

Cryotherapy after childbirth: the length of application and changes in perineal temperature

CRIOTERAPIA NO PÓS-PARTO: TEMPO DE APLICAÇÃO E MUDANÇAS NA TEMPERATURA PERINEAL

LA CRIOTERAPIA EN EL POSPARTO: EL TIEMPO DE APLICACIÓN Y CAMBIOS EN LA TEMPERATURA PERINEAL

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ABSTRACT

We present a descriptive study based on the data from two clinical trials conducted at a maternity hospital in São Paulo, Brazil, in 2008 and 2009. This study aimed to describe perineal temperature after the application of an ice pack during the postpartum period. Three groups of 38 postpartum women (n=114 total) received an ice pack between 2 and 48 h after delivery. The results showed that after 10 minutes of cryotherapy, the mean perineal temperature varied between 13.3°C and 15.3°C, with a small reduction at the end of the 15- and 20-minute applications (2.4°C and 2.7°C, respectively). Women who received cryotherapy for 10 minutes reported a cool sensation and pain relief; after a session of 15 or 20 minutes, the women reported anesthesia and numbness. In conclusion, an ice pack applied for 10 minutes reduced the perineal temperature to the recommended levels for analgesia (10-15°C).

DESCRIPTORS

Cryotherapy
Perineum
Postpartum period
Obstetrical nursing

RESUMO

Estudo descritivo com dados de dois ensaios clínicos realizados em 2008 e 2009 em uma maternidade de uma instituição filantrópica da cidade de São Paulo. Teve como objetivo descrever a temperatura perineal após a aplicação de bolsa de gelo no pós-parto normal. Três grupos com 38 puérperas cada (n=114) receberam aplicação perineal de bolsa de gelo entre 2 e 48h após o parto. Os achados indicaram que com 10 min de crioterapia as médias da temperatura perineal atingiram de 13,3 a 15,3°C, com pequena redução de temperatura ao final de aplicações de 15 e 20 minutos (2,4 e 2,7°, respectivamente). Após resfriamento por 10 min., as mulheres referiram frio e alívio e, depois de 15 a 20 min., dormência e anestesia local. Conclui-se que 10 minutos de aplicação foram suficientes para reduzir a temperatura perineal aos níveis recomendados para analgesia (10-15°C).

DESCRIPTORIOS

Crioterapia
Períneo
Período pós-parto
Enfermagem obstétrica

RESUMEN

Estudio descriptivo con datos de dos ensayos clínicos realizados en 2008 y 2009 en una maternidad de institución filantrópica de la ciudad de São Paulo. Tuvo como objetivo describir la temperatura perineal luego de la aplicación de bolsa de hielo en el posparto normal. Tres grupos de 38 puérperas cada uno (n=114) recibieron aplicación perineal de bolsa de hielo entre 2 y 48 horas luego del parto. Los resultados indican que con diez minutos de crioterapia, los promedios de temperatura perineal alcanzaron de 13,3 a 15,3°C, con escasa reducción de temperatura al final de aplicaciones de 15 y 20 minutos (2,4 y 2,7°C, respectivamente). Luego del enfriado por diez minutos, las mujeres refirieron frío y alivio, y después de 15 a 20 minutos, adormecimiento y anestesia local. Se concluye en que diez minutos de aplicación fueron suficientes para reducir la temperatura perineal a los niveles recomendados para la analgesia (10-15°C).

DESCRIPTORIOS

Crioterapia
Períneo
Período de posparto
Enfermería obstétrica

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INTRODUCTION

Cryotherapy is often used in clinical practice, mainly to treat complications from posttraumatic lesions. In obstetrics, cryotherapy is used to reduce edema and to prevent bruising. However, the use of this approach for relieving perineal pain after vaginal delivery is rare.

Using cryotherapy to manage pain after childbirth is justified due to the physiopathological local cooling effects on the tissue. Furthermore, this method is easy to apply, non-invasive, inexpensive, and has few side effects or contraindications. Despite these factors, there is a lack of evidence to support the application of this practice, including the appropriate length of application⁽¹⁾.

The proper length of a cryotherapy session is important to reduce tissue temperature to recommended therapeutic levels and to minimize the discomfort and adverse effects that may result from prolonged exposure to cold. The variability in the length of cryotherapy sessions in perineal care hinders its safe and effective use.

Cryotherapy is the application of substances that remove body heat and reduce the temperature of the tissues as a treatment approach⁽²⁾. This non-pharmacological method is used as second-line therapy for relieving perineal pain after vaginal delivery⁽³⁾.

Cryotherapy indications include injury or acute inflammation, pain, muscle spasms and restoration of the range of motion. The contraindications are related to the intolerance of low temperatures, which can manifest in the form of allergies, hypersensitivity or circulatory failure⁽⁴⁾.

Although the mechanisms of tissue cooling have not been clarified, we know that when cold is applied, the tissue cools rapidly, starting with the superficial tissues and progressing to the deepest layers. This cooling causes physiopathological changes that decrease the inflammatory reaction, edema and pain^(2,4).

The effectiveness of cooling as a method of pain relief is related to the time and technique of application. Examples of cooling techniques are the application of ice or ice packs, ice massage, cold sitz baths, and cold gel compresses⁽²⁾. These techniques may have differences in cost, ease of use and acceptance.

Studies have shown the possible effects of different cooling methods⁽⁵⁻⁸⁾, but there is no evidence indicating which approach is the most effective. Applications of cold substances in solid or block form are more effective at reducing tissue temperature because they draw heat from the tissue by conduction, thereby changing from solid to liquid. These substances continue to remove heat from the tissue as they increase in temperature⁽²⁾.

Ice is better than cold gel and frozen peas for reducing skin and intramuscular temperature tissue (up to 2 cm below the skin surface). The amount of water contained in peas is less than that in an ice block, and gels are unable to solidify like ice⁽⁹⁾. Furthermore, ice slows the velocity and amplitude of nerve conduction^(7,10). Therefore, an ice pack is the most adopted method of cooling to alleviate perineal pain.

In addition to the material used, the proper session length is essential for cryotherapy effectiveness. Short applications may not promote tissue cooling to temperatures appropriate for analgesia (between 10 and 15°C)⁽¹¹⁾. Conversely, prolonged exposure to cold may be uncomfortable for the woman and may cause adverse effects, such as ulcers and burns⁽²⁾.

There is no consistency in the recommendations for the length of cryotherapy sessions in postpartum care. However, the protocols for the treatment of sports injuries recommend an ice pack application for between 15 and 30 minutes^(2,4).

Several studies have investigated the use of ice for relieving perineal pain. Cryotherapy treatment protocols for perineal care vary in the temperature used and the frequency and duration of the application.

A Cochrane Library systematic review included ten trials that used exposure times from 10 to 20 minutes⁽¹⁾. The available evidence regarding perineal temperature achieved after applying ice was restricted to data for 20-minute sessions⁽¹²⁾, and there was no consensus on whether cooling for 10 or 15 minutes promoted a perineal temperature compatible with the recommended level for analgesia⁽¹³⁾.

Therefore, this study aimed to provide information regarding perineal temperature after cryotherapy to assist with the choice of cryotherapy application length in clinical practice.

OBJECTIVE

The objective of this study was to describe the perineal temperature after applying ice packs for 10, 15 and 20 minutes.

METHOD

This descriptive study used data from two randomized controlled trials (RCTs). The first trial was completed in 2008 and consisted of a randomized, controlled, parallel trial in which the outcome assessor was blinded to the use of an ice pack for relieving perineal pain after vaginal delivery. Subjects in this study were randomized into three groups: the experimental group, composed of women who received an application of an ice pack for 20 minutes, the placebo group, composed of women who used a bag of water at

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room temperature, and the control group, composed of women who did not receive any intervention. The authors concluded that applying an ice pack for 20 minutes was effective at relieving perineal pain after delivery⁽¹²⁾.

The second study was a randomized controlled trial in which the subjects were blinded to the length of the intervention. This trial was conducted in 2009, and its aim was to compare the effectiveness of the ice pack to alleviate perineal pain after childbirth among single sessions lasting 10, 15 or 20 minutes. The population was divided into two groups: Group A, consisting of women who used ice packs for 10 minutes, and Group B, consisting of postpartum women who used ice packs for 15 minutes. These participants were compared with Group C, which was composed of women who used ice for 20 minutes on the perineum in the first study. There was no difference in analgesic effectiveness among the ice pack treatments lasting for 10, 15 or 20 minutes⁽¹⁴⁾.

Both studies were conducted in the Rooming Care Unit (RCU) of the Amparo Maternal Hospital in São Paulo, Brazil. This maternity hospital is a philanthropic institution specializing in low-risk pregnancies and is designated exclusively for obstetric care by the National Health System (SUS). The maternity ward is composed of a Birth Center (BC) with 16 labor beds, six delivery rooms and six immediate postpartum period beds. There are 84 beds in the Rooming Care Unit and eight in the neonatal intensive care. Assistance with labor, normal birth and postpartum issues is provided by midwives with minimal intervention. Obstetric physicians are responsible for the admission and care of pregnant women with pathological conditions or dystocia. Episiotomies are performed after the administration of local anesthesia with lidocaine. Simple catgut thread sutures are placed continuous in the vaginal mucosa and separate in the muscle, subcutaneous tissue and skin.

In the RCU, women remain hospitalized for approximately 48 hours and are orally medicated with dipyrone sodium 500 mg every six hours and diclofenac sodium 50 mg every eight hours. At this maternity ward, there is no protocol regarding non-pharmacological treatment for alleviating perineal pain.

Inclusion criteria for both trials were women who were ≥18 years old, were primiparous, carried a single fetus to term, were cephalic, were 2 to 56 hours postpartum, did not receive analgesics in the last 6 hours before inclusion in the study, did not receive spinal or epidurals, had no difficulty communicating or understanding Portuguese, had a newborn in good condition and reported perineal pain ≥ 3 on a numerical scale (0-10, where zero means no pain and ten is maximum pain) at the time of enrollment.

In the current study, were included only 114 postpartum women underwent to cryotherapy: 38 women used ice for 20 minutes in the first study (Group C)⁽¹²⁾

and 76 women participated in the second trial. Of the 76 women in the second trial, 38 women used an ice pack for 10 minutes (Group A) and 38 women underwent cryotherapy for 15 minutes (Group B)⁽¹⁴⁾. Data from women in the control and placebo groups in the first study⁽¹²⁾ were not included in this study because those women did not receive an application of ice.

The ice pack was made from a plastic 7.5x22 cm bag filled with 250 ml of water. To avoid direct contact of the skin and the pack, the ice pack was wrapped in a cloth cotton diaper measuring 20x20 cm (fabric with a thin layer of cotton). The application lasted 10, 15 or 20 minutes and was applied with the woman in the lithotomy position. We used a digital clock with a Timex® Model WR 50 m timer to monitor the duration of the application.

The room temperature was measured by an Incoterm® TA 6002 ambient thermometer. The axillary temperature of the women was evaluated by a Medeqco® DT-11A digital thermometer. Perineal and ice pack temperatures were assessed by a Minipa® MT 405 digital thermometer. This thermometer was composed of a dual channel, consisting of the surface thermocouple MTK01 and the immersion thermocouple MTK13. The measuring range of the device varies between -50°C and 200°C, with an accuracy of 0.75% or ± 2.2°C.

The end of the surface thermocouple was covered with PVC film and fixed with Micropore® near the root of the right thigh, approximately 3 cm from the fourchette in a horizontal line perpendicular to the vagina. The immersion thermocouple MTK13 remained inside the ice pack during the cryotherapy session.

Perineal temperature was recorded before the application of ice (T0) and every five minutes (T5, T10, T15 and T20) after starting cryotherapy. After the applications, the women were asked about their sensations during the intervention.

We performed a descriptive analysis of the data. Qualitative variables were presented as frequencies, and quantitative variables were presented as means, medians and dispersion measures.

The study, including the two trials, was approved by the Ethics Committee Search of the School of Nursing of the University of São Paulo (FR128862). Women participated voluntarily and provided informed consent.

RESULTS

The study included 114 women (38 from the first trial and 76 from the second trial) divided into three cryotherapy groups composed of 38 postpartum women. The mean age was 22.6±4.6 years (18-38 years). The predominant ethnic group was non-white. The mean postpartum time at which women were recruited was 22±14.8 h.

The mean axillary temperature was 36.5±1.0°C. The temperature of the room varied between 19.8±2.8°C and 27.1 ± 2.5°C for the 10- and 20-minute cryotherapy treatment groups, respectively.

The baseline temperature of the perineum ranged from 31.1±2.1°C in the group who received cryotherapy for 10 minutes to 32.7±1.3°C in the group who received therapy for 20 minutes. At the end of the ice application, the perineal temperature varied between 13.3±4.5°C and 12.6±4.8°C for the 10- and 20-minute cryotherapy treatment groups, respectively. The difference between the perineal baseline temperature and the perineal temperature after cryotherapy application was 17.8°C for 10 minutes, 20.3°C for 15 minutes and 20.1°C for 20 minutes. The cooling occurred mainly in the first 10 minutes, with a reduction of approximately 18°C in this period and little change thereafter (Table 1).

The baseline temperature of the ice pack was between 1.9±1.0°C and 3.8±2.8°C. After application for 10 and 20 minutes, the temperature of the ice pack decreased by 1.3°C and 1.9°C, respectively.

Women whose perineum was cooled for 10 minutes reported sensations of cold and pain relief at the end of the therapy, while those who underwent cooling for 15 and 20 minutes reported numbness and anesthesia.

Table 1 – Mean and standard deviation (SD) of the perineal temperatures before and at 5, 10, 15 and 20 minutes after starting cryotherapy, presented by group - Sao Paulo, 2008

Intervals	Perineal temperatures (°C) Mean (SD)
Before application	
10 min group	31.1 (2.1)
15 min group	31.6 (1.7)
20 min group	32.7 (1.3)
At five minutes of application	
10 min group	17.6 (6.4)
15 min group	15.9 (6.0)
20 min group	18.7 (4.6)
At ten minutes of application	
10 min group	13.3 (4.5)
15 min group	13.7 (5.2)
20 min group	15.3 (4.8)
At fifteen minutes of application	
10 min group	-
15 min group	11.3 (4.5)
20 min group	13.7 (5.0)
At twenty minutes of application	
10 min group	-
15 min group	-
20 min group	12.6 (4.8)

Note: (n=38)

Table 2 – Sensations reported by the women during cryotherapy, presented by group - São Paulo, 2008

Sensations	Group							
	10 min		15 min		20 min		Total	
	N	%	N	%	N	%	N	%
Cold	10	26.3	14	36.8	18	47.5	42	36.8
Pain relief	10	26.3	10	26.3	7	18.4	27	23.7
Numbness	3	7.9	2	5.3	10	26.3	15	13.2
Burning at the beginning	7	18.4	4	10.5	-	-	11	9.6
Warmth at the beginning	6	15.8	3	7.9	1	2.6	10	8.8
Anesthesia	2	5.3	4	10.5	1	2.6	7	6.1
Nothing	-	-	1	2.6	1	2.6	2	1.8
Total	38	100	38	100	38	100	114	100

DISCUSSION

In the current study, we applied an ice pack for 10, 15 or 20 minutes. We observed that perineal temperature reduction was quicker and more progressive in the first 10 minutes after starting cryotherapy (approximately 18°C); thereafter, the temperature variation was smaller. In another clinical trial in which crushed ice was applied for 20 minutes, the results showed a lower decrease in temperature in the first 10 minutes (mean 11.1°C) and a smaller temperature reduction 10 minutes after this period (approximately 2.9°C)⁽¹⁵⁾.

When assessing the effectiveness of cooling, the presence of a barrier between the skin and the cooling modality should be considered; if the cooling mode is wrapped in a cloth, the skin temperature will decrease quickly between approximately 8 and 10 minutes after starting the application. Conversely, if the cooling mode is in direct contact with the skin, the cooling will be faster and will occur in approximately 5 minutes. However, regardless of the presence of the barrier, the surface temperature of the tissue generally does not change much between 5-10 minutes and 20 minutes because the tissue temperature reduction is not constant. Initially, the temperature decreases quickly; after the initial decrease, the decline slows until the temperature is stabilized^(5,7,9,16-17). Therefore, although a longer exposure to cooling potentiates heat removal from the body, the temperature decrease appears to be limited to a period in which the heat transfer from the skin to the cryotherapy modality occurs until both temperatures reach equilibrium⁽²⁾.

Analgesia is one of the advantages of cooling, and changes in the conduction velocity of sensory fibers can explain this effect. When skin temperature is reduced by 18.2°C to 27.6°C, the conduction velocity of the sensory nerves decreases by 31.9% to 41.8%⁽¹⁰⁾. Thus, the perineal temperature reduction achieved in this study of between 17.8°C and 20.3°C after cooling for 10 to 20 minutes may

decrease the local nervous conduction velocity. The analgesic effect is achieved when the skin temperature is between 10°C and 15°C⁽¹¹⁾.

This study verified that a five-minute application of ice packs was insufficient to decrease the perineal temperature to the recommended levels for relieving pain. However, starting at 10 minutes, the perineal temperature was between 10°C and 15°C; this temperature was maintained until the end of the 15- and 20-minute applications.

The Cochrane Library systematic review regarding cryotherapy in obstetric practice demonstrated the effectiveness of cold applications in the treatment of perineal pain in the first three days after birth compared to women who did not receive treatment⁽¹⁾. However, studies⁽¹⁸⁻¹⁹⁾ on this topic did not mention the perineal temperature before and after applying the cold; consequently, a comparison of the results of the previous studies with the results of this study is limited.

Only one study evaluated perineal temperature before and after cooling and showed that local temperature dropped from 34.5°C to 20.4°C after 10 minutes. This variation is smaller than the difference observed in our study, in which the mean temperature between 31.1°C and 32.7°C before application decreased to 13.3°C and 12.6°C for women who underwent cryotherapy for 10 and 20 minutes, respectively. In both studies, the initial perineal temperature was lower than the basal body temperature (36.1°C - 37.1°C)⁽¹⁾.

Body heat results from cellular metabolism, and deep tissue temperature is higher than skin temperature. The core temperature is more constant, while in the skin, the temperature changes according to the ambient temperature. When a body is exposed to extremely cold ambient temperatures, the skin temperature can drop to less than 36.6°C⁽²⁰⁾.

A clinical trial⁽¹⁷⁾ examining three methods of cryotherapy in non-pregnant women found a lower mean temperature on the thigh (28.9°C) than in the axilla (36.4°C).

Sports medicine and rehabilitation studies^(5-6,9,16) also observed thigh and ankle temperatures (28.8°C to 32.1°C) that were lower than normal body temperature. Conversely, another clinical trial demonstrated that the gastrocnemius temperature (34°C–36°C) was similar to basal body temperature⁽⁷⁾.

Tissue injury resulting from cryotherapy is rare and is related to factors such as temperature, time of application, the body part exposed to the cold and the cooling modality. Most cryotherapy techniques currently used are not able to cause tissue damage, except when the cold is applied directly and continuously to the skin for more than one hour and is associated with pressure⁽²⁾. Intermittently applying ice covered by a barrier for 10 minutes can prevent possible tissue injury⁽¹¹⁾.

No perineal injury was observed after applying ice for 10, 15 and 20 minutes in this study. However, we did not assess long-term treatment effects, such as the impact on perineal healing. The institution where the data were collected does not provide a return visit, making it difficult to access the women after discharge.

Clinical trials included in the systematic review of the Cochrane Library involved cryotherapy for 10 to 20 minutes. No perineal lesions were identified due to cooling; however, the reviewers highlighted that further investigations assessing the potential adverse effects of cooling should be performed⁽¹⁾.

Avoiding damage from ice applications is important. Moreover, cryotherapy may be uncomfortable; some authors report that the sensation of pain is reported immediately⁽²⁾, although this sensation decreases during the course of therapy⁽²¹⁾. Sensations of cold, burning, itching and numbness were reported in another study⁽¹⁷⁾.

These reported sensations manifested progressively, starting with cold, followed by pain, tingling and numbness. The mechanisms that trigger these sensations are not clear. We know that these sensations manifest more strongly and earlier after colder and longer exposure to cooling⁽²⁾ and with greater variations in the temperature of the tissue⁽¹⁷⁾.

Recent research demonstrated that 5 minutes after the application of ice packs, the thigh temperature reached 13.8°C. At this temperature, sensations of cold and stabbing were reported. At 10 minutes of application, the temperature reached 9°C, and there were reports of numbness in addition to the previous complaints. After 15 minutes, the temperature of the thigh was 7.8°C, and the first complaint of anesthesia was reported (1/11, 9.1%). After 20 minutes of cryotherapy, the temperature reached 6.5°C, and more of the subjects reported anesthesia (7/11, 63.6%)⁽¹⁷⁾.

The results of the current study were similar to those in this previous report. Postpartum women also experienced sensations of cold, numbness and pain relief after ice was applied for 10 minutes, while women who underwent cryotherapy for 15 and 20 minutes reported numbness and anesthesia⁽¹⁷⁾.

Local cooling is a well-accepted therapy method for women⁽²²⁾, although this approach causes discomfort. A low ambient temperature, the cooling technique and other factors can increase the discomfort and cause women to refuse this treatment. Therefore, choosing the method and time of application that causes less discomfort is important to increase the acceptance and use of this method.

Brazilian women reported that applying ice packs for 20 minutes to the perineum was comfortable (95.8%). Most of the women surveyed were satisfied with the treatment (87.5%) and reported that they would use cryotherapy again (95.8%)⁽¹⁵⁾. Australian research concluded that applying ice was extremely effective for 15.6% of women, quite effective

for 43% of women and ineffective for 32.8% of the women included in the study⁽³⁾. Moreover, frozen gel pads appeared to be the modality of cooling preferred by women⁽¹⁸⁻¹⁹⁾, while cold sitz baths were less accepted⁽²²⁾.

Methods of cryotherapy that change from liquid to solid are most effective to reduce the perineal temperature as these substances absorb body heat to change from solid to liquid and consequently increase in temperature⁽²⁾.

Ice was significantly more effective at reducing the skin surface temperature, heat transfer and low temperature maintenance^(9,16) than other types of cryotherapy (frozen peas and frozen gel)⁽²⁰⁾. Other studies have demonstrated that frozen gel reduces tissue temperature⁽¹⁷⁾ and alleviates pain more effectively⁽²³⁾. However, ice bags are more accessible

and less expensive than gel pads, so ice packs may be a more feasible approach, especially in developing countries.

CONCLUSION

These findings suggest that applying an ice pack for 10, 15 or 20 minutes cools the perineal region to temperatures between 10°C and 15°C, which is the tissue temperature range recommended for analgesia. Therefore, these findings provide data to guide decision making about the length of perineal cryotherapy treatment during the postpartum period.

Further research should investigate the impact and possible deleterious effects in the short and long term of each session in multiple applications and assess the time of maintenance of cooling according to the time length of the session.

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