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## Warm perineal compresses during the second stage of labor for reducing perineal trauma: A meta-analysis



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### ABSTRACT

**Objective:** Perineal trauma may have a negative impact on women's lives as it has been associated with perineal pain, urinary incontinence and sexual dysfunction. The aim of this systematic review and meta-analysis of randomized controlled trials was to evaluate the effectiveness of warm compresses during the second stage of labor in reducing perineal trauma.

**Methods:** Electronic databases were searched from inception of each database to May 2019. Inclusion criteria were randomized trials comparing warm compresses (i.e. intervention group) with no warm compresses (i.e. control group) during the second stage of labor. Types of participants included pregnant women planning to have a spontaneous vaginal birth at term with a singleton in a cephalic presentation. The primary outcome was the incidence of intact perineum. Meta-analysis was performed using the Cochrane Collaboration methodology with results being reported as relative risk (RR) with 95% confidence interval (CI).

**Results:** Seven trials, including 2103 participants, were included in this meta-analysis. Women assigned to the intervention group received warm compresses made from clean washcloths or perineal pads immersed in warm tap water. These were held against the woman's perineum during and in between pushes in second stage. Warm compresses usually started when the baby's head began to distend the perineum or when there was active fetal descent in the second stage of labor. We found a higher rate of intact perineum in the intervention group compared to the control group (22.4% vs 15.4%; RR 1.46, 95% CI 1.22 to 1.74); a lower rate of third degree tears (1.9% vs 5.0%; RR 0.38, 95% CI 0.22 to 0.64), fourth degree tears (0.0% vs 0.9%; RR 0.11, 95% CI 0.01 to 0.86) third and fourth degree tears combined (1.9% vs 5.8%; RR 0.34, 95% CI 0.20 to 0.56) and episiotomy (10.4% vs 17.1%; RR 0.61, 95% CI 0.51 to 0.74).

**Conclusion:** Warm compresses applied during the second stage of labor increase the incidence of intact perineum and lower the risk of episiotomy and severe perineal trauma.

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### Introduction

The incidence of perineal trauma after vaginal birth can vary considerably, with between 53–79% of women experiencing some

type of perineal trauma [1]. Most are first and second-degree tears, whereas around 3.3% of women have a third-degree tear and about 1.1% have a fourth degree tear [2]. Severe perineal tears, though uncommon, may have a negative impact in a woman's life as they have been associated with perineal pain, urinary and fecal incontinence and sexual dysfunction [1,2]. Prevention of perineal trauma, and third and fourth-degree lacerations in particular is therefore essential [1–19]. Different techniques have been reported to prevent perineal lacerations, including perineal

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massage [3], hands-on technique [4], Ritgen's maneuver [5], use of lubricant gel [6] and warm compresses [7,2–19].

### Objective

The aim of this systematic review and meta-analysis of randomized clinical trials (RCTs) was to evaluate the effectiveness of warm compresses during the second stage of labor in reducing perineal trauma.

### Methods

#### Eligibility criteria, information sources, search strategy

This review was performed according to a protocol designed a priori and recommended for systematic reviews of interventions [20]. Electronic databases (i.e. MEDLINE, Scopus, ClinicalTrials.gov, EMBASE, Sciencedirect, the Cochrane Library at the CENTRAL Register of Controlled Trials, Scielo) were searched from inception of each database to May 2019. Search terms used were the following text words: “cesarean,” OR “caesarean,” OR “warm compression,” OR “warm packs,” OR “warm compresses,” OR “second stage,” OR “labor,” OR “labour,” OR “vaginal delivery,” OR “perineum,” OR “perineal,” OR “episiotomy,” OR “perineal trauma,” OR “perineal lacerations,” OR “perineal tears,” OR “postpartum pain,” OR “meta-analysis,” OR “meta-analysis,” OR “review,” AND “randomized,” OR “randomised,” OR “clinical trial.” No restrictions for language or geographic location were applied. In addition, the reference lists of all identified articles were examined to identify studies not captured by electronic searches. The electronic search and the eligibility of the studies were independently assessed by three authors (GM, GS, CT). Disagreement was resolved by discussion with a forth reviewer (HD).

#### Study selection

We included all RCTs comparing warm compression (i.e. intervention group) with no warm compresses (i.e. control group) during the second stage of labor. Warm compress was defined as a moist warm cloth or pad. Types of participants included pregnant women planning to have a spontaneous vaginal birth at term with a singleton fetus with a cephalic presentation. Application of warm gel pads were excluded. Other perineal techniques, e.g. perineal massage, flexion technique, Ritgen's maneuver, hands-on or hands-poised were not included in this meta-analysis. Quasi randomized trials were also excluded.

#### Data extraction and risk of bias assessment

The risk of bias in each included study was assessed by using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions*. Seven domains related to risk of bias were assessed in each included trial since there is evidence that these issues are associated with biased estimates of treatment effect: 1) random sequence generation; 2) allocation concealment; 3) blinding of participants and personnel; 4) blinding of outcome assessment; 5) incomplete outcome data; 6) selective reporting; and 7) other bias. Review of authors' judgments were categorized as “low risk”, “high risk” or “unclear risk” of bias.<sup>20</sup> Only two trials were at low risk of bias (Figs. 2 and 3).

#### Primary and secondary outcomes

Analysis were done using an intention-to-treat approach. The primary outcome was the rate of intact perineum (defined as no lacerations and no episiotomy). The secondary outcomes were perineal trauma not requiring suturing, perineal trauma requiring

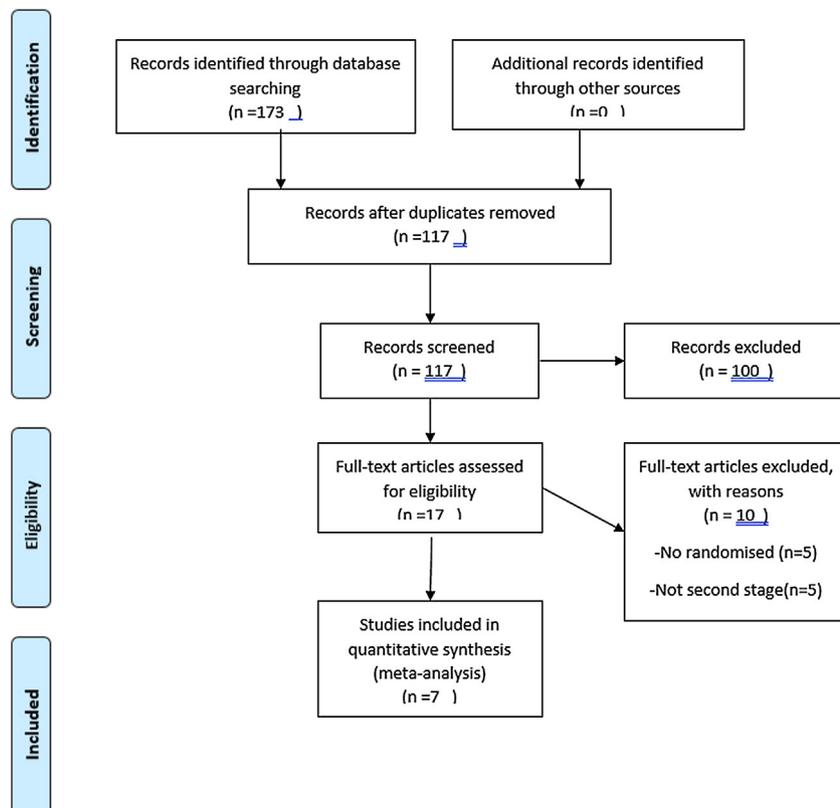


Fig. 1. Study flow chart.

suturing, first- second- third- fourth-degree perineal lacerations and third and fourth degree lacerations combine, incidence of episiotomy

Three authors (GM, GS, CT) independently assessed inclusion criteria, risk of bias and data extraction. Disagreement was resolved by discussion with forth reviewer (VB).

### Statistical analysis

The data analysis was completed independently by two authors (GS and CT) using Review Manager v. 5.3 (The Nordic Cochrane Centre, Cochrane Collaboration, 2014, Copenhagen, Denmark). The completed analyses were then compared, and any difference was resolved by discussion. The summary measures were reported as summary relative risk (RR) or as summary mean difference (MD) with 95% of confidence interval (CI) using the random effects model of DerSimonian and Laird. I-squared (Higgins  $I^2$ ) was used to identify heterogeneity.

The review was reported following the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA)

statement [21]. Before data extraction, the review was registered with the PROSPERO International Prospective Register of Systematic Reviews (registration No.: CRD42018100564).

## Results

### Study selection

Seven trials, including 2103 participants [7,8,10,16–19], met the inclusion criteria for this meta-analysis, (Fig. 1, Table 1). Most studies had a low risk of bias in selective reporting and incomplete outcome data according to the Cochrane Collaboration's tool. No study was double blinded because this was deemed difficult methodologically given the intervention. One trial blinded the assessor for the perineal trauma (Fig. 2). Statistical heterogeneity within the trials ranged from low to high with an  $I^2 = 87%$  for the primary outcome.

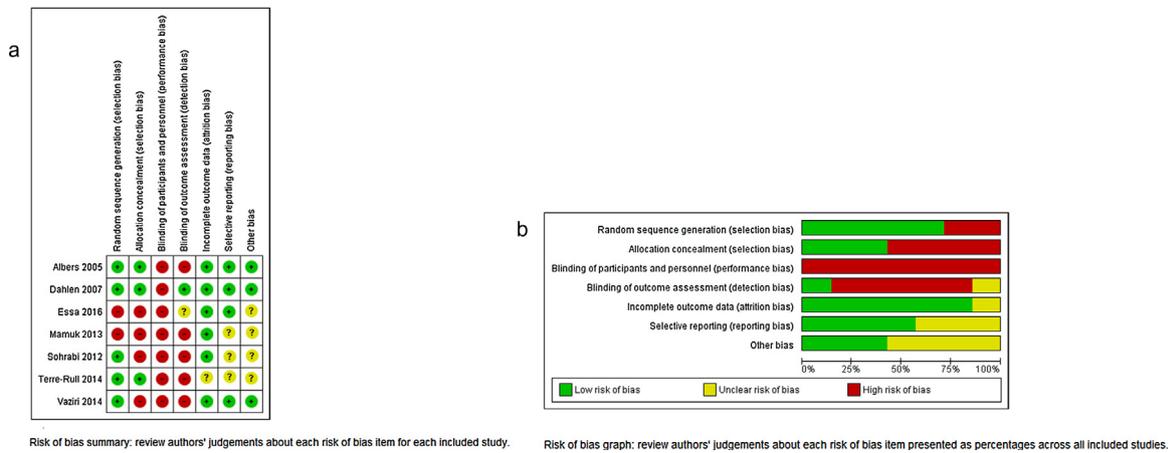
All trials included pregnant women planning to have a spontaneous vaginal birth at term with a singleton in a cephalic presentation. Women assigned to the intervention group received

**Table 1**  
Characteristics of the included trials.

|   | Albers 2005  | Dahlen 2007   | Sohrabi 2012   | Mamuk 2013   | Vaziri 2014  | Terré-Rull 2014                                      | Essa 2016  |
|---|--|---|--|--|--|--|--|
| Study location  | New Mexico, USA  | Sydney, Australia   | Iran   | Turkey   | Shiraz, Iran   | Barcelona, Spain                                     | Damanhour, Egypt   |
| Singleton   | Yes  | Yes   | Yes  | Yes  | Yes  | Yes  | Yes  |
| Cephalic presentation   | Yes  | Yes   | Yes  | Yes  | Yes  | Yes  | Yes  |
| Gestation at enrollment (weeks)                                     | At term  | At least 36 weeks   | NR   | Between 37 and 42 weeks  | Between 37 and 42 weeks  | NR   | At term  |
| Maternal age (range in years)                                       | Older than 18 years  | Older than 16 years   | 18- 35 years   | NR   | 18-35 years  | Older than 18 years                                  | 18 to 35 years   |
| Other inclusion criteria  | Healthy  | Anticipated a normal birth  | Live fetus, no underlying maternal disease estimated fetal weight < 4000 g | Previous vaginal delivery, estimated fetal weight of 2500–4000 g | Live fetus, Hemoglobin level $\geq 11$ mg/dl   | Low or medium risk, spontaneous delivery             | Normal pregnancy, no perineal massage previous             |
| Sample size*  | 808 (404 vs 404)   | 717 (360 vs 357)  | 76 (38 vs 38)  | 60 (30 vs 30)  | 150 (75 vs 75)   | 132 (66 vs 66)                                       | 160 (80 vs 80)   |
| Primary outcome   | Intact perineum  | Need for suturing   | Perineal lacerations and need for repair                                   | NR   | Pain severity and onset of sexual activity   | Need for suturing                                    | Perineal trauma and need to repair                         |
| Intervention group  | Warm compresses  | Warm compresses   | Warm compresses and Ritgen's maneuver                                      | Warm compresses  | Warm compresses  | Warm compresses                                      | Warm compresses  |
| Control group   | Hands off  | Standard care   | Ritgen's maneuver  | Standard care  | Standard care  | Standard care  | Standard care  |
| Time to start warm packs  | Active fetal descent or when the fetal head was visible with a uterine contraction | When the fetal head began to distend the perineum and the patient was aware of a stretching sensation | NR   | Second stage of labor  | Second stage of labor  | Second stage of labor                                | Second stage of labor                                      |
| Time compresses were held to perineum (before put again into water) | Applied continuously as possible until crowning, during and between pushing        | Applied during contractions, until delivery   | During and after pushing   | NR   | Between and during contractions, for at least 15 minutes and a maximum of 20 minutes | For at least 10 minutes, and a maximum of 30 minutes | During each contraction                                    |
| Water temperature of the jug  | NR   | 45°-59 °C   | NR   | 60-70 °C   | 70 °C  | 45 °C  | 45°-59 °C  |
| Time to keep compresses in warm water                               | NR   | Between contractions  | During and after pushing   | 10-15 minutes  | 12 minutes   | NR   | Between contractions                                       |
| How often to replace water in the jug                               | NR   | Every 15 minutes until delivery or if the temperature dropped below 45 °C                             | NR   | NR   | NR   | NR   | Every 15 minutes or if the temperature dropped below 45 °C |

NR, not reported.

\* Total number (number in the intervention group vs number in the control group).



**Fig. 2.** Assessment of risk of bias. (A) Summary of risk of bias for each trial; Plus sign: low risk of bias; minus sign: high risk of bias; question mark: unclear risk of bias. (B) Risk of bias graph about each risk of bias item presented as percentages across all included studies.

warm compresses made from clean washcloths or perineal pads immersed in warm tap water. In one of the trials a moist warm and dry warm compress were used (only data for the moist pack was analyzed). Compresses were held against the patient’s perineum during second stage of labor and changed as needed to maintain warmth and cleanliness. Warm compresses usually started when the baby’s head began to distend the perineum or when there was active fetal descent in the second stage of labor (Table 1).

**Synthesis of results**

Primary and secondary outcomes were reported in Table 2. We found a higher rate of intact perineum in the intervention group compared to the control group (22.4% vs 15.4%; RR 1.46, 95% CI 1.22–1.74; Fig. 3); a higher rate of perineal trauma not requiring suturing (54.1% vs 47.1%; RR 1.15, 95% CI 1.07–1.24; Fig. 4); no

difference in first degree (24.8% vs 21.4%; RR 1.22, 95% CI 0.93–1.60) or second degree tears (25.2% vs 25.3%; RR 1.00, 95% CI 0.86–1.15); a lower rate of third degree tears (1.9% vs 5.0%; RR 0.38, 95% CI 0.22 to 0.64), fourth degree tears (0.0% vs 0.9%; RR 0.11, 95% CI 0.0 to –0.86), third and fourth degree tears combined (1.9% vs 5.8%; RR 0.34, 95% CI 0.20 to 0.56) and episiotomy (10.4% vs 17.1%; RR 0.61, 95% CI 0.51 to 0.74).

**Discussion**

**Main findings**

Our review of seven RCTs (n=2103) showed that warm compresses used in the second stage of labor was associated with an higher rate of intact perineum, and lower rate of perineal trauma not requiring suturing, and of episiotomy.

**Table 2**  
Perineal outcomes.

|  | Albers 2005                       | Dahlen 2007                        | Sohrabi 2012                  | Mamuck 2013                  | Vaziri 2014                   | Terré-Rull 2014               | Essa 2016                      | Total                               | RR or MD (95% CI)   |
|--|-----------------------------------|------------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------------|---------------------|
| Intact perineum                                | 94/404(23.3%) vs 90/404 (22.2%)   | 13/360(3.6%) vs 17/357(4.8%)       | 21/38(55.3%) vs 16/38 (42.1%) | 13/30(43.3%) vs 7/30 (23.3%) | 29/75(38.7%) vs 5/75(6.7%)    | 16/66(24.2%) vs 25/66 (37.9%) | 50/80 (62.5%) vs 2/80(2.5%)    | 236/1053(22.4%) vs 162/1050 (15.4%) | 1.46 (1.22 to 1.74) |
| Perineal trauma not requiring suturing         | 321/404(79.5%) vs 316/404 (78.2%) | 77/360(18.7%) vs 73/357 (18.6%)    | 14/38(39.5%) vs 17/38 (44.7%) | NR                           | NR                            | 47/66(71.2%) vs 37/66 (56.1%) | NR                             | 513/948(54.1%) vs 445/945 (47.1%)   | 1.15 (1.07 to 1.24) |
| Perineal trauma requiring suturing             | 83/404(20.5%) vs 88/404 (21.8%)   | 283/360(78.6%) vs 284/357 (79.6%)  | 24/38(63.2%) vs 21/38 (55.3%) | NR                           | NR                            | 19/66(28.8%) vs 29/66 (43.9%) | 26/80 (32.5%) vs 78/80 (97.5%) | 435/948(45.9%) vs 500/945 (52.9%)   | 0.87 (0.80 to 0.94) |
| First degree                                   | 97/404(24.1%) vs 89/404 (22.0%)   | NR                                 | 12/38(31.6%) vs 18/38 (47.4%) | NR                           | NR                            | 31/66(47.0%) vs 12/66 (18.2%) | 2/80 (2.5%) vs 0/80 (0%)       | 153/618(24.8%) vs 132/618 (21.4%)   | 1.22 (0.93 to 1.60) |
| Second degree                                  | 70/404(17.3%) vs 74/404 (18.3%)   | 150/360 (41.7%) vs 136/357 (37.8%) | 5/38(13.2%) vs 4/38 (10.5%)   | NR                           | NR                            | 14/66(21.2%) vs 16/66 (24.2%) | 0/80 (0%) vs 9/80 (11.3%)      | 239/948(25.2%) vs 239/945 (25.3%)   | 1.00 (0.86 to 1.15) |
| Third degree                                   | 3/404(0.7%) vs 2/404(0.5%)        | 15/360 (4.2%) vs 31/357 (8.7%)     | 0/38(0%) vs 0/38(0%)          | NR                           | NR                            | 0/66(0%) vs 2/66(3.0%)        | 0/80 (0%) vs 12/80 (15.0%)     | 18/948(1.9%) vs 47/945(5.0%)        | 0.38 (0.22 to 0.64) |
| Fourth degree                                  | 0/404(0.0%) vs 4/404(1.0%)        | 0/360(0.0%) vs 0/357(0.0%)         | 0/38(0.0%) vs 0/38(0.0%)      | NR                           | NR                            | 0/66(0.0%) vs 0/66(0.0%)      | 0/80 (0.0%) vs 4/80 (5.0%)     | 0/882(0.0%) vs 8/879(0.9%)          | 0.11 (0.01 to 0.86) |
| Severe perineal trauma (third & fourth degree) | 3/404(0.7%) vs 6/404(1.5%)        | 15/360(4.2%) vs 31/357(8.3%)       | 0/38(0%) vs 0/38(0%)          | NR                           | NR                            | 0/66(0%) vs 2/66(3.0%)        | 0/80 (0%) vs 16/80 (20%)       | 18/948(1.9%) vs 55/945(5.8%)        | 0.34 (0.20 to 0.56) |
| Episiotomy                                     | 1/404(0.3%) vs 2/404(0.5%)        | 39/360(10.8%) vs 41/357(11.5%)     | 0/38(0%) vs 0/38(0%)          | 0/30(0%) vs 7/30(23.3%)      | 39/75(52.0%) vs 68/75 (90.7%) | 5/66(7.6%) vs 11/66(16.7%)    | 26/80 (32.5%) vs 50/80 (62.5%) | 110/1053(10.4%) vs 179/1050 (17.1%) | 0.61 (0.51 to 0.74) |

NR, not reported; RR, relative risk; CI, confidence interval. Data are presented as numbers in the intervention group vs numbers in the control group with percentages. \*Detected at the 6 weeks postpartum office visit, including continued perineal pain, faulty healing or anatomic abnormality.

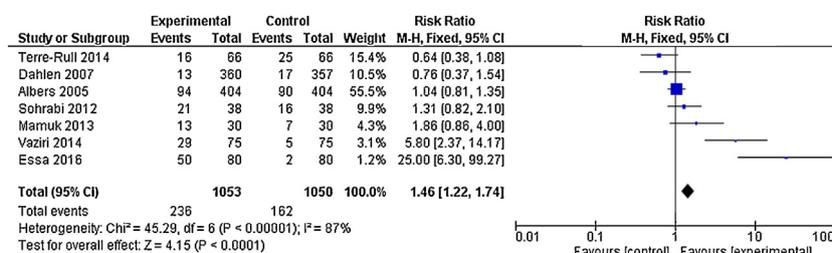


Fig. 3. Forest plot for intact perineum.

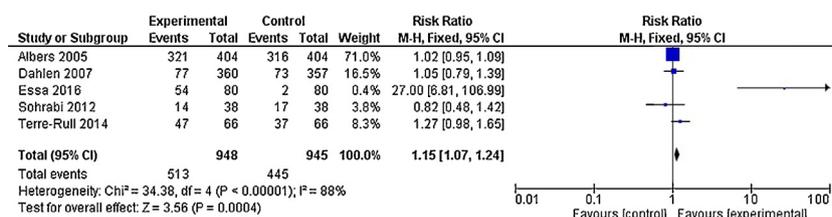


Fig. 4. Forest plot for perineal trauma not requiring suturing.

The study was limited by the low number of the included women, variations in temperature of the water, timing and length of application and variations in technique used in second stage management (i.e. Ritgens Maneuver). The temperature of the water used was of particular concern as some studies reported temperatures of up to 70 °C. There was also inconsistency in when and for how long the warm packs were applied, with some just applied when the fetal head distended the perineum and others applied as soon as second stage commenced. Only one study [8] followed women up postnatally to three months following birth.

### Implications

More than half of pregnant women experience perineal trauma during a vaginal birth. Perineal trauma can vary from minor to major perineal lacerations, with an incidence of third and fourth degree lacerations of 3.3% and 1.1% respectively [22,23]. It is important to prevent severe perineal trauma in order to reduce blood loss, perineal pain, as well as urinary, bowel and sexual dysfunction. In this meta-analysis we evaluated the efficacy of warm compresses during the second stage of labor. Heat can produce some positive therapeutic effects leading to dilatation of blood vessels and an increase of blood flow. Muscle spasm or tension produces local ischemia; however, increased blood flow can reduce the level of nociceptive stimulation and increase the clearance of inflammatory mediators [10].

The American College of Obstetricians and Gynecologists (ACOG) recommends using warm compresses during the second stage of labor due to a meta-analysis of four studies that found significantly reduced third-degree and fourth-degree lacerations [1]. A recent Cochrane review in 2017 reported no difference in terms of intact perineum, perineal trauma not requiring suturing or requiring suturing, first degree and second degree tears, but a significant reduction in the number of third and fourth-degree lacerations [22]. With the inclusion of three more trials in our review we showed a shift occurring in the efficacy of warm compresses.

### Conclusions

In conclusion, warm compresses applied during the second stage of labor increase the incidence of intact perineum and lower

the risk of episiotomy and severe perineal trauma. More research is needed into the optimal temperature of the water and length of time of application. Further research is needed to determine if perineal warm compresses reduce urinary incontinence following the birth.

### Disclosure

Dahlen authored one of the papers included in the review

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