids are beta-endorphins, and together with oxytocin release, this help suppresses inflammatory pain, pain nociception, and emotional stress[18,19]. These show the usefulness of psychological support for postpartum patients experiencing pain. Another proposed mechanism of the analgesic effect from SSC is the distraction mechanism. Distraction mechanisms are believed to be associated with sensory and motivational pain processing located in the thalamus, somatosensory cortices, insula, and anterior cingulate cortex[20]. However, this study was intended to avoid distraction mechanisms, so we did not assess pain during the SSC. Another proposed mechanism suggests that SSC stimulates the mother's vague nerve, a parasympathetic nervous system, which helps to reduce anxiety and has a sedative effect[22]. The last proposed mechanism is that SSC increases the secretion of epinephrine and norepinephrine, causing peripheral vasoconstriction leading to reduced inflammatory mediators to the perineal area, resulting in reduced pain[22]. These theories postulate how SSC can reduce episiotomy wound pain in postpartum patients. However, none of these theories have been fully proven, and further studies are needed.

A pilot study by Vamour et al. examined the effects of SSC on patients undergoing elective caesarean section on reducing intraoperative pain. They used the Analgesia Nociception Index (ANI), a pain assessment tool based on analysis of autonomic nervous system responses, to evaluate pain during anesthesia and surgery. The study showed the dominance of the parasympathetic nervous system function when the women were relaxed during the SSC, which ultimately resulted in a higher median ANI value, indicating less pain[17]. This finding is consistent with our study, as SSC was associated with decreased pain perception without any apparent adverse effects. Parasympathetic system dominance may have also played a part in lower perception to perineal pain in our study as well.

In 2022, Zou et al. conducted a randomized control trial study to evaluate the effect of SSC on episiotomy wound pain. This study began SCC immediately after birth and assessed episiotomy pain via a VAS immediately after the wound repair was finished. The SSC group had statistically significantly less pain than a non-SSC group, with a median difference of VAS of 8 millimeters with an interquartile range of 4-13 (p-value 0.008)[22]. The duration of SCC was at least 120 minutes, which is longer than both our study and the WHO recommendations. However, our study found that a minimum of 30 minutes of SSC duration was sufficient to reduce episiotomy wound pain. Moreover, in an earlier study by Kelly, the difference of VAS in two participant groups was required to be 9 millimeters different to be considered of clinically significant[25], but Zou's study found that although the median difference of VAS 8 millimeters was statistically significant, it was not clinically significant for pain reduction. In our study, the SSC group had a median VAS 15 millimeters different from the control group, showing statistical significance. Thus, according to Kelly's study[25], this outcome was reliable both clinical and statistically significant pain reduction.

In a 2016 study, Sharma et al. evaluated pain during the repair of episiotomy wounds, as a secondary outcome, in SSC and non-SSC groups. The study found that the SSC group had statistically significantly less pain, with the mean difference of VAS was 6 millimeters, p-value <0.01[21]. This study reported the duration of SSC was 45 minutes, which is longer than the duration in our study. Moreover, the pain reduction might have been mainly due to a distraction mechanism because the pain assessments were conducted during the SSC while the wound repair was being carried out. In addition, the mean difference in the VAS scores in Sharma's study was not considered to be clinically significant.

Gabriel et al. evaluated pain during the repair of episiotomy wounds, in SSC and non-SSC groups, as in Sharma's study. They found no statistically significant difference between the groups (VAS 1.4 cm and 1.3 cm with p-value 0.78 between the non-SSC and SSC groups, respectively)[26]. Our study was not consistent with the Gabriel study, but this is likely because in Gabriel's study, 95% of the participants had epidural anesthesia, which might be a major confounding factor.

Solt Kırca, et al. investigated the effects of immediate postpartum SSC between mothers and newborns on episiotomy pain and anxiety. The study found that the pain among the group who had SSC was lower than the group without such contact[11].

The WHO recommends immediate, uninterrupted SSC within ten minutes of birth for at least one hour. There is strong evidence showing this is beneficial for both mothers and babies in terms of mortality reduction and a positive breastfeeding outcome[13]. Although there are several advantages of SSC between a mother and newborn, one recent survey found that the levels of SSC among mothers and newborns in Asian countries were relatively low, i.e. only 17.3% in Japan, 15% in India, and 9.6% in the Philippines[27]. In Thailand, the use of immediate SSC is low even though it is a very simple procedure and can yield and has been shown to have various positive benefits for both the mother and the baby. This study aimed to bring attention to the

benefits of the immediate SSC. Our study found that SSC significantly reduced post-episiorrhaphy pain. Although the WHO recommends SSC for at least one hour, this study found a contact time of only at least 30 minutes improved the immediate pain outcome. Therefore, this 30-minute protocol could be applied in healthcare centers with limited resources to improve episiotomy pain.

The strength of this study is that it is the first study conducted in Thailand that investigated the effect of maternal-fetal physical contact on reducing maternal perineal pain. The drop-out rate was low in this study. In addition, the study design of this study was a randomized controlled trial with adjusted confounders which made the data analysis more accurate and with less bias.

In terms of the limitations, 1) This study was conducted in a single center with limited ethnicities. 2) The long-term maternal and perinatal outcomes were not followed. 3) The research protocol could not be concealed from either the researchers or the participants. This is because the patients were asked for permission before the research was initiated and each group had a different methodology. However, the group of researchers reduced the potential bias by asking other staff members who were not aware of the particular group of the participants to conduct the pain surveys. 4) The duration of the episiotomy wound repairs was not recorded, although all patients had their wound repairs completed less than one hour before the pain assessments began and the attending doctors who repaired the episiotomy wounds did not have a different effect on both groups. 5) The episiotomy pain was only evaluated at a single point of time, at one hour after delivery. In the future, participants could be followed for a longer period to see trends in pain improvement and possibly other beneficial postpartum outcomes.

Conclusion

This study has found that SSC between mothers and their infants after birth is a successful approach in reducing and improving episiotomy pain during the immediate postpartum period. In conjunction with pharmacological management, it represents a valuable and risk-free approach for improving patient outcomes without incurring any additional costs.

Conflicts of interest

The authors have no conflicts of interest to declare.

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